IFAD
Investing in rural people

Cambodia

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Main report and annexes

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

Map of the Project Area



The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.

Map compiled by IFAD | 07-11-2024

In line with IFAD mainstreaming commitments, the project has been validated as:

☐ Be gender transformative ☐ Be youth sensitive ☐ Be nutrition sensitive ☐ Prioritize persons with disabilities ☐ Prioritize indigenous peoples ☑ Include climate finance ☑ Build adaptive capacity

Executive Summary

This project is following the OPR procedures on Green Climate Fund (GCF) Cofinanced Projects (Annex XVII of the Project Design Guidelines).

GCF templates are being used accompanied by IFAD-specific Decision Memo (DM for Cofinancing GCF Projects). Please refer to the annexes for the full list of GCF-IFAD documents.

Chapter 1: Context

1.1 Project in brief

1. Please refer to the annexes.

1.2 National or Regional Context

2. Please refer to the annexes.

1.3 Strategic Alignment

3. Please refer to the annexes.

1.4 Portfolio and Lessons Learned

4. Please refer to the annexes.

1.5 Rationale and IFAD's comparative advantage

5. Please refer to the annexes.

Chapter 2: Project/Programme Description

2.1 Theory of Change

6. Please refer to the annexes.

2.2 Targeting Strategy

7. Please refer to the annexes.

2.3 Project/Programme Objectives

8. Please refer to the annexes.

2.4 Component, Sub-component and Activities

9. Please refer to the annexes.

2.5 Sustainability, Scaling Up and Exit Strategy

10. Please refer to the annexes.

2.6 Project financing

11. Please refer to the annexes.

2.7 Economic and Financial Analysis

12. Please refer to the annexes.

Chapter 3: Organisation and Management

3.1 Organisational set-up and Governance

13. Please refer to the annexes.

3.2 IFAD Supervision

14. Please refer to the annexes.

3.3 Planning, Monitoring and Evaluation

15. Please refer to the annexes.

3.4 Knowledge Management and Country Level Policy Engagement (CLPE)

16. Please refer to the annexes.

3.5 Target group engagement

17. Please refer to the annexes.

3.6 Strategic partnerships

18. Please refer to the annexes.

3.7 Financial Management

19. **1. Summary.** FM capacity and risk assessments have been completed per FMD guidelines; the assessment was made during the meetings with MOWRAM and NCCD ministry officials in January 2023. The overall FM risk at design is rated "Substantial" because of the risks at the entity and project control levels. The risk assessment takes into account the policy specifically designed for externally funded projects (SOP) that prove to be successful on other IFAD-funded projects; MOWRAM and NCCD already have experienced staff for implementation of donor funded projects with available computerized accounting software. . However, additional consultants will be required as government staff to be seconded will not have sufficient time to handle all FM aspects of the project and accounting software will need to be customized.

20. The Executing Entity (EE) for the project will be the Ministry of Water Resources and Meteorology (MOWRAM) which is responsible for sustainable water resource management and irrigation in Cambodia. MOWRAM will establish a Project Management Unit for the coordination of all components and consolidation of the project planning and reporting. In addition, the National Committee for Sub-National Democratic Development Secretariat (NCDD-S) will be responsible for the implementation of component 1 which is designed to improve farmlevel climate adaptation and resilience. The NCDD-S is a Direct Access Accredited Entity to the GCF and will have a
Project Implementation Unit (PIU) for implementing the component 1 activities. The FM operation is managed with the partial use of country PFM, especially the seconded staff for key positions and Standard Operating Procedures (SOP) on Financial Management of the externally financed project. Project fund flow, budget, accounting system and reporting, and external audit arrangements will not include the use of the Government's internal systems. They will be regulated in accordance with PIM and IFAD's FM requirements. This semi-ring-fencing model will mitigate the weakness of country risk and PFM shortcomings. Both MOWRAM and NCCD have extensive experience in working with international donors. MEF plays an essential role in the oversight and support of the project and effective collaboration with IFAD about project FM function. MOWRAM has no experience working on an IFAD-funded project; however, NCCD was the implanting agency of the ASPIRE project; the start-up training for PMU staff on FM and procurement is critical to ensure sufficient FM capacity.

21. Lesson learned from existing projects: Despite the country's high risk on the corruption perception index, internationally funded projects have been well performing with credit to the strong coordination of MEF, Ministries, and LPAs. The Standard Operating Procedure provides specific guidance on project FM operation.

22. **2. Organization and staffing.** MOWRAM is the Lead Project Agency, and NCCD is an implementing partner; MOWRAM and NCCD already have a finance unit with experience in international donor-funded projects that can support CAISAR. PMU and PIU will be set up for MOWRAM and NCCD with a combination of seconded staff and contract staff. The seconded Finance Officer will oversee the project's financial management to ensure the effective FM system and internal control are maintained in accordance with the procedures in SOP and PIM. The seconded Finance Officer will have relevant experience working on other internationally funded projects. The contract Finance staff will be hired to support project FM functions daily including: a) Ensuring sufficient supporting documentation and approvals for payment; b) Posting transactions to the accounting software; c) Providing periodical and financial reports to the management; d) submitting of IFR and WA to IFAD, providing other support to Seconded Finance Officer as required. The Finance staff will be recruited with relevant experience and qualifications. FM

functions will have clear roles and responsibilities to ensure the segregation of duty and payment authorization in accordance with SOP and PIM.

23. IFAD start-up training will be organized after project entry into force, focusing on IFAD financial control and financial management, budget and budget management preparation, disbursement procedures, financial reporting, and auditing.

24. **3. Budgeting.** The project budget is separate from the government budget; however, it will be integrated into the Public Investment Plan; the procedures for budget preparation are described in the SOP, and the AWPB will also include the projection of counterpart contributions. AWPB is subject to approval by MEF before submission to IFAD for no Objection.

25. NCCD-PIU will prepare the AWPB and submit it to MOWRAM-PMU; PMU will consolidate the AWPB and submit it to IFAD for NOL. The AWPB and procurement plan will be prepared in IFAD format with details and a summary of activities and categories.

26. The budget will be monitored in the accounting software. PMU/PIU will ensure to keep track of the progress reports against the budget and provide required information for interim financial reports and annual financial reports.

27. Integration of Project Budgets with PIP and Ministry/Sector Budgets. The Public Investment Program (PIP) is the Government's main mechanism for identifying and listing specific projects and activities to achieve the broader sectoral goals and targets specified in the NSDP. In turn, the Government's Rectangular Strategy and the NSDP are the two main documents that drive the Government's Development Agenda. The PIP is prepared on a three-year rolling program basis and is developed and approved prior to the commencement of the Government's Budget Cycle. For this to occur, the PIP process begins well in advance of the Budget Cycle, as described in the updated Manual on Project Management of the Standard Operating Procedures (SOP).

28. **4. Disbursement Arrangements and Flow of Funds.** The government treasury system is not applied for project fund flow. MEF will authorize the opening of a designated account (DA) in USD at the National Bank of Cambodia for the receipt of Financing from IFAD. There will be two USD project accounts (one for MOWRAM and one for NCCD) which shall be opened at commercial banks for the payment of project activities.

29. One Government Counterpart Fund Account is to be maintained by MEF through which the proceeds of the Financing shall be further transferred to two sub-accounts in commercial banks to receive the counterpart fund from the Counterpart Fund Account.

30. The disbursement of the IFAD fund will follow through the Revolving Fund Mechanism in which the project can withdraw/justify the advance based on the Interim Financial Report (IFR) following the procedures and conditions outlined in FMFCL. IFAD will send the FMFCL to MOWRAM and MEF with guidance on disbursement procedures; MEF will send IFAD the ICP letter providing the delegation and authorization of the persons who can request and approve the submission of IFR and WA in ICP.

31. As the Lead Project Agency, MOWRAM will be responsible for consolidating the IFR from NCCD and submit to MEF for approval via ICP; once MEF approves the WA, it is sent to IFAD for the justification and advance. Funds will be sent from IFAD to DA according to the consolidated cash forecast requested and then from DA to MOWRAM and NCCD project accounts according to the respective cash forecasts for each unit.

32. **5. Internal Controls and Internal audit arrangements.** According to the PEFA for Cambodia, the effectiveness of internal audits was rated C.

33. PMU and PIU will be set up separately from the government system and will follow the internal control procedures from the Government's Standard Operating Procedures (SOP), which is deemed to be effective for internationally funded projects. The SOP articulates the responsibilities and critical elements of internal control, financial delegation, transaction processing, and computerized accounting system controls. PIM and Financial Management Manual will outline key FM arrangements and controls.

34. The Internal Audit Department of MOWRAM and NCCD will conduct the internal audit of PMU and PIU annually to ensure compliance with the internal control procedures; the outcome of the internal audit will be shared with IFAD.

35. **6. Accounting Systems and Financial Reporting Mechanisms.** PMU and PIU accounting procedures will follow Standard Operating Procedures (SOP) for internationally funded projects. According to SOP, CAISAR will apply the Cambodia Public Sector Accounting Standard (cash basis), which is based on the International Public Sector Accounting Standards (IPSAS).

36. Standard accounting software shall be used for PMU/PIU that will be compatible with IFAD and other donor's financial reporting requirements. Standard Government's chart of accounts will be set up in the accounting software to capture all payment transactions; in addition, project components, categories, sources of funds, and other segments will be set up and recorded for the transactions in the software to ensure financial reports and budget reports produced in accordance with IFAD and Government requirements. The details of the accounting process and records are outlined in the SOP. All accounting records are required to be maintained in electronic format for a period of 10 years after project closure.

37. MOWRAM PMU will be responsible for the consolidation of financial reports from NCCD-PIU for each quarter; within 30 days, NCCD PIU will send to MOWRAM PMU the interim financial report (IFR) in the agreed format that will finally be consolidated and submitted to IFAD for justification of advance and requesting new advances.

38. Fixed asset register will be regularly maintained by PMU and PIU and subject to the verification and reconciliation as indicated in section 15 of SOP. Fixed asset register will be part of the audited financial report as required by IFAD.

39. **7. External Audit.** CAISAR project financial statements will be audited by a private audit firm appointed by MEF, with the TOR prepared by MEF taking into account the IFAD requirements. The audit will be conducted in accordance with Cambodian Auditing Standards, which is adapting the International Standards on Auditing. The unaudited annual Financial Statement will be

submitted to IFAD within 4 months after the end of the fiscal year; the audited financial statement will be submitted to IFAD within 6 months after the end of the fiscal year. The management letter with an assessment of the project's internal control matter will be included as an integral part of the audit report.

3.8 Procurement

40. Please refer to the annexes.

3.9 Risks and Risk Management

41. Please refer to the annexes.

3.10 Implementation Readiness

42. Please refer to the annexes.

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Project Design Report

Annex 1: Key Files

Document Date:	28/07/2025
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Asia and the Pacific Division
Programme Management Department

DECISION MEMO

TO: QAG Secretariat

THROUGH: Reehana Raza
Regional Director, APR

FROM: Frew Behabtu
Country Director, APR

DATE: 21 November 2024

SUBJECT: **Memo for cofinancing GCF projects**
Kingdom of Cambodia: Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) **Project ID:** 2000003926

Map of the project area



Introduction

1. The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project is one of the pipeline projects in IFAD's Country Strategic Opportunities Programme (COSOP) 2022-27. The project directly links to COSOP's Strategic Objectives 3 of supporting the development and adoption of low carbon emission, climate resilient and environmentally sustainable agriculture techniques, promote agriculture diversification and climate resilience of poor rural people's economic activities in Cambodia. The project will be one of the pillars of the IFAD programmatic approach through the improvement of farm-level climate resilience and water use efficiency climate-proofing water infrastructure to complement other key pillars of the IFAD country programme: ASPIRE (extension programme), SAAMBAT (market infrastructure, digital technology, and youth programme), AIMS (value chain and market programme), and the IFAD non-sovereign operation facility with AMK micro finance one of the leading private microfinance institutions in the country.
2. The lack of irrigation water is a crucial barrier for farmers; alongside projected increase in dry days and rising temperatures aggravating climate change-induced water shortages which prevent the cultivation of more than a single crop each year. The lack of timely information on droughts and floods (seasonal forecasts, the changing length) is a major problem. Farmers lack the knowledge

and tools to adapt their farming practices and production techniques to climate change; they are largely unaware of climate resilient practices, stress-tolerant seed varieties and improved planting materials, efficient input management, or the benefits of applying these practices. Persistent poverty, limited access to finance, and insufficient institutional capacities have left the rural agrarian population vulnerable to the negative impacts of climate change, economic slowdown, and environmental degradation. The Royal Government of Cambodia (RGC) is committed to the sustainable development of the country's water resources and to strengthening resilience against unexpected shocks, such as those resulting from climate change impacts. Establishing sustainable irrigation is a key priority for Cambodia to alleviate food poverty and ensure economic growth in the face of climate change. The CAISAR project originated from the RGC's National Water Resources Management and Sustainable Irrigation Road Map and Investment Program (2019 -2023). The project will support the implementation of Cambodia's Sustainable Development Goals 2016-2030, the National Strategic Plan on Green Growth 2013-2030, and the Pentagonal Strategy, Phase I, which outlines the government's overarching objectives and provides a roadmap for economic growth, development, and poverty reduction. The project is also strongly aligned with Cambodia's Nationally Determined Contribution (NDC). The project is designed to assist the Ministry of Water Resources and Meteorology (MOWRAM) with its strategic plans to modernize the irrigation sector.

3. The overall goal of the project is to introduce controlled water management in the project areas to make the agriculture in these schemes' climate resilient and sustainable. The specific objective of the project is to modernize the irrigation sector by installing smart irrigation systems, enable farmers to adapt agricultural technologies to mitigate climate risks through use of energy and water efficient technologies, timely weather information and improved market integration and by introducing flood control facilities to prevent flooding of the downstream ends of the 6 selected irrigation schemes. CAISAR's Theory of Change is premised on the experience that addressing the complex impacts of climate change on rain-fed and irrigated agriculture requires action at three levels; farm level; irrigation scheme level and at the national level by creating a strong institutional base and an enabling environment.

4. The project's objective will be achieved by implementing three components that aim at addressing climate change vulnerabilities, increasing agriculture productivity, and developing institutional capacities. The components include Component 1: Farm-level climate adaptation and resilience which focuses on building climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. Component 2: Upgrading and climate-proofing of water infrastructure for increased resilience which will focus on rehabilitating and modernizing of irrigation and flood protection/drainage infrastructure in the 6 sub-projects, including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions. And Component 3: Strengthened institutional and regulatory capacity for low-emission climate-resilient development pathways which aims to strengthen Government institutions, mainly the MOWRAM, MoE the NCDD-S and the FWUCs. The focus for MOWRAM will be on upgrading technical capacity in various aspects of Climate Resilient irrigation design and management. The key focus area under NCDD-S will be on climate resilient crop production. For MoE the emphasis will be on strengthening climate policies and strategies and in building capacities for monitoring climate actions at national level. This component will have three sub-components.

5. The project was initiated by the Asian Infrastructure Investment Bank (AIIB) and the Royal Government of Cambodia (RGC) and later tasked IFAD (as GCF Accredited Entity) to take lead in the preparation and the submission of the GCF funding proposal for additional resource of USD 80 Million. The total funding proposal is USD 240 Million (USD 100M from AIIB, USD 80M from GCF, USD 45M from IFAD- (USD 20M PBAS, USD 25M Financing Gap, and USD 15M from the RGC). The project will be implemented through the Ministry of Water Resources and Meteorology (MOWRAM) as Executing Agency and the national Direct Access Entity (DAE) –the National Committee for Sub-National Democratic Development Secretariat (NCDD-S) as an Implementing Agency.

Rationale for IFAD's Engagement in Co-financing and IFAD's Value Added

6. IFAD has been long engaged in Cambodia in areas of agriculture innovation and changes through various projects and program's focusing on poverty reduction and more recently on climate change impacts. To date IFAD, under the new COSOP 2022-27, has supported 4 investment projects and

pipeline, CAISAR, for a total project cost of US$ 700 million with financial contribution of US$ 218 million from IFAD and US$ 482 million in co-financing. With IFAD, Cambodia has previously mobilized climate and environment financing from the GEF (GEF6 S-RET) and through IFADs ASAP1 programme (ASPIRE). Recently additional GEF project, Climate Resilience Enhancement for Building Adaptive Capacity in Agri-Value Chais in Cambodia (CREA) was approved that will be implemented through ASPIRE-AT. The portfolio is in a good health, without any chronic problem project.

7. The RGC considers IFAD as one of the key donors and a valuable partner in its development initiative. IFAD has gained trust and confidence of the Government and the farming community. The project will benefit from IFAD's global experience of funding cost effective and people centred programmes. IFAD's comparative advantage lies in its targeting of the poor and vulnerable people and investing to ensure sustainability, climate resilience and inclusive economic progress.

8. Investments in the water sector are one of new pillars of the IFAD programme in order to stabilize and increase agriculture production, reduce farmers' susceptibility to droughts and floods, and ensure food security. Irrigation systems need to be rehabilitated and upgraded to improve their performance and enable multiple cropping of rice while, at the same time, rendering them more resilient to climate change impacts. In addition, given the important role of Farmer Water User Committees (FWUCs) in helping sustain irrigation schemes, it is necessary for IFAD to invest in establishment of efficient and effective FWUCs, through community organization, and provide them with adequate inputs and support, particularly training and capacity building, to ensure that they function well. FWUCs also need to be provided with financial assistance, especially during the initial years of irrigation system operation before irrigation service fees (ISFs) could be fully collected to meet O&M expenses. Policy and legal mechanisms need to be put in place to enable farmers, through the elected FWUCs, to collect water user fees to enable the schemes to be operated and maintained adequately with appropriate incentives.

Lessons Learned

9. While IFAD has not been engaged in irrigation and water sector in Cambodia so far, this project design builds on the lessons learned and experience gained out of implementation of similar projects and programs in the country. In addition, it will incorporate lessons and best practices available globally.

10. Structural transformation of the economy has been accompanied by increasingly market-oriented agriculture. The COSOP 2022-27 highlights lessons learned from IFAD's country programme including the potential for smallholders to successfully compete in the market given appropriate support which includes market-led "extension plus" services, increasing use of mobile applications and a programmatic approach to integrate capacity building with "hard" investments. The Country Strategic Programme Evaluation (CSPE) of 2018 highlighted the need for tailored strategies to support agricultural commercialisation of relatively advanced smallholders and to support the coping strategies of poor households.

11. IFAD's experience in helping smallholders transition to farming as a business highlights the importance of smallholder POs particularly in linking farmers with buyers. More than 1,400 POs mobilised by ASPIRE and AIMS have active contracts with buyers. Lessons from IFAD's Independent Office of Evaluation on value chain programs show that sufficient duration of training of PO is key for them to reach required maturity and sustainability levels. Systemic change requires use of a holistic approach focusing on: (i) social capital and inclusive governance; (ii) production and productivity; and (iii) PO's access to sustainable markets (domestic urban and export) and (iv) viable business model (revenue streams vs costs) and quality financial management. It implies a blend of tailor-made interventions to improve the technical, management and entrepreneurship skills of the smallholders and their apex POs/ACs so that they can borrow, invest in value addition, engage actively with key off-takers, and become recognized business entities within selected pro-poor value chains1. As suggested in PMI toolkit on producer organizations and lessons from several projects, developing and monitoring adapted score cards can help track progress and target required support.

[1] More specifically, the new Agriculture Services Programme for an Inclusive Rural Economy and Agricultural Trade (ASPIRE-AT) currently under design foresees in its exit strategy that "By the end of the project, producer organisations (ACs and Unions of ACs) should be registered as legal entities, have adequate business management capacity and have secure partnerships with agri-businesses and attract credit and investment from financial organizations."

12. To support scalable value chain investment, it is key to develop partnerships with financial institutions and adapt solutions to value chain economic needs.2. IFAD's partnership with AIIB is focused on achieving synergies between their mandates on capital intensive rural infrastructure and our focus on farmers capacity building and small-scale rural infrastructure. Natural hazards such as floods and droughts occur annually. There are annual water shortages because of the climate, topography, limited water storage, and accessibility, especially in the Tonle Sap River basin. During the wet season, extensive flooding and flash floods cause infrastructure damage and waterborne diseases. Climate change is likely to intensify storms and extend the number of consecutive dry days during the wet season and cause hotter days during the dry season. Annual rainfall is projected to increase by 3.6%–4.8% by 2050, whereas the number of wet days is projected to decrease by 3.7%–7.4%.7 This will likely lead to even greater pressure on water supplies during the dry season and flood management during the wet season.

13. The voice and civic engagement of farmers and other rural actors, remains limited in the decision making on the design and implementation of programs for value chain development. Farmer organizations in Cambodia tend to be small, with limited official recognition (unless they are registered as cooperatives) with the local authorities. Nonetheless, they have the potential to play an important role in supporting farmers, to ensure they have a voice in the design and implementation of programs and projects which are designed to improve their livelihoods. Along with their small size, farmer organizations in Cambodia are constrained by their limited human capacity. The main actors supporting farmer organizations in Cambodia are a range of non-governmental organizations that are active at the provincial level to build both their technical and leadership capacity. There is a need to partner with these organizations to ensure farmer organizations can act as an effective voice during the implementation of donor financed rural development program and to ensure that the views of all (regardless of age, gender, and ethnicity) are well represented.

14. Farmers lack also access to on-demand irrigation and adequate water management, which is essential for successful crop diversification and competitiveness improvements. Though overall Cambodia can be classed as having abundant water resources, its availability is highly variable both temporally and spatially. Even during the wet season, there can be long dry spells and supplementary irrigation is required to avoid crop moisture deficits between rainfall events. Most existing irrigation schemes have been developed for rice cultivation and would have to be adapted for diversified cropping with different irrigation methods to be introduced, depending on the crop.

15. One of the main reasons for the agriculture sector's underperformance is poor agricultural production infrastructure, which severely limits cropping intensity and crop diversification. Of the 3.98 million ha of agriculture land, only about 1.30 million ha are located within the command area of 2,480 irrigation systems.5 90% of the systems are underperforming or dysfunctional, mainly because of the lack of (i) proper design; (ii) a farm-level distribution system; and (iii) consideration for crop water requirements, water availability, and hydraulic conditions; (iv) system O&M owing to expensive and unpopular farm-level user fees; (iii) systems developed in regions with suitable soils; (iv) sustainability of many systems over a 10-20 year timeframe; and (v) farm credit, inhibiting the affordability of on-farm irrigation equipment (pumps, fuel) and tertiary access (feeder canal construction). As a result, dry season rice crop only accounted for about 18% of total rice production in Cambodia as farmers only have water for wet season rice and are not willing to invest in higher-value crops due to unreliable water supply.

16. One of the key lessons in Cambodia and globally has been the need to transform irrigation sector from a sectorial approach to that of an integrated approach. In the past, irrigation intervention has been more focused to rehabilitation of dilapidated infrastructures without giving due attention to social and agricultural dimensions. This has led to poor performance of irrigation sector. Learning from this, the proposed project integrates irrigation investment (component 2) with agriculture within broader framework of integrated water resource management. It also considers irrigation system as part of multiple water use systems (environmental, social uses) and technical designs will follow an integrated approach to address needs of different users.

17. Past irrigation and agriculture intervention has largely followed a top-down approach with users at the end of receiving end in Cambodia. This had serious implications for future sustainability of investments. Implementation of this project, in both components, largely follows a participatory

[2] Grow Asia report on inclusive value chain business model, 2020:
http://exchange.growasia.org/system/files/Grow%20Asia%20x%20iBAN%20Knowledge%20Paper_FINAL_0.pdf

approach. It will also invest in strengthening the local institutions like farmers water users' groups, producers' organizations and enhance their capacity in agriculture water management.

18. Future water management in the changing climate context is a complex issue world-wide. Application of evolving tools and technologies including the ICTs in both agriculture and water management has been globally recognized. In water management, water accounting, ET based water management, ICT applications for modernizing water control systems have been widely applied. For flood control and associated risks management, advance technologies including application of RS technologies have been adopted. This however needs new capacities and investments and reforms in policies and institutions. The project design has incorporated most of the evolving technologies and practices as applicable to Cambodian context.

Project Impact Potential

19. The project is expected to lead to (i) improved farm-level climate adaptation, resilience, and water use efficiency; (ii) rehabilitated/upgraded, climate proofed, and modernized irrigation infrastructure for increased resilience and (iii) strengthened institutional and regulatory capacity for low-emission climate-resilient development pathways. Training farmers on climate change adaptation and mitigation, the Project will enhance their knowledge and skills and improve the environment for enhancing climate resiliency in irrigated agriculture. The CAISAR investments are expected to improve yields and provide better drought and flood resilience over the 25-year asset life, with the project expecting significant yield and crop production improvements in all targeted irrigation sub-project areas3. The CAISAR project will be novel in Cambodia, with its focus on reducing the vulnerability of rural populations through the creation of a climate resilient IWRM based project design that incorporates flood protection, sustainable water resource development, climate smart solutions, environmentally aware design and gender equality4. The CAISAR project will promote economic growth and improve the livelihoods of those affected by enhancing agricultural production, reducing farmers' exposure to variability in crop yields, and increasing monthly income for families.

20. The use of innovative climate-smart solutions will reduce the overall climate impact of the scheme and endeavor to reduce the emission of greenhouse gases from the existing and proposed agricultural practices with the introduction of solar pumps and improved water management and agronomic practices in rice cultivation (Land Laser Levelling, Direct seeding, Alternate Wetting and Drying techniques together with improved agronomic practices like IPM). The project will support the RGC's effort to improve and strengthen the disaster resilience of the population of four provinces in Cambodia through improved water information system and agriculture advisory services. Through combining irrigation rehabilitation with climate smart and resilient design, the project will build a low carbon and climate resilient future, enabling rural populations to adequately adapt to current and future climate impacts and increase their food security and livelihoods whilst also enabling the RGC to meet its climate targets.

21. CAISAR is expected to impact 500,000 people directly and 2,300,000 people indirectly. The direct beneficiaries are expected to benefit from adopting improved and climate resilient cropping and diversification patterns, improved access to water, enhanced water governance, greater market integration for improved access to adaptive inputs and early warning systems. The combined impact of these investments will be to enhance water and food security. Improved irrigation infrastructure has the potential to increase Cambodia's potential rice yields. It is expected that changing from rain-fed irrigation or using dilapidated irrigation infrastructure to proper systems for irrigated rice cultivation with improved water management could result in significant production increase. Water security will be enhanced as a result of modernizing the irrigation systems, making them more resilient to climate risks and reducing conveyance losses. The project will enhance water use efficiency for an area of 32,056 ha out of a gross area of 80,000 ha in the target areas during the wet season for the rice crop. From this area, a second irrigated dry season rice crop can be established on 22,051 ha. In the remaining 10,005 Ha a non-rice crop will be established in the dry season, mainly homestead gardening including vegetables, chicken production and aquaculture production. The project will assist farmers gradually diversify their cropping patterns for additional income in the dry season. The project will develop the required irrigation infrastructure to allow for a second irrigated rice crop during the dry season using AIIB resources. GCF resources will be used to provide investments for flood control/drainage for the entire gross project area of 80,000 ha.

[3] Annex 2: Feasibility Study. WAPCOS Report. 2022.
[4] Ibid. 2023.

22. Reduction of GHG emissions from rice production will be achieved by shifting away from traditional flooded rice methods to improved water management with required drainage facilities diversifying to other crops/livestock/fisheries, promoting carbon sequestration activities, and use of renewable energy sources for pumping water from canals to fields instead of the diesel pumps currently used. The project will reduce and avoid GHG emissions as a result of better production practices for rice cultivation, improved soil management and replacement of diesel pumps with solar pumps for pumping water from the canals to the tertiary canals and farmer's fields. The key factors contributing to the decrease is the reduction in the area under flooded rice, improved irrigation practices and greater use of Alternate Wetting and Drying practices for rice production and the replacement of diesel pumps with solar pumps, assuming a 75% adoption rate for the switch. Based on these factors it is expected that - the total mitigation potential of the project over 20 years is -1,001,400 tCO2-eq. This would amount to a carbon balance of -2.3 tCO2-eq per hectare per year (Annex 22).

23. The indirect beneficiaries will be generated through wider dissemination of the adaptation practices and technologies through lead farmers, private sector and agriculture extension workers and by enhanced availability of inputs in the market once the practices are adopted and generate a demand to which private suppliers respond. Benefits are also expected to accrue as a result of the more sustainable production technologies and increase in yields along the selected value chains through greater resilience and enhanced access to water. One of the most widely spread benefits will result from the use of early warning systems that will have a coverage beyond the project area. The early warning systems are expected to help prepare the farmers in case of changes in precipitation and temperature, droughts, floods, to help prepare them against crop loss through pest infestation and disease.

24. Another aspect which will add to water security and sustainability is through improved water governance. The project will strengthen local level institutions such as the FWUCs which have the mandate to operate and maintain irrigation schemes at the tertiary level. The project will strengthen their capacity for collection of water fee and plans to pilot mechanisms for collection that will be up scaled by MOWRAM using the existing Cambodian water law under which the farmers have to contribute to the O&M costs of irrigation systems. The project expects that farmers will enhance their contribution to O&M based on a more reliable and efficient system that will make the water governance system more financially sustainable.

Contribution to SDGs and alignment with country sector and IFAD objectives

25. The project will directly support UNSCDF's the Outcome 1 (Economy – By 2028, people in Cambodia, especially those at risk of being left behand, benefit from and contribute to productive, diversified, gender equal, formalized and low carbon and climate adapted captivity), Output 2.1 (Agrifood systems are more efficient, climate-adapted, inclusive, formalized and safer. By focusing on climate resilient irrigation, the project will directly address to SDG 13 on climate action. In addition, its implementation will directly contribute to achievement of SDG 6, clean water and sanitation and SDG 12, responsible production and consumption. The Project is focusing on climate change adaptation with cross-cutting benefits through the reduction of GHG emissions linked to the use of high efficiency smart irrigation systems, the use of renewable energy for pumping, and agroforestry and cover techniques to reduce evapotranspiration and enhance GHG reduction. The Project is aligned with the RGC's priorities on low-carbon and climate resilient development as outlined in the RGC's overarching Rectangular Strategy Pillar IV 2019 -2023 and with the thematic portfolio Climate Change and Natural Resources Management of the Mekong Region Cooperation Programme (MRCP) 2022-2025.

26. The proposed Project with its disaster and climate change adaptation design features will be upscaled to other provinces. RGC and MOWRAM appreciate water is a limited resource and is taking an integrated water resource management (IWRM) approach to managing water resources nationwide. MOWRAM is establishing the Water Resources Data Management Center (NWRDMC) and a National Water Resources Information System (WRIS) with ADB assistance. WRIS is an adaptive system, housed in the MWRDMC facility, that integrates spatial information, CISIS and IAMS, meteorological data, hydrological data, ground measurements, satellite-derived remote sensing data, and Lidar. All CAISAR data is coalesced in WRIS and used to model water availability, use, and floods across entire watersheds.

27. The project will be one of the pillars of the IFAD programmatic approach through the improvement of farm-level climate resilience and water use efficiency climate-proofing water infrastructure in complement to other pillars: ASPIRE-AT stergnth the PO and AC, improve domestic and

international market), SAAMBAT (market infrastructure, digital technology, and youth programme), and AIMS (value chain and market programme). The project will support all the three COSOP's strategic objectives[5].

Definition of Target Groups and Targeting Strategy

28. The proposed project will benefit more than 2.3 million people (Roughly 13% of its population) in four provinces across Cambodia: Kampong Speu, Kampong Chhnang, Kandal and Pursat. Identification of the target areas has been done based on poverty situation and increasing threat of high flood risk. These geographic targets were accordingly selected by the RGoC given their vulnerability to climate change on water and irrigation sector and priority for Government in the context of their SDG targets, especially given the moderate-to-high poverty incidence rates that prevail in these four provinces. The IFAD and GCF investment will directly targeting the smallholder and poor farmers.

29. Geographical targeting strategies typically focus on less-developed or food insecure regions or districts. This can be problematic for value chain projects, as value chains are not bound by administrative borders. Following the 2019 Independent Evaluation of IFAD's engagement in pro-poor value chain development, the project will use a cluster approach, grouping poor areas with wealthier ones offering comparative advantages in markets. To ensure greater participation and social inclusion of the project's target groups, a combination of self and direct targeting methods will be set in place. For self-targeting, the selection of value chains will be conducted based on specific social and climate criteria to ensure investments are fitted for target beneficiaries. Direct targeting will be done through dedicated activities (e.g. specific pro-poor or women/youth-led value chains) as well as through quota for participation of target beneficiaries. The targeting strategy will be based on the following: i) selection of value chain and agricultural practices more conducive for specific targets (e.g. cassava with resource poor farmers, poultry with women participants, value chains with fewer capital intensive agricultural innovations etc.); ii) providing pro-poor incentives while also enforcing pro-poor requirements along financial and value chain partnership and screening of underlying business proposals and farming practices; iii) mobilization of farmers in inclusive PO that can negotiate effectively with other actors and create value for members through functional upgrading (e.g. through processing, and reducing the role of intermediaries); iv) investments opportunity in enabling environment.

IFAD's Mainstreaming Areas

30. The project is targeting financing from the Green Climate Fund therefore is fully aligned with a climate focus and the strong rationale of the project which guides all aspects. The project meets IFADs mainstreaming commitments for climate adaptation and has co-benefits of mitigation through climate smart rice production activities. The project will prioritize opportunities lower Cambodia's overall methane emissions through low emission practices and diversification. The project is linked to the global methane pledge through investments to improve existing canals and pumping facilities to enable controlled water management. The project will also promote training and an awareness campaign to encourage better water management behavior.

31. The project aims to be a gender mainstreamed project and ensure both men and women will equally benefit from project intervention. Needs, criteria and preference of women will be incorporated in the project design involving them in all project activities and at all stage of project implementation. The aspects of the project focused on diversification of rural livelihoods as well as more consistent access to water will also significantly improve the nutrition of beneficiaries. The aspects of youth will be further defined during the project design. Project's result framework will include indicators that will help evaluate how Gender, youth and nutrition have been mainstreamed in project implementation.

Results Framework

32. See the Logical Framework in section E of the GCF FP and ORMS that includes IFAD core indicators.

[5] COSOP's SO1: productive capacity of 250,000 poor Cambodian rural households increased, including measures to raise productivity in farming and employment as a basis for; SO2: 250,000 poor Cambodian rural households increase their incomes through participation in remunerative agricultural value chains, to be achieved primarily through interventions to assist smallholders to form producer organizations linked to strengthened pro-poor value chains; and SO3: strengthen the environmental sustainability and climate resilience of poor rural people's economic activities.

Knowledge Management

33. The project will engage with the International Rice Research Institute (IRRI) through a technical assistance contract to prepare high-level knowledge products and provide capacity support to MAAF, service providers, and other stakeholders. IRRI will organize 15 consultative workshops and seminars and develop 16 knowledge products and training materials on the application of Mechanized Dry Seeded Rice. The project will integrate the roles of project officer to handle both M&E and KM, exemplifying a strong integration between knowledge management activities and the project's monitoring and evaluation system, thereby providing evidence for policy engagement. The facilitation of knowledge management themes through workshops and focused studies ensures continuous knowledge sharing and learning. Additionally, the project is dedicated to transparency and broad stakeholder engagement by disseminating information to the public via various channels—including electronic media, printed materials, and press articles. The PMU and PIUs will actively disseminate knowledge and green solutions in climate adaptation and mitigation among farmers, policy and decision-makers, and rural communities.

Sustainability and Scaling up

34. The project will introduce a self-sustaining climate-smart agriculture sector in which farmers will adopt climate-resilient technologies and practices, including water-efficient adaptation methods. Two factors will support this transformation: First, these practices offer better economic returns while adapting to climate-resilient methods. Second, farmers will receive technical support, awareness, capacity-building assistance, and access to modernized and climate-proofed irrigation infrastructure tailored to their service requirements, helping them overcome initial adoption barriers. The project will facilitate and demonstrate the benefits of climate-resilient agricultural practices. It will mainstream the use of a range of climate-smart farming technologies and practices that reduce vulnerability to evolving climate threats (such as floods and droughts), create financial benefits for farmers, ensure increased production, and protect production assets.

35. The project has developed a scalable model for climate adaptation and mitigation, designed to be upscaled through both the public and private sectors. It will invest in climate-resilient agricultural technologies and practices, modernize and climate-proof irrigation infrastructure, and strengthen the institutional capacity of relevant organizations to enhance climate resilience. The lessons learned and experiences gained from this initiative will guide future efforts to improve climate resilience in irrigated agriculture across Cambodia.

Management Arrangements

36. IFAD will serve as the Accredited Entity (AE) for this project and will be responsible for the overall management of the project, including: (i) administrative, financial and technical oversight and supervision throughout project implementation; (ii) ensuring funds are effectively managed to deliver results and achieve objectives; (iii) ensuring the quality of project monitoring, as well as the timeliness and quality of reporting to GCF; and (iv) undertake project mid-term and completion evaluation. IFAD will ensure that each of these areas of responsibility are undertaken in accordance with the detailed provisions outlined in the Accreditation Master Agreement (AMA) between IFAD and GCF. IFAD's role as AE will be assigned to its sub-regional office in Hanoi and its country office in Cambodia. AIIB is co-financing the project and will provide funds directly to the MEF for remitting to MOWRAM. In its capacity as co-financier, AIIB will undertake joint supervision of the project with IFAD and also participate in and contribute to the evaluation of the project.

37. The project builds on the expertise of MoWRAM, which successfully implemented the Rehabilitation and Improvement of the Stung Chinit Irrigation System, aimed at enhancing agricultural productivity and water management efficiency. Key modifications have been made to increase the project's impact, including a stronger focus on agriculture and the integration of green and climate-smart technologies. These social investments will be implemented by NCDD-S, which has developed a robust capacity for executing a variety of livelihood projects aimed at enhancing local governance and community development. NCDD-S's organizational structure is designed to support these initiatives, with a clear mandate to coordinate and support sub-national administrations. The committee is effective in stakeholder engagement, working closely with local governments, communities, and international partners to ensure project success. Strengthening these partnerships and communication channels can further enhance project outcomes.

38. The project secures a start-up advance of up to US$500,000 and does not anticipate the need for the Facility for Faster Implementation of Project Start-Up (FIPS). The plan includes essential

preparatory steps such as opening designated accounts, setting up project management offices, and scheduling onboarding sessions for key PCU staff on IFAD's OPEN system and Client Portal.

Executing Agency

39. The Executing Entity (EE) for the project will be the Ministry of Water Resources and Meteorology (MOWRAM) which is responsible for sustainable water resource management and irrigation in Cambodia. MOWRAM will establish a Project Management Unit for the coordination of all components and consolidation of the project planning and reporting. In addition, the National Committee for Sub-National Democratic Development Secretariat (NCDD-S) will be responsible for the implementation of component 1 which is designed to improve farm-level climate adaptation, resilience, and water use efficiency. The NCDD-S is a Direct Access Accredited Entity to the GCF and will have a Project Implementation Unit (PIU) for implementing the component 1 activities.

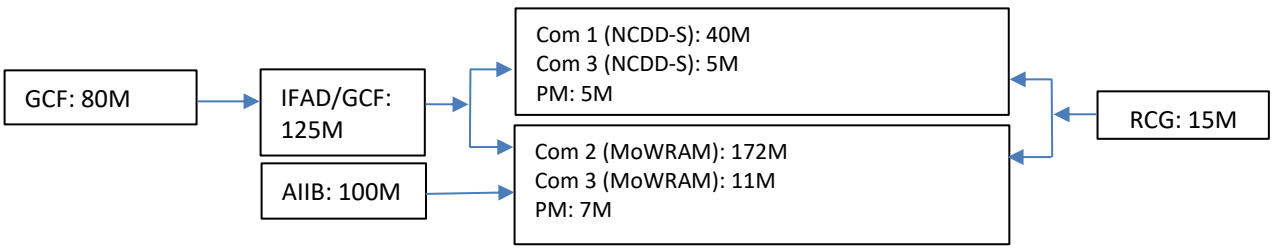
40. A Project Steering Committee (PSC) will be established for inter-ministerial coordination. It will be chaired by the Minister of MOWRAM and comprise of senior officials from MOWRAM, the Ministry of Economy and Finance (MEF), the Ministry of Interior (MOI) which is responsible for the NCDD-S), Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Environment (MOE), and the Provincial Governor's Offices of Pursat, Kampong Chhnang, Kandal, and Kampong Speu provinces. An Inter-Ministerial Resettlement Committee (IRC), chaired by MEF, will manage resettlement and land acquisition issues where they arise. The National Project Coordinator of the Project Management Unit (PMU) will serve as a secretariat to the PSC.

Flow of Funds

41. The Asian Infrastructure Investment Bank (AIIB) and GCF are the two main co-financiers of the project, with IFAD and the RCG also providing significant funds. AIIB and IFAD have provided grant funds and technical assistance for project preparation activities. The GCF funds will be provided to IFAD and then transmitted through the Ministry of Economy and Finance (MEF) of the Government of Cambodia and then through the Ministry of Water Resources and Meteorology. The funds of the Asian Infrastructure Investment Bank (AIIB) will also be provided through the MEF to MOWRAM for investment in the climate resilience and modernization of irrigation infrastructure. The Royal Cambodian Government will provide in kind support directly during the implementation of the project.

42. MEF will authorize MOWRAM PMU and the NCDD-S PIU to open a designated account (DA) at the National Bank of Cambodia for funding from IFAD and GCF. MOWRAM PMU and NCDD-S PIU shall open one project account at a commercial bank to receive the fund transfer from the IFAD DA to pay for project activities.

Figure 1: Funds Flow Diagram



Supervision Arrangements

43. IFAD will act as Accredited Entity (AE) and will assume the oversight function. It is responsible for the project design, and administration of the component and sub-components to be financed by GCF and IFAD in close coordination with AIIB. AIIB agreed to follow IFAD's environmental and social safeguards policy and procedure. Project supervision, Mid-Term Review (MTR) and Completion Reviews will be conducted jointly by GoKC, IFAD and AIIB in line with GCF requirement.

Risk

44. It is a medium risk project in overall terms. While the risk associated with the operational dimensions of the project (technical, financial and procurement, staffing etc.) are moderate, while environmental and social risks are high. Cambodia is already integrated to the global economy and changing global economic context will have profound impact on project's outcomes and implementation measures. Key factors include increasing commodity prices as a result of Ukraine conflict and impacts of COVID

19 which is expected to continue for several years. While addressing the impacts of these external shocks are challenging and needs continuous monitoring of the evolving situations, the associated risks can be reduced through appropriate policy interventions by the government.

45. The project is going to be implemented in complex agro-ecological setting. The project sites are adjacent to the Tonle-sap Lake connected to Mekong River. High flood risks and vulnerability to irrigation system not only depends on the climate change context of the project area, but also to the wider Tonlesap-Mekong hydrological settings. Addressing flood risk and future water management, which are the core part of the project, are therefore complex. This will be addressed through establishing a sound water accounting systems and through flood risk management strategies and will be included in the component 2 of the project.

46. Technical capacities within MoWRAM and other relevant Government institutions is generally low to address the complex issue of climate change in water and agriculture. Likewise, there are limited skilled efficient contractors and service providers to implement the project in timely and cost-effective manner. This will be addressed through two different ways. First, the project will invest in capacity development of Government institutions and relevant private sectors. Second, specific knowledge, skills and expertise will be provided through specialized service providers where necessary.

47. Many of the irrigation systems included in the project are large size, over 1000 ha. The project involves construction of new irrigation canals and will come across land ownership and acquisition issues. The project is therefore high-risk category from safeguard perspective. To address the safeguard issues, first an ESMF will be prepared as there are numerous sub projects scattered within the project area and detail information will be available only at design stage. Followed by this, a detail environmental and social impact assessment (ESIA) will be conducted leading to preparation of ESMP.

Update status on the design process

48. The CN project received approval from IFAD on December 5, 2022. Since then, project designs have been developed under the leadership of MOWRAM, with the support from IFAD, AIIB, and FAO. AIIB has transferred USD 4.5M to MOWARM for the design of the full funding proposal, including the study for Detail Design Engineering (DED) for one of the proposed schemes, as DED is a prerequisite for the approval of AIIB-financed projects. The target approval dates for the AIIB, GCF, and IFAD Executive Boards are set for February 2025, June 2025, and September 2025, respectively. If the project is not approved during the June GCF Board meeting as planned, a contingency plan is in place. IFAD will continue with the Executive Board as scheduled, and the funding initially expected from GCF will be reallocated to the Funding Gaps to be filled by GCF or other DP. This approach will ensure the project's integrity and help avoid any delays in start-up or implementation after the AIIB Board Approval. Additionally, the initial costs for establishing the Project Management Unit (PMU) will be covered by the Government and AIIB, ensuring that the project implementation can commence without delay.

ATTACHMENTS (in ORMS):

For DRM Meetings:

1. *Updated Decision Memo for co-financing GCF projects for DRM*
2. *GCF Funding Proposal (FP)*
3. *Results framework from GCF (with IFAD core indicators clearly integrated)*
4. *Annex (IFAD standard requirement at DRM): Theory of change*
5. *Annex (IFAD standard requirement at DRM): First Annual Work Plan and Budget (AWPB) for first 18 months*
6. *Annex (IFAD standard requirement at DRM): Integrated Project Risk Matrix (IPRM)*
7. *Annex (IFAD standard requirement at DRM): Exit Strategy*
8. *Annex (IFAD standard requirement at DRM): Mainstreaming Tool*
9. ***GCF ANNEX 1:** NDA no-objection letter(s) **(template provided)** **(mandatory)***
10. ***GCF ANNEX 2:** Feasibility study - and a market study, if applicable **(mandatory)***
11. ***GCF ANNEX 3** (and also IFAD standard requirement at DRM): Economic and Financial Analysis **(mandatory)***
12. ***GCF ANNEX 4** (and also IFAD standard requirement at DRM)**:** Detailed budget plan (template provided) **(mandatory)***

13. ***GCF Annex 5.*** *Implementation timetable including key project/programme milestones* ***(template provided)*** ***(mandatory)***
14. ***GCF Annex 6: SECAP*** *(ESS disclosure form provided): Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (ESMP) or Environmental and Social Management System (ESMS), or Others (e.g. Resettlement Action Plan, IP Plan, Gender Plan, Land Acquisition Plan, etc.)* ***(mandatory)***
15. ***GCF ANNEX 7:*** *Summary of consultations and stakeholder engagement plan* ***(mandatory)***
16. ***GCF ANNEX 8:*** *Gender assessment and project level action plan* ***(template provided)*** ***(mandatory)***
17. ***GCF ANNEX 9:*** *Legal Due Diligence (Regulation, Taxation and Insurance)* ***(mandatory)***
18. ***GCF ANNEX 10*** *(and also IFAD standard requirement at DRM)****:*** *Procurement Plan for first 18 months (template provided)* ***(mandatory)***
19. ***GCF Annex 11:*** *Monitoring and evaluation plan* ***(template provided)*** ***(mandatory)***
20. ***GCF ANNEX 12:*** *AE fee request* ***(template provided)*** ***(mandatory)***
21. ***GCF ANNEX 13:*** *Co-financing commitment letter, if applicable* ***(template provided)*** ***(mandatory)***
22. ***GCF ANNEX 14:*** *Term sheet including a detailed disbursement schedule and, if applicable, repayment schedule* ***(mandatory)***
23. ***GCF ANNEX 21*** *(and also IFAD standard requirement at DRM): Project Implementation Manual (PIM)*
24. ***GCF Annex 22.*** *Assessment of GHG emission reductions and their monitoring and reporting (for mitigation and cross cutting-projects)* ***(Annex 22 is mandatory for mitigation or cross-cutting projects)***

Inputs needed for ORMS

1. Project Identification Form (PIF)
2. Integrated Integrated Project Risk Matrix (IPRM)
3. Logframe core IFAD indicators
4. Mainstreaming Validation (done after DRM, before final endorsement)

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex 2: Logframe

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Logical Framework

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Outreach	1 Persons receiving services promoted or supported by the project				Project MIS; household surveys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	Rural farmers are receptive to the services provided by the project; and the Farmer Water User Communities (FWUCs) support the outreach programs
	Males (number)	0	378172	709072				
	Females (number)	0	252115	866644				
	Young (number)	0	63029	315143				
	Not Young (number)							
	Indigenous people (number)	0	12606	31514				
	Non-Indigenous people (number)							
	Total number of persons receiving services (number)	0	630287	1575716				
	Male (%)	0	60	45				
	Female (%)	0	40	55				
	Young (%)	0	10	20				
	1.b Estimated corresponding total number of households members				Project MIS; household surveys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	
	Household members (number)	0	150068	375171				
	1.a Corresponding number of households reached				Project MIS; household surveys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	
	Women-headed households (number)	0	75034	187586				
	Non-women-headed households (number)	0	75034	187586				
	Households (number)	0	150068	375171				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Project Goal The goal of the project is to make the agriculture sector in Cambodia climate resilient and sustainable	Enhanced incomes and food diversity				Project MIS; project GIS mapping; and outcome survey	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	The project impact on rural poverty has direct impact to national rural poverty percentage Global economic slowdown and/or global reduction in demand does not affect growth As outlined in the EX-ACT Annex
	Number of HH beneficiaries with enhanced incomes and food diversity (number)	0	16000	40000				
	GHG emissions reduced, avoided or removed/sequestered				Household surveys, EX-ACT	Annual	PMU, supported by FAO and IFAD	
	GHG Emissions reduced by year 7 - tCO2eq (number)	0	0	213501.58				
Development Objective The objective of the project is to modernize the irrigation sector by installing smart irrigation systems and enable farmers to adapt to climate risks and mitigate crop emissions through use of energy- and water-efficient technologies and practices, timely weather information and improved market integration	Beneficiaries adopting improved and/or new climate-resilient livelihood options				Project MIS; project GIS mapping; and outcome survey	Project completion	PMU and PIUs and their project implementation consultants, and individual survey consultants	Catastrophic flooding or drought, vastly exceeding the vulnerability and climate risk assessments does not occur
	Households - percentage (%) (%)		4	15				
	FHHs (number)		3125	12500				
	Total number of people (number)		45000	215000				
	Total households (number)		4261	17042				
	Beneficiaries with more climate-resilient water security				Project MIS; project GIS mapping; and outcome survey	Project completion	PMU and PIUs and their project implementation consultants, and individual survey consultants	
	Total number of household members - Number of people (number)		30000	192000				
	Households - Percentage (%) (number)		6	36				
	Women-headed households - Households (number)		3521	22535				
	Households - Households (number)		7042	40000				
Outcome 1. Reduction in crop losses and improved (agricultural) production	Increase in annual rice production with increase in HH income				Project MIS; household surveys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	Catastrophic flooding or drought, vastly exceeding the vulnerability and climate risk assessments does not occur
	% yield increase for rice in targeted HH benefiting directly from the project (%)	0	15	30				
	% yield increase for vegetables in targeted HH benefiting directly from the project (%)	0	10	20				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
	% decrease in post-harvest losses for rice in targeted HH benefiting directly from the project (%)	0	10	20				
	% decrease in post-harvest losses for vegetables in targeted HH benefiting directly from the project (%)	0	15	30				
	3.2.1 Tons of Greenhouse gas emissions (tCO2e) avoided and/or sequestered				Project MIS; household surveys; EX-ACT	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	
	Hectares of land (ha)	0	22046	22046				
	tCO2e/20 years (number)	0	45750	1006507				
	tCO2e/ha (number)	0	2.1	45.7				
	tCO2e/ha/year (number)	0	0.8	2.3				
Output 1.1 Increased farmer capacity in climate smart agriculture	Farmers trained in climate smart agriculture				Project MIS; household surveys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)
	Total number of farmers (male and female) trained in CR technologies through the FFS training programme (number)	0	20000	40000				
	Number of trainers (male and female) trained to demonstrate and propagate the CR technologies and practices to farmers (number)	0	100	200				
	Percentage of farmers adopting climate resilient farming practices promoted by the project (%)	0	50	80				
	Average percentage of beneficiaries who are satisfied with the knowledge gained from the trainings provided (%)	0	70	90				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Output 1.2 Climate adaptive value chains developed by 4Ps and increased access to finance	Value chains developed by 4Ps and increased access to finance				Project MIS; household surverys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	a. Beneficiaries apply some or all of the climate adaptation measures every cropping season during the project; b. access to the credit line only; and c. local authority engagement defined by monthly contact with the CCs during the project
	Number of farming households benefiting from the 4P model through increased access to finance (number)	0	14000	28000				
	Number of MSMEs with increased access finance due to the linkages facilitated by the 4P model (number)	0	50	120				
Output 1.3 Increased access to and use of climate information and advisory services for climate responsive water-use and crop planning	3.1.2 Persons provided with climate information services				Project MIS; household surverys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	a. Beneficiaries apply some or all of the climate adaptation measures every cropping season during the project; b. access to the credit line only; and c. local authority engagement defined by monthly contact with the CCs during the project.
	Males (number)	0	140689	281378				
	Females (number)	0	140689	281378				
	Young (number)	0	28138	56276				
	Persons provided with climate information services (number)	0	281378	562756				
	Hydromet station installed for improved Climate Data and Warning				Project MIS; household surveys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	
	Number of hydromet stations and agrometeorological stations rehabilitated (number)	0	5	10				
Output 1.4 Increased resilience of farm road infrastructure to climate change	2.1.5 Roads constructed, rehabilitated or upgraded				Project MIS; household surverys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	Catastrophic flooding or drought, vastly exceeding the vulnerability and climate risk assessments does not occur.
	Length of roads (km)	0	5	90				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
	Roads constructed, rehabilitated or upgraded cont				Project MIS; household surverys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	
	farmers benefiting from improved road connectivity in the project areas (number)	0	5000	10683				
Outcome 2. Rehabilitated/upgraded, climate proofed, and modernized irrigation infrastructure for increased resilience	1.2.1 Households reporting improved access to land, forests, water or water bodies for production purposes				Project MIS; household surverys		Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	
	Households reporting improved access to water (%)	0	8	30				
	Size of households reporting improved access to water (number)	0	30000	135000				
	Women-headed households (number)	0	4125	16500				
	Total no. of households reporting improved access to water (number)	0	8250	33000				
	Total households reporting improved access (number)	0	8250	33000				
Output 2.1 Irrigation schemes and ponds modernized	Modernization of irrigation scheme and ponds				Project MIS; household surveys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	
	Area provided with irrigation services - Improved (ha)	0	10000	22051				
	6 Irrigation schemes finalised of rehabilitated/upgraded, climate proofed, and modernized (%)	0	0	100				
Output 2.2 Flood-proofed and improved drainage	Flood-proofing and Drainage improvements				Project MIS; household surveys	Annual	Project Management Unit (PMU), supported by Project Implementation Units (PIUs)	
	Area provided with drainage services - Improved (ha)	0	5000	10005				
	Polder detailed design and procurement (number)	0	1	2				
Output 2.3 Farmers Water User Communities (FWUC) established and trained	Establishments and training of Farmers Water User Communities (FWUC)				Project MIS, GIS	Annual	PMU	

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
	Number of FWUC established and trained (number)	4	6	11				
	Establishment of Water information and Management (SCADA)				Project MIS, GIS	Annual	PMU	
	farmer-households using Climate information and early warning (CIEWS) advisory services promoted by the project (%)	0	20	75				
	people trained in using the Supervisory Control and Data Acquisition (SCADA) system (number)	0	20	40				
Outcome 3: Enhanced environmental governance	Strengthened MOWRAM and NCDDS				Project MIS	Annual	PMU	
	Number of MOWRAM and NCDDS Staff Trained (number)		200	600				
Output 3.1: Strengthened MOWRAM capacity	Strengthened MOWRAM Capacity (MOWRAM staff trained in river basin management, water accounting, SCADA system operation, and the design and implementation of climate-resilient green technologies)				Project MIS	Annual	PMU	Training sessions are attended by actual SCADA and M&E staff
	staff trained (number)	0	180	260				
	staff trained (number)		120	240				
	total staff trained (number)	0	200	600				
Output 3.2: NCDDS strengthened at national and provincial level	NCDDS strengthened at national and provincial level (NCDDS staff trained on project management, policy formulation and implementation and resource mobilization				Project MIS	Annual	PMU	
	staff trained (number)	0	105	210				
	staff trained (number)	0	70	140				
	total staff trained (number)	0	175	350				

Investing in rural people

Cambodia

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex 3: Project Cost and Financing

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

IFAD Design Guidelines Annex XVII: Green Climate Fund (GCF) Cofinancing Projects

Requirement for DRM Meetings:

1. Updated Decision Memo for co-financing GCF projects for DRM
2. GCF Funding Proposal (FP)
3. Results framework from GCF (with IFAD core indicators clearly integrated)
4. Annex (IFAD standard requirement at DRM): Theory of change
5. Annex (IFAD standard requirement at DRM): First Annual Work Plan and Budget (AWPB) for first 18 months
6. Annex (IFAD standard requirement at DRM): Integrated Project Risk Matrix (IPRM)
7. Annex (IFAD standard requirement at DRM): Exit Strategy
8. Annex (IFAD standard requirement at DRM): Mainstreaming Tool
9. GCF Annex 1: NDA no-objection letter(s) (template provided) (mandatory)
10. GCF Annex 2: Feasibility study - and a market study, if applicable (mandatory)
11. GCF Annex 3 (and also IFAD standard requirement at DRM): Economic and Financial Analysis (mandatory)
12. GCF Annex 4 (and also IFAD standard requirement at DRM): Detailed budget plan (template provided) (mandatory)
13. GCF Annex 5. Implementation timetable including key project/programme milestones (template provided) (mandatory)
14. GCF Annex 6: SECAP (ESS disclosure form provided): Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (ESMP) or Environmental and Social Management System (ESMS), or Others (e.g. Resettlement Action Plan, IP Plan, Gender Plan, Land Acquisition Plan, etc.) (mandatory)
15. GCF Annex 7: Summary of consultations and stakeholder engagement plan (mandatory)
16. GCF Annex 8: Gender assessment and project level action plan (template provided) (mandatory)
17. GCF Annex 9: Legal Due Diligence (Regulation, Taxation and Insurance) (mandatory)
18. GCF Annex 10 (and also IFAD standard requirement at DRM): Procurement Plan for first 18 months (template provided) (mandatory)
19. GCF Annex 11: Monitoring and evaluation plan (template provided) (mandatory)
20. GCF Annex 12: AE fee request (template provided) (mandatory)
21. GCF Annex 13: Co-financing commitment letter, if applicable (template provided) (mandatory)
22. GCF Annex 14: Term sheet including a detailed disbursement schedule and, if applicable, repayment schedule (mandatory)
23. GCF annex 21 (and also IFAD standard requirement at DRM): Project Implementation Manual (PIM)
24. GCF Annex 22. Assessment of GHG emission reductions and their monitoring and reporting (for mitigation and cross cutting-projects) (Annex 22 is mandatory for mitigation or cross-cutting projects)

Inputs needed for ORMS

1. Project Identification Form (PIF)
2. Integrated Integrated Project Risk Matrix (IPRM)
3. Logframe core IFAD indicators
4. Mainstreaming Validation (done after DRM, before final endorsement)

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Project Design Report

Annex 4: Economic and Financial Analysis

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IFAD Design Guidelines Annex XVII: Green Climate Fund (GCF) Cofinancing Projects

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Project Design Report

Annex 5: SECAP Review Note

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Programme Management Department

The SECAP Review note should build on the preliminary note mentioned above, draw on the results of the screening exercise and be informed by the issues raised during the design mission, the stakeholders interviews, publicly available tools and dataset, and environmental, social or climate-related studies that inform on the characteristics of the project location. The SECAP review note includes the revised ESMP and should be attached to the Project Design Report, integrated in Draft Project Implementation Manual (PIM) and COSTAB and shall be submitted to Design Review Meeting (DRM) or IRC (for NSOs).

1. Introduction

1. This preliminary Social, Environmental and Climate Assessment Procedures (SECAP) review note was prepared in support of the formulation of the new Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project covered in the 12th IFAD's replenishment cycle 2022-2024. The purpose of this note is to highlight potential environmental, social, and climate-related impacts, both positive and negative. Design-stage consultations are planned to take place (and some are currently underway) with the Government of the Kingdom of Cambodia (GoKC) line agencies at central, provincial, district levels; civil society and non-governmental organisations, and target groups including the Indigenous Peoples in potential project areas. This SECAP review note is also based on a desk review of recent projects in Cambodia funded by IFAD, World Bank, and other International Financing Institutions. As the CAISAR project is still in the nascent stage of design, the preparation of this note was limited by time and further consultations/assessment will take place once the design has further developed.

2. The CAISAR project's objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia. The project objective will be achieved by implementing two components that aim at addressing climate change vulnerabilities, increasing agriculture productivity, and developing capacity for efficient water resources management and climate proofing of infrastructure and agroecosystems. The investments to be implemented will: (i) combine robust climate adaptation water use management practices at the farm level with climate-proofed irrigation and flood-control infrastructure; (ii) develop institutional capacity to plan, maintain, and operate irrigation and flood control infrastructure; and (iii) promote low-carbon strategies and climate-resilient agricultural practices. Some of the activities will include disaster and climate resilient water-use initiatives, ecosystem-based and climate informed smart irrigation systems, and enhanced systems for monitoring, evaluation, verification, and reporting of climate information by various government agencies.

2. Situational analysis and potential project impacts

n/a

2.1 Socio-economic assessment

a. Overall poverty situation

3. Poverty in Cambodia is defined by the Ministry of Planning as people living with daily earnings under the poverty line threshold[i]. Under this definition, the poverty headcount fell from around 15% in 2013 to less than 10% in 2019, but the COVID-19 pandemic has reversed some of the progress made in poverty alleviation. National poverty headcount is now estimated at 17.8% of the total population, ranging from 12.6% in urban areas other than Phnom Penh to 22.8% in rural areas, based on the results of the Cambodia Socio-Economic Survey 2019-2020 (MoP, 2021).

4. Cambodia's HDI value for 2019 is 0.594— which put the country in the medium human development category—positioning it at 144 out of 189 countries and territories (UNDP Human Development Report 2020). With a Gender Inequality Index of 0.474 in 2019, Cambodia is ranked 117 over 162 countries (HDR report, 2020).

5. The target provinces of the CAISAR project are: Kampong Speu, Kampong Chhnang, Kandal and Pursat (Figure 1). These areas have the highest population density, high total percentage of poor households (Figure 2) and high percentage of women headed households.[i] The livelihoods of the most vulnerable people in the region depend on agricultural production and water availability through precipitation, river flow, or irrigation schemes. As such, these persons are expected to be positively impacted through the CAISAR project activities.



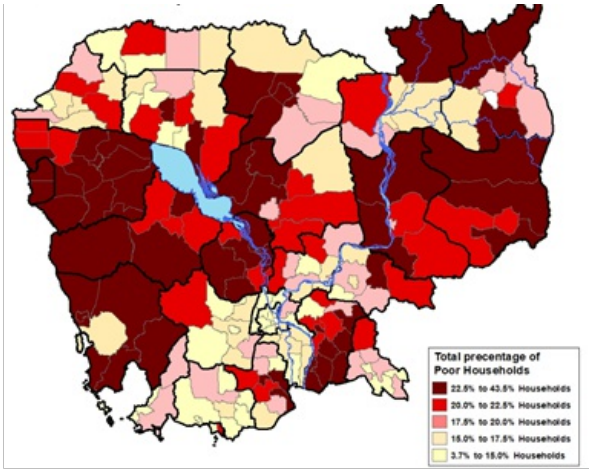


Figure 1: Map of project area and 4 target provinces **Figure 2:** Total percentage of poor households by (level 1 & 2) 2016 (AF, 2018)

[i] The Asia Foundation (2018). cambodia-atlas-on-gender-and-environment.pdf.pdf (opendevelopmentmekong.net)

[i] The poverty line has been updated as: KHR 10,951 (USD 2.67) per day for Phnom Penh, KHR 9,571 (USD 2.33) per day in other urban areas of Cambodia and KHR 8,908 (USD 2.17) per day in rural areas

b. Gender

6. In the five-year strategic plan for strengthening gender mainstreaming and women's empowerment (Neary Rattanak V, 2019-2023), the Ministry of Women's Affairs (MoWA) reported that gender equality and women's empowerment had progressively improved before the pandemic. The ministry adopts the Gender Gap Index as a key indicator widely used to quantify the gaps between women and men in four key areas: health, education, economy, and politics.

7. Cambodia's gender gap ranking improved from 108th in 2014 to 89th out of 152 countries in 2019. However, the pandemic has had a negative impact on gender equality and some of the progress made over the last decade has been reversed. The latest gender gap report indicates that Cambodia had a gender parity score of 0.684 in 2021, ranking 103rd out of 156 countries worldwide and 12th out of 20 countries of East Asia-Pacific region.

Table 1. Gender Gap indicators for Cambodia (Global Gender Gap Report, 2021)

	Rank in 2006	**Rank in 2019 (pre-pandemic)**	**Rank in 2021**	**Score 2021**
Global Gender Gap Index	89	89	103	0,684 *
Economic Participation and Opportunity	29	25	46	0.729
Educational Attainment	105	124	128	0.919
Health and Survival	1	73	46	0.978
Political Empowerment	94	119	126	0.111

(*) Score of 1 reflects gender parity

8. Another metric, the UN Gender Inequality Index (GII) is a composite measure reflecting inequality in achievement between women and men in three dimensions: reproductive health, empowerment and the labour market (UNDP, 2019). It has a value of 0.474 for Cambodia, ranking it 144 out of 170 countries in 2019, but it has not been updated since the pandemic started to impact Cambodia in early 2020.

9. Economic empowerment: As per the latest Cambodia Socio-Economic Survey 2019/20, women's share of wage employment was the highest in the service sector (39%) followed by agriculture sector (36%) and the industrial sector (25%). Women participation in the labour force is 80.5%, significantly less than men (89.6%) and wage equality for similar work remains far from achieving parity: Women in Cambodia earn an estimated USD 3,500 on average, vs USD 4,400 for men. However, Cambodia fares well in terms of income earned by women, ranking 13th Job positions with higher responsibilities (legislators, senior officials and managers) are overwhelmingly held by men (75.9%) while professional and technical work positions are more evenly balanced (54.1% men and 45.9% women). Gender imbalance in economic opportunities has worsen during the pandemic. As many jobs were lost in the garment, hospitality, entertainment, restaurant, and construction sectors, women suffered high levels of unemployment in 2020, forcing many from the formal economy into the informal economy and/or into debt. Recent data suggest that at least as many women re-entered the labour market in the second half of 2020 as those who had left in the first half of the year, but they did so into 'lower quality' jobs than they had prior to the crisis, often informal, own-account or contributing family work (ADB, 2022).

10. Workload of rural women and division of labour: Women have a relatively high representation in agricultural households[i]: Members of agricultural households are in vast majority female (61%), and 24% of agricultural households are women-headed, vs 21.5% in the general population[ii]. They have a higher work burden because of their triple role (which includes their reproductive, productive, and social roles). Women generally perform most of the on-farm work (sowing, weeding, crop maintenance, animal feeding), at the exception of operations involving agricultural machinery such as land preparation (mechanized at 98%) and harvesting (mechanized at 75%, although machinery availability remains a constraint during peak season).

11. Based on a desk review of SECAP notes from recent projects in the country, field visit findings from those projects demonstrated that women employed in agri-processing factories were generally assigned low technical labour-intensive tasks (sorting pepper, peeling mangoes, shelling cashew nuts, etc.) whilst men perform more technical tasks (e.g. operating machinery and equipment) and are more often in supervisor and manager positions.

12. Access and control over assets: Gender discrimination remains a key constraint for women to control and manage productive assets such as land, buildings, and equipment. Legally, the Land Law guarantees equal rights to land for men and women but in practice female-headed households as much as women in male-headed households face various constraints with regard to access to land. Customary practices undermine principles of joint ownership in male-headed households. In addition, gender-biased norms often prevent women from exercising or claiming their rights[iii]. It is estimated that less than 9% of women between 15 and 49 years of age own land, both alone and jointly[iv]. Women have also relatively less access to productive services such as credit, markets, etc.

13. Women's voice and role in decision making: For decision making at the household level, 86.3% of women participated in making major decisions in the household in 2014; 96% of women participate in decisions about visits to family, relatives, or friends; 93% in decisions about major household purchases; and 91% in decisions about their own health care (World Bank gender data).

14. Data-based evidence from on-going projects show that women are relatively well represented in community-based producers organisations/at the community organization level and that their participation in decision making has improved, but gender parity is yet to be achieved. Among the 1200 Agricultural Cooperatives currently registered nationwide, women account for 63% of the total membership. In business clusters (like the informal producers' organisations supported by the IFAD-funded ASPIRE programme), women represent around 40% of the membership. A recent assessment of around 2,000 business clusters showed that gender parity in decision-making positions is almost achieved with 40% of administrative positions occupied by women. In most cases, however, women are assigned the role of cashier (46%) while they are much less likely to be in deputy and leader positions (31% and 23% respectively). The same pattern is also valid across the 1200 Agricultural Cooperatives registered nationwide: there are around 40% of women in cooperative management committees. Women represented 20.1% of those employed in senior and middle management in 2017 and at national level, only 20% of seats in national parliament were held by women in 2020 (World Bank gender data). Women are generally well represented in last-mile extension workers positions, and gender parity is almost achieved for roles such as Community Extension Workers (CEWs).

15. Gender based violence: Economic pressures such as loss of employment, reduced income, or indebtment are known factors that contributes to gender-based violence (GBV), by causing women to remain in abusive situations for financial reasons or to become vulnerable to exploitation (report by the NGO Committee on the United Nations' Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW)). In Cambodia, the share of women who have experienced intimate partner violence[v] is 27%, less than the world average (World Bank gender data). However, recent studies and assessments indicate that the pandemic's impact on employment and indebtedness had direct repercussions on more frequent GBV.

16. The CAISAR project will take place in provinces with a high percentage of women headed households, and it is expected that the project activities pertaining to on-farm

[i] Ministry of Planning – NIS, Cambodia Inter-Censal Agriculture Survey 2019
[ii] Ministry of Planning - Cambodia Socio-Economic Survey 2019/2020
[iii] Anne Hennings, 2021: https://landportal.org/book/narratives/2021/cambodia
[iv] The percentage of women age 15-49 who both solely and jointly with someone else own a land which is legally registered with their name or cannot be sold without their signature. "Both alone and jointly" Implies a woman owns a land alone and another land jointly with someone else.
[v] Intimate partner violence is by far the most prevalent form of violence against women globally and is defined as the percentage of ever-married women (ages 15-49) who have ever experienced physical or sexual violence committed by their husband or partner, whereas those who have ever experienced any form of sexual violence is the percentage of women (ages 15-49) who ever

experienced sexual violence irrespective of marital status and perpetrator.

c. Youth

17. Youth are defined[i] by people who are between 15 and 30-year-old of age as per the National Youth Policy and the National Youth Action Plan. The share of youth aged 15-29 not in employment, education, or training (NEET) is relatively low at 6.4%. The majority of NEETs are inactive, i.e. not looking for a job and not studying, and they are mostly women[ii]. Young women are clearly disadvantaged compared to young men in the labour market.

18. Civil society organisations are progressively gearing up to the challenge and provide support to youth to integrate in the society and take part in the national economy. For example, JCI has a network of seven chapters nationally and work in four areas: Entrepreneur ship, skill development, community impact, international cooperation. Business matching events are also organised to facilitate access to finance and support for potential young entrepreneurs.

19. Entrepreneurship opportunities for youth in rural areas remains rare. Rural youth may be attracted by modern farm business models (hydroponic, net-houses, etc.). Ultimately, agro-processing facilities owned and operated by either SMEs or ACs in rural areas are the best options to provide employment opportunities to youth, both for unskilled work and technical, administrative or management positions.

20. CAISAR activity 1.1.3, *"improve enabling conditions, capacities and disaster risk management strategies and implementation capacities,"* will support rural youth as the proposed agricultural centres of excellence would provide opportunities for training rural youth in productive skills, particularly the installation, operation and maintenance of agricultural productions, green infrastructures and equipment. In addition, the CAISAR project will comprise one pillar of IFAD's programmatic approach through the improvement of farm-level climate resilience and water use efficiency, climate-proofing water infrastructure in complement to other pillars – including those related to youth (e.g. SAAMBAT project on market infrastructure, digital technology, and youth programme).

[i] In IFAD-funded ASPIRE, the Management Information System was revised in 2019 to change the acceptation of Youth as people between 16 and 24 years of age.
[ii] Youth Well-being Policy Review of Cambodia, OECD 2017: https://www.oecd.org/dev/inclusivesocietiesanddevelopment/Youth-well-being-policy-review-Cambodia.pdf

d. Indigenous peoples

21. In Cambodia, the government defined indigenous peoples as the group of people that resides in the territory of the Kingdom of Cambodia whose members manifest ethnic, social, cultural and economic unity and who practice a traditional lifestyle, and who cultivate the lands in their possession according to customary rules of collective use.[i]

22. The National Report on Demography Socio-Economic Status of Indigenous People published by the Ministry of Planning in 2021 stated that indigenous peoples or groups were identified on the basis of their mother tongue and, using this parameter, there were found to be 22 indigenous ethnic groups[ii] located across 15 provinces[iii] with a population of 183,831 (equal to 1.25% of the total population of Cambodia[iv]). Among the 22 indigenous ethnic groups, there are six groups who comprise the majority of the indigenous population (i.e. over 10,000 people). These groups include: Tampoun, Bunong, Kroeung, Kui, Jarai and Brov, which make up for a combined 88% of the total indigenous population in Cambodia. Even though the indigenous peoples live across 15 provinces, the majority of them (92.40%) are living in the six provinces of Ratanakiri, Mondulkiri, Kratie, Stung Treng, Kampong Thom and Preah Vihear[v].

23. As the CAISAR project occurs outside of the six provinces listed above, high IP populations are *not* anticipated within the project area. There are only two provinces targeted by the CAISAR project which have recorded populations of IPs (albeit in limited numbers): Kampong Speu and Pursat. Details on IPs residing in those areas and/or IPs adjacent to those areas with the potential of being affected by the project will be presented in an Indigenous Peoples' Plan (including Free, Prior and Informed Consent (FPIC)) at the time of the full funding proposal submission.

[i] Land law 2001 article 23 paraph #1
[ii] The 24 IPs groups are, Tumpun, Jarai, Kreung, Prao, Kavet, Pnong, Kouy, Steang, Kraol, Mil, Kachak, Por, Khaonh, Chorng, Sui, Thmol, Lun, Sa-och, Rode, Khe, Ro-orng, Spung, Laern, and Samre IPs groups.
[iii] Rattanakiri, Mondulkiri, Kratie, Preah Vihear, Kampong Thom, Stung Treng, Oddor Meanchey, Kampong Cham, Pursat, Kampong Speu, Koh Kong, Kampong Saom, Battambang, Bantheay Meanchey and Siem Reap provinces
[iv] National report on demography, socio-economic status of indigenous peoples in Cambodia.
[v] National report on demography, socio-economic status of indigenous peoples in Cambodia.

e. Marginalised groups

24. According to the 2019 General Population Census, 4.9% of Cambodia's population aged five years and above experiences some difficulty in performing basic functions. Persons with disabilities face multiple challenges such as inequality and discrimination in access to education, healthcare, employment, social protection, and justice, public transport and are particularly vulnerable to

violence and other violations of their rights. Women and girls with disabilities face additional discrimination and barriers when accessing services compared to men with disabilities. They are also vulnerable to violence because of their gender and disabilities (UNDP).

25. The CAISAR project will develop a Stakeholder Engagement Plan (SEP) as part of the full funding proposal package which will take into consideration the diversified needs of potential beneficiaries and/or project affected persons with disabilities and those who have been historically marginalized.

f. Nutrition

26. Prevalence of undernourishment[i] decreased from 17% in 2004/2006 to 6.2% in 2019, but overall prevalence of food insecurity in the general population is still high: severe food insecurity affects 13.4% of the population and moderate food insecurity 44.8%. Another preoccupying issue is the severe prevalence of anaemia that affected more than 47% of women of reproductive age (age 15-49) in 2019 (State of food security and nutrition in the World, SOFI, 2021).

27. At the consumer level, food safety concerns influence dietary behaviours in low- and middle-income countries (LMICs) but despite food safety concerns, consumers could not always ensure that they consumed safe food; barriers were affordability, accessibility and appeal. Key concerns included fear of pesticides, fertilizers, hygiene in/around food outlets, unhygienic vendor practices and household storage/preparation methods (Liguor J. et al, 2021).

28. Food safety at farm and Producers Organisation levels is a concern in post-harvest and processing operations (food safety being the absence of – or safe, acceptable levels of – hazards in foods that may harm the health of consumers). Food borne hazards can be microbiological, chemical, or physical in nature and are often invisible to the plain eye; bacteria, viruses or pesticide residues are some examples. The food products for which food safety challenges are most prominent are cereals and nuts susceptible to aflatoxin contamination, and high-value fresh products such as fresh fruit and vegetables, meat and dairy (IFAD, 2017).

29. The CAISAR project does not seek to address food safety concerns, however it does address food security insofar as it will focus on increasing climate resilience and agricultural productivity. To this end, the project is expected to have a positive impact on food security within the project area.

[i] after World Bank data

2.2 Environment and climate context, trends and implications

n/a

a. Environmental assessment

30. Landscapes and biodiversity: Within the broad Indo-Malayan ecological region, Cambodia encompasses a rich diversity of landscapes, categorised in eight distinct eco-regions, three of which have conservation status assessed as critical/endangered. The links in the figure below provide detailed information on the characteristics of each eco-regions including their intrinsic biodiversity features[i].

31. Cambodia has a total land area of 176,500 km², of which 41% is under protected area status. The 2008 Protected Areas Law (2008) defined eight categories of natural protected areas, for forest land, wetland and marine ecosystems. As late 2017, Cambodia had almost 50 protected areas, covering 7.5 million hectares. However, fragile forest habitats of Cambodia have been affected by deforestation, and three of the country's eight ecoregions are now considered as critical / endangered.

32. Current estimates of remaining natural forest cover vary considerably, but the official consensus is that about half of Cambodia's land area has some form of forest cover (MoP-NIS, Statistical Yearbook, 2021). The World Bank data show that forest cover declined from 60% in 2009 to less than 46% in 2020. Hayward, D. and Diepart J.C. (2021) identified three key drivers of deforestation: (i) large-scale acquisition of land for agro-industrial development; (ii) agrarian expansion by smallholder farmers; and (iii) illegal logging. The study estimates that large-scale agro-industrial plantations cover 831,300 ha, equivalent to about 31% of the deforestation that occurred between 2001 and 2019. The study also links smallholder's agrarian expansion to deforestation, due to internal migratory movements between rural areas, in the context of on-going transition from subsistence farming to commercial agriculture.

33. Land use and land degradation: Cambodia's 31.5% of the total land area is agricultural land. Soils of Cambodia belong to two main texture classes: Clay-loam in the low-lying areas of the Tonle Sap and Mekong delta zones, and sandy clay loam (SaClLo, as per USDA classification) on sloping land of higher grounds in the plateau/mountain zone, where siliceous sedimentary formations occur.

34. These sandy soils are of low fertility and are also the most prevalent in agricultural lands. When not under vegetation cover, these soils are also particularly susceptible to erosion and land degradation. In respect to soil erosion, Cambodia has about 4.45 million ha of land under highly erodible class. The map in figure 4 (below) shows the Land Productivity Dynamics, which is a representation of land productivity trends that have persisted between 2001 and 2018. These trends (decline, stress, stability and gain of productivity) are generated through the interaction of three NDVI-based indicators (steadiness, initial standing biomass, and standing biomass at change).

35. The drivers of land degradation in Cambodia have been attributed mainly to deforestation, expanding agricultural lands, climate

change, pest and diseases, unsustainable land management, and infrastructure development (MAFF, 2018)[i].

36. In the framework of the United Nations Convention to Combat Desertification (UNCDD), the government has determined Land Degradation Neutrality Targets to 2030. A set of ambitious measures have been defined to achieve the target of Land Degradation Neutrality by 2030, including forest protection and reforestation, restoration of degraded and deforested landscapes in Kampong Thom, Preah Vihear and Siem Reap provinces[ii] (all outside of the CAISAR project area), reduction of forest land conversion by cessation of economic land concession program, governance and law enforcement, increased productivity of cropland by applying good agriculture and animal husbandry production standards (GAP and GAHP), application of sustainable agricultural practices (Conservation agriculture, organic farming) to increase soil organic matter content to 4% of cropland per year (Rice, vegetables, fruit trees), among other measures (MAFF, 2018).

37. Agricultural Soils: Agricultural soils in Cambodia are generally assessed as having low chemical fertility. Analysis of soil sample in the national database showed that all types of soils low pH (ranging from 4.6 to 5.4), low to very low Cation Exchange Capacity and very low organic Carbon content (ranging from 0.25 to 1.17%). In addition, conventional rice cultivation destroys any structure that they have.

38. Potential pathways to build and maintain soil fertility are to shift from monocropping and promote more diversified crop rotations and introduce relay crops, cover crops, mix/intercrop, and other form of crop association. Other options include soil conservation techniques (zero tilling or minimal soil preparation) to limit soil disturbance and promote soil microorganisms. Moreover, use of bio compost and innovative soil carbon sequestration options that have multiple benefits on soils structure, microbiological activity, water retention capacity. In turn this soil management approach has proven positive impacts on plant health that ensure higher tolerance to pests and diseases.

39. Another emerging issue in agricultural soil management is linked to the intensification of vegetable production under net-houses. With up to nine production cycles a year, nutrient depletion of soils under net-housing is a growing concern. Similarly, the use of hormones to produce mango three times a year is also affecting the soil health and local biodiversity.

40. Agricultural intensification and monocropping is also linked with pests and disease outbreaks affecting cassava, banana, mango, cashew nut as well as poultry production. Increased use of agrochemicals has direct adverse impact on rural households' health, and ecosystems (aquatic life, soil biodiversity, fauna and flora). Agricultural intensification is also associated with increased use of equipment made of plastic for greenhouses, plastic sheets for mulching and soil solarization, drip lines and other "water saving irrigation" equipment, protective fruit bagging on mango, banana trees, agro-chemical packages, vegetable and fruit retail packages, etc. In absence of adequate handling and disposal practices, plastics may end up in the soils and negatively affect the soil microbiologic activity.

41. The project will mitigate many of the above inherent risks by promoting climate-resilient and sustainable production practices under Component 1, such as activity 1.1.1 which facilitates the planning and deployment of resilient measures, introducing farmers to climate-resilient and sustainable options based on climate knowledge, and encouraging the use of ecosystem-based solutions at the farm level. Activity 1.1.3 also support the establishment of agricultural centers of excellence in partnership with the private sector for the development and dissemination of improved sustainable agricultural techniques in response to climate change and income diversification. Activity 1.1.3 will include (i) improved tolerance to pests and diseases, including control techniques and climate resistant cultivars; (ii) modern production techniques, including efficient resource-use and low-carbon and climate resilient agriculture; (iii) climate- and market-informed crop planning; (iv) smart soil fertility management; (v) agricultural machinery, including innovative renewable energy efficient models; (vi) post-harvest, processing and storage techniques; and (vii) climate and early warning systems.

42. Water resources: About 70% of the annual water resources are water inflow from upstream countries, mostly through the Mekong River. About 86% of Cambodian territory is located within the Mekong River Basin that include the Mekong Mainstream, the Bassac river, the Tonle Sap River and associated Great Lake. Variations in water availability are by nature highly seasonal in Cambodia, due to the rainfall distribution and fluctuations of river discharges in the Mekong basin. This annual pattern typically features floods, typhoon and droughts and poses challenges in terms of water management to fulfill the ever-increasing water demand of various end users: agriculture accounts for 96% of all water use; domestic rural use 1%; and industry, domestic urban, and aquaculture use less than 1%. Water quality in the Lower Mekong Basin is regularly monitored by the River Mekong Committee[iii] and has been consistently assessed as of good or very good for the protection of both human health and aquatic life.

43. It is estimated that only about 2% of the total surface water volume is currently used, but water shortages regularly occur (frequently in dry season in the Tonle Sap river basin), due to lack of water storage and constraints in access to water. Water shortage directly affect crops, livestock, fisheries, and domestic use but also ecosystems sustainability. It is expected that the current water management challenges will be further compounded by the effect of climate change (see SECAP note sub-section on climate). To address these challenges, the Government, through the Ministry of Water Resources and Meteorology has defined a National Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019–2033. It has identified the water management constraints as: (i) lack of water storage to support all water user needs including agriculture, urban, and the environment; (ii) minimal water resources information to support evidence based decision-making; (iii) lack of integrated water resources management and water allocation plans at river basin levels; and (iv) irrigation schemes that lack modern facilities to support efficient water delivery and higher agriculture production including diversification into high value crops.

44. There is tremendous potential to improve irrigated agriculture and production: There are about 2,500 irrigation schemes nationwide, serving a cumulated command area of about 1.2 million hectares, which represents only 22% of all arable land. In more than 50% of the irrigation schemes, only one crop cycle can be achieved. The schemes located in the Tonle Sap River Basin represent 60% of the country's irrigated areas but the majority do not have access to reliable, year-round water sources

(ADB brief 171, 2021).

45. CAISAR explicitly focuses on improving irrigation systems under Component 2, which is linked with Component 1 and focuses on rehabilitating and modernizing infrastructure above farm-level including canals, ponds, flood-proof existing and rehabilitated irrigation infrastructure and supplying high efficiency climate-resilient irrigation systems. These climate adaptation activities will ensure that the projected increase in extreme wet days and more frequent upstream flooding do not lead to damages and destruction of irrigation infrastructure and also transform this risk into green opportunity by storing more water in irrigation ponds. Finally, more efficient irrigation technologies will ensure that farmers can irrigate for longer periods throughout the year. Given the extent of rehabilitation and modernization anticipated under Component 2, the associated risk is considered high. To ensure that the related potential impacts (both social and environmental) are addressed prior to on-ground implementation, the project plans to commission an Environmental and Social Impact Assessment (ESIA) via an independent third-party.

[i] Cambodia is one of the most biodiverse countries in Southeast Asia, with as many as 8,260 plant species (10% of which may be endemic) along with more than 250 species of amphibian and reptile, 874 fish species and over 500 bird species (https://www.fauna-flora.org/countries/cambodia/)
[i] Land Degradation Neutrality Targets, MAFF, January 2018
[ii] Approaches include implementing Restoration Opportunities Assessment Methodology (ROAM) and Forest Landscape Restoration, as well as assisted natural regeneration
[iii] http://interactive.mrcmekong.org/sobr-2018-findings/environmental-dimension/

b. Climate trends and impacts

46. Like other monsoon dependent countries, climate change is altering Cambodia's and project areas' monsoon calendar[i], increasing total drought days and shifting the start of the rainy season. While annual rainfall is expected to increase, the number of days with rain is decreasing and daily rain intensity is increasing, resulting in extreme rainfall events and potential flooding. World Resource institute (WRI) rates the upper and lower Tonle Sap watershed as extremely high for water risk (WRI, Aqueduct). Inter-annual variability in rainfall significantly influences river discharges and between one and four million hectares of Cambodia's floodplain, of which about 25 falls in the project areas, may be submerged during the wet season, reaching critical thresholds for irrigation and ecosystem stability.

47. Flooding in the project areas generally occurs between July and October driven by rainfall as well as high water levels in the Mekong River and Tonle Sap Lake. With the increased intensity of wet-season rainfall, both the duration and extent of flooding have increased in some areas. While local rainfall patterns are important for rainfed agricultural systems, irrigation and water supply also depends on the Mekong River's hydrology and upstream sections in the neighbouring countries.

48. Observed impacts of climate change trends in recent years have manifested by longer dry seasons and more intense "El Niño" related droughts, delayed onset of the monsoon season, increased rain intensity and frequency, leading to floods, and unexpected dry periods during the rainy season. Annual mean temperature anomaly has increased at a rate of 0.23 °C per decade since 1950[ii], with a stronger signal of increase during the dry season. The rate of temperature change is notable in the dry season (December, January and February) followed by pre-monsoon (March, April and May) and, to a minor extent, by wet season months (June, July and August). The increase in mean annual temperature and decrease in dry season rainfall have manifested in droughts and water shortages significantly impact rainfed agriculture due to a late start and early ending of the wet season.[iii]

49. Future projections of climate change in the project area under the RCP4.5 scenario indicate temperature increase of 6°C by mid-century (2036-2065) and up to 2.2°C by the end of the 21st century (2066-2095). Nights exposed to high temperatures are projected to become more frequent during the 21st century (+114 nights by mid-century and +151 nights by the 2080s). Population, crop and livestock systems will also experience heat extremes more frequently in comparison to the reference period (42 days by mid-century and reaching to 62 days by the 2080s) (IFAD's preliminary climate analysis).

50. The changes in precipitation and temperature patterns induced by climate change in the project area could affect the climatic suitability of cereals, vegetables and starchy crops produced. On average, for most crops analysed for this project, it was found that precipitation suitability could remain constant across the century, while temperature suitability could progressively decrease with some crops falling outside their optimal temperature levels. Overall, this change in patterns could contribute to a reduction in crop yield for both irrigated and non-irrigated crops. For example, in the Kampong Chhang region, rice yield could decrease from 9 to 12%, with and without irrigation respectively, by 2050 (period of 20 years centred around 2050) compared to 2020. These projections are for the RCP8.5 scenario and without CO2 fertilization. As smallholder farmers' income are largely dependent on their yield, it is anticipated that farmers' income could become more volatile with a decreasing trend over time.

51. The CAISAR project aims to explicitly address climate change issues through its targeted interventions which would (i) improve water security and community resilience in a changing climate; and (ii) climate-proof irrigation infrastructure.

[i] Climate change & Agriculture in Cambodia, AIIB-IFAD CAISAR: climate (RCP4.5), crops and livestock analyses (2021-12-08)
[ii] Thoeun, H. C. (2015) Observed and projected changes in temperature and rainfall in Cambodia. *Weather and Climate Extremes.* 7:61.
[iii] MAFF (2017) MAFF Annual Report 2016-17

c. Climate change mitigation

52. Potential adaptation and mitigation measures will be further assessed during the full design.

2.3 Target group profiles

53. CAISAR is designed to target four provinces (Kampong Speu, Kampong Chhnang, Kandal, and Pursat) with the highest population density, high total percentage of poor households, and high percentage of women-headed households. The livelihoods of these most vulnerable peoples in the region depend on agricultural production and water availability through precipitation, river flow or irrigation schemes. Under Component 1, activities are set to target and directly work with youth, women, and those most vulnerable to climate change. Component 1 will address the needs of the climate vulnerable/women/youth in terms of livelihoods opportunities and climate resilience. By design, the activities will also help to economically empower youth and women. Whilst IP groups are not explicitly targeted within the project design, the project will address the needs of IPs in and adjacent to the project areas through the Indigenous Peoples' Framework (and, at a later stage, the IP Plan). An overview of youth, women, rural poor, and indigenous persons in the project area has been provided in section 2.1 of this preliminary SECAP note.

54. In addition to youth, women, rural poor and climate vulnerable populations, the CAISAR project also aims to build capacity within the Royal Government of Cambodia and work with line ministries to implement the project. As such, another key target group of the project is the line ministries within the government, notably: Ministry of Water Resources and Meteorology (MoWRAM) and the National Committee for Sub-National Democratic Development (NCDD).

3. Institutional analysis

55. The CAISAR project will work with the Royal Government of Cambodia's (RGC's) Ministry of Water Resources and Meteorology (MoWRAM), Provincial Departments of Water Resources and Meteorology (PDWRAM), and the National Committee for Sub-National Democratic Development (NCDD). It also employs the services of consulting agencies like Water and Power Consultancy Services (WAPCOS) for preparatory work in terms of feasibility studies for the planned rehabilitation, modernization, and climate-proofing of irrigation infrastructure under Component 2. Under Component 1, the project will namely engage Farmer Organizations (FOs), Farmer Water Use Communities (FWUCs), and agricultural extension personnel.

56. A major barrier to sustainable and climate-resilient development of irrigation and water infrastructure in the project area is insufficient investment in planning and long-term maintenance of infrastructure in a systematic way. In addition, technical capacities of relevant national institutions and Farmer Water Use Communities (FWUCs) are rarely assessed in detail at the design stage. In most irrigation schemes, there is largely no systematic cost-recovery practice leading to a lack of incentive for the FWUCs members to manage the infrastructure properly. A capacity and needs assessment of MoWRAM, PDWRAM, and relevant FWUCs / FOs in the region has been planned for the design stage (currently underway) to ensure targeted interventions and suitable training programs are included in the project to build the skills needed to undertake O&M responsibilities. This assessment will also include information on readiness for implementation, monitoring, and enforcement of environmental and social safeguards-related measures.

57. Another important barrier in the project area is the lack of extension services at the provincial level. Agricultural extension lacks personnel, capacity, and network to access remote communities. In addition, current extension personnel possess an inadequate understanding of climate change and responsive practices and technologies that are suitable for local contexts. Farmers have limited knowledge of technologies and techniques that are more sustainable and climate resilient. Agricultural expansion has been possible through unsustainable practices including the mono-cropping, excessive application of chemical fertilizers and pesticides and poor soil nutrient management. Farmers, agricultural cooperatives, and SMEs have limited access to finance which may facilitate the adoption of appropriate technologies and techniques. Access to finance remains the major barrier as farmers and agribusinesses often cannot meet the high collateral requirements and financial institutions tend to charge high interest and provide short-term loans because of the risks associated with agriculture. The lack of credit history and low financial literacy are other reasons for their poor financial access.

58. The CAISAR project builds on existing national policies, strategies, and regulatory frameworks, specifically: CAISAR is aligned with the RGC's priorities on low-carbon and climate resilient development as outlined in the RGC's overarching Rectangular Strategy Pillar IV 2019 -2023.[i] Cambodia has developed and implemented the Climate Change Strategic Plan 2014 – 2023, and associated action plans developed by each relevant ministry. These plans are Cambodia's first ever comprehensive national policy documents that illustrate the country's priority adaptation needs. The Updated NDCs 2020 identify a lack of access to financial, technological and human resources as the primary challenge. Adaptation priorities for agriculture include: (i) scaling-up of climate-resilient agriculture systems including the introduction of climate-resilient and ecologically appropriate crop varieties; (ii) community-based actions to restore and maintain critical environmental services affected by climate change; (iii) strengthening of early warning and climate information systems and dissemination; and (iv) strengthening of capacity to conduct climate impact assessments and carry out cross-sectoral planning. The project is also aligned with the thematic portfolio Climate Change and Natural Resources Management of the Mekong Region Cooperation Programme (MRCP) 2022-2025 and it will include indicators on: national policies and legal frameworks in the field of climate change (CCE_TRI_1); disaster risk prevention and reduction (DRR_TRI_3); and persons benefiting from concrete climate change adaptation measures (CCE-ARI-1).

[i] Rectangular Strategy-Phase IV, 9 Sep 2018, International Relations Institute of Cambodia.

4. Environmental and social category

59. Whilst the types of interventions in the CAISAR project are standard to most IFAD projects (e.g. irrigation rehabilitation, improving livelihoods and resilience of rural farming communities, increasing agricultural productivity), the topography of Cambodia and scale of the project interventions under Component 2 (i.e. the irrigation infrastructure) require a high risk rating to ensure that the project does no harm and, rather, actively improves the environmental and social situation in the project areas. This high risk rating is also based on the associated flood risks given projected changes in climate, which necessitates thorough feasibility studies, ESIAs, and related assessments to ensure: (i) no adverse impacts in terms of changes to flood plains and water flows; (ii) clear resettlement plans and procedures to avoid/mitigate/compensate, where needed, instances of physical and/or economic displacement. The process will involve iterative consultations with communities, particularly those of marginalized groups (women, youth, IPs, extreme poor, disabled, elderly). With adequate safeguards measures and incorporation of these measures directly into the project design (wherever possible), the residual risk will be reduced to substantial or moderate, depending on the sub-project.

5. Climate risk category

60. Based on the climate projections and current climate scenario for Cambodia (as listed in section 2 of this note), this project has a substantial climate risk rating. Whilst the inherent climate risk based on projections and present-day situation is substantial, the project has been explicitly designed to address climate risk through the climate-proofing of key irrigation infrastructure and building of community resilience to climate changes.

6. Recommendations for project design and implementation

61. Recommendations for project design and implementation are detailed in the table 2, below.

Table 2. Recommendations Disaggregated by Component for Project Design and Implementation:

Component	Design stage	Implementation stage
1) Improving farm-level climate adaptation, resilience, and water use efficiency The objective of this component is to build sustainable climate adaptation solutions for smallholder farmers and enhance engagement sustainable water-user practices through evidence-based planning and context-relevant climate resilient practices at the farm level. The component will support smallholder farmer groups to implement climate-resilient crop and water management methods and promote viable business models for the private sector to deliver affordable, smart and efficient technology solutions for water and crop management. Local financial institutions, agricultural cooperatives and farmer organizations will be engaged to facilitate uptake. A credit line for climate-resilient investments will be employed.	Iterative consultations based on the project's Stakeholder Engagement Plan (under development) to be held with key target groups, notably: youth involved with the agricultural centres of excellence; women-headed households; and IP groups within the project area. The consultations will help to establish a grievance redress mechanism based on differentiated needs; determine areas where participatory monitoring/reporting can be used during implementation; and key needs/preferred methods of engagement for that group. Needs-assessment of FOs/FWUCs to better specify and target sub-component activities. Build-in indicators relating to engagement of women and youth as part of the Results Framework.	Recommendations for implementation are to be determined pending further design studies. Initial recommendations include the use of participatory monitoring (where relevant) and provision of credit to women specifically under Component 1.1.2.

2) Climate-proofing water infrastructure for increased resilience Component 2 is linked with Component 1 and it will focus on rehabilitating and modernizing infrastructure above farm-level including canals, ponds, flood-proof existing and rehabilitated irrigation infrastructure and supplying high efficiency climate-resilient irrigation systems. These climate adaptation activities will ensure that the projected increase in extreme wet days and more frequent upstream flooding do not lead to damages and destruction of irrigation infrastructure and also transform this risk into green opportunity by storing more water in irrigation ponds. Finally, more efficient irrigation technologies will ensure that farmers can irrigate for longer periods throughout the year.	Full ESIA to be prepared for by an independent third party for any tentative high-risk subprojects involving large-scale rehabilitation/ modernization/ climate-proofing of irrigation infrastructure. In instances where the sub-projects are not identified, a list of first-year projects is to be determined with accompanying feasibility studies. Study on the state of land tenure and access to resources in the proposed project areas, with accompanying recommendations on how to address potential economic and/or physical displacement. This study will feed into the Resettlement Framework document. Where applicable, hydrological modelling to determine potential changes/shifts in flood plains and spillways.	Recommendations for implementation are to be determined pending further design studies.

7. Further studies needed

62. Based on CAISAR's high risk rating, the following studies will be prepared during the full design:

- Environmental, Social, and Climate Management Framework (ESCMF);
- Resettlement Action Framework (RAF);
- Indigenous Peoples Planning Framework (IPPF);
- Gender Analysis/Assessment & Gender Action Plan (GAP);
- Stakeholder Engagement Plan (SEP).
- Climate analysis and rationale.

63. The ESCMF, RF, IPF, GAP, and SEP will be primary documents for preparation and disclosure at least 120 days prior to submission to the Board of the Green Climate Fund. A larger ESIA is to be prepared by an independent third party during the first year of the project (prior to the implementation of any high risk subprojects). Costing for each of these documents is under discussion and a budget will be provided later during the design phase.

8. Monitoring and evaluation

64. The Project will define a project management and monitoring system in line with the AIIB and IFAD's requirements and the government' standard operating procedures (SOPs). Separate consulting firms and individual consultants will be recruited to support the project implementation; to undertake detailed design services and construction supervision; and provide project management support to the Project Management Unit (PMU) and the Project Implementation Units (PIUs), including monitoring and evaluation. The PMU will submit quarterly annual progress reports reporting on the status of the Project, including the status of environmental & social safeguards. A dedicated monitoring and evaluation specialist at the PMU will be responsible for the data collection by the staff of the PIUs and for reporting. AIIB and IFAD Project teams will conduct quarterly virtual missions per year until business travel resumes and coordinates with the PMU and the PIUs through virtual monthly progress meetings. The project team is considering additional digital tools based on augmented reality to better monitor specific issues arising under the Project.[i]

65. MoWRAM is a project Implementing Entity (IE), and the IE budget is in Component 2. The Executing Agency (EA) will coordinate and consolidate planning and reporting, contracting with Technical Assistance Team for the overall project implementation. NCDD is a sub-IE and their management budget is in the Component 1.

66. Key indicators relating to gender, youth, IPs, and safeguards more broadly are currently under discussion and will be developed prior to submission of the full funding proposal.

[i] The augmented reality package constitutes of virtual 3D glasses connected to smart phone cameras onsite with a proprietary communication software to be purchased during Project preparation.

9. References

67. Please refer to the footnotes listed at the end of this document.

ESCMP Matrix

68. The ESCMP matrix will be prepared later in the design stage and will be integrated into the project's implementation manual.

Footnotes

Footnotes included in the main text.

Environmental and Social Safeguards Classification: High

Environmental and Social Safeguards				
Biodiversity conservation	**Yes/No**	**Likelihood**	**Consequence**	**Risk Rating**
1.1 Could the project potentially involve or lead to conversion or degradation of biodiversity, habitats (including modified habitat, natural habitat and critical natural habitat) and/or ecosystems and ecosystem services?	Yes	Possible	Moderate Project will significantly affect modified habitat, but will not impinge on natural habitat or critical natural habitat.	Moderate
1.2 Could the project involve or potentially lead to activities involving habitats that are legally protected, officially proposed for protection, or recognized as protected by traditional local communities and/or authoritative sources (e.g. National Park, Nature Conservancy, Indigenous Community Conserved Area, ICCA, etc.)?	Yes	Unlikely	Minor Project is close to a protected area, and associated facilities may have an indirect impact unless the project is modified	Low
1.3 Could the project potentially involve or lead to an increase in the chance of human-wildlife encounters/conflict?	Yes	Possible	Moderate Conflict leads to some loss of livelihood or threat to wildlife, but this is not catastrophic	Moderate
1.4 Could the project potentially involve or lead to risks to endangered species (e.g. reduction, encroachment on habitat)?	Yes	Possible	Moderate Net loss in biodiversity with a status of Endangered, or status change to Edangered due to project impacts.	Moderate
1.5 Could the project potentially involve or lead to impacts/risks to migratory wildlife?	Yes	Possible	Moderate Project or associated facilities close to sites of importance to migratory wildlife sites. No direct impact, but possible indirect impact.	Moderate
1.6 Could the project potentially involve or lead to introduction or utilization of any invasive alien species of flora and fauna, whether accidental or intentional?	Yes	Possible	Moderate High potential for invasive alien species of flora and fauna to be introduced, but strict controls likely to be adequate.	Moderate
1.7 Could the project involve or lead to the handling or utilization of genetically modified organisms?	No			Low
1.8 Could the project involve or lead to procurement through primary suppliers of natural resource materials?	Yes	Possible	Moderate Poject requires procurement of natural resources through primary suppliers, and resource extraction is tightly regulated	Moderate
Resource Efficiency and Pollution Prevention	**Yes/No**	**Likelihood**	**Consequence**	**Risk Rating**
2.1 Could the project involve or lead to the release of pollutants to the environment due to routine or non-routine circumstances with the potential for adverse local, regional, and/or transboundary impacts?	Yes	Possible	Moderate Pollutants may possibly be released, either routinely or by accident, but treatment systems are proven and verified. Receiving environment is highly senstive.	Moderate

Environmental and Social Safeguards				
2.2 Could the project involve or lead to primary not environmentally sustainable production of living natural resources? (Note: this includes the cultivation or rearing of plants or animals, including annual and perennial crop farming, animal husbandry (including livestock), aquaculture, plantation forestry, etc)	Yes	Possible	Moderate Project is fully dependent on production of living natural resources. Project is sited in an existing agricultural area, with low environmental and/or social sensitivity.	Moderate
2.3 Could the project involve or lead to engagement in areas of forestry, including the harvesting of natural forests, plantation development, and/or reforestation?	No			Low
2.4 Could the project involve or lead to significant consumption of raw materials, energy, and/or water?	Yes	Possible	Moderate The project will require consumption of raw materias, energy, and/or water. This will be a significant component of the project, but impacts can be appropriately managed.	Moderate
2.5 Could the project involve or lead to significant extraction, diversion or containment of surface or ground water (e.g. construction of dams, reservoirs, river basin developments, groundwater extraction)?	Yes	Likely	Severe The project relies entirely on water-based (groundwater and/or surface water) development. It incudes construction of medium to large irrigation schemes (above 999 ha per scheme); significant extraction/diversion/containment of surface water, leaving the river flow less than 5% above the environmental flow when downstream user requirements are taken into account; withdrawal of groundwater in areas already experiencing soil subsidence due to over-abstraction and/or increasing groundwater depth (e.g. observed in existing wells); withdrawal of groundwater close to the recharge rate considering all abstraction needs from the groundwater unit.	High
2.6 Could the project involve inputs of fertilizers and other modifying agents?	Yes	Likely	Moderate The project requires use of fertilizers, but options are available to replace polluting fertilizers with alternatives.	Substantial
2.7 Could the project involve or lead to procurement, supply and/or result in the use of pesticides on crops, livestock, aquaculture or forestry?	Yes	Possible	Moderate The project requires use of pesticides, but options are available to replace potentially polluting pesticides with alternatives.	Moderate
2.8 Could the project be located in an area which is being, or has been, polluted by an external source (e.g. a mine, smelter, industry)?	No			Low

Environmental and Social Safeguards				
2.9 Could the project involve livestock – extensive and intensive systems and animal products (dairy, skins, meat, etc.)?	Yes	Unlikely	Moderate Intensive/extensive livestock/aquaculture systems are in place, but these are only one component of the project.	Moderate
Cultural Heritage	**Yes/No**	**Likelihood**	**Consequence**	**Risk Rating**
3.1 Could the project be located in areas that are considered to have archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values or contains features considered as critical cultural heritage?	Yes	Possible	Moderate The project is thought to be close to an area that is considered to have archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values or contains features considered as critical cultural heritage. The site has not been surveyed, and so the presence of cultural heritage is not well known.	Moderate
3.2 Could the project directly or indirectly affect indigenous peoples' rights, lands, natural resources, territories, livelihoods, knowledge, social fabric, traditions, governance systems, and culture or heritage (tangible and intangible)?	Yes	Possible	Moderate Moderate impact on indigenous population. Damage to/or temporary loss of access to indigenous land, assets, resources, and/or cultural heritage.	Moderate
3.3 Could the project involve or lead to significant excavations, demolitions, movement of earth, flooding or other environmental changes?	Yes	Possible	Moderate Moderate impact on land. Some short-term earth moving and environmental changes required. Rehabilitation is straightfoward.	Moderate
3.4 Could the project involve or lead to adverse impacts to sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g. knowledge, innovations, practices)? (Note: projects intended to protect and conserve Cultural Heritage may also have inadvertent adverse impacts)	Yes	Possible	Moderate The project is thought to be close to an area that is considered to have archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values or contains features considered as critical cultural heritage. The site has not been surveyed, and so the presence of cultural heritage is not well known.	Moderate
3.5 Could the project involve or lead to alterations to landscapes and natural features with cultural significance?	Yes	Possible	Moderate Moderate impact on indigenous population. Some short-term earth moving and environmental changes required. Rehabilitation is straightforward.	Moderate
3.6 Could the project involve or lead to utilization of tangible and/or intangible forms (e.g. practices, traditional knowledge) of Cultural Heritage for commercial or other purposes?	No			Low
indigenous peoples	**Yes/No**	**Likelihood**	**Consequence**	**Risk Rating**

Environmental and Social Safeguards				
4.1 Could the project be sited in areas where indigenous peoples are present (including the project area of influence)?	Yes	Possible	Moderate The project may have a moderate impact on indigenous people, because it is sited within commuting distance of indigenous communities, and because it offers employment to indigenous people.	Moderate
4.2 Could the project result in activities located on lands and territories claimed by indigenous peoples?	Yes	Possible	Moderate The project is sited in an area that was previously used by indigenous people, and groups are mobilizing with the intention of making a claim.	Moderate
4.3 Could the project result in impacts on the rights of indigenous peoples or to the lands, territories and resources claimed by them?	Yes	Possible	Moderate Moderate impact on indigenous population. Damage to/or temporary loss of access to indigenous land, assets, resources, and/or cultural heritage.	Moderate
4.4 Could the project result in the utilization and/or commercial development of natural resources on lands and territories claimed by indigenous peoples?	No			Low
4.5 Could the project lead to impacts on the Cultural Heritage of indigenous peoples, including through the commercialization or use of their traditional knowledge and practices?	No			Low
Labour and Working Conditions	**Yes/No**	**Likelihood**	**Consequence**	**Risk Rating**
5.1 Could the project operate in sectors or value chains that are characterized by working conditions that do not meet national labour laws or international commitments? (Note: this may include discriminatory practices, high gender inequality and the lack of equal opportunities, denial of freedom of association and collective bargaining, labour migrants)	Yes	Possible	Moderate The project operates in sectors or value chains that have, in the past, not met national labour laws, or international commitments, but is now adequately nationally regulated. However, international value chains are not regularly audited for environmental or social performance.	Moderate
5.2 Could the project use or operate in a value chain where there have been reports of forced labour? (Note: Risks of forced labour may be increased for projects located in remote places or where the status of migrant workers is uncertain)	Yes	Possible	Moderate The project does not operate in sectors or value chains where forced labour was evident in the past. The status of forced labour regulation is currently unclear.	Moderate
5.3 Could the project involve children (a) below the nationally-defined minimum employment age (usually 15 years old) or (b) above the nationally-defined minimum employment age but below the age of 18 in supported activities or in value chains?	Yes	Possible	Moderate The project does not operate in sectors or value chains where child labour was evident in the past. The status of forced labour regulation is currently unclear.	Moderate

Environmental and Social Safeguards				
5.4 Could the project: (a) operate in a sector, area or value chain where producers and other agricultural workers are typically exposed to significant occupational and safety risks, and/or (b) promote or use technologies or practices that pose occupational safety and health (OSH) risks for farmers, other rural workers or rural populations in general? (Note: OSH risks in agriculture might include: dangerous machinery and tools; hazardous chemicals; toxic or allergenic agents; carcinogenic substances or agents; parasitic diseases; transmissible animal diseases; confined spaces; ergonomic hazards; extreme temperatures; and contact with dangerous and poisonous animals, reptiles and insects. Psychosocial hazards might include violence and harassment.)	Yes	Possible	Moderate The project operates in a sector, area, or value chain where workers are occasionally exposed to significant OSH risks, and where regulation is known to be weak or non-existent.	Moderate
Community Health, Safety and Security	**Yes/No**	**Likelihood**	**Consequence**	**Risk Rating**
6.1 Could the project be at risk from water-borne or other vector-borne diseases (e.g. temporary breeding habitats), and/or communicable and non-communicable diseases?	Yes	Possible	Moderate The project is situated in an area where there is past evidence of negative impacts from water-borne or other vector-borne diseases, or communicable/non-communicable diseases, but where regulation or containment of these impacts has been shown to be effective.	Moderate
6.2 Could the project lead to unintended negative impacts on nutrition?	No			Low
6.3 Is there a possibility of harm or losses due to failure of structural elements of the project (e.g. collapse of buildings or infrastructure)?	No			Low
6.4 Could the project involve or lead to the construction or rehabilitation of dams?	Yes	Possible	Minor The project involves the rehabilitation of dam(s) and/or reservoir(s) meeting at least one of the following criteria: - less than 10 metre high wall; - less than 300m long crest; or - less than 1 million m3 reservoir capacity.	Moderate
6.5 Could the project involve or lead to transport, storage, and use and/or disposal of hazardous or dangerous materials (e.g. explosives, fuel and other chemicals during construction and operation)?	Yes	Possible	Minor The project has only minor involvement with the transport, storage, and use and/or disposal of hazardous or dangerous materials, and regulation of hazardous materials is effective.	Moderate
6.6 Could the project lead to adverse impacts on ecosystems and ecosystem services relevant to communities' health (e.g. food, surface water purification, natural buffers from flooding)?	Yes	Possible	Moderate Moderate adverse impacts to ecosystems and their services that could negatively affect the health of communities in the direct vicinity of the project are possible, but similar projects have shown that Impacts can be mitigated or offset through schemes such as Payment for Ecosystem Services.	Moderate

Environmental and Social Safeguards				
6.7 Could the project lead to the potential for gender-based violence, including sexual harassment, exploitation and abuse, as a result of labour influx, land redistribution, or other actions that alter community dynamics?	Yes	Possible	Moderate Moderate changes to community dynamics may result in increased potential for gender-based violence or sexual exploitation. Gender-based violence interventions are integrated into project design.	Moderate
6.8 Could the project lead to increases in traffic or alteration in traffic flow?	Yes	Possible	Moderate Moderate changes to traffic volumes or alterations to traffic flow. Risk of injury or death is reduced by good design and implementation of safety protocols. New construction, rehabilitation or upgrade of rural roads, with Annual Average Daily Traffic (AADT) below 400	Moderate
6.9 Could the project lead to an influx of project workers?	Yes	Possible	Moderate The project is partly dependent on an influx of project workers, but the majority of workers are local. Risks of impacts have been planned for, and protocols are in place	Moderate
6.10 Could the project involve or lead to the engagement of security personnel to protect facilities and property or to support project activities?	No			Low
Physical and economic resettlement	**Yes/No**	**Likelihood**	**Consequence**	**Risk Rating**
7.1 Could the project result in temporary or permanent and full or partial physical displacement (including people without legally recognizable claims to land)?	Yes	Almost certain	Severe >100 households/ businesses displaced.	High
7.2 Could the project result in economic displacement (e.g. loss of assets or access to resources due to land acquisition or access restrictions – even in the absence of physical relocation)?	Yes	Possible	Major Significant loss of assets or access to resources. Project may result in between 10% and 15% reduction in a farmer assets or a community assets.	Substantial
7.3 Could the project present a risk of forced evictions?	No			Low
7.4 Could the project result in impacts on or changes to land tenure arrangements and/or community-based property rights/customary rights to land, territories and/or resources?	Yes	Likely	Major Signficant changes to land tenure arrangements and/or community-based property rights. Legal recourse and other forms of arbitration/conflct resolution are available.	Substantial
Financial intermediaries and direct investments	**Yes/No**	**Likelihood**	**Consequence**	**Risk Rating**
8.1 Could the investment be granted to an institution that does not have an environmental and social policies and an associated environmental and social management system (ESMS) in place (transparent, publicly available)?	No			Low

Environmental and Social Safeguards				
8.2 Could the investment be granted to an institution with insufficient capacities (i.e. unqualified personnel e.g. ES Officer) to implement the ESMS?	No			Low
8.3 Could the investment be granted to an institution that does not have an Exclusion List?	No			Low
8.4 According to the institution's portfolio classification: Could the institution have potential high-risk projects in their portfolio?	No			Low
8.5 Is there evidence that the institution does not comply with the local legal framework?	No			Low
8.6 Does the institution provide a stable communication channel with stakeholders and local communities (e.g. a Grievance Redress Mechanism)?	No			Low
8.7 Does the organization provide auxiliary or capacity building support services.	No			Low

Climate Risk Classification: Substantial

Step 1: Hazard identification	
What are the expected hazards in the project intervention area?	**No, Yes, TBD**
River flood	Yes
Costal Flood	No
Urban Flood	Yes
Landslide	Yes
Cyclone	Yes
Water Scarcity (agricultural droughts and/or dry spells)	Yes
Extreme Heat	Yes
Wildfires	Yes
Future climate scenarios foreseen (period 2040-2059) - Change in frequency and intensity	**No, Yes, TBD**
Change in temperature (increase or decrease)	Yes
Change in rainfall (increase or decrease)	Yes
Climate variability (larger or smaller)	Yes
Intensity and frequency of extreme events (larger or smaller)	Yes
Is the project expected to have an impact on climate change (i.e. contribute to greenhouse gas emissions)?	**No, Yes, TBD**
Is the project expected to be a significant emitter of greenhouse gases?	No
Step 2: Exposure Assessment	
Is the project located in exposed areas to weather-related natural hazards?	**No, Yes, TBD**
Low-lying areas (valleys, coastal zones, and small islands)	No
Very warm areas (subtropical)	No
Tropical areas (rainforests)	Yes
Arid and semi-arid areas (deserts)	No
Mountains zones and permafrost areas (tundra)	No
River banks	Yes
Does the project target agricultural systems, ecosystems or livelihoods exposed to weather-related hazards?	**No, Yes, TBD**
Is crop production frequently affected by rainfall variability, prolonged droughts, changes in temperature or pests and diseases?	Yes
Is livestock productivity frequently affected by rainfall variability, prolonged droughts, changes in temperature or diseases?	Yes
Are fisheries frequently affected by ocean acidification, water salinity and changes in sea surface temperature due to ocean-atmospheric oscillations or climate change?	Yes
Is forest productivity frequently affected by wildfires, diseases, rainfall variability, prolonged droughts, or changes in temperature?	N/A
Is the biodiversity in the project area likely to be affected by changes in climate variables?	Yes
Is any stage of the agricultural value chain (production, storage, processing and marketing) exposed to climate related hazards?	Yes
Is any rural infrastructure likely to be affected by flooding, landslides, changes in temperatures, and extreme winds.	Yes
Step 3: Sensitivity Assessment	
What are key sensitivities for the populations in the project's areas of intervention?	**No, Yes, TBD**
Is conflict exacerbating the population's sensitivity to weather related hazards?	No
Is population displacement being exacerbated by climate change impacts?	No

Are diseases (e.g. COVID-19, malaria, cholera) increasing the population´s vulnerability and affecting their capacity to address potential weather-related hazards?	No
Is the income of the target population predominately coming from agriculture?	Yes
Are social inequalities (e.g. based on gender, youth, indigenous persons and other marginalized groups) being exacerbated by climate change?	Yes
Is the Human Development Index (HDI) equal to or below 0.6?	Yes
Is the Multidimensional Poverty Index (MPI) equal to or above 0.1?	Yes
Step 4: Adaptive capacity and climate resilience	
What are key adaptive capacities in the areas of project intervention?	**No, Yes, TBD**
Is the country well ranked in the Disaster risk reduction progress score?	No
Are climate and weather information services (real-time weather data, seasonal forecasts etc.) effectively being delivered (through radio, TV, SMS, extension services etc.) to farmers, rural dwellers, and end users?	No
Does the project country have an early action plan (preparedness and emergency response) to mitigate the impacts of weather-related hazards once the shock occurs?	Yes
Does the government or other institutions support the target population/communities with the necessary social and economic resources to prepare for or respond to climate-related events?	No
Is the target community carrying out (using their own means) agricultural adaptation?	Yes
Does the target population have the economic means or support to adjust or adapt their activities in response to weather related shocks?	No
Do policies/mechanisms exist that make financial credit, loans, and agricultural insurance available?	Yes
Are rural infrastructures effectively delivering services to farmers and rural dwellers?	No

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex 6: First (Annual) Work Plan and Budgets

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

Contents

Climate Adaption Irrigation and Sustainable Agriculture for Resilience (CASAIR)

Component 1: Farm level climate alternation and resilience (NCDD-3)

Detailed Costs

Summary Decisions

Expenditure | Other Accounts | Noted

Fin. Rate

Implementing Agency/Partners

| | Unit | Quantities Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Total | Unit-Cost (US$) | Base Cost (US$) Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Total | Sub Component | A/C | Account | Disb.Acct. | Category | Fin. Rate | GIAC | IFAD-Blend Loan | GCF | GAC Contribution | Partner Financial Contribution | Beneficiary Contribution | Total | TARDA, Government of the Kingdom of Cambodia (GKG) Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Total | IFAD-Blend Loan Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Total | GCF Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Total | GAC Contribution Q1 | Q2 | Q3 | Q4 | Total | Partner Financial Institution Q1 | Q2 | Q3 | Q4 | Total | Beneficiary Contribution Q1 | Q2 | Q3 | Q4 | Grand Total |
|---|---|---

Company:

Project: ampba x Irrigation and Sustainable Agriculture Co-Functions (CARAVA)

Budget Case:

Budget Options

Hypothesis

Other Account

Input

Pre-Study

Pre-Study Investment Cost (Irrigation Development Cost)

Investment Cost (Irrigation Development Cost)

Post-Study Investment Cost (Irrigation Development Cost)

Annual Operation Cost (Irrigation Development Cost)

Overall Total

Operation

Asset Cost

Maintenance Cost

Asset Component

Activity

Cost Driver

Unit

Quantity

Unit Cost (Irrigation Development)

Asset Value (USD)

Technical Lifetime (Years)

Unit

Initial Cost (Birr)

Initial Cost (Birr)

Recurring Cost (Birr/year)

Total

Y1

Y2

Y3

Y4

Y5

Y6

Y7

Y8

Y9

Y10

Y11

Y12

Y13

Y14

Y15

Y16

Y17

Y18

Y19

Y20

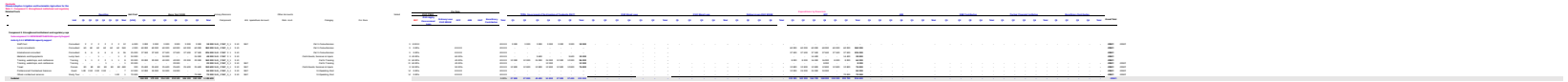
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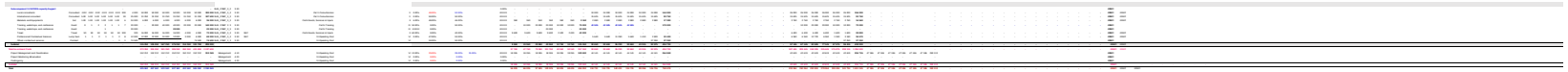
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Y25







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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex 7: Financial Management Assessment

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

Detailed FM arrangements in the Project Design Report (PDR) (Annex 7)
Cambodia: Climate Adaptive Irrigation And Sustainable Agriculture For Resilience (CAISAR)

I. Summary of Financial Management arrangements[1]

1. FM capacity and risk assessments have been completed per FMD guidelines; the assessment was made during the meetings with MOWRAM and NCCD ministry officials in January 2023. The overall FM risk at design is rated "Substantial" because of the risks at the entity and project control levels. The risk assessment takes into account the policy specifically designed for externally funded projects (SOP) that prove to be successful on other IFAD-funded projects; MOWRAM and NCCD already have experienced staff for implementation of donor funded projects with available computerized accounting software. However, additional consultants will be required as government staff to be seconded will not have sufficient time to handle all FM aspects of the project and accounting software will need to be customized.
2. Strengths and weaknesses of proposed FM arrangements.
   Key strengths of the CAISAR FM arrangements are:
   - Cambodian SOPs that are mandatory for all IFAD-funded projects are well-designed documents for each step of project implementation.

   However, the most challenging issues for CAISAR FM arrangements are:
   - Potential low FM staff capacity at implementing agencies.
   - No previous experience of the MOWRAM in IFAD-funded projects.
   - Past external audit reports did not comply with IFAD requirements.

   Both Inherent and Residual risks are substantial for CAISAR due to the abovementioned weaknesses. Residual risk will be revised when mitigation measures are implemented.
   The design of CAISAR includes mitigation measures to minimize potential risks and integrates current strengths into overall FM arrangements. Therefore, CAISAR design includes competitive recruitment of FM consultants with adequate experience and education background to mitigate low staff capacity related risks. In addition, development of PIM and FMM with clear roles for supporting documents filing and accounting record keeping for all implementing partners and

[1] Normally this summary will be included only in the main design report under Financial / Fiduciary section, Annex 7.

implementation of accounting software for accounting record keeping, financial reporting and accounts reconciliations will further strength overall FM arrangements. As a result, the FM arrangements for CAISAR are satisfactory to IFAD. First Disbursement conditions in the FA will be (i) PIM approval, (ii) Accounting software customization, and (iii) recruitment of experienced and qualified FM staff for CAISAR.

II. Project financial profile[2]

3. The total incremental investment and recurrent costs for CAISAR, including price and physical contingencies, are estimated at US$ 240.1 million. As per the Vietnamese laws, IFAD funds are not used for recurrent costs. Overall, the recurrent cost share as a percentage of total project cost is 5.5%. The breakdown of the costs by component is shown in Table 1 below.
4. Table 1. CAISAR costs by component.

US$ million

Components	Total Cost (USD)	Funding Sources				
		Green Climate Fund (Grant)	Green Climate Fund (Credit)	IFAD (Credit)	AIIB (credit)	Government (in kind)
Component 1 - Farm Level Climate Adaptation and Resilience	**40.4**	11.0	-	27.9	-	1.5
Component 2 - Upgrading and climate-proofing water infrastructure for increased resilience	**167.7**	20.8	36.8	3.8	96.3	10.0
Component 3 - Strengthened institutional and regulatory capacity for low-emission climate-resilient development pathways	**10.7**	4.1	3.2	1.4	-	2.0
Project monitoring & evaluation	**13.3**	4.1	-	3.8	3.7	1.6
Contingency credit	**8.0**	-	-	8.0	-	-

[2] Note that COSTAB and Financing Plan may be finalized at a later date after the design mission. In such cases this section, as well as other relevant information, should be revised and updated by the Finance Officer before the President's Report is presented in Scriptoria for FMD clearance.

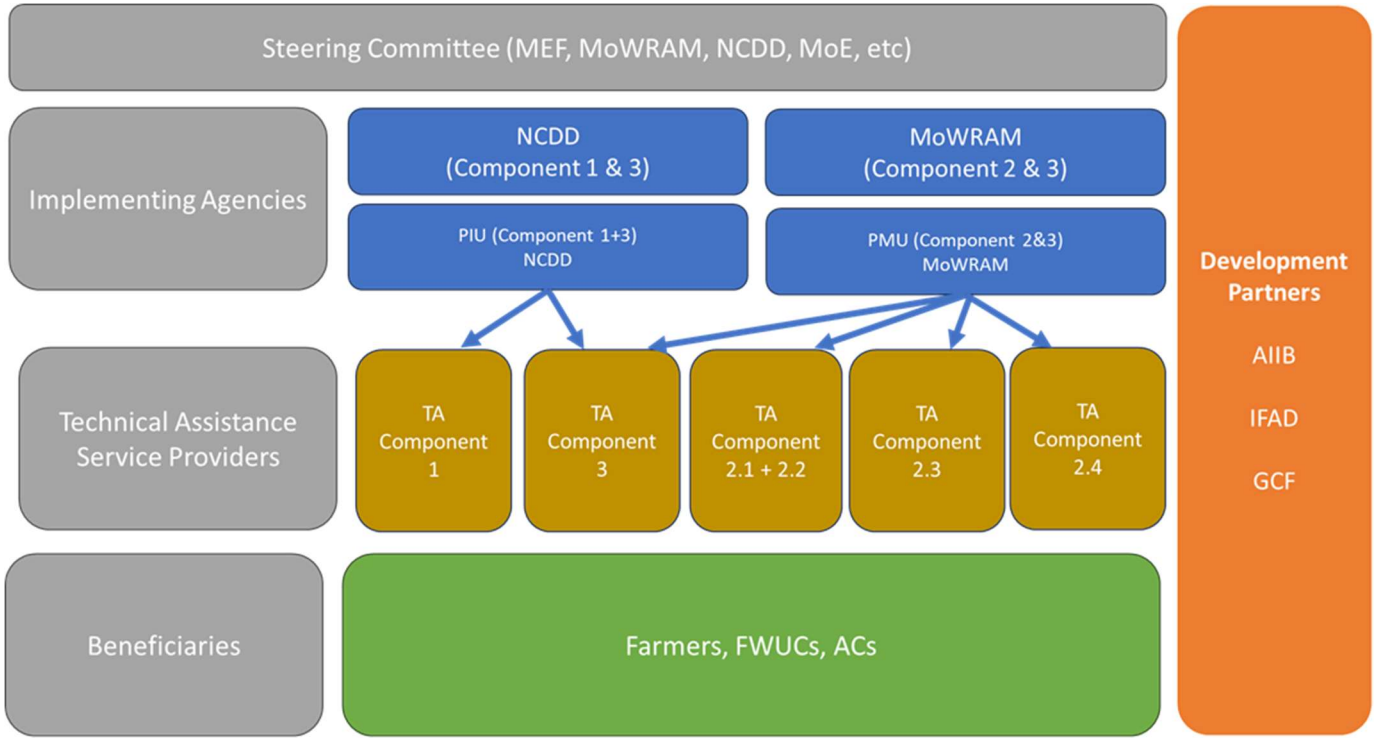
TOTAL	**240.1**	**40.0**	**40.0**	**45.0**	**100.0**	**15.1**
		16.7%	**16.7%**	**18.7%**	**41.6%**	**6.3%**

5. The financing plan will be as follows: IFAD contribution (PBAS 13) is US$ 45.0 million- 18.7%. In addition, AIIB will allocate US$ 100 million (41.6%) in parallel financing and GCF will allocate US$ 40 million loan (16.7%) and US$ 40 million grant (16.7%). Government will contribute US$ 15.1 million (6.3%).

6. Description of cost categories and eligible expenditures:
The CAISAR will not have cost categories. Instead, it will have cost allocations by components as per GCF requirements.

III. Implementation Arrangements

7. **Organizational Structure:** The Executing Entity (EE) for the project will be the Ministry of Water Resources and Meteorology (MOWRAM) which is responsible for sustainable water resource management and irrigation in Cambodia. MOWRAM will establish a Project Management Unit for the coordination of all components and consolidation of the project planning and reporting. In addition, the National Committee for Sub-National Democratic Development Secretariat (NCDD-S) will be responsible for the implementation of component 1 which is designed to improve farm-level climate adaptation and resilience. The NCDD-S is a Direct Access Accredited Entity to the GCF and will have a Project Implementation Unit (PIU) for implementing the component 1 activities.
8. A Project Steering Committee (PSC) will be established for inter-ministerial coordination. It will be chaired by the Minister of MOWRAM and comprise of senior officials from MOWRAM, the Ministry of Economy and Finance (MEF), the Ministry of Interior (MOI) which is responsible for the NCDD-S, Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Environment (MOE), and the Provincial Governor's Offices of Pursat, Kampong Chhnang, Kandal, and Kampong Speu provinces. An Inter-Ministerial Resettlement Committee (IRC), chaired by MEF, will manage resettlement and land acquisition issues where they arise. The National Project Coordinator of the Project Management Unit (PMU) will serve as a secretariat to the PSC.
9. Overall project organizational structure:



10. FM staffing arrangements. CAISAR will employ the existing seconded staff from MOWRAM and NCCD. However, each of them will recruit one additional consultant with adequate experience and educational background to maintain project accounting records in the accounting software and financial reporting.

IV. Financial Management Risk Assessment[3]

11. Project risk assessment

Inherent risk: Substantial

Transparency International (TI)

12. Cambodia's 2023 TI Corruption Perception Index (CPI) score is 22, representing a two-point decrease compared to 2022. This places Cambodia at 158th position out of 180 countries assessed, down from 150th last year. The result marks a concerning trend, as Cambodia's CPI score has fluctuated within the low 20s for the past decade, despite sporadic improvements.

Public Financial Management (PFM) and Debt Assessment.

13. Growth for 2023 is projected at 5.3 percent. This is backed by the recovery in tourism and non-garment exports—notably solar panels and electric parts, as well as fiscal support. The public debt to GDP ratio is projected to increase moderately, and the risk of debt distress remains low. According to staff's debt sustainability analysis, in the baseline scenario, the total public and publicly guaranteed (PPG) debt-to-GDP ratio, which is 35 percent of GDP as of end-2022, is projected to rise by around 4 percentage points of GDP during the next decade due to higher financing costs of the fiscal deficit. This ratio is projected to remain stable under several stress scenarios, suggesting a low risk of debt distress.9 However, the analysis shows that Cambodia's external debt remains vulnerable to shocks in exports and growth.

14. FM risk summary.

FM Control Area (level 3 risk)	Comment(Risk identified)	Mitigation actions	Inherent Risk	Residual Risk
1. Organization and Staffing	• Lack of experience in IFAD-funded operations/projects • Delay of recruitment of PMU/PIU staff, including finance staff. • Staff needs training on IFAD FM and disbursement procedures.	• Competitive and transparent selection of candidates. • Start-up training for FO. • Networking of FOs of IFAD-funded projects in Cambodia.	Substantial	Substantial
2. Budgeting	• MOWRAM does not have experience in IFAD AWPB preparation • Delay of AWPB preparation due to challenges related to coordination between PMU and PIU. • Budget may not be closely monitored due to lack of expertise and	• Training on preparation of AWPB. • Customized accounting software to monitor budget vs actual will be introduced within 6 months of the entry into force of the project.	Substantial	Moderate
3. Funds Flow / Disbursement Arrangements	Delay in the preparation and submission of IFR and WA to IFAD	• MOWRAM and NCCD will cooperate to prepare and consolidate IFR, and then WA can be submitted to IFAD promptly. • Training on IFR and ICP will be conducted at the start-up.	Moderate	Moderate
4. Internal Controls	• PEFA: Effectiveness of internal audit was rated C Internal Audit Department be established in each ministry and state enterprise and report to its head, with a copy to the National Audit Authority. • Risk of unclear role, responsibility, and delegation. • Risk of insufficient controls for detecting fraud.	• PIM will be approved at the project inception.] • IFAD anti-corruption training will be conducted at the start-up. • PMU and PIU will follow the internal control procedures from Government Standard Procedures (SOP) for internationally funded projects. • PMU/PIU will be subject to line-ministry inspection on internal control and procurement.	Substantial	Substantial

5. Accounting and Financial Reporting	• PMU/PIU will apply the Cambodia Public Sector Accounting Standard (cash basis). • Standard accounting software shall be used for PMU/PIU and be compatible with IFAD and other donors' financial reporting requirements.	• Ensure the Accounting software is installed, customized, and capable of providing the financial information for IFR. • IFR training will be conducted at the project start-up.	Substantial	Substantial
6. External Audit	• External Auditors may not follow standard TOR and audit contract requirements.	• Audit TOR will be reviewed by IFAD and cleared. Coordination with MEF will be essential to ensure compliance with IFAD audit requirements.	Substantial	Substantial
Overall rating	CAISAR FM Residual risk is Substantial before mitigation measures are implemented. The project will benefit from an adaptation of a semi-ring-fenced PMU with seconded staff from a designated unit specializing in implementing donor-funded projects. However, recruiting qualified FM staff, installing and customizing accounting software, developing PIM/FMM, and adequate external audit arrangements must be completed before the residual risk becomes moderate. The project shall comply with the government's SOP like other donor-funded projects.		Substantial	Substantial

15. Overall risk: The Inherent FM risk is Substantial due to (i) Potential low FM staff capacity at implementing agencies, (ii) No previous experience of the MOWRAM in IFAD-funded projects; (iii) Past external audit reports did not comply with IFAD requirements. The IR and RR are Substantial. RR will be revised after project negotiations.
16. CAISAR design will include the following to mitigate the risks:
    - Recruitment of qualified consultants with relevant experience and educational background.
    - Development of PIM and FMM with clear roles for supporting documents filing and accounting record keeping for all implementing partners.
    - Customization of accounting software for accounting record keeping and financial reporting.
    - Close coordination with MEF to ensure compliance with IFAD audit requirements.

V. Financial Management and Disbursement Arrangements

17. ***Disbursement*:** The government treasury system is not applied for project fund flow. MEF will authorize the opening of a designated account (DA) in USD at the National Bank of Cambodia for the receipt of Financing from IFAD. There will be two USD project accounts (one for MOWRAM and one for NCCD) which shall be opened at commercial banks for the payment of project activities. One Government Counterpart Fund Account is to be maintained by MEF through which the proceeds of the Financing shall be further transferred to two sub-accounts in commercial banks to receive the counterpart fund from the Counterpart Fund Account. The disbursement of the IFAD fund will follow through the Revolving Fund Mechanism in which the project can withdraw/justify the advance based on the Interim Financial Report (IFR) following the procedures and conditions outlined in FMFCL. IFAD will send the FMFCL to MOWRAM and MEF with guidance on disbursement procedures; MEF will send IFAD the ICP letter providing the delegation and authorization of the persons who can request and approve the submission of IFR and WA in ICP.
18. **Staffing:** MOWRAM is the Lead Project Agency, and NCCD is an implementing partner; MOWRAM and NCCD already have a finance unit with experience in international donor-funded projects that can support CAISAR. PMU and PIU will be set up for MOWRAM and NCCD with a combination of seconded staff and contract staff. The seconded Finance Officer will oversee the project's financial management to ensure the effective FM system and internal control are maintained in accordance with the procedures in SOP and PIM. The seconded Finance Officer will have relevant experience working on other internationally funded projects. The contract Finance staff will be hired to support project FM functions daily including: a) Ensuring sufficient supporting documentation and approvals for payment; b) Posting transactions to the accounting software; c) Providing periodical and financial reports to the management; d) submitting of IFR and WA to IFAD, providing other support to Seconded Finance Officer as required. The Finance staff will be recruited with relevant experience and qualifications. FM functions will have clear roles and responsibilities to ensure the segregation of duty and payment authorization in accordance with SOP and PIM.
19. ***Planning and budgeting:*** The project budget is separate from the government budget; however, it will be integrated into the Public Investment Plan; the procedures for budget preparation are described in the SOP, and the AWPB will also include the projection of counterpart contributions. AWPB is subject to approval by MEF before submission to IFAD for no Objection. NCCD-PIU will prepare the AWPB and submit it to MOWRAM-PMU; PMU will consolidate the AWPB and submit it to IFAD for NOL. The AWPB and procurement plan will be prepared in IFAD format with details and a summary of activities and categories. The budget will be monitored in the accounting software. PMU/PIU will ensure to keep track of the progress reports against the budget and provide required information for interim financial reports and annual financial reports.

20. ***Internal control:*** According to the PEFA for Cambodia, the effectiveness of internal audits was rated C. PMU and PIU will be set up separately from the government system and will follow the internal control procedures from the Government's Standard Operating Procedures (SOP), which is deemed to be effective for internationally funded projects. The SOP articulates the responsibilities and critical elements of internal control, financial delegation, transaction processing, and computerized accounting system controls. PIM and Financial Management Manual will outline key FM arrangements and controls. The Internal Audit Department of MOWRAM and NCCD will conduct the internal audit of PMU and PIU annually to ensure compliance with the internal control procedures; the outcome of the internal audit will be shared with IFAD.
21. ***Accounting systems, policies, procedures, and financial reporting:*** PMU and PIU accounting procedures will follow Standard Operating Procedures (SOP) for internationally funded projects. According to SOP, CAISAR will apply the Cambodia Public Sector Accounting Standard (cash basis), which is based on the International Public Sector Accounting Standards (IPSAS). Standard accounting software shall be used for PMU/PIU that will be compatible with IFAD and other donor's financial reporting requirements. Standard Government's chart of accounts will be set up in the accounting software to capture all payment transactions; in addition, project components, categories, sources of funds, and other segments will be set up and recorded for the transactions in the software to ensure financial reports and budget reports produced in accordance with IFAD and Government requirements. The details of the accounting process and records are outlined in the SOP. All accounting records are required to be maintained in electronic format for a period of 10 years after project closure. MOWRAM PMU will be responsible for the consolidation of financial reports from NCCD-PIU for each quarter; within 30 days, NCCD PIU will send to MOWRAM PMU the interim financial report (IFR) in the agreed format that will finally be consolidated and submitted to IFAD for justification of advance and requesting new advances.
22. ***External audits*****:** CAISAR project financial statements will be audited by a private audit firm appointed by MEF, with the TOR prepared by MEF taking into account the IFAD requirements. The audit will be conducted in accordance with Cambodian Auditing Standards, which is adapting the International Standards on Auditing. The unaudited annual Financial Statement will be submitted to IFAD within 4 months after the end of the fiscal year; the audited financial statement will be submitted to IFAD within 6 months after the end of the fiscal year. The management letter with an assessment of the project's internal control matter will be included as an integral part of the audit report.
23. ***Country systems*****:** Government staffing, partial budgeting, internal controls (SOPs), accounting and audit standards will be used to implement CAISAR.
24. ***Lessons learned*****:** Despite the country's high risk on the corruption perception index, internationally funded projects have been well performing with credit to the strong coordination of MEF, Ministries, and LPAs. The Standard Operating Procedure provides specific guidance on project FM operation.

VI. Implementation Readiness

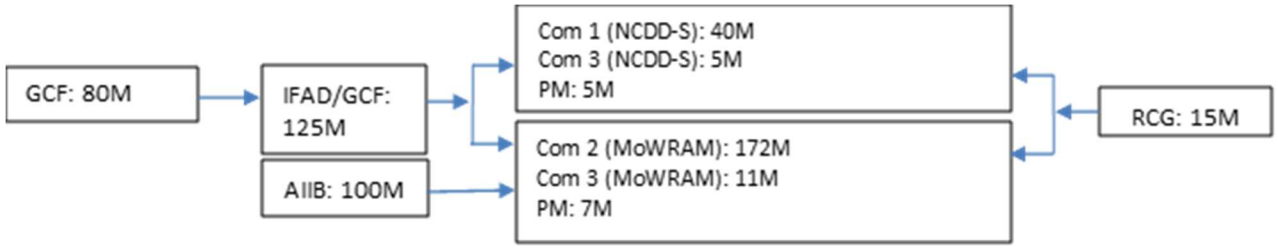
25. Table 3: FM Actions Summary: The actions needed to mitigate FM risks are summarised below:

	Action	Responsible Party / Person	Target Date / Covenants[4]
1.	PIM and FMM development.	CAISAR PMU/PIU	By the entry into force FA Covenant required
2.	Accounting software customization.	CAISAR PMU/PIU	By the entry into force FA Covenant required
3.	Recruitment of experienced and qualified FM staff.	CAISAR PMU/PIU	By the entry into force FA Covenant required
4.	Collaboration with MEF to ensure audit compliance	IFAD	ongoing

26. **FM Supervision plan**

FMS or FO will join the IFAD Supervision mission once a year. In addition, FMS will participate in the Implementation Support Mission every year until project residual risk is reduced to Medium.

Appendix 1: Flow of Funds Chart


GCF: 80M
IFAD/GCF: 125M
AIIB: 100M
Com 1 (NCDD-S): 40M
Com 3 (NCDD-S): 5M
PM: 5M
Com 2 (MoWRAM): 172M
Com 3 (MoWRAM): 11M
PM: 7M
RCG: 15M

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex 8: 18-month Procurement Plan

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

Annex 10: Procurement Plan

I. General

1. **Project information** *[Project name, Project Number, Country]*:
   Project Name: Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR)
   Project Number:
   Country: Cambodia

2. **Version of the Plan**: Version 3.0 dated 17 November 2024

3. **Procurement Plan clearance date (to be indicated by GCF)**:

4. **Period covered by this procurement plan:** The first 18 months

   This initial procurement plan is expected to cover at least the first 18 months of project/program implementation, or the full implementation period if available. Subsequent procurement plans (if needed) or substantial changes to this approved plan shall be communicated to the GCF upfront.

II. Procurement Methods and Prior Review Thresholds

	Procurement Category and Method[1]	Financial threshold applicable[2] / Threshold for use of method	Prior Review Threshold (applicable if the Executing Entity is not the AE)[3]	Remarks
A	**Goods and goods-related non-consulting services**			
1	International Competitive Bidding for Goods	Always allowed	US$ 150,000 or more	
2	National Competitive Bidding for Goods	Always allowed	US$ 150,000 or more	
3	Shopping for Goods	US$ 40,000 or less	US$ 150,000 or more	
4	Direct Contracting	With due justification	US$ 5,000 or more	
B	**Works and work-related non-consulting services**			
1	International Competitive Bidding for Goods	Always allowed	US$ 300,000 or more	
2	National Competitive Bidding for Goods	Always allowed	US$ 300,000 or more	
3	Shopping for Goods	US$ 40,000 or less	US$ 300,000 or more	
4	Direct Contracting	With due justification	US$ 5,000 or more	
C	**Consulting services and related non-consulting services**			
1	Quality and Cost Based Selection (QCBS)	Always allowed	US$ 80,000 or more	
2	Quality Based Selection (QBS)	Always allowed	US$ 80,000 or more	
3	Fixed Budget Selection (FBS) OR Lest Cost Selection (LCS)	Always allowed	US$ 80,000 or more	
4	Consultants Qualification Selection (CQS)	US$ 150,000 or less	US$ 80,000 or more	
5	Individual Consultant Selection (ICS)	Contracts with individuals regardless of the value	US$ 30,000 or more	
6	Single Source Selection (SSS) – Consulting Firm	With due justification	US$ 5,000 or more	
7	Single Source Selection (SSS) – Individual Consultant	With due justification	US$ 5,000 or more	

1. As per applicable procurement policy of the Accredited Entity. The procurement methods and procedures are specified under IFAD Procurement Handbook (accessible via https://www.ifad.org/en/w/document/ifad-procurement-handbook). The procurement thresholds will be inserted into IFAD's Online Procurement End-to-End system (OPEN) for plans and monitoring implementation of project procurement activities.
2. Financial threshold for which the indicated procurement method should be used.
3. Financial threshold above which the Accredited Entity will review and provide clearance prior procurement process is initiated (not applicable if AE is the executing entity).

III. Procurement activities

1	2	3	4	5	6	7	8	9	10	11	12	13
Item No.	**Activity/ Component Reference No.**	**Description of works, goods, non-consultancy and consultancy services to be procured**	**Required Delivery/ Commencement of Services time (weeks/ months after FP approval)**	**Procuring entity**	**Estimated cost (USD)**	**Procurement/ Selection method**	**Prequalification (Yes/No)**	**Review by AE (Prior/Post procurement process)**	**Tender issuing (e.g. weeks/months from the FP approval, etc)**	**Bid submission deadline (days/weeks after tender issuing day)**	**Evaluation and contract signing time (days/weeks after bid submission deadline)**	**Remarks**
A.		**Consultancy services (Firms)**			**28,343,545**							
1	1.1.1, 1.1.2, 1.1.3, 1.1.4	Service provider in charge of vegetables, poultry and aquaculture	11mths	NCDD PIU	1,195,208	QCBS	Yes	Prior	6mths	6wks	12wks	07 years
2	1.1.4, 1.1.5, 1.1.6	Service Provider to produce extension materials, conduct awareness raising and facilitate e-voucher	11mths	NCDD PIU	1,195,194	QCBS	Yes	Prior	6mths	6wks	12wks	07 years
3	1.1	Service Provider on rice (IRRI)	09mths	NCDD PIU	1,500,000	SSS	Yes	Prior	6mths	4wks	9wks	60 months over 07 years; IRRI recruited through SSS method. International Rice Research Institute (IRRI) has been continuously active in Cambodia since 1986. The organization has supported the government agencies in Cambodia in various aspects of rice sector development, including varietal development, seed systems, IPM, improved agronomic practices, mechanization and water management (please see more in http://books.irri.org/Cambodia_IRRI_brochure.pdf). IRRI also maintains

1	2	3	4	5	6	7	8	9	10	11	12	13
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												solid working relationships with other international crop research institutes belonging to the Consortium of International Agricultural Research Centers (CGIAR). Concerning the wide-ranging achievements in development of climate resilient rice varieties and dissemination of climate smart agricultural practices and technologies to various countries, and in recognition of outstanding contributions to advancements in Cambodian rice breeding programs, strengthening of rice seed systems, on-farm mechanization and capacity development of Cambodian scientists, extension workers and policymakers, IRRI is ideally placed to provide its services under the TA package for increasing farmer capacity on climate resilient rice production under Sub-component 1.1 in a comprehensive manner. The project plans to engage IRRI

1	2	3	4	5	6	7	8	9	10	11	12	13
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												through a TA contract on several aspects of this Sub-component 1.1, including activities 1.1.1 - 1.1.5.
4	1.2.3	A consulting service for business development, capacity building for 4PF implementation	20mths	NCDD PIU	44,000	CQS	Yes	Post	6mths	3wks	4wks	PY2
5	1.4.2	Consulting service for Detail design and supervision of rural road	11mths	NCDD PIU	2,220,400	QCBS	Yes	Prior	6mths	6wks	12wks	PY1-3; Number of packages to be confirmed
6	2.1	Consulting services for the DD and work supervision of 6/7 schemes	11mths	PMU	9,351,529	QCBS	Yes	Prior	6mths	6wks	12wks	
7	2.3.1	Consultancy service to develop 9 FWUCs (3 in OTP, 4 in LH, 5 in KP)	11mths	PMU	4,550,000	QCBS	Yes	Prior	6mths	6wks	12wks	PY1-7, Number of packages to be confirmed
8	3.4.1	Project Management Consultant at MOWRAM	11mths	PMU	8,287,214	QCBS	Yes	Prior	6mths	6wks	12wks	83 months over FY1-7
B.		**Consultancy services (Individuals)**			**2,438,000**							
1	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #1	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
2	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #2	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
3	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #3	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable

1	2	3	4	5	6	7	8	9	10	11	12	13
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4	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #4	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
5	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #5	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
6	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #6	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
7	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #7	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
8	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #8	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
9	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #9	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
10	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #10	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
11	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #11	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
12	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #12	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
13	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #13	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
14	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #14	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
15	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #15	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable

1	2	3	4	5	6	7	8	9	10	11	12	13
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16	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #16	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
17	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #17	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
18	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #18	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
19	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #19	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
20	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #20	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
21	1.2.1	National consultant to support VC study and planning	06mths	NCDD PIU	40,000	ICS	Yes	Prior	3mths	3wks	7wks	PY1
22	1.2.3	National consultant to support 4PF and value chain financing throughout the project lifespan (US$/year)	05mths	NCDD PIU	25,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
23	1.2.3	Intermittent international consultants on 4PF, VC financing	06mths	NCDD PIU	50,000	ICS	Yes	Prior	3mths	3wks	7wks	PY2, Intermittent, extendable
24	1.3.1, 1.3.2, 1.3.3, 1.3.4	National consultant #1 for Activity 1.3 - Agro-meteorological information and services	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
25	1.3.1, 1.3.2, 1.3.3, 1.3.4	National consultant #2 for Activity 1.3 - Agro-meteorological	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable

1	2	3	4	5	6	7	8	9	10	11	12	13
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		information and services										
26	1.3.2, 1.3.3	International consultant #1 for Activity 1.3 - Agro-meteorological information and services	06mths	NCDD PIU	144,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months over PY 1 and 2, extendable
27	1.3.2, 1.3.3	International consultant #2 for Activity 1.3 - Agro-meteorological information and services	06mths	NCDD PIU	144,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months over PY 1 and 2, extendable
28	1.4.1	National consultant - Engineer #1	05mths	NCDD PIU	25,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2
29	1.4.1	National consultant - Engineer #2	05mths	NCDD PIU	25,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2
30	1.4.2	National consultant to facilitate detail design work #1	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
31	1.4.2	National consultant to facilitate detail design work #2	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
32	1.4.2	National consultant to facilitate detail design work #3	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
33	1.4.2	National consultant to facilitate detail design work #4	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
34	1.4.2	National consultant to facilitate detail design work #5	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
35	1.4.2	National consultant to facilitate detail design work #6	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
36	1.4.3	National consultant for	18mths	NCDD PIU	30,000	ICS	Yes	Prior	15mths	3wks	7wks	12 months of PY2, extendable

1	2	3	4	5	6	7	8	9	10	11	12	13
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		construction supervision										
37	3.1.1	National consultant #1 for Activity 3.1 - MOWRAM/PDoWRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
38	3.1.1	National consultant #2 for Activity 3.1 - MOWRAM/PDoWRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
39	3.1.1	National consultant #1 for Activity 3.1 - MOWRAM/PDoWRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
40	3.1.1	National consultant #2 for Activity 3.1 - MOWRAM/PDoWRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
41	3.1.1	National consultant #1 for Activity 3.1 - MOWRAM/PDoWRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
42	3.1.1	International consultant for Activity 3.1, working 50% per year	06mths	PMU	150,000	ICS	Yes	Prior	3mths	3wks	7wks	6 months over PY 1, extendable
46	3.3.1	National consultant #1 for Activity 3.3 - NCDDS capacity Support	06mths	NCDD PIU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
47	3.3.1	National consultant #2 for Activity 3.3 - NCDDS capacity Support	06mths	NCDD PIU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable

1	2	3	4	5	6	7	8	9	10	11	12	13
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48	3.3.1	National consultant #1 for Activity 3.3 - NCDDS capacity Support	06mths	NCDD PIU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
49	3.3.1	National consultant #2 for Activity 3.3 - NCDDS capacity Support	06mths	NCDD PIU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
50	3.3.1	International consultant for Activity 3.3, working 5 months per year	06mths	NCDD PIU	125,000	ICS	Yes	Prior	3mths	3wks	7wks	5 months for FY1, extendable
51	3.4.1	NCDD-S National Project Management Advisor	06mths	NCDD PIU	72,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
52	3.4.1	NCDD-S National Finance Specialist	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
53	3.4.1	NCDD-S National Procurement Specialist	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
54	3.4.1	NCDD-S National M&E Specialist	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
55	3.4.1	NCDD-S Admin and Finance Assistant	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	7wks	12 months, extendable
56	3.4.1	Provincial Management Advisor - Kadal	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
57	3.4.1	Provincial Management Advisor - Kampong Speu	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
58	3.4.1	Provincial Management Advisor - Pursat	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
59	3.4.1	Provincial Management Advisor - Kampong Chhnang	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
60	3.4.1	Provincial Livelihood and	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable

1	2	3	4	5	6	7	8	9	10	11	12	13
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		Market Advisor - Kadal										
61	3.4.1	Provincial Livelihood and Market Advisor - Kampong Speu	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
62	3.4.1	Provincial Livelihood and Market Advisor - Pursat	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
63	3.4.1	Provincial Livelihood and Market Advisor - Kampong Chhnang	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
64	3.4.1	Provincial Finance Advisor - Kadal	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
65	3.4.1	Provincial Fiance Advisor - Kampong Speu	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
66	3.4.1	Provincial Finance Advisor - Pursat	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
B		**Goods**			**4,569,000**							
1	1.1.2	Training materials, 1 set	5mths	NCDD PIU	45,000	NCB	No	Post	3mths	4wks	4wks	for PY 1
2	1.1.4	Input materials for FFS	17mths	NCDD PIU	100,000	NCB	No	Post	15mths	4wks	4wks	for PY 2
3	1.1.4	Rice demonstration inputs and materials	17mths	NCDD PIU	124,000	NCB	No	Post	15mths	4wks	4wks	for PY 2
4	1.1.4	Vegetable demonstration inputs and materials	17mths	NCDD PIU	124,000	NCB	No	Post	15mths	4wks	4wks	for PY 2
5	1.1.4	Poultry demonstration inputs and materials	17mths	NCDD PIU	124,000	NCB	No	Post	15mths	4wks	4wks	for PY 2
6	1.1.4	Aquaculture demonstration inputs and materials	17mths	NCDD PIU	124,000	NCB	No	Post	15mths	4wks	4wks	for PY2
7	1.1.5	LLL machinery	4mths	NCDD PIU	32,000	NS	No	Post	3mths	2wks	3w	for PY2

1	2	3	4	5	6	7	8	9	10	11	12	13
Item No.	**Activity/ Component Reference No.**	**Description of works, goods, non-consultancy and consultancy services to be procured**	**Required Delivery/ Commencement of Services time (weeks/ months after FP approval)**	**Procuring entity**	**Estimated cost (USD)**	**Procurement/ Selection method**	**Prequalification (Yes/No)**	**Review by AE (Prior/Post procurement process)**	**Tender issuing (e.g. weeks/months from the FP approval, etc)**	**Bid submission deadline (days/weeks after tender issuing day)**	**Evaluation and contract signing time (days/weeks after bid submission deadline)**	**Remarks**
8	1.3.1	6 hydromet stations, 4 agromet stations, 4 automatic weather stations	18mths	NCDD PIU	500,000	NCB	No	Prior	15mths	4wks	8wks	FY2, Number of packages/lot to be confirmed after having detailed designs and cost estimation
9	2.4.1	Water Information and Management System	13mths	PMU	3,300,000	ICB	No	Prior	9mths	6wks	9wks	Number of packages/lot to be confirmed after having detailed designs and cost estimation
10	3.1.1	Input material for capacity building support	5mths	PMU	48,000	NCB	No	Post	3mths	4wks	4wks	for PY 1 and 2
11	3.3.1	Input material for capacity building support	5mths	NCDD PIU	48,000	NCB	No	Post	3mths	4wks	4wks	for PY 1 and 2
C		**Works**			**20,828,000**							
1	2.1.4	Construction of Kropeu Trom irrigation scheme	21mths	PMU	3,000,000	ICB	no	Prior	18mths	6wks	9wks	Number of lots/packages to be determined after having detailed design
2	2.1.5	Construction of Yotasast irrigation scheme	21mths	PMU	2,612,000	NCB	no	Prior	18mths	4wks	8wks	Number of lots/packages to be determined after having detailed design
3	2.1.6	Construction of Stoeung Krang Bat irrigation scheme	22mths	PMU	4,216,000	ICB	no	Prior	18mths	6wks	9wks	Number of lots/packages to be determined after having detailed design
4	2.2.3	Flood-proofing and Drainage improvements - Anlong Chrey River bassin	22mths	PMU	11,000,000	ICB	no	Prior	18mths	6wks	9wks	Number of lots/packages to be determined after having detailed design

Notes:

- PMU: Project Management Unit at MOWRAM
- PIU: Project Implementation Unite at NCDD-S

Investing in rural people

Cambodia

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex 9: Project Implementation Manuals

Document Date:	28/07/2025
Project No.	2000003926
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Asia and the Pacific Division
Programme Management Department

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR)

Cambodia

Project Operation Manual (POM)
Project Implementation Manual (PIM)

Table of Content

1. Introduction	4
1.1 The Project at a Glance	5
1.2 Project description	7
1.3 Project Area	8
1.4 Project outreach	11
1.5. Target Groups and Targeting Strategy	12
2. Implementation Arrangements	17
2.1 Financial management and Disbursement Arrangements	43
2.2 Project Cost and Financing	43
2.3 Flow of Funds	43
3. Social, Environmental and Climate Assessment Procedures	50
3.1 Annual Gender Action & Social Inclusion Plan (GASIP)	52
4. Procurement Procedure.	52
4.1 Procurement principles and arrangement.	52
4.2 Procurement methods and prior review requirements.	53
4.3 Guidance on environmental and social safeguard measures in procurement.	54
4.4 Governance and Anti-corruption measures	58
4.5 Grievance Redress Mechanisms (GRM)	59
Annexes -	61
Annex 1: Procurement Plan	61
Annex 2: Results Monitoring Framework	75
Annex 4: Terms of Reference – Project Management Implementation Consultants	80
Annex 5: Terms of Reference – NCDD Project Implementation Unit	104

Map of the project area



Figure 1 – Maps of CAISAR target Area.

Figure 2 – Maps of CAISAR target Area.

1. Introduction

1. This Project Operation Manual (POM) guides implementation of the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR). The POM is intended primarily for use by Project Management, the Project Management Unit and Project Implementing Units. The purpose of the POM is to assist Project Management to achieve the Project Development Objective and Project Outcomes defined in the Project Design Report and the Project Financing Agreement. The POM reflects agreements between the Asian Infrastructure Investment Bank (AIIB) and Government of the Kingdom of Cambodia (GoKC) on how project funds provided by AIIB will be used. The POM provides guidance on:

    - Project implementation structure, including roles and responsibilities;
    - Project planning;
    - Eligible uses of project funds;

- Rules that apply to project implementation, including sub-project selection and prioritization, environmental and social safeguards (ESS), project administration, financial management, procurement; and monitoring and evaluation (M&E) and Reporting.

The POM presents important principles and guidelines for implementing project activities. The POM cannot provide every detail. Detailed procedures will be developed as needed by the project implementation team and consultants during the start-up phase of implementation. The POM itself is a living document that can be changed through agreement between the Project Director and AIIB/IFAD. The framework for implementation of CAISAR is RGC's Sub-Decree on Promulgating the Updated Standard Operating Procedures on Project Management, Standard Operating Procedures on Financial Management, Standard Operating Procedures on Procurement for Implementing All Externally Financed Projects / Programs, in Cambodia, Updated Version December 2019, and its subsequent amendments.

Under the agreement between AIIB and RGC, in any case where AIIB rules and procedures are different from RGC rules and procedures, AIIB rules will take precedence in particular the AIIB Environmental and Social Safeguards and AIIB Guide to Procurement.

1.1 The Project at a Glance

Project Name	Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR)
Executing Agencies (EA)	There will be two Executing Entities in the Project, The Ministry of Water Resources and Meteorology (MOWRAM) will be the main Executing Entity (EE) for CAISAR. The Ministry will be responsible for implementation of Component 2 and a part of Component 3. The National Committee for Sub-National Democratic Development Secretariat (NCDDS will also be an Executing Entity for the project. NCDDS will play a crucial role in the implementation of Component 1 and part of Component 3, in close collaboration with provincial departments and service providers.
Start Date	01/06/2025
End Date	31/12/2032
Project Cost	USD 240 million
Project Financing	Project amounts to US 240 million with AIIB being the major lender with USD 100 million along with USD 80 Million grant/loan financing from the GCF, and USD 45 Million from IFAD, and USD 15 Million as in-kind co-financing from RGC.
Sectors	Irrigation, Agriculture, Rural Economic Development
Themes	Irrigation, Flood protection, Drainage, Value Chain, Rural Infrastructure, Skill Development, SME Development, Digital Technology, Climate Change Adaptation and Mitigation.
Target Area	Pursat, Kampong Chhnang, Kampong Speu, Kandal
Targeting Strategy	This project will directly target 71,266 households identified as the poorest by the government, prioritizing women and youth. Indirectly, it will benefit 1.15 million people living along improved canals and roads. The project also includes "self-targeting," allowing young people (15-30 years old) and women-headed households to actively participate in project activities.

Goal	Modernize Irrigation, Improve Flood and Drainage, Reduce Poverty, Enhance Food Security, Climate Adaptation and Mitigation
Development Objective	Inclusive and sustainable agriculture sector growth based on better market access, early warning system.
Beneficiaries	562,757 direct beneficiaries 1.15 million indirect beneficiaries
Components, Outcomes and Key Results	
Component 1	Farm-level climate adaptation and resilience
1.1 Climate Resilient crop-water management practices and pro-poor adaptation measures at farm level	Increased farmer capacity in climate smart agriculture Direct - 40000 HH Indirect - 98906 HH
1.2 Climate Adaptive Value Chains	Climate adaptive value chains developed by 4Ps and increased access to finance. No of MSME - 120 HH benefiting 28000 Access to Grant - 120 MSME Access to BDS - 120 MSME
1.3 Agro-meteorological information and service S	Increased access to and use of climate information and advisory services for climate responsive water-use and crop planning. Direct - 563000
1.4 Resilient Farm Roads	Increased resilience of farm road infrastructure to climate changes 90 Km of Rural Road for better access to the market. Direct - 10700 HH
Component 2	Upgrading and climate-proofing water infrastructure for increased resilience

2.1 Modernized Irrigation Schemes and Ponds	Three sub-projects with a total of six separate irrigation schemes covering an area of 22,051 ha
2.2 Flood-proofed and Improved Drainage	The flood protection works will directly benefit an area of 10,005 ha, including a proposed semi-polder area of around 2,550 ha The improved drainage will include both the irrigated and flood proofed area covering a total area of 32,056 ha
2.3 Farmers Water User Communities (FWUC) established and trained	Eleven FWUCs will be established and trained under the project
2.4 Water information system established and operational in three sub-projects	A SCADA system will be established for ensuring the distribution of water to irrigation schemes covering an intervention area of 123,838 ha
Component 3	Strengthened institutional and regulatory capacity for low-emission climate-resilient development pathways
3.1 Strengthening MOWRAM Capacity	250 Individuals
3.2 Strengthening of NCDDs	350 Individuals

1.2 Project description

Project Overview. The Project originated from the RGC's National Water Resources Management and Sustainable Irrigation Road Map and Investment Program (2019-2023). The Project is designed to assist the Ministry of Water Resources and Meteorology (MOWRAM) with its strategic plans to modernize the irrigation sector. The overall goal of the Project is to make the agriculture sector in Cambodia climate resilient and sustainable.

The Project area is expected to comprise 32,056 hectares. The sub-projects under the Project will include the Ou Tapaong (OTP) and Lum Harch along with four smaller sub-projects in the Krang Ponley Valley. The selected provinces covered by the Project have the highest population density, a high proportion of poor households, and a significant percentage of female-headed households. The livelihoods of the poorest and most vulnerable people in the region depend mainly on agricultural production and water availability through precipitation, river flow, and irrigation schemes.

The Project has significantly benefited from AIIB's PPSF-funded upstream studies (USD4.7 million), which have supported key preparatory work, including the Climate Vulnerability Assessment Report, Hydrology and Hydraulic Reports, Livelihood and Vulnerability Analysis, a GCF Funding Proposal, and Detailed Engineering Designs (DEDs) for the AIIB-financed

component 2.1 modernization of schemes and GCF financed component 2.2 flood proofing and drainage improvements. The DEDs are covering the five sub-schemes; Kropeu Trom, Ou Tapaoung, Brambei Mom, Yutasast and Stung Kraing Bat. The DED of Lum Harch will be taken up by the PMIC which is jointly financed by all the financiers. To address coordination complexities and delays in completing DEDs, the Project's Grant Agreement, signed between AIIB and the Kingdom of Cambodia, has been extended to December 31, 2026. With USD 3.2 million PPCF grant allocated out of USD 4.7 million for Phase 2, efforts are now focused on finalizing DEDs for key irrigation schemes, ensuring Project readiness for AIIB-identified investments.

Project Goal and Objectives

The project goal and objective are to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve the livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia. The Project aims to make the agriculture sector in Cambodia climate resilient and sustainable through modernization of the irrigation sector by installing resilient irrigation systems. It will also enable farmers to adapt to climate risks and mitigate crop emissions through use of energy- and water-efficient technologies and practices. The Project will provide timely weather information and improved market integration, ultimately enhancing the livelihoods of vulnerable rural groups in the target provinces of Cambodia. The objective will be achieved by implementing three components that aim at addressing climate change vulnerabilities, increasing agriculture productivity, and developing institutional capacities. The components include:

Component 1: Improving farm-level climate adaptation, resilience, water use efficiency which focuses on climate resilient crop-water management practices, improve food security and income generation through strengthening and improving adaptive capacity and climate resilience focusing on rice, vegetable, poultry and aquaculture production, provide opportunities for greater market integration and agro-meteorological information and services.

Component 2. Upgrading and climate-proofing of water infrastructure for increased resilience which will focus on modernization of irrigation schemes and ponds, flood-proofing and drainage improvements, establishment and training of FWUC and improve the water management of large-scale irrigation scheme with the establishment of a SCADA system.

Component 3. Institutional Strengthening which aims to strengthen Government institutions, mainly the MOWRAM and the National Committee for Sub-National Democratic Development (NCDD) and the FWUC's. While the focus for MOWRAM will be on up-grading technical capacity in various aspects of irrigation design and management, the key focus area for NCDD will be on provide capacity building in climate resilient agriculture, application of agrometeorological systems and strengthening climate policies and strategies at provincial level.

1.3 Project Area

Geographical area & Province selection: The proposed project CAISAR will benefit more than 1.8 million people (Roughly 11% of its population) in four provinces across Cambodia viz, Kampong Speu, Kampong Chhnang, Kandal and Pursat. Identification of the target areas has been done based on i) greater prevalence of poverty, ii) higher exposure to disaster risk especially flood iii) higher vulnerability to climate change. The specific characteristics of each province, mapped against the criteria for selection.

District & village selection: Within the four (4) provinces, the CAISAR project implementation will be concentrated in eleven (11) districts. The districts have been selected based on the climate vulnerability, flood risks and high poverty index. The project activities will mostly be concentrated around the six schemes identified jointly by MOWRAM and NCDDS. The project is targeting 31 communes and 184 villages from the identified 11 districts following IFAD's targeting strategy for component 1.

Table 1.1 - Details of the districts, communes and villages

Sl No	Scheme Name	Command Area(ha)	No of District	No of Commune	No of Village
1	Ou Ta Paong	17,079	1	2	31
2	Lum Harch	6,350	3	10	55
3	Kropeu Trom	1,140	1	1	14
4	Yotasast	2,693	1	3	15
5	Stoeung Krang Bat	1,394	2	3	13
6	Brambei Mom	3,400	3	12	56
	Total	32,056	11	31	184

CAISAR project area is composed of the three sub-projects covering six schemes in four provinces of Cambodia covering a total of 32,056 ha as shown in Tables 1-2 and 1-3.

- Ou Ta Pong sub-project (Pursat Province)
- Lum Harch sub-project (Kampong Chhnang province)
- Krang Ponley sub-project (Kampong Speu, Kampong Chhnang and Kandal Province).

The six sub projects and schemes were selected from the four provinces mentioned in the following Table 1.2.

Table 1-2 presents the sub-project, schemes and provinces targeted by CAISAR project.

Provinces	Sub-project	Schemes
Pursat	Ou Tapaong sub-project	Ou Tapaong
Kampong Chhnang	Lum Hach	Lum Hach scheme
Kampong Speu, Kampong Chhnang and Kandal	Krang Ponley	Krapeu Troum Yotasast Steung Krang Bat Brambei Mom

Table 1-3. Summary of the targeted area for each scheme under CAISAR project

Irrigation scheme	Component 1 *Same as Comp 2.1+2.2	Component 2			Total
		Component 2.1	Component 2.2 *Additional area of C2.1	Component 2.3 *Additional area of C2.1+C2.2	

							** Not included in the total area			
	Area(ha)	Ratio (%)	Area(ha)	Ratio (%)	Area(ha)	Ratio (%)	Area(ha)	Ratio (%)	Area(ha)	Ratio (%)
Ou Ta Paong	17,079	53%	14,874	67%	2,205	22%	80,000	100%	17,079	53%
Lum Harch	6,350	20%	3,900	18%	2,450	24%	-	-	6,350	20%
Kropeu Trom	1,140	4%	690	3%	450	5%	-	-	1,140	4%
Yotasast	2,693	8%	593	2%	2,100	21 %	-	-	2,693	8%
Stoeung Krang Bat	1,394	4%	994	5 %	400	4%	-	-	1,394	4%
Brambei Mom	3,400	11%	1,000	5%	2,400	24%	-	-	3,400	11%
Total	32,056	100 %	22,051	100%	10,005	100%	80,000	100 %	32,056	100 %

C2.2* River training: length of river training work * 400 m (width of impact) converted in ha.
C2.2* Polder: length of polder (m) * 1000 m (width of impact) – converted in ha.
C2.3* Masterplan area potential impact (80.000 ha) – OTP scheme area (not included in total area)

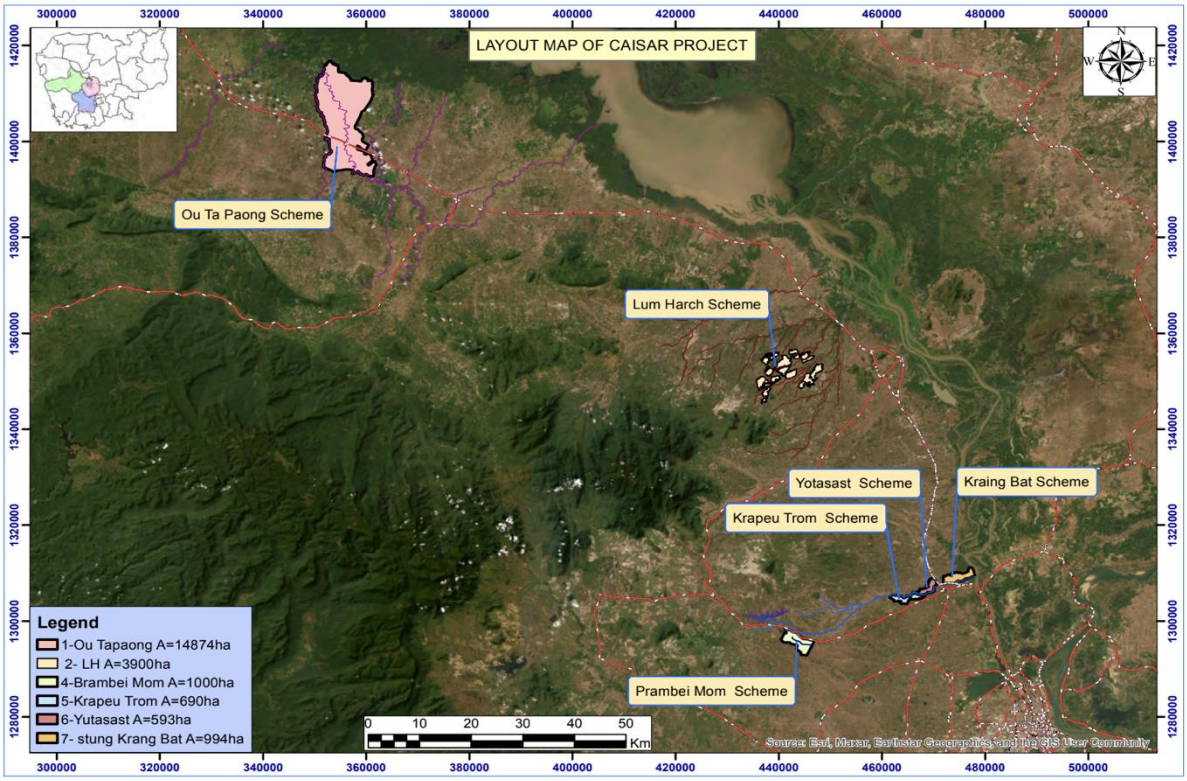


Figure 1 – Maps of CAISAR target Area.

1.4 Project outreach

CAISAR interventions will directly benefit 71,266 households covering 500,000 individuals. Out of these 500,000 individuals, 40 % will be women and 15 % will be youth beneficiary.

Target groups

The CAISAR project will be working with mainly five types of the target groups very poor & poor HH, HH above poverty line, women, youth, and smallholder farmers.

Poor 1 (Very Poor) and Poor 2 (Poor) Households: In Cambodia, 17.8% of the population lived below the national poverty line as per government record in 2019. Government of Cambodia has published province wise poverty data in 2023[1].

Poverty scenario of the selected province (derived from the poverty data GoRC):

Province	Poverty Rate	Total Number of Households (HH)	Total Number of Poor HH	Number of Poor 1 HHs	Number of Poor 2 HHs
Kampong Chhnang	12.27 %	138,950	17,055	3,494	13,561
Kampong Speu	14.18 %	196,076	27,811	7,082	20,729
Pursat	19.16 %	131,457	25,181	8,779	16,402
Kandal	12.61 %	300,945	37,958	10,946	27, 012

Very poor: Out of the total 71, 266 households targeted for the project 64 % of the households will fall into this category of Poor 1 and Poor 2. These HHs will be selected from the i) Poorest of the poor (based on the government data on below poverty line), ii) a climatically vulnerable families, (iii) having children less than two years of age (iv) pregnant and/or lactating women, (v) adolescent girls, elderly, PWDs, (vi) women-headed households, (vii) IP households, (viii) landless families, ix) experienced complete loss of production owing to climate change. Any two to three of the mentioned criteria will make the households eligible for project interventions.

Above Poverty line Households: The rest of the Households, 36 % of 71,266 will be selected from relatively less poor community. Some of these families already have some kind of trainings on the enterprise development or they have started some enterprises viz., rice processing, dairy or poultry enterprises etc. They will be provided matching grants to scale up their existing enterprises or they will be supported to start the business by providing start up capital, capacity building training etc. mentioned in the project activities. They will also be supported by training on quality standard food items and marketing of products etc.

Women: Rural women are among the most vulnerable due to discriminatory gender norms and social stigma. They struggle with unemployment, food insecurity, malnutrition, and limited awareness on climate resilient technologies and have poor access for modern agricultural machineries and equipment. However, women in Cambodia shouldered majority of the household's responsibility and helps their male counter parts in farming activities which includes home gardening, animal husbandry and rice production. Many women, particularly the women headed HHs, face the difficulties of finding labourers for agriculture work and have very limited access to the modern machineries, often take care of rice during cropping season. CAISAR will

include 40 % of such women from very poor and poor HHs in all activities including, awareness of agrometeorological advisories, knowledge sharing, agrometeorology information, skill development, Farmers Field School training etc. CASIAR project is designed to target women to be the member of the water user group (FWUC) and their voice will be included during decision making on water use, choice of crops etc. which is beyond the norm in Cambodia. This will be able to mitigate some of the constraints women face in typical societies in Cambodia. A special advantage will be given for women led enterprises (MSMEs) from Public Private Partnership Facility (4PF).

Youth: According to the General Population Census of the Kingdom of Cambodia 2019, one in six Cambodians was between 15 and 24 years old and more than a quarter of the population was at the age of between 15 and 29. Seventy per cent of young people aged 15-29 were economically active in 2019. Furthermore, young people aged 15-29 made up a major part of Cambodia's working-age population (37 per cent). A structured survey of young people aged 15-24 that was conducted as part of the "Youth Situation Analysis in Cambodia" (December 2020), indicated that 59 % of those surveyed were not in employment, education, or training (NEET). Moreover, rural youth face difficulties in finding decent rural employment opportunities and accessing land, which also limits access to credit. Thus, a high proportion migrate to urban areas in search of work. Poverty incidence among ethnic minorities is not significantly higher than among the majority, but they suffer disadvantages in access to health, education, financial and other services. CAISAR project will include minimum 15 % youth both male and female in all activities mentioned above. In some cases, especially for creating MSMEs or accessing loans, preference will be given to the youth and minimum 20 % youth will get access to financial support from the 4PF initiative. The 4PF initiative aims to support at least 100 MSMEs, with a goal of achieving an 80% increase in net turnover among recipients and a return on investment exceeding 10%.

Smallholder Farmers: The majority of the population in the target area are rural farmers (rice typically), whilst some also supplement their income via alternative jobs such as working in the service sector. Households typically do not have stable annual incomes or expenditures due to the annual cycle of the wet and dry season and the impact this has on agricultural yields and livelihoods. Most rice farmers are smallholders who use low input rainfed systems to produce rice for food and income. They have limited capacity to adapt to climate change and lack the technical and financial resources to access the technologies and adopt the practices that can build their resilience. CAISAR will directly target the smallholder farmers who are cultivating rice and help them adapt to climate risks and help them diversify and increase their sources of income from agriculture. The women will be trained on poultry and home gardening to increase the income of the families and improve the dietary requirements of the families.

1.5. Target Groups and Targeting Strategy

Targeting Strategy

The targeting strategy that will be adopted for this project areas are as follows:

Direct Targeting: Direct targeting will follow the same methodology described in para 15. The HHs will be selected from the poorest of the poor based on the government below poverty line data along with women and youth related data. 71,266 HHs will be impacted by several activities mentioned in component 1 and 2. The direct beneficiary of each of these activities have been given in table xxx in para 9. Total number of direct beneficiaries is 500,000 and indirect beneficiary will

be around 1.8 million. The male and female number of individuals is mentioned in para 15. The indirect beneficiaries will be the inhabitants along the canals selected for renovation and the road infrastructure. These activities will support in terms of accessibility and availability of water and road infrastructure which in turn will help in increasing their income potential and ability to adapt against the climate variabilities and change.

Self Targeting: The above-mentioned activities will attract the young men and women aged between (15-30 years) and will be enrolled many of these above-mentioned activities and will be covered as self targeting beneficiaries. They will not be covered by the eligibility of the direct targeting group. The youth and women of the poor and above poor families also be part of this self targeting in addition to already targeted as direct targeting group. Any women headed HHs who has not covered by direct targeting, can also be part of the self targeting group for the project. They will get preference of any project related benefits. The self targeted group can come from the activities mentioned in para 19 as well.

Gender equality and women empowerment (GEWE): Cambodia's irrigated agriculture faces increasing challenges from adverse impacts of climate change, especially the changes in rainfall patterns, duration and timing of the rainy season, and climate induced water disasters such as floods and droughts. Climate Resilient and low emission practices and investments in agriculture and water management are, therefore, crucial to protect and enhance Cambodia's agricultural production and productivity, and contribute to increasing food security, poverty reduction, and livelihood development. A gender assessment has been conducted in accordance with GCF's Gender Policy. The assessment examines the livelihood activities of project's target, covering existing gender norms and how these norms affect people's daily livelihood activities. For livelihood/income generation activities, the assessment focuses on the main income source for majority of target farmers (rice), and other secondary income sources (cash crops, animal husbandry). The gender assessment found that women have limited access to climate-smart technologies, water, income diversification and value-chain development opportunities. Yet, given the primary role that women play in rural society, strengthening of their adaptive capacity is essential to contributing to the resilience of their households and communities. Inputs for the gender assessment were gathered from the poor, ethnic minority groups, women, men, elderlies who participated individual interviews and FGDs during the feasibility study.

Five key barriers are identified as current gender gap and potential constraint to promoting new technology adoption for improved adaptation. These include:

- Traditional gender norms,
- Burden of household chores,
- Limited education and skills,
- Lack of local wage jobs and increasing migration

27. Gender norms shape the gender division of labour in household chores, farming, and income generation. Men generally take care of heavy works (physically heavy) in farming and participate in social activities. Women bear the primary responsibility for childbearing, raising and domestic works. Domestic work is time consuming. For instance, fetching water can take up to 3 hours a day.

28. In addition to their domestic role, women also participate in farming including home gardening, animal husbandry and rice production alongside men. Many women take care of rice during cropping season and participate in harvesting in case they do not have access to modern machinery. This is particularly the case for women headed households who face chronic lack of labour and more limited access to machinery and equipment. A total number of 71,266 households will be positively

benefitted from the project activities from the four provinces. Out of these many households, 145,371 male and 156,035 females will be enefitted from the project directly, apart from these number, 1.8 million people will be indirectly benefitted from the project activities.

The gender strategy of the project aims specifically at:

29. Alleviating women's workload. This will be done by a) raising awareness on the importance of sharing household chore and farming workload to give women more time to learn new skills (climate-smart farming technologies, irrigation system, financial management, business) that are essential for them to enhance they adaptation capacity.

30. Promoting women's economic empowerment. This will be done by enhancing women's access to skills and business development training that are centred around project target value chains for commodities such as rice, poultry, vegetable and fish that are appropriate to them. Women will be encouraged to participate in project trainings that help them address the potential impact of climate changes which include a) adoption of water-saving alternate wet and dry, b) adopt new seed varieties (which are more pest resistant and drought tolerant), c) adopt sustainable intensification packages that reduce seed rate, fertilizers and pesticide to save agricultural input costs and increase crop yield. Women will be invited to take part in relevant trainings either jointly with their husbands or individually to support adoption of climate-smart technologies that also respond to their needs and preferences. Out of the 40,000 farmers who will be trained in Farmers Field School, 40 % which is around 16000 farmers will be women and they will be trained in women friendly climate resilient technologies. In addition, they will be encouraged to diversify their existing sources of income, to improve the efficacy of existing income sources such as home-based gardening, animal husbandry (poultry and fish); promoting women's access to grant schemes as well as employment opportunities through value-chain development and 4PF.

31. Strengthening women's role in decision-making both at the household and community level. It is expected that the role of women in decision making at household level will be enhanced as the outcome from component 1 and 2 above. At the household level, gender specific tools will be used to encourage joint decision-making in technology adoption and investment decisions. Women will participate in consultation activities and planning of irrigation infrastructures, value-chain development and early warning system. The project will also promote women's participation and leadership in FWUCs, which will be trained on how to enhance equitable access to water for women and other vulnerable groups.

Table 1: Target group categories and development pathways:

Category/classification	Key Characteristics	Direct outreach	Targeting strategy	Targeted activities & Development Pathways
Very poor and poor Households: This category consists poor and very poor Households, lying below poverty line and vulnerable due to climate variabilities (recurrent flood and drought situation)	These HHs are resource-poor, climatically vulnerable and food insecure, having children less than 2 years of age group, women/ youth headed HHs, pregnant/ lactating women, landless families, people with disabilities (PwDs),	64 % of 71,266 HHs will fall into this category. Which will be	Direct Targeting (as described in para 20. This strategy will thus form a part of the broader exit plan for Component 1.	These poor farmer HHs will be capacitated with CR technologies mainly focusing on rice cultivation and diversify the agricultural practices. HHs having insufficient irrigation water supply in the dry season for a second rice-crop, they will be supported for alternatives such as vegetable production, poultry, and aquaculture especially for farmers with small land holdings. Women will be capacitated to decide on their own crop's choice. Farmers will be trained on Alternate Wetting and Drying technique (AWD), direct seeded rice (DSR), Land Laser Levelling (LLL), and rice straw management which can directly reduce methane emissions from agricultural field. Farming HHs will be trained in

				Farmers Field Schools where 40% women will be given training on women friendly crops and management of water and energy in efficient manner. Landless HHs will get other support like poultry, and aqua culture to improve their livelihoods.
Households above the poverty line	These HHs are not below the poverty line of the government data, having marginal lands, they have started some micro level enterprise but not having any market linkages and never received any financing from banks or other financial Institutions.	36 % of the total 71,266 HH will be under this category	Direct Targeting and self-targeting as described in para 20 and 21 above.	Providing training for startup enterprise Capacity development through the 4PF initiative Providing matching grant from the project Establishing market linkages for them for increased earnings
Youth	Youth (age group between 15-30) will be given special attention while providing credit linkages from 4PF initiative.	Minimum 15 % youth will be included in all activities mentioned in component 1 and 2. In case of establishing MSMEs, 20 % youth will get preferential services from 4 PF initiative.	Direct targeting & Self targeting	Providing CR technology training Providing agrometeorological advisories and techniques for adaptation to climate variabilities and change Providing Enterprise support training Providing matching grant from 4 PF initiative

				Establishing market linkages for their products
Women	Very poor vulnerable families, women headed HHs, having small children, pregnant/ lactating mothers, aged women, Women with PwDs	40 % women will be included in all project activities.	Direct targeting & Self targeting	Providing CR technology training as they are mostly ignored while selecting beneficiaries due to lack of awareness. Providing agrometeorological advisories and techniques for adaptation to climate variabilities and change Providing capacity building support on decision making on distribution of water Inclusion in FWUCs for better decision making on water use efficiency and crop choice. Providing Enterprise support training including financial management, balance sheet, marketing etc. Providing grants from 4 PF initiative for new entrepreneurs Establishing market linkages for their products.

2. Implementation Arrangements

The Project implementation will follow the Royal Government of Cambodia's (RGC's) Standard Operating Procedures (SOPs) and the Project Operational Manual (POM) for the Project management, procurement, and financial management (FM). A Project Steering Committee (PSC) will be established for inter-ministerial coordination. The establishment of the PSC has been set as a disbursement condition. It will be chaired by the Minister of MOWRAM and comprise of

senior officials from MOWRAM, the Ministry of Economy and Finance (MEF), the Ministry of Interior (MOI) which is responsible for the National Committee for Sub-National Democratic Development Secretariat (NCDD-S), Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Environment (MOE), and the Provincial Governor's Offices of Pursat, Kampong Chhnang, Kandal, and Kampong Speu provinces. An Inter-Ministerial Resettlement Committee (IRC), chaired by MEF, will manage resettlement and land acquisition issues as they arise. The National Project Coordinator of the Project Management Unit (PMU) will serve as a secretariat to the PSC.

The Ministry of Water Resources and Meteorology (MOWRAM) will serve as the main Executing Entity for the Project, responsible for sustainable water resource management and irrigation in Cambodia. MOWRAM has established a Project Management Unit (PMU) for the implementation of the Project and to coordinate all components and consolidate project planning and reporting. The PMU is led by the Secretary of State (MOWRAM) as the National Project Director (NPD) and managed by an appointed National Project Manager (NPM). The NPM will be responsible for overall project management and coordination. The PMU includes personnel from MOWRAM, the Department of Hydrology and River Works (DHRW), and Provincial Departments of Water Resources and Meteorology (PDWRAMs) of the selected provinces involved. The PDWRAMs will coordinate field activities with Farmer Water User Committees (FWUCs), while the Department of FWUC will appoint additional personnel at provincial and district levels to support FWUC operations. The PMU will directly implement Component 2 (irrigation infrastructure) and Sub-Component 3.1 (institutional strengthening).

The PMU is responsible for the overall management of the Project; it will coordinate directly with project stakeholders, support execution of day-to-day activities, and ensure the technical quality of the Project outputs, activities, financial management, procurement, monitoring and evaluation.

The National Committee for Sub-National Democratic Development Secretariat (NCDD-S) will also be an Executing Entity and be responsible for the implementation of Component 1 and sub-component 3.1. A Project Implementation Unit (PIU) will be established and contract service providers at the provincial level as required. The NCDDS is a Direct Access Accredited Entity to the GCF. The National Committee for Sub-National Democratic Development (NCDD) has demonstrated significant capacity in project management and implementation over the years, executing a wide range of development initiatives aimed at enhancing governance, climate resilience, livelihoods, and rural poverty reduction in Cambodia. From 2001 to 2023, NCDD managed over 10 major projects with the support of international partners such as UNDP, SIDA, DFID, JICA, and the World Bank, among others. These projects, such as the *Project for Support to Democratic Development through Decentralization and Deconcentration (PSDD)* and the *Tonle Sap Poverty Reduction and Smallholder Development Project (TSSD)*, collectively mobilized millions of dollars in funding. The NCDD's focus on decentralization, climate change adaptation, natural resource management, and gender equality is reflected in its ability to implement complex, multi-sectoral initiatives, including the *Strategic Programme for Climate Resilient Development* and the *Food Security and Community-based Recovery Support to Flood-affected Communities in Cambodia*. The effective execution of these projects highlights NCDD's expertise in managing large-scale, multi-donor programs and its central role in shaping Cambodia's governance and development landscape.

MEF will open two separate designated accounts in the name of MOWRAM and NCDD-S, respectively. The budget allocation between MOWRAM and NCDD-S will be determined based on prepared cost tables. Monthly coordination between MOWRAM and NCDD-S will ensure synergies between components. Additionally, NCDD-S will work closely with provincial and

district agencies for agriculture, coordinating with other programs to leverage existing synergies and institutional capacities.

Accredited Entity (AE) The International Fund for Agriculture Development (IFAD) has a long history of implementing rural development projects in Cambodia, which became a member in 1992. IFAD has supported twelve investment projects for a total value of USD 940 million in collaboration with a host of co-financing partners and its own financing of USD 309 million benefitting 1,565 million households. IFAD will serve as the Accredited Entity (AE) for this project and will be responsible for the overall management of the IFAD/GCF funded activities including: (i) administrative, financial and technical oversight and supervision throughout project implementation; (ii) ensuring funds are effectively managed to deliver results and achieve objectives; (iii) ensuring the quality of project monitoring, as well as the timeliness and quality of reporting to GCF; and (iv) undertake project mid-term and completion evaluation. IFAD will ensure that each of these areas of responsibility are undertaken in accordance with the detailed provisions outlined in the Accreditation Master Agreement (AMA) between IFAD and GCF. IFAD's role as AE will be assigned to its sub-regional office in Hanoi and its country office in Cambodia.

Major Co-Financer. AIIB is co-financing the project and will provide funds directly to the MEF for a separate designated account in the name of MOWRAM. In its capacity as co-financier, AIIB will be responsible of management of component 2.1 and undertake joint supervision of the project with IFAD and also participate in and contribute to the evaluation of the project.

Implementation organization charts

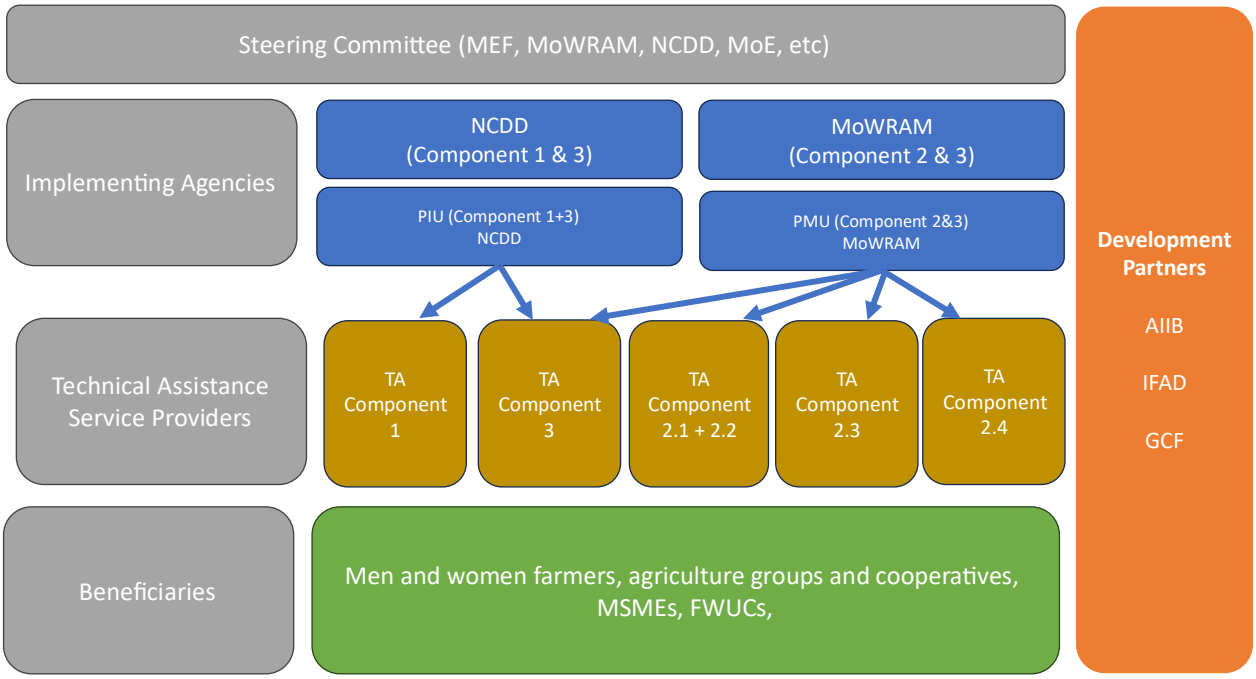


Figure – 1 The figure presents the implementation organization charts.

Project Oversight and Steering Arrangements A Project Steering Committee (PSC) will be established for inter-ministerial coordination. It will be chaired by the Minister of MOWRAM and comprise of senior officials from MOWRAM, the Ministry of Economy and Finance (MEF), the Ministry of Interior (MOI) which is responsible for the NCDDS, Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of Environment (MOE), and the Provincial Governor's Offices of Pursat, Kampong Chhnang, Kandal, and Kampong Speu provinces. An Inter-Ministerial Resettlement Committee (IRC), chaired by MEF, will manage resettlement and land acquisition issues where they arise. The National Project Coordinator of the Project Management Unit (PMU) will serve as a secretariat to the PSC.

Chair: Minister, MOWRAM
Secretary: Deputy Director, DFWUC/Project Manager

Members:

H.E. Secretary of State, MOWRAM
H.E. Secretary of State, MOI (NCDDS)
H.E. Secretary of State, MEF
H.E. Secretary of State, MOE
H.E. Under Secretary of State, MEF
H.E. Under Secretary State, MAFF
H.E. Director General, MEF
H.E. Four Provincial Governors
Director of Department of Multilateral Cooperation, MEF

Operational Management Arrangements As mentioned above MOWRAM will establish a Project Management Unit (PMU) for the implementation of the CAISAR project. The PMU will be led by the Secretary of State (MOWRAM) as the National Project Director (NPD) and managed by an appointed National Project Manager (NPM). The NPM will be responsible for overall project management and coordination. Within the PMU, project-recruited staff and staff seconded by the government will collectively comprise a project delivery team that will ensure sound and effective project implementation. The PMU will also include an Operations Officers, Gender Specialist, Finance Officer, Human Resources and Administration Officer, Procurement Officer and Monitoring and Evaluation Officer. To ensure a smooth implementation also a team of international project management specialists with extensive knowledge of the CAISAR background and technical activities will be contracted during the first part of the implementation to get the Project Management Implementation Consulting firm and NCCD PIU off to a proper implementation considering the complexities and size of the project. A Project Management and Implementation Consulting firm and individual consultants will be recruited to support the project implementation and undertake detailed design services and construction supervision and provide technical and management report to MOWRAM PMU and to a lesser extent to NCDD PIU. Start-up orientation sessions will be organized to orient staff with regards to the procedures of AIIB, GCF, and IFAD. Capacity building sessions in understanding the procurement, financial management and monitoring and evaluation sessions will be held as needed.

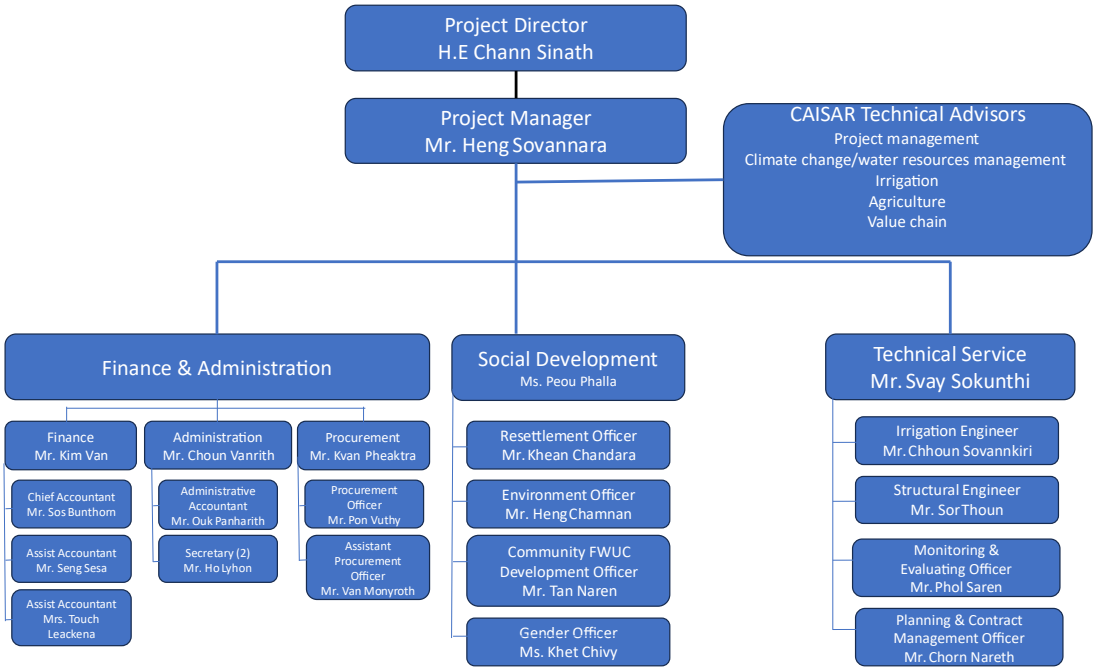


Figure 2. The organization of PMU under the implementation of CAISAR.

The Project Management Unit will besides the positions mentioned above consist of personnel from MOWRAM, the Department of Hydrology and River Works (DHRW) of MOWRAM, and Provincial Departments of Water Resources and Meteorology (PDWRAMs) of the four provinces in which the project will be implemented. The PDWRAMs will be responsible for coordinating all field activities with Farmer Water User Committees (FWUCs). The Department of Farmer Water User Committees (DFWUC) has personnel at the central level but no office or personnel at the Province and District level. For the effective operation of the committees, the Department of FWUC will through the PDWRAMS appoint additional personnel at the provincial and district levels.

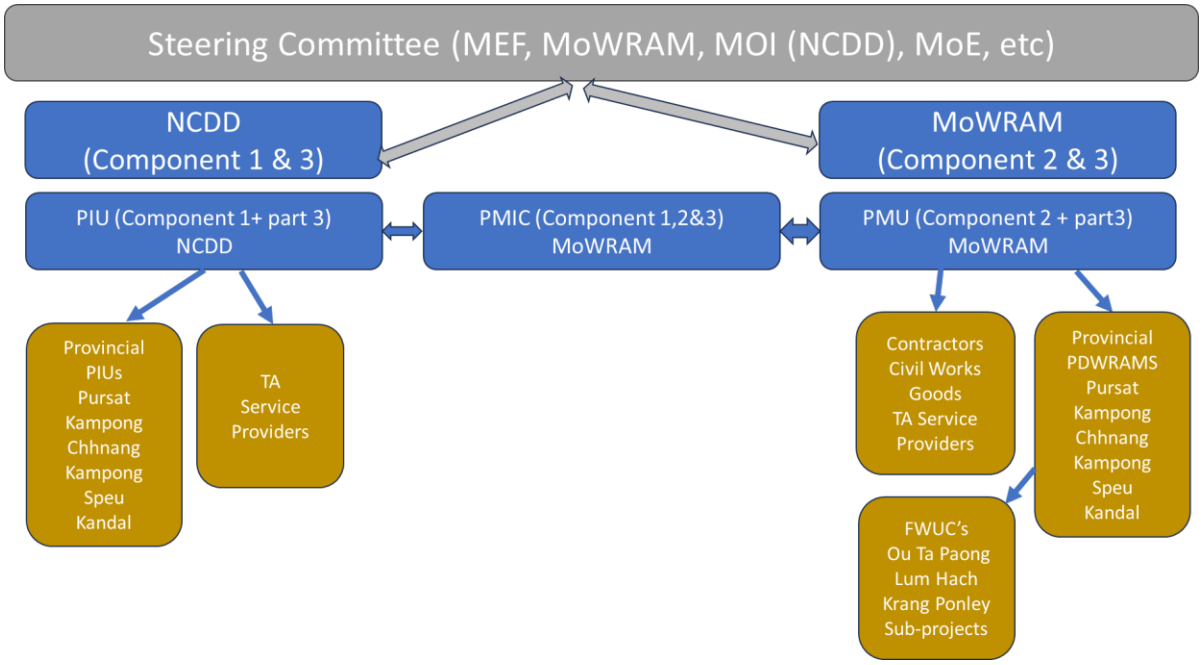


Figure – 3 Project operational management arrangement

The PMU will be responsible for the overall management of the project; it will coordinate directly with EEs and project stakeholders, be responsible for providing support to the execution of day-to-day activities and be responsible for the technical quality of the project outputs, activities, financial management, procurement, monitoring and evaluation. The National Committee for Sub-National Democratic Development Secretariat (NCDDS) will be responsible for the implementation of Component 1 and sub-component 3.2. NCDDS will establish a National Project Implementation Unit (PIU) and contract Service providers at the provincial level as required. The PMU will be directly responsible for the implementation of Component 2 (irrigation infrastructure) and sub-component 3.1 (institutional strengthening).

The roles and responsibilities of each organization have been clearly outlined, with MOWRAM responsible for overall supervision and guidance, for preparing the annual work plan and budgets, initiating and coordinating communication, coordinating with the NCDDS PIU on agriculture support activities, and implementing social and environmental safeguards, among other tasks. The PDWRAM will assist the PMU in disseminating information and coordinating with the Ministry of Economy and Finance-General Department of Resettlement (MEF-GDR) to implement the resettlement plan, among other tasks. NCDDS PIU will work in close coordination with the provincial and district agencies for agriculture to implement the activities under Component 1 through Provincial PIUs in each province. The role and relevance of the NCDDS in CAISAR underscores its institutional capacity in successfully implementing farm-level components which are one of its mandates under the Decentralization and De-concentration (D&D) Management Policy which the NCDDS is tasked with discharging.

The project is attempting to transform farmer behaviour in their production decisions and beneficiaries will play a central role in all project activities and their participation and ownership will be critical to the success and sustainability of project interventions. Beneficiaries are expected to participate in the Farmer Field Schools and lead farmers are expected to disseminate the information to other households not directly participating in project activities. Similarly, farmers and other players along the value chain are expected to play an active role in the Multi-Stakeholder Platforms for greater market integration. In the irrigation sector, the water users will play an active role in scheme supervision and oversight and the FWUCs will play a critical role in the operation and maintenance of the schemes and will sustain the systems through payment of O&M charges as stipulated by the regulation.

The contracted Project Management and Implementation Consultant (PMIC) working with the PMU will be responsible for the implementation of the Component 2 activities and sub-component 3.1 and oversee and coordinate with the NCDD PIU. The detailed scope of work for PMIC is in the Terms of Reference.

PMIC will hold joint monthly meetings with all project partners and prepare minutes of the meeting.

PMIC will prepare quarterly progress reports with input from PMU and PIU and other partners. The progress reports should be submitted to PMU who will then submit to Development Partners for review and commenting. The PMIC will also produce mid-term and completion reports, as required.

The below table 1 illustrate the roles and responsibilities of the development partners, the executing entities and their implementation units. As seen from the table IFAD is responsible for M&E for the main part of the project and AIIB only for Component 2.1. For the overall Component 2 and sub-component 3.1 the AIIB will have a supporting role. The table also indicates the funding source of each of the sub-components.

Table 1: Roles and responsibilities of national institutions and development partners

Project Outputs and Outcomes	Funding Source	Executing Entity	Responsible for Implementation	Responsible for M&E	Support/ Supervision of Sub-Components
Outcome 1 Reduced crop losses and improved agricultural production					
Output 1.1: Increased farmer capacity in climate resilient agriculture.	GCF/IFAD	NCDDS	PIU	IFAD	IFAD
Output 1.2: Climate adaptive value chains developed through the adoption of the 4P model	GCF	NCDDS	PIU	IFAD	IFAD
Output 1.3: Access to climate information and advisory services improved for climate responsive water-use and crop planning.	GCF	NCDDS	PIU	IFAD	IFAD
Output 1.4: Increased resilience of farm road infrastructure to climate change.	GCF	NCDDS	PIU	IFAD	IFAD
Outcome 2: Increased water use conveyance and use efficiency					
Output 2.1: Irrigation schemes and ponds modernized	AIIB	MOWRAM	PMU	AIIB	AIIB
Output 2.2: Flood-proofed and improved drainage	GCF/IFAD	MOWRAM	PMU	IFAD	AIIB
Output 2.3: Farmers Water User Communities (FWUC) established and trained	GCF	MOWRAM	PMU	IFAD	AIIB
Output 2.4: Water information system (CIEWS and SCADA) established and operational in three subprojects.	GCF	MOWRAM	PMU	IFAD	AIIB
Outcome 3: Enhanced environmental governance					
Output 3.1: Training and capacity building support provided to MOWRAM	GCF	MOWRAM	PMU	IFAD	AIIB
Output 3.2: Training and capacity building support provided to NCDDS at national and provincial levels	GCF	NCDDS	PIU	IFAD	IFAD

Component 1. *Farm-level climate adaptation and resilience.* *(NCDD-S)*

The objective of this component is to build climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. This component is designed to address the lack of knowledge and skills to deploy technologies and practices at farm level by farmers and the lack of appropriate extension services to propagate them. It will introduce farmers with various climate resilient technologies and practices for both rice and non-rice commodities such as vegetable, poultry and aquaculture. The component will assist in value addition, facilitate market linkages, introduce agro-meteorological information and services for climate informed agriculture planning and improve both physical and digital connectivity to facilitate improved production and marketing. Component 1 is expected to benefit over 110,000 farming households. In addition, some of the technologies and practices, for example the Alternate Wetting and Drying technique (AWD), direct seeded rice (DSR), Land Laser Levelling (LLL), and rice straw management will directly reduce methane emissions contributing to GHG reduction. The component will be implemented by NCDDS through four outputs described in the following paragraphs. The activities under this component will also capitalize on the presence of existing platforms, studies and plans in order to avoid potential overlapping, duplication or spending unnecessarily resources in planning activities. The agencies responsible for implementation this component will undertake the tasks of identifying existing resources at the outset.

Outcome 1: Reduction in crop losses & improved production

Output 1.1: Increased farmer capacity in climate resilient agriculture *(NCDD-S)*

This output will focus on developing farmer's capacity in deploying climate resilient technologies and practices to transform the agricultural production system to adapt to the changing climate context. Separate dialogues will be held with women to ensure that their concerns and needs are addressed in designing the training curricula, the schedule and delivery methodology. The main objective is to strengthen adaptive management strategies to mitigate climate variability risks. Both men and women farmer's will be trained to first develop Action Plans (AP) to re-orient farmer behaviour and assist them in transforming the agriculture production system in a manner that is better adapted to factoring in the agro-ecological context and expected climate change impacts. Farmer capacities will be strengthened in CR technologies mainly focusing on rice cultivation. However, for those parts of the project areas which have insufficient irrigation water supply in the dry season for a second rice-crop, alternatives will be supported such as vegetable production, poultry and aquaculture especially for farmers with small land holdings. Crops of interest to women will be included in the selection. Farmers are generally resistant to adopting new technologies due to their inability to afford the technologies or technological incompatibility i.e. when the technology is not climatically fit or it is labour intensive, costly or not suitable for smallholder farmers. Those designing the courses and the technological packages under CAISAR will be mindful of these barriers. The plans will be refined over time based on the local context and crop choices and emerging adaptation technologies. The project will use the Farmer's Field and Business School approach (FFBS) and design context specific training materials to enhance the capacities of the farming communities. The FFBS will run for both rice and non-rice crops and will use a cascade approach to disseminate the training messages to a wider audience using key farmers including both women and men leaders. It is expected that 40,000 farmers will be re-oriented of which at least 40% will be women. The improvement of the irrigation systems will be critical to fully capitalise on the training provided to farmers.

Activity 1.1.1 Preparation of community-based action plans (AP) to transform agriculture with CR practices and technologies (NCDD-S)

The project will utilize a Climate Smart (CS) Mapping approach[50] to develop awareness materials on climate change and its impacts on men and women separately. IRRI will conduct CS Mapping in the first year as a part of their TA contract, combining participatory data with GIS and crop modeling to create risk maps identifying areas vulnerable to climate stresses like drought and flood. These maps will also outline recommended adaptation options and be gender disaggregated where required to ensure that the needs of women are reflected. Additionally, the project will facilitate the creation of Value Chain Action Plans (VCAP) at the provincial level, which will inform annual commune-level Action Plans (AP). There is currently no agricultural value chain planning at the provincial level. The VCAP will help the target provinces to conduct VC planning and the communes in augmenting their development plans with considerations on agronomic and market opportunities. The APs will be developed through participatory sessions involving both men and women farmers, Producer Organizations, water users' groups, service providers, and NGOs, ensuring representation from men, women, and minority groups. Communities will identify and prioritize potential adaptation options and prepare a plan to implement them. Such options may include crop diversification such as vegetable or fruit production, poultry and aquaculture production, rotation or changing varieties (for e.g. flood or drought resistant varieties in rice) or improved water management (for e.g. AWD) and new practices such as Laser Land Levelling (LLL), mechanized direct seeded rice (mDSR), soil health management options, and Integrated Pest Management (IPM) in both rice and non-rice crops, rice straw management, etc.

The annual AP will specify preferred rice varieties, vegetable choices, and adaptation measures like poultry production and aquaculture, along with capacity support needed for the selected value chains. It will also outline implementation schedules, targets, and monitoring arrangements, with revisions made annually based on new data and community feedback. The APs will ensure the inclusion of women and women-headed-households in their development. A community-based monitoring and evaluation system will track AP outcomes, integrating findings from climate information systems and groups of both men and women farmers. Furthermore, representatives from each commune involved in AP preparation will participate in district-level multi-stakeholder platforms (DMSPs) to enhance value-chain coordination, ensuring effective communication between the commune and district levels. Special efforts will be made to ensure the inclusion of at least 30% women and 20% youth in these forums. MSMEs will also be a key part of these forums given their vital role in agriculture development in Cambodia. CAISAR will include elements of the APs into commune plans and build local capacity to enable them to develop them on their own. Representatives from other communes will be invited to learn from the experience for further dissemination. Provincial level staff will also be trained in the development of these VCAP to enable them to develop them on their own. Medium, Small MSMEs[51] will be engaged in the exercise to enable the private sector to work with local farmer groups and cooperatives and develop them independently. Representatives from other provinces and communes will be invited to learn from the experience and ensure that the MSMEs and private sector service providers are able to expand the idea to other areas due to the value they add in helping them increase their revenue and increase farmer incomes. Lead farmers are expected to be an important resource to demonstrate the impact on agriculture productivity.

Activity 1.1.2 Preparation of training materials to support implementation of the AP (NCDD-S)

The project will create and update training curricula and materials to support farmer adoption of climate-resilient (CR) technologies and practices outlined in action plans. Emphasizing user-friendly, visual learning materials like charts, leaflets, and short notes, the initiative aims

to accommodate men and women farmers with lower literacy rates. Training materials will be regularly revised based on field experiences, new practices, varieties, and climate information and feedback from the participants particularly women for the crops they are involved in producing. IRRI and a service provider will develop these materials for rice and non-rice commodities, respectively, which will be suitable for Training of Trainers (ToTs) and Farmer Field and Business School (FFBS) training. The materials will encompass both technical and facilitation aspects of crop, livestock, and agribusiness management, featuring hands-on activities related to production and business planning. The specific tasks that women perform in each crop will be considered in designing the training programmes.

Key training topics will include best practices for irrigated and rainfed lowland rice, vegetable production techniques (e.g., drip irrigation), fish farming, and improving household chicken production. Where required separate training sessions will be conducted for men and women. Existing materials from GDA, CARDI, and IRRI will be adapted to the specific contexts of target provinces and needs by gender. TOT will also draw on activity 1.3.3, 1.3.4, and 1.3.5 for CIEWs. Collaborative input will be sought from various stakeholders, including service providers and men and women farmers, through consultative meetings to ensure the training materials are context-specific and relevant. The training materials and course content will be provided to both NCDDS and the MAFF for further dissemination and use. The staff from both these institutions will be invited to attend these courses to build their capacity and introduce them to other areas.

Activity 1.1.3 Conduct training of trainers to create a pool of expertise to demonstrate and propagate the CR technologies and practices (NCDD-S)

Once the training materials are prepared, ToTs will be organized to create a pool of expertise to propagate the CR technologies and practices, and outreach to farmers and disseminate information about CIEWS (including, awareness of mobile app(s))About 200 champions from interested NGOs, PDAF, universities or any external institutions and private entities will be trained, who will be able to work as Master Trainers (MTs). At least 40% of the TOTs will be women. The training will be organized by the SMSs who will continue to provide support to the MTs in testing and adapting to new technologies and practices, and create awareness and understanding of how to use CIEWS in decision making.

The project will organize two ToT sites in each province or a total of 8 in the project area. The 8 ToT sites will be retained until the fifth year of the project to strengthen the knowledge base of the MTs and to test, modify and demonstrate new technologies and practices as required based on the changing context. The pool of expertise developed will help address the extension gaps in CR practices and technologies and will be able to disseminate and expand the evolving practices even after project completion.

Activity 1.1.4 Training and advisory on CR technologies and practices (NCDD-S)
The core team trained will start training farmers using the training materials developed. Altogether, 40,000 farmers will be trained through 1600 Farmer's Field Schools. Given the need to cover such huge numbers of farmers in a short time, a cascade approach will be followed. The details of the cascade system are described in Annex 2. It will begin with a 160 FFS in the first year implemented by the Master Trainers (MTs), and will be expanded utilizing newly trained key farmers, which include women and youth under the supervision of the MTs. Inclusion of women as Master Trainers and separate sessions for women will be considered wherever this is preferred by the participants. The program will continue until the 7th year of the project. The project will enter into agreement with training entities who have been trained earlier (MT trainings above) to implement the FFS programs. Arrangements will be made to keep a roster of the MTs with both MAFF and NCDDs for further dissemination of the

techniques and technologies disseminated through the FFS in other areas for programmes that can help finance the training.

Table 3: Outreach of FFS

Year	Target groups	FFS target	Beneficiary target	Objective	Remarks
1	Master trainers only (NGOs, /PDAFF, research institutes, young ag. graduates etc.)	8	200	Develop master trainers (MTs) to conduct training to farmers	Trained by subject matter specialists (SMS) at IRRI and a service provider in collaboration with commune facilitators. These MTs will be responsible for training to farmers from year 2.
2	Farmers	160	4000	Build farmers 'capacity on CR technologies	Trained by MTs, supported/ supervised by SMS
3	Farmers	320	8000	Build farmers 'capacity on CR technologies	Trained by key farmers and MTs, overall supervision by SMS
4	Farmers	320	8000	Build farmers 'capacity on CR technologies	Trained by key farmers and MTs, overall supervision by SMS
5	Farmers	320	8000	Build farmers 'capacity on CR technologies	Trained by key farmers and MTs, overall supervision by SMS
6	Farmers	320	8000	Build farmers 'capacity on CR technologies	Trained by key farmers and MTs, overall supervision by SMS
7	Farmers	160	4000	Build farmers 'capacity on CR technologies	Trained by key farmers and MTs, overall supervision by SMS
		1600	40,000		
About 40% of FFS will be focused on women groups only (vegetable production, mushrooms, chicken production, aquaculture etc.), FFS will have at least 40% women participation and at least 15 % youth participation (age group till 30 years)					

The FFBS activities will be used to link the farmers with markets and build their capacities in value chain development covered under Output 1.2. An important element of the training will be the integration of some of these alternative crops in the rice farming system and the focus on post-harvest management and marketing. To further fortify the capacity development post-FFBS, practical video library and online advisory services on rice and non-rice commodities will be developed through mobile application, allowing farmers to access information and troubleshoot via their mobile phones.

Activity 1.1.5 Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery (NCDD-S)

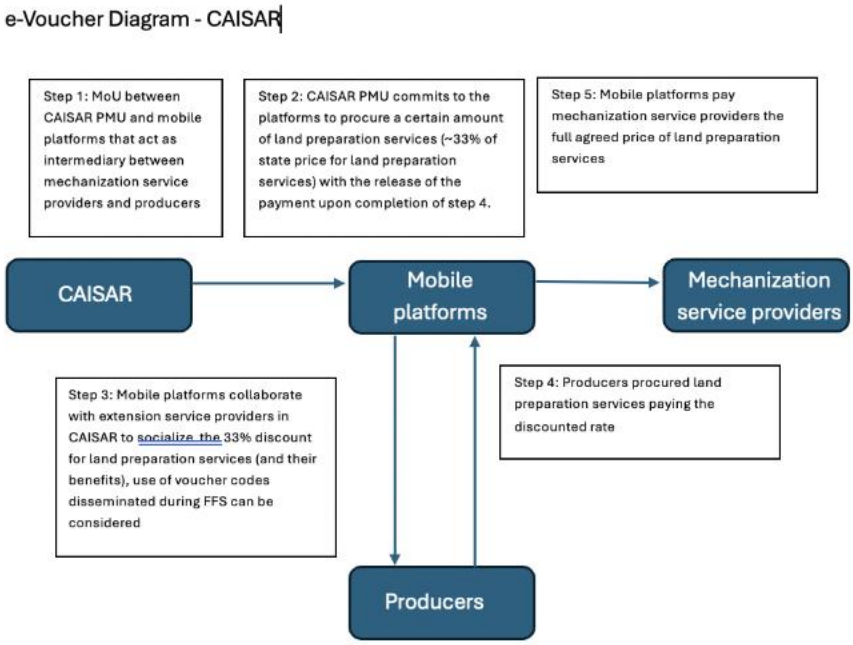
This activity aims to enhance the availability of high-quality mechanization services to farmers, especially to support them to shift towards the mechanized direct seeded rice (mDSR) IRRI.

The mechanization service providers will be linked with the machinery dealers and mechanics for smooth service delivery to farmers. As explained in Annex 2, there is already a strong desire among farmers and willingness to pay to shift mDSR from existing manual broadcasting method.

For LLL, there is a growing interest among farmers, but the technique is still seen as expensive by farmers. In addition, farmers have seen benefit of LLL mostly in dry season rice or in dry direct seeded rice practices. The project will therefore procure 20 LLL units (five for each province) for demonstration purpose and will integrate it with the service providers so that interested farmers can more readily access LLL. This approach has already worked well to establish successful private industry laser levelling providers in Cambodia. IRRI will be engaged for high level knowledge products and capacity support to commune agricultural officers. IRRI will organize training for commune agricultural officers on facilitating the growth

of mechanization service providers at the commune level, provide continuous backstop and develop knowledge products and training materials on the application of mDSR.

The project will strengthen the commune agricultural officers' current extension model to promote mechanization especially in rice cultivation. MAFF's commune level extension workers will be trained on promotion of mDSR and other technologies and will co-ordinate the services of service providers through capacity support and in assisting them in developing viable business models. A mobile platform connecting service providers and farmers will be developed in mobile app and farmers will be incentivized to try the mDSR services through eVoucher in the app. By demonstrating the value of these technologies, the project will increase demand which will encourage Private sector to provide these services on an on-going basis. The demonstration of increased yields from the use of these technologies will increase demand beyond the project area and scale their use through provision by private sector.



Activity 1.1.6 Community-based monitoring and evaluation (CBME) of the implementation (NCDD-S)

Local farming communities play a crucial role in implementing climate-resilient measures, and their involvement in monitoring outcomes is vital for the sustained adoption of these practices. The Community Based Monitoring and Evaluation (CBME) approach enhances community ownership from planning to evaluation. Performance indicators will be developed in collaboration with men and women farmers and stakeholders to track the effectiveness of interventions. These indicators may include metrics on training participation, engagement of female farmers in various production activities, and the introduction of new crop varieties. The indicators will be validated for integration into the project's monitoring and evaluation framework and national Climate Action Monitoring systems.

Results and lessons from the CBME will be linked to a Web-based monitoring system. This will facilitate information flow both ways, allowing feedback from national levels to inform community-based systems. The feedback from agriculture cooperative and farmer groups will also be reported. By the sixth year, discussions will be initiated at the sub-national level to explore the potential for integrating community action planning and CBME processes into

routine operations beyond the project's duration. The M&E system will report also on the project performance in the inclusion of women and youth in the training programmes. Commune level officers and MAFF and NCDDs staff will be included in understanding the monitoring system so that they can then use it for their own purposes. The participation of the MAFF and NCDDs staff in the commune monitoring system may lead to its upscaling to other areas.

Output 1.2 **Climate adaptive value chains developed by 4Ps and increased access to finance** *(NCDD-S)*

This output aims to address financial barriers to invest and improve sales of smallholder farmers, farmer groups, agricultural cooperatives and related MSMEs by helping them leverage capital for adaptation and value chain investments. The scaling up of climate smart practices, services, and technologies demonstrated under output 1.1 will be supported under this output. This output consists of three key and synergistic activities: (i) Value chain (VC) study that aims to identify the gaps and improve VC governance; (ii) Establish and facilitate multi-stake holder platforms to improve VC coordination and stimulate investment from the financial sector to invest in climate change adaptation through VC development; (iii) Public – Private – Producer – Partnership Facility (4PF) that crowd in, de risk, and co-finance investment with MSMEs and farmers in support of climate-sensitive commodity development and rural employment generation. The development of these value chains activities will be undertaken through a gender lens to capture the engagement of women in the different agriculture commodities and their specific role in each value chain and how they can benefit from the activities of the project.

Activity 1.2.1. Value chain study and planning (NCDD-S)

The project will focus on enhancing the value chains for rice, vegetables, native chicken, and fish in Cambodia, with the possibility of adding more commodities later. Within the first six months, the Agri-Enterprise Development (AED) team, supported by international experts, will train provincial and district partners to develop concise value chain action plans (VCAP). These plans will involve mapping commodity actors, identifying value-added processes, and pinpointing challenges and opportunities. The VCAPs aim to highlight interventions that provide higher income potential, are inclusive of vulnerable groups, and are climate resilient.

The VCAP development process will consist of five steps: conducting background research, mapping commodity sectors, analyzing structural and dynamic factors, performing financial and economic analysis, and hosting a workshop to validate findings. Each target province will produce at least four approved VCAPs, which will guide commodity development integration into provincial programs, provide technical support, mentor value chain actors, and facilitate business operations. The VCAPs will also inform community-based adaptation planning, ensuring ongoing updates and relevance to agribusiness entrepreneurs in the region.

Activity 1.2.2 – Establish Multi-Stakeholder Platforms (MSPs) (NCDD-S)

The project will establish Multi-Stakeholder Platforms (MSPs) to facilitate collaboration among value chain actors, focusing on enhancing governance and improving relationships within selected agricultural value chains. Two types of MSPs will be created: District Commodity-Based Multi-Stakeholder Platforms (DMSPs) and Provincial Agro-Financing Workshops. DMSPs shall strengthen coordination among stakeholders such as farmers, traders, and financial institutions, and Provincial Agro-Financing Workshops to connect local financiers and producers. The DMSPs aim to organize at least 1,000 events throughout the project to improve market linkages, enhance transparency, and foster partnerships, while the Agro-Financing

Workshops will occur bi-annually at the provincial level to inform participants about financing options and opportunities.

The DMSPs will provide a structured approach to identify challenges and opportunities within the value chains, facilitating discussions on potential interventions and joint actions among stakeholders. These will be undertaken from a gender perspective. The outcomes may include improved market information, stronger partnerships, coordinated actions, and conflict resolution among value chain actors. Follow-up actions will be tailored to stakeholder needs, and the success of these platforms will rely on effective facilitation and engagement. How women can best be engaged in the value chains will be an area of focus. The Provincial Agro-Financing Workshops will be coordinated with local and regional financial institutions and relevant stakeholders to share innovative financing options, ensuring the participation of MSMES, and relevant Financial Institutions. It is expected that some sustainable relationships will be built after the organization of the large number of events throughout the project lifecycle which will foster partnerships and can be continued on their own. In case some of these partnerships are successful they are expected to be scaled up beyond the project area due to mutual benefit. While the bi-annual workshops at the provincial level may not continue after the end of the project it is expected that some of the introductions made during the process will lead to better access to financial institutions and some of the access to financing options are expected to continue beyond the project period.

Activity 1.2.3. Public Private Producer Partnership Facility (4PF) and leveraging of capital (NCDD-S)

Cambodia's agricultural sector has experienced substantial growth over the past two decades, leading to significant poverty reduction and improved food security. However, concerns persist regarding the quality, sustainability, and environmental impact of this growth. In response, the Royal Government of Cambodia (RGC) is evolving its agricultural and rural development strategy to emphasize sustainable development through the "Triple Bottom Line" approach, focusing on economic, social, and environmental goals. The RGC aims to foster public-private partnerships to enhance investments, improve the quality of services, encourage innovation, and manage resources more effectively.

The Public Private Partnership Facility (4PF) is designed to strengthen micro, small, and medium enterprises (MSMEs) in the agricultural sector, particularly focusing on supporting young rural entrepreneurs and women entrepreneurs. Through grants and technical assistance, the 4PF encourages investments that benefit both businesses and local men and women farmers. Eligible enterprises can receive financial support based on their investment size, with specific criteria for applicant selection, including economic viability, equity participation and potential impact on target groups. The types of investments which are eligible for financing will include both production-oriented activities and value-added activities that improve the capacity for processing, access to markets, improve product quality, reliability and produce in sufficient scale to attract the private sector. The initiative aims to support at least 120 MSMEs, with a goal of achieving an 80% increase in net turnover among recipients and a return on investment exceeding 10%. At least 40% of these enterprises will be those which are led by women or have a majority of women shareholders or employees. To ensure inclusion of youth, a target of 20% will be established for inclusion of youth. Separate windows will be established to ensure the inclusion of women and youth in the grant application call. The 4PF will be managed, likely by a third party contractor, to ensure a private sector approach, including due diligence and standards of service. It will operate in close collaboration with other project components to ensure that supported investments positively affect local farmers and agricultural practices. Details of the grant and/or TA mechanism are outlined in Annex 2. The grant facility is envisaged as an incentive for demonstration purposes, to derisk first responders and those with significant climate risks. The project will

provide technical assistance for a specific period and grant support of a specific amount after which it will only provide mentoring and supervisory support during the project period. The role of the financial institutions will be to subsequently upscale the investments through a system that provides finance on a more sustainable basis through loans and equity of the investors.

Building on IFAD's ongoing projects, such as AIMS and SAAMBAT, the initiative will encourage the financial sector to identify and invest in climate change adaptation and rural value chain development opportunities. While MFIs report having sufficient capital for medium and long-term investments, they lack risk management tools to engage in climate adaptation efforts. To bridge this gap, CAISAR aims to attract financing from various financial institutions by enhancing their understanding of rural activities and investments including capitalizing on increased business opportunities which the project seeks to stimulate at the farm and business level by organizing semi-annual Provincial Agro-Finance Workshops to improve information flow between value chain actors and financial institutions and address asymmetries of information. Further, commercial finance will also be integrated into the 4p investments where possible, creating viable pipelines for finance and both reinforcing existing, and stimulating new, value chain finance. This proactive approach is expected to unlock substantial financial resources for agricultural investments, significantly impacting rural economies and poverty alleviation in the target provinces.

Output 1.3. Increased access to climate information and advisory services for climate responsive water-use and crop planning *(NCDD-S)*

In Cambodia, the capacity to utilize weather and climate data for agricultural applications is limited, despite significant investments in data generation. The PEARL project by the GCF identifies critical gaps in agro-meteorological services, particularly in value-added services and their uptake by farmers. While some NGOs have provided climate-informed advisories, these efforts tend to be project-specific and lack sustainability. Existing platforms, such as the PRISM initiative by the WFP, focuses primarily on social protection against climate events rather than comprehensive farm-level advisory services. There is a pressing need to enhance the capabilities of the Department of Meteorology and the Department of Hydrology and River Works to improve data collection, modeling, and the translation of weather forecasts into actionable agricultural advisories.

To address these challenges, Component 2.4 of the project will focus on strengthening national institutions to improve water and weather information systems, enabling more effective forecasts and early warnings for floods and droughts. This output aims to develop and disseminate relevant agrometeorological information tailored to local agricultural needs, facilitating better climate risk management for farmers. It will draw on approaches such as PICSA (Participatory Integrated Climate Services for Agriculture) that allows for co-designing advisories with intermediate and end-users, ensuring timely, relevant and actionable information. The information needs of women and the most appropriate channels of communication for them will be examined to ensure they access the information they need given their key role in crop and livestock management. A diversity of dissemination channels and mechanisms has been proposed to take unique circumstances into account. In general, information will be accessible through mobile apps but also disseminated through traditional communication channels where appropriate and feasible (extension system, local radio, village commune leaders). Within the mobile apps, the project will explore alternatives to text-based content – using visual and verbal options. In addition, reinforcement on availability of information and its utility will occur through FFS (in which 40% of target participants are women) and FWUCs, with FFS sessions dedicated to discussing forecasts and advisories at critical junctures in the cropping season or when specific risks are triggered. A coordination platform will be established at the provincial level to integrate national advisories into localized services, benefiting approximately 90,000 people (40% women) across four provinces. This

approach will ensure a collaborative and adaptive learning process, promoting effective agricultural practices and enhancing resilience to climate change.

Activity 1.3.1 Strengthening agro-meteorological stations in the project area (NCDD-S)

This activity involves the procurement and rehabilitation of six automatic hydromet stations and four agrometeorological stations, enhancing data collection capabilities in areas not covered by the Ou Ta Paong SCADA system. Additionally, four automatic weather stations will be established. The network will generate reliable data to support decision-making across national, provincial, district, and local levels, while improving connectivity and data-sharing mechanisms among various departments. Equipped with sensors to measure temperature, water levels, rainfall, turbidity and soil pH-moisture sensor, soil temperature sensor, evaporation pan, pyranometer, etc as required. The infrastructure will be managed by (MoWRAM) through its General Department of Meteorology (GDM) and the data collected will be transmitted to a server as part of the SCADA system, facilitating better water management and providing farmers with quality agrometeorological information. To ensure data sharing and operability at national and provincial levels, CAISAR will leverage and align with similar activities of existing projects (e.g., PEARL).

Activity 1.3.2 Establish Provincial-Level Coordination Platform for climate-informed agricultural advisories (NCDD-S)

A process to integrate meteorological with agricultural data and produce national level agrometeorological advisory is being developed outside this project. This component will facilitate the translation of national level agrometeorological advisories into district level advisories. Provincial coordination platforms will be established to prepare Agricultural Meteorological Advisory Services (AMAS) at the district level, tailored to specific target crops. This platform will include representatives from provincial departments of water resources, meteorology, agriculture, research institutes, key farmers, NGOs, and relevant private sector members. It will integrate weather, climate, and soil data to produce routine, crop-specific advisory services, verify past forecasts, enhance dissemination efforts, and gather feedback from farmers to improve these services. The provincial coordination platform will receive technical support from organizations like IRRI that are involved in the project's implementation.

Activity 1.3.3 Build the capacities to deliver services (NCDD-S)

Capacity development will focus on enhancing the technical skills necessary for climate data collection and management, as well as translating this data into agricultural advisories through modeling and statistical analyses. The initiative will involve focus group discussions to facilitate co-creation among various government entities and farming communities, primarily targeting staff and professionals in climate and agriculture data management, public services, research, and NGOs. The program aims to train approximately 250 individuals through structured training courses, including short-term summer courses on GIS and data validation, as well as advanced training in areas like crop modeling. Both formal training and on-the-job learning approaches will be employed to build these capacities effectively. Inclusion of women will be an area of focus for capacity building ensuring that at least 40% of the individuals are women.

Activity 1.3.4. Establish the agrometeorology information and warning systems and the mechanisms including awareness raising (NCDD-S)

The dissemination of advisory services will be structured as a daily, bi-weekly and/or weekly bulletin (interval will be confirmed during implementation), utilizing multiple channels to reach

farmers and stakeholders effectively. Some bulletins will be seasonal in nature to allow FWUCs to plan cropping area and project irrigation requirements. Given the existing gaps in systematic communication within Cambodia, the project will leverage various methods to ensure that essential information is widely shared. This includes posting advisories on the websites of the Ministry of Water Resources and Meteorology (MOWRAM), as well as local government platforms. Additionally, advisories will be broadcast through local radio and television programs, tailored into accessible audio and video formats for greater community reach. Special effort will be made to identify the channels of communication most accessible to women and use them as well. To further enhance accessibility, SMS messages will be sent to men and women farmers, commune leaders, and Farmer Water User Communities (FWUCs), who will help disseminate the information to the wider farming population. The advisories will also be integrated into ongoing Farmer Field Schools (FFS) to educate and inform participants directly. Furthermore, mobile applications (e.g., Chamkar app that is used in other IFAD-funded projects in Cambodia) will be employed to provide real-time access to advisory services, ensuring that farmers can easily obtain relevant information and make informed decisions about their agricultural practices.

To enhance farmers' awareness of agrometeorological advisories, an effective delivery mechanism will be established through participatory and cross-disciplinary approaches. This involves organizing awareness programs and seminars that bring together men and women farmers, research institutions, and other stakeholders as equal partners. These initiatives aim to educate farmers about the weather forecast process, its challenges, and how to utilize climate information in their decision-making. Existing platforms, such as FFBS and Agricultural Planning (AP) formulation processes, will be leveraged for outreach, incorporating field days and visits to explain the significance of climate-informed practices in simple, relatable terms. Additionally, targeted training sessions on climate-informed agricultural decision-making will be conducted, involving 320 key farmers and stakeholders. These trained individuals will serve as resource persons, promoting the importance of climate awareness during the FFBS and AP processes. The key farmers will also include 40% of women farmers. Feedback and lessons learned from these interactions will be continuously integrated into the advisory services, ensuring that the information provided remains relevant and effective for the farming community.

Output 1.4: Increased resilience of farm road infrastructure to climate change *(NCDD-S)*

Approximately 90 kilometers of rural roads in targeted project areas will be upgraded to enhance climate resilience, providing a safer and more cost-effective road network with year-round access to markets and social services. These improvements will differ from "inspection roads" constructed atop embankments of primary and secondary irrigation canals, which also serve local communities and aid in the operation and maintenance of upgraded irrigation systems under Component 2. When feasible, flood defense embankments will be designed to serve dual purposes of flood control and road access. This initiative will benefit about 10,673 farmers across 35 villages directly and another 1.15 million people indirectly by improving connectivity.

Road designs will take into account current and future climate change risks, including increased flooding and drought incidents. Drought conditions significantly affect unpaved roads, leading to higher dust levels, reduced visibility, and poorer air quality. Addressing flooding and soil moisture concerns will be prioritized to protect road investments. Resilience will be enhanced through climate-resilient designs, embankment raising, surface strengthening, drainage improvements, and erosion protection using vegetation and bio-engineering methods.

A list of potential farm roads has been identified, with feasibility studies completed (See Annex 2). Improving local road networks is a key-supporting factor for socio-economic development and will be integrated with Component 2, particularly along irrigation canals allowing farmers to better monitor crop progress and water levels. Independent farm-to-market roads fall under Component 1, managed by NCDDS. Activities for these roads will include:

Activity 1.4.1 Identification, selection and initial planning (NCDD-S)

The initial planning will involve consultative meetings with the communities and stakeholders to gather insights on local contexts, opportunities and challenges. This engagement will inform the design process, utilizing lessons from the Community Participation Framework (ADB 2018) prepared under the Rural Roads Improvements Project III. Key data on traffic volumes, climate change impacts, and existing conditions will be collected, along with future maintenance needs.

Activity 1.4.2 Technical survey and design considerations, preparation of cost estimation (NCDD-S)

In this activity, the design of rural roads will prioritize climate resilience, addressing the anticipated increases in flooding and drought due to climate change. The hydrology of the project areas indicates that both the frequency and intensity of flooding will rise during wet seasons, while droughts will become more prevalent in dry seasons. To mitigate these impacts, design approaches will incorporate advanced techniques, such as raising embankments, enhancing drainage, and utilizing bioengineering solutions for erosion control. The integration of climate resilience features will ensure roads remain functional year-round, with specific design elements including sufficient drainage capacity, flexible pavement materials, and vegetation-based erosion protection.

Three types of roads will be considered for improvement: polder embankment roads, canal embankment roads, and standalone rural roads (Type 3 and Type 4). For polder embankments, the design will maintain a minimum top width of 4.5 meters with a slope of 1:2.5, while ensuring adequate side protection using local vegetation. Canal embankments will follow similar criteria, reinforcing their dual function as transport routes. Type 3 and Type 4 roads will incorporate features such as increased embankment heights, improved cross drainage, and the selection of permeable materials to enhance resilience against flooding. Overall, the design will be informed by hydrological data and best practices to ensure sustainable, climate-proof road infrastructure.

Activity 1.4.3 Improve 90 Kilometers of farm roads (NCDD-S)

The construction of the road works will be executed through competitively procured local contractors and supervised by both technical experts and community members for proper quality assurance. The local communities will be engaged in monitoring and reporting on the construction works and will be trained for the purpose by the consultants.

Activity 1.4.4 Handing over of the completed works (NCDD-S)

The completed roads will be handed over to the Ministry of Rural Development (MRD). The MRD will commit to the operation and maintenance of the roads in line with the sustainable road maintenance program. This will be agreed prior to construction in an MOU between the project and MRD. The costs of the annual O&M will be estimated and indicated in the MOU.

Component 2: Upgrading and climate-proofing water infrastructure for increased resilience. (MOWRAM)

Component 2 is linked with Component 1 such that it facilitates the implementation of CR on farm crop and water management practices through improved field level water supply delivery and drainage. It will focus on rehabilitating and modernizing of irrigation and flood protection/drainage infrastructure in the 3 sub-projects[52], including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions.

The expected outcome of this component is that within the 6 irrigation schemes the water management condition throughout the year is improved and can be controlled, meaning that there will be no major flooding in the wet season and no severe drought in the dry season. As concluded during the re-evaluation of the Feasibility Study and Project Preparation (FIRM) study, the Overall Feasibility Study (Annex 2) proposes to modernize and rehabilitate the irrigation and drainage infrastructure serving 32,056 has. The anticipated cropping calendar is based on a rain-fed/partially irrigated rice crop in the wet season in the entire project area, while in the dry season in around 70% of the total project area a second dry season irrigated rice crop can be grown, with in the remaining 30% of the project area (mainly the Lum Hach irrigation scheme) the other 3 value chains will be providing sustainable livelihoods as availability of irrigation water in this area is limited. The climate adaptation activities will ensure that the projected increase in extreme wet days and more frequent upstream flooding do not lead to damage and destruction of irrigation infrastructure and also transform this risk into a green opportunity by storing more water in irrigation ponds, improved drainage facilities to drain the excess flood and increased access to water through solar pumping. Additionally, more efficient irrigation technologies will ensure that farmers can irrigate larger parts of the schemes for longer periods throughout the year.

This component will be implemented through four integrated outputs. Output 2.1 is dedicated to the enhancement, establishment, and modernization of hydraulic infrastructure to elevate irrigation practices within the framework of the three sub-projects. In addition, component 2.2 is geared towards enhancing infrastructure that protects the project areas against flooding by means of encompassing rivers, drainage systems, and embankments. Consequently, the project aims to deliver irrigation systems that are highly efficient and resilient to climate change, catering to both increased flood risks and drought conditions. These two components aim to ensure and boost agricultural production by improving irrigation supply and safeguarding crops from water-related disasters.

The sustainability of the irrigation scheme will be ensured by strengthening the O&M capacities of the FWUC (Output 2.3) and PDoWRAM with the creation of a SCADA system for Ou Ta Paong scheme (output 2.4). The proposed areas that combine adequate potential with greatest need for assistance have been identified in consultation with MOWRAM and PDWRAMs. For ensuring that local information is taken into account, the FIRM study undertook field surveys and stakeholder consultations. Output 2.3 aims to strengthen the FWUC for improved irrigation management while the last output provides farmers relevant water information and SCADA based canal operation. Based on available water and weather information, farmers will be supported with the agro meteorological services as described in output 1.3. These four outputs are described in more detail in the following paragraphs.

Output 2.1: Modernized irrigation schemes and ponds (MOWRAM)

Rehabilitating, upgrading and, where water and land resources are available and socially and environmentally possible, constructing new irrigation facilities and storage ponds within the 6 irrigation schemes, which will all have positive climate adaptation and mitigation impacts.

Thus, this output has two main benefits: (i) increasing water availability and restoring existing and introducing new storage capacity for irrigation in the form of ponds while decreasing the destructiveness of floods on downstream locations; and (ii) the possibility of implementing crop diversification and new activities to increase farming incomes such as vegetables, poultry production and/or aquaculture. It will also allow for creation of employment opportunities, especially for young people. This measure would be part of integrated and resilient water resources management and climate proofing to secure the sustainability of the overall irrigation system against negative climate impacts of droughts and dry spells as well as floods during the monsoon season. Output 2.1 and 2.2 will be implemented in three sub-projects within a total of six separate irrigation schemes. The flood protection works will directly benefit an area of 10,005 ha, including a proposed semi-polder area of around 2,550 ha (Output 2.2).
Activity 2.1.1: Technical analysis, field surveys and preparation of plans for system upgrading *(MOWRAM)*

After the detailed topo-surveys have been completed in all 6 irrigation schemes a detailed DED for all irrigation and drainage/flood control systems will be prepared taking into consideration the detailed social-and environmental impact assessment to minimize the amount of private land to be used and plot the new infrastructure as much as possible on public land. For the larger schemes, tertiary distribution systems are foreseen. This DED will primarily be based on gravity-driven flow irrigation but in case the natural slopes are insufficient to allow for gravity flow, solar-driven pumps will be considered at the beginning of the secondary or tertiary canals to allow for sufficient head to have good distribution of the available water over the entire scheme.

In this final DED the different layout options as identified in the FIRM phase will also be reinvestigated for technical, environmental and social/safeguard considerations. The implementation will focus on maximizing ecosystem-based solutions, reducing energy consumption, and consequently reducing GHG emissions. In addition, current diesel pumps lifting water to tertiary and secondary canals will be replaced where possible by collective solar pumping systems when the pre-conditions are acceptable with low pressure water delivery at the plot level to increase the water efficiency, avoid land losses and improve water use efficiency. Moreover, these technologies will allow to save time and labour, especially for women, and offer opportunities to engage rural youth.

Activity 2.1.2: Implementation of infrastructure upgrading *(MOWRAM)*

The implementation will follow a participatory approach involving farmers' at all stages from the survey, design, construction, implementation and operations. It will also cover all cross-cutting issues such as gender, environmental and social issues, resettlement, etc. The land rights aspects in construction-related activities will be guided by the Resettlement Planning Framework (RPF). The project will minimize land acquisition by following existing rights of way, where land acquisition is required, it will implement fair and transparent processes under the RPF. The ESCMF includes detailed procedures for managing land acquisition, including socio-economic surveys, eligibility and entitlement criteria, consultation, grievance redress, and monitoring, ensuring access to recourse for affected persons. This subcomponent will be financed by AIIB and Government.

Activity 2.1.3: Preparation of canal O&M plans including application of ICT and SCADA for operation *(MOWRAM)*

Upon completion of construction works, schemes will be handed over to the Irrigated Agriculture Department (IAD) of MOWRAM, and O&M responsibilities will be shared between the concerned Provincial Department of Water Resources and Meteorology (PDWRAM) and FWUC. MOWRAM's Irrigated Agriculture Department will be assigned overall management

responsibility and required to introduce a system of on-going M&E and reporting of scheme performance. FWUCs will receive financial support until they become financially independent. PDWRAMs will provide technical backstopping to FWUCs. MOWRAM will arrange government budget for funding routine and periodic maintenance of the infrastructure retained under government control and for providing financial support over the first five years after FWUC formation. MOWRAM will authorize the transfer of management responsibility to a FWUC after training and assessment of the FWUC being financially independent (Prakas 306/2000-PID-RGOC Annex 21). It is expected that the impact of the project on increase water use efficiency through modernization of the schemes will encourage greater allocation of resources for expanding the modernization of irrigation schemes in other areas.

Output 2.2: Flood-proofing and drainage improvement (MOWRAM)

It focuses on improving disaster prevention and protection of farmlands and assets by establishment of early warning systems and improvement of the existing drainage and flood protection systems. Existing drainage and river training networks will be improved based on the results of the hydrological modelling and consultation with stakeholders living in the project areas.

Activity 2.2.1 Technical analysis, field surveys and preparation of plans for system upgrading *(MOWRAM)*

This output focuses on equipping the 6 schemes with facilities to withstand the currently annually recurring flooding of all parts, but mostly the downstream parts of the 6 schemes and also disaster prevention and protection of farmlands and assets by the establishment of flood protection embankments and drainage canals helped by early warning systems to improve capacities of the existing drainage networks and flood embankments. This flooding is partially due to the water inflow from the downstream end of the scheme from the Tonle Sap Lake and partly from local runoff of the higher areas upstream of the scheme for which no proper drainage infrastructure was made. Existing drainage and river training networks (especially in the Ou Ta Paong and Lum Harch schemes) will be improved based on the results of the hydrological modelling and consultation with stakeholders living in the project areas. Also, at the downstream end of these subprojects in the new semi-polder area solar-driven water pumps will be installed wherever necessary to pump excess drainage water to the outer area.

Activity 2.2.2: Strengthening and construction of flood control and drainage infrastructures (*MOWRAM)*

The applicability of nature-based solutions in flood management (e.g., revival of old river channels like Ou Ta Paong River, embankment improvement with vegetation strips, etc.) will be reviewed and subsequently used to inform the investment planning under this component. Farmers will also be supported to restore, and construct farm level drainages as required while project will install sub surface drainages in needy areas. In addition, it will also support strengthening of river training and their embankments to make them resilient against intensifying flood threat under the changing climate context. These improved embankments will be linked to the flood risk assessments improved in Component 1 and the water-related data will feed into the national database to improve flood early warnings for target areas (delivered through output 1.3). New flood protection embankments will be constructed in Ou Ta Paong and Stoeung Krang Bat irrigation schemes to avoid high season water levels in the neighboring Tonle Sap River into the command area.

The levels of the embankments have been based on the topo surveys recently carried out and the 2 water models focusing on the impact of the climate change on the flood levels in the Tonle Sap Lake and the rivers crossing the various project areas. For more information reference is made to the D.4 report of the FIRM study. One additional very considerable

benefit of these embankments will be improved accessibility for the communities in these lower parts of the scheme as now they will be able to use the newly built embankments for local transport while in the past they had to use small boats. This will facilitate local communities to access markets and the flow of agriculture inputs and outputs. Annex 2 provides more details of the drainage infrastructure at the sub-basin level.

Output 2.3: Farmers Water User Communities (FWUC) established and trained (MOWRAM)

Establishment and training of FWUC: FWUCs are critical for ensuring the sustainable and effective operation and maintenance of irrigation schemes, in particular at the distributary network system (secondary tertiary and quaternary levels. With the rehabilitation of the irrigation systems and the creation of a flood protection embankment system of the three subprojects, the project will support the establishment and capacity building of the FWUC from the participatory approach of FWUC creation in the design, development and sustainable use of the rehabilitated irrigation schemes to be rehabilitated by the Project as these organisations are crucial for O&M management.

Activity 2.3.1: Formation and institutional strengthening of the FWUC *(MOWRAM)*

FWUCs are critical for ensuring the sustainable and effective operation and maintenance of irrigation schemes, in particular at the secondary and tertiary levels. With the rehabilitation of the irrigation system and the creation of a flood protection/drainage embankment and canal system in the lower parts of the 3 sub-projects, the project will also focus on establishing new FWUCs and strengthening the existing FWUCs as these organizations are crucial for water management. This will include investments in improving the capacities in O&M activities, water use efficiency, improving the arrangement of water rights, water allocation, use of green technology, service fee collection and making them more inclusive. Furthermore, the project will train women and men farmers on using sustainable local water resources, climate adaptation strategies, and mitigation tools to reduce GHG emissions and increase agriculture productivity without negatively impacting the environment. The activities will be designed to strengthen the capacity of FWUCs for sustainable operation of the climate-resilient and climate-proofed irrigation systems. The inclusion of women in the FWUCs will be encouraged in both leadership positions and as members.

Activity 2.3.2: Build technical capacities of FWUCs for canal O&M *(MOWRAM)*

Build technical capacities of FWCUs for canal structure O&M and 2.3.3. prepare long term financing plan for O&M of the systems including the WUAS. The participation of women in these forums will be encouraged in discussion with women farmers. This will require an identification of the capacity needs, membership, and functionality of the FWUCs in the area. The concept of water pricing is embodied in the *Water Law*. However, mechanisms for water pricing have yet to be implemented. Thus, CAISAR will assist them in developing a business model for the operation and maintenance of each irrigation scheme on a self-sustaining basis in partnership with the farming communities and the private sector. This will entail the development of an O&M plan for the infrastructure investments, assessment of the willingness and ability of the users to pay for the services and a regulatory framework that gives the WUAs the authority to collect the fee and assess the basis on which water fee will be paid as Irrigation fees that can be based on the size of the land being irrigated or the volume of water used. Fees will be charged only when the scheme becomes operational.

Output 2.4: Water information system established and operational in three sub-projects[53] (MOWRAM)

The SCADA model is crucial to tackle the significant challenges in the agricultural sector on the inefficiency of irrigation practices, characterised by both indiscriminate and irregular water

distribution, leading to substantial water wastage. This approach offers real-time information on water levels and flow rates, enabling more accurate and timely responses to fluctuations in water demand. The SCADA presents a contemporary solution for the modernization of existing irrigation systems, prevent flooding and it does so with a fundamental, cost-effective approach. Implementing the Water Information System allows for command-and-control functionalities while collecting valuable data on irrigation. This, in turn, will rationalise and streamline the irrigation process, significantly mitigating the wastage of water.

Activity 2.4.1 Preparing all processes for establishment of the SCADA and water information system *(MOWRAM)*

This output aims to establish a water information and warning system such that farmers and other relevant stakeholders are fully aware of climate condition, water availability, silt condition so as to effectively plan their irrigation scheduling and operation. The water and weather information will further help develop crop specific advisory services as described in component 1. However, the forthcoming IWRM, CWISP programs in the MoWRAM will be developing area specific flood and drought warning system, water information and will also engage in capacity support. The project will directly use these available systems to help farmers in the project areas better plan their agriculture and protect their livelihood assets. Working together with the above projects, a communication system using mobile phones will be established so that farmers are timely informed on evolving threats and challenges.

At irrigation system level, it will install Supervisory Control and Data Acquisition systems (SCADA) in the Pursat hydraulic system network that includes the Ou Ta Pong irrigation scheme. The SCADA system will allow the water manager to monitor the real-time information on water levels and flow rates and the possibility to respond to fluctuations more accurately and timely. It provides command and control and collect data on irrigation to rationalize and streamline the process of irrigation service delivery. The proposed SCADA system will involve remote terminal units (RTU) to collect local data (water levels, flow rates, gate positions) and command local equipment (gates); a command center, to supervise/manage all the RTU; a communication system, to link the RTUs to the command center. Further details are explained in Annex 2.

The component 2 will be implemented by the Project Management Unit (PMU) at MOWRAM and its Project Implementation Units (PIUs) at the provincial level, including training and capacity development on development partners' policies and standards, monitoring, evaluation, reporting and verification, including climate rating and climate finance. Thus, PMU and PIUs will actively disseminate knowledge and green solutions in climate adaptation and mitigation among farmers, policy- and decision-makers, and rural communities.

Component 3. Strengthened institutional and regulatory capacity for low-emission climate-resilient development pathways.

This component aims to strengthen Government institutions, mainly the MOWRAM, MoE the NCDDS and the FWUCs. The focus for MOWRAM will be on upgrading technical capacity in various aspects of CR irrigation design and management. The key focus area under NCDDS will be on climate resilient crop production.

Output 3.1 Strengthened MOWRAM *(MOWRAM)*

This output supports, training and capacity development for the project management unit (PMU) and will enhance the institutional capacity of the Ministry of Water Resources and Meteorology (MOWRAM) and Provincial Departments of Water Resources and Meteorology (PDWRAM). This includes preparation of design manuals, capacity building and training in river basin management and water accounting, the operation of Supervisory Control and Data

Acquisition (SCADA) systems, in the design and implementation of climate-resilient green technology, low-carbon pathways, climate-proof irrigation systems and gender mainstreaming and social inclusion. The development of standard designs and construction manuals will enhance the replicability and long-term sustainability of the project. In addition, it will build capacities to employ digital platforms and the best-available climate and water data to monitor and boost the operational performance of the irrigation systems and future maintenance plans.

Activity 3.1.1 Strengthening river basin management and water accounting systems *(MOWRAM)*

CAISAR's investment in irrigation development envisages improved water availability to and throughout each of the schemes. This will require careful management of water resources storage, allocation, and delivery, and careful distribution of delivered water to the farmer/water users. Therefore, CAISAR will support capacity strengthening for water accounting in the river basins where CAISAR will rehabilitate and climate proof the irrigation infrastructure. CAISAR Component 2.4 will support MOWRAM with establishing a water information system, and this will serve and needs to be designed in such a manner that it provides the water accounting systems that will be strengthened with the data these systems need. The CAISAR activity will support MOWRAM and the four PDWRAMs in reviewing their current water accounting system in the project-related river basins and to plan/implement improvements where desirable and feasible. Activity 3.1.2. Communicating with stakeholders

Activity 3.1.2 Communication with stakeholders *(MOWRAM)*

MOWRAM's PDOWRAMs participate actively in the various Provincial-level meetings where water-related aspects are relevant in the discussions. Key items are the flood management plan for the wet season and the water allocation plan for the dry season. For MOWRAM/PDOWRAM to prepare and implement these plans properly, it will make use of the water information system and water accounting system mentioned above. This will be achieved efficiently and effectively by publishing the water situation on a website that can easily be consulted by the stakeholders. MOWRAM already has such an information website, namely for Flood and Drought Forecasting and is in the process of establishing a water data and information centre, which will result in more data coming available. These are centrally managed, with data being provided by PDWRAMs and other MOWRAM units, closer to 'the field'.

Activity 3.1.3. Support to and guidance of leaders of commune, village and FWUCs and gender awareness *(MOWRAM)*

The development of standard designs and construction manuals will enhance the replicability and long-term sustainability of the investment. Building capacities to employ digital platforms and the available climate and water data will also benefit other irrigation systems. More details are provided in Annex 2 section 6-part B page no194-195.

Output 3.2 NCDDS strengthened at national and provincial level

NCDDS plays a crucial role in promoting democratic development through decentralization and deconcentration of reforms throughout the country. To effectively carry out this mission, the secretariat of NCDDS has been actively engaged in capacity development initiatives aimed at enhancing the skills and knowledge of sub-national government officials

Activity 3.2.1 Strengthening of NCDDS at the national level (NCDDS)

The capacity development efforts of NCDDS will include:

Strengthening NCDDS' project management capacity: This includes training on project cycle management, financial management, monitoring and evaluation, human resources management, climate change and gender perspectives.

Policy formulation and implementation: Enhancing the capacity to develop and implement effective policies and programs at the sub-national level, especially the Sub decree 182 on the functions transferred to the district level. Disseminate and knowledge sharing the role and responsibility of district and municipality to support farmers.

Resource mobilization: Strengthening skills in resource mobilization, and planning at the sub-national level. GCF is another window where institutions can access to Climate Fund, so capacity building of NCDDS staff on project feasibility study and preparing full project proposal to GCF can help NCDDS to mobilize more resources.

Institutional strengthening and coordination: Promoting efficient institutional structures, coordination mechanisms, and inter-agency/ministry collaboration at the national level and sub-national level.

Activity 3.2.2 Strengthening of the provincial teams (NCDDS)

This will involve the following sub-activities:

Conduct a detailed capacity development needs assessment - The full evaluation of the current capacity of PDAFF, PDOC, PDWA to support extension service will be done by a consultant recruited for this purpose. Tools to be developed and administered to provincial staff and a report capturing the findings will be drafted. The purpose of a capacity development needs assessment is to identify the gaps between the current capacity of the Provincial Staff and the capacity required to achieve its objectives.

Training in technical concepts and cross-cutting subjects - Training and capacity building for Provincial staff in areas such as policy analysis, project management, market systems development, use of ICT tools and incorporating gender perspectives. Support to the adoption of ICT tools to improve the project efficiency, effectiveness, and transparency. To effectively carry out their duties, Provincial staff need to be well-versed in a wide range of technical concepts and cross-cutting subjects. In addition to the gaps, topics like - Sustainable agriculture, climate change adaptation and Information and communication technology (ICT) and gender analysis to be included in the training. The project will provide structured support to ensure that the participants are able to conduct some of the activities independently. The trainings will be structured to provide skills adequate for the functions that NCDDS staff are expected to complete. The increase in management capacity will be useful for deploying in other areas and the resource mobilization capacity will ensure the generation of resources for scaling up. The strengthening of the provincial teams will enable them to scale up and expand to other areas.

2.1 Financial management and Disbursement Arrangements

The Asian Infrastructure Investment Bank (AIIB) and GCF are the two main co-financiers of the project, with IFAD and the RGC also providing significant funds. AIIB and IFAD have provided grant funds and technical assistance for project preparation activities. The GCF funds will be provided to IFAD and then transmitted through the Ministry of Economy and Finance (MEF) of the Government of Cambodia to the Ministry of Water Resources and Meteorology and the National Committee for Sub-National Democratic Development The funds of the Asian Infrastructure Investment Bank (AIIB) will also be provided through the MEF to MOWRAM for investment in the climate resilience and modernization of irrigation infrastructure. The Royal Cambodian Government (RGC) will provide in kind support directly during the implementation of the project.

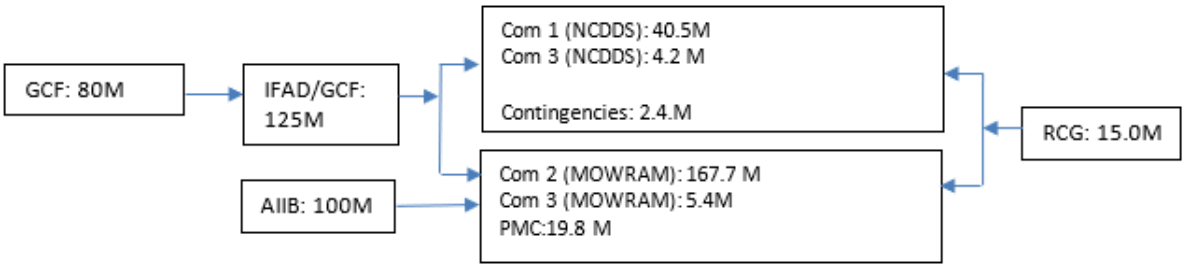
MEF will authorize MOWRAM PMU and the NCDDS PIU to open a designated account (DA) at the National Bank of Cambodia for funding from AIIB and IFAD/GCF. MOWRAM PMU and NCDDS PIU shall open one project account at a commercial bank to receive the fund transfer from the AIIB and IFAD DA to pay for project activities.

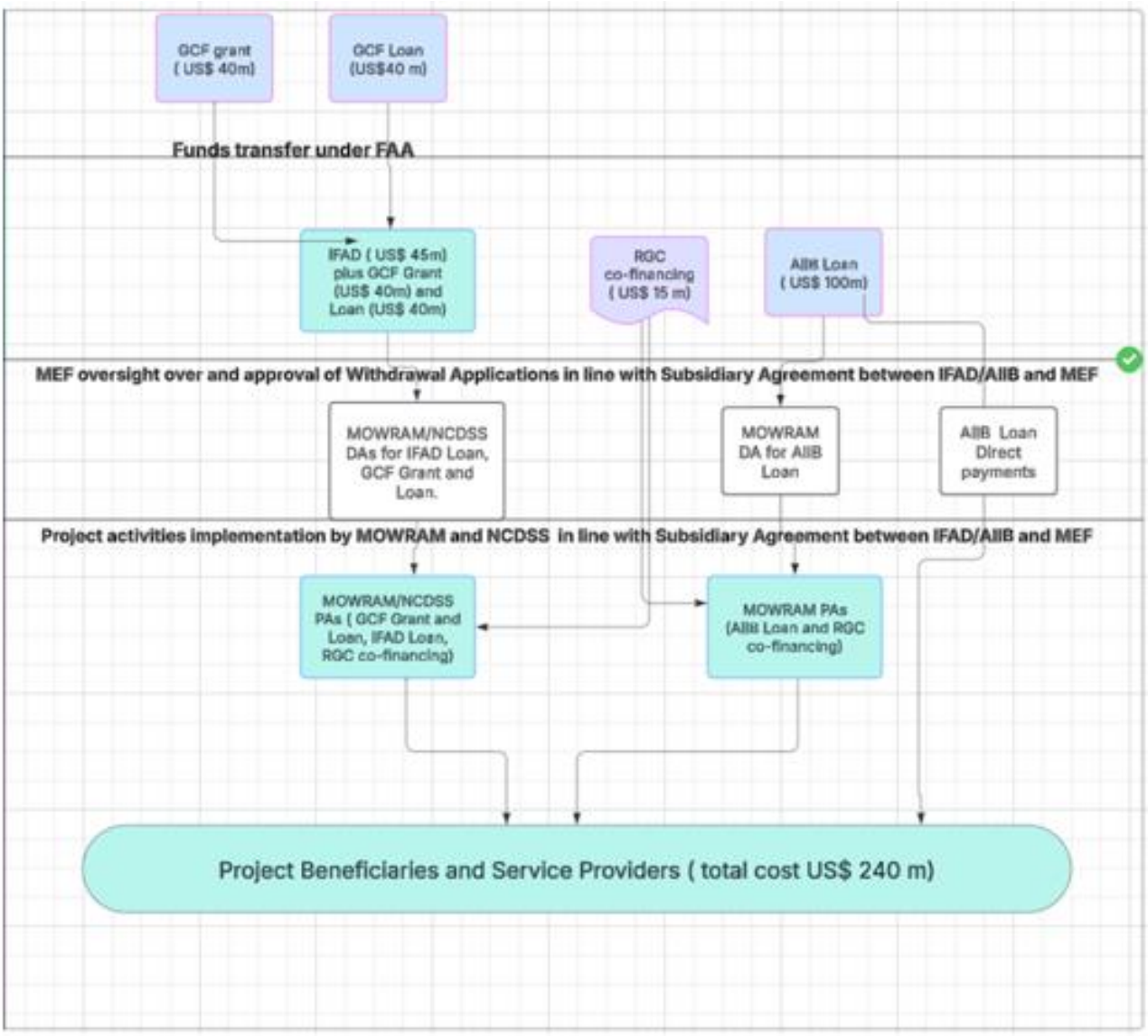
2.2 Project Cost and Financing

The total cost of the project is USD 240 Million (100M from AIIB, 80M from GCF, 15M from RGC, and 45 M from IFAD). The financing arrangement for each component and flow of fund is described in the below tables.

2.3 Flow of Funds

Figure 4: Funds Flow Diagram (USD)





Parallel co-financing

The Project will be co-financed with IFAD and GCF, with AIIB acting as lead co-financier. As project preparation was initiated prior to AIIB's GCF accreditation, components that will be funded by GCF will be administered by IFAD. IFAD and AIIB will be applying their respective policies for components which are financed in parallel. For Component 3 (Project Management) of the Project it will be jointly co-financed between AIIB, IFAD and GCF, The Project adopted a common documentation approach for the investment aligning the ES policies of AIIB, IFAD, and GCF, focusing on a client-first strategy to simplify processes for the government while maintaining environmental and social standards AIIB policies will apply to the sub-components it funds (2.1 and 3.4).

AIIB will serve as the lead financier for the Project, which will be co-financed in parallel by the International Fund for Agricultural Development (IFAD) and the Green Climate Fund (GCF). To support project preparation, AIIB has provided a USD4.7 million grant through its Project Preparatory Special Fund (PPSF). This funding is being utilized for detailed engineering designs (DEDs), procurement package support, and additional surveys required for the feasibility studies.

Further, The DEDs of the 5 sub-schemes; Kropeu Trom, Ou Ta Poung, Brambei Mom, Yutasast and Stung Krang Bat include Component 2.1 modernization of schemes and 2.2. flood-proofing and drainage improvements.

Co-Financing Arrangements and Alignment of Policy Application.

The Project is a collaborative initiative co-financed jointly and in parallel by the Asian Infrastructure Investment Bank (AIIB), the International Fund for Agricultural Development (IFAD), and the Green Climate Fund (GCF), with AIIB serving as the lead co-financier. Given that Project preparation commenced prior to AIIB's GCF accreditation, components funded by GCF will be administered by IFAD. To ensure consistency and effective coordination among all stakeholders, Annex 3 has been appended which outlines the framework for aligning policy application and procedures of the development partners involved in the Project—AIIB, IFAD, and GCF. It addresses key areas such as environmental and social risks and impacts management, procurement, financial management, reporting, and overall project implementation. This harmonization is essential for efficient project execution, clearly defining roles and responsibilities, and promoting the long-term sustainability of the Project outcomes. By streamlining processes, the Project reduces complexity for the government, providing clarity while facilitating smooth multi-partner collaboration.

Financing Plan

AIIB, IFAD and GCF will co-finance the Project jointly and in parallel. The AIIB portion of the financing will support the modernization of infrastructure for six irrigation schemes, improving water use efficiency and supporting project management and implementation consultants. A breakdown of the Project costs and financing plan are presented in Table x below and a more detailed one is presented in annex xx. The funding from RGC will be used for land acquisition, resettlement and compensation costs, taxes and duties, Project administration, and supporting consultants to the Project Management Unit (PMU). The remaining costs will be borne by the loans of AIIB, IFAD, and GCF grants.

Table xx: Project Budget by Component and Funding Source

Components	Total Cost (USD)	Funding Sources					%
		Green Climate Fund (Grant)	Green Climate Fund (Credit)	IFAD (Credit)	AIIB (credit)	Government (in kind)	
Component 1 - Farm Level Climate Adaptation and Resilience	40.4	26.3	-	12.9	-	1.2	16.9%
Component 2 - Upgrading and climate-proofing water infrastructure for increased resilience	167.7	3.3	39.0	18.3	96.0	11.1	69.9%
Component 3 - Strengthened institutional and regulatory capacity for low-emission climate-resilient development pathways	9.6	8.7	-	-	-	0.9	4.0%
Project Management and Coordination (PMC)a/	19.8	1.7	1.0	11.3	4.0	1.8	8.3%
Contingencies	2.4	-	-	2.4	-	-	1.0%
TOTAL	240.0	40.0	40.0	45.0	100.0	15.0	100.0%
		16.7%	16.7%	18.8%	41.7%	6.3%	

a/ it includes M&E cost

AIIB Loan Disbursement Procedures

AIIB will handle project disbursements for its financed activities according to its disbursement procedures. Disbursements will follow the transaction-based method, including the following procedures: Advance method (through advances to the Designated Account), Direct Payment method, Special Commitment method and Reimbursement method with full documentation, including reimbursements under the Retroactive Financing procedure. The withdrawal applications should be submitted by post to AIIB. Initially and later by electronic submission to be introduced by AIIB to streamline the process. Further details will be described in the Disbursement Letter.

The Government Counterpart Financing USD Account will be opened at the National Bank of Cambodia (NBC), the initial advance being based on a six-month cash forecast and replenishments based on paid expenses with supporting documentation. The submission Process for WA will initially be by post and later by electronic. The DA will be opened at an AIIB-approved commercial bank with ceiling limit of cash requirements for six months.

MOWRAM PMU will establish and maintain a separate Designated Account (DA) in any financial institution agreed between AIIB and PMU for AIIB funds. The currency of the DA will be the US dollar.

MOWRAM, through its PMU, administers the DA and is accountable and responsible for the proper use of advances, including advances to any sub-accounts.

MOWRAM PMU may request initial and additional advances to the DA based on the six-month cash forecast, which sets out the estimated expenditures to be financed through the DA for the forthcoming six months. Supporting documents should be retained by MOWRAM PMU in accordance with AIIB's Interim Loan Disbursement Manual for Sovereign-backed Loans (issued in September 2016) when liquidating or replenishing the DA. The SOE procedure will be used to reimburse eligible expenditures or liquidate advances to the DA. Supporting documents and records for the expenditures claimed under the SOE should be maintained and made readily available for review upon AIIB's request for the submission of supporting documents on a sampling basis and for an independent audit.

IFAD Loan, and GCF Grant and Loan Disbursement Procedures

As IFAD will administer the GCF grant and loan, IFAD's Disbursement procedures will apply to the withdrawal of GCF grant funds. The government treasury system is not applied for project fund flow. MEF will authorize the opening of a designated account (DAs) in USD at the National Bank of Cambodia for the receipt of Financing from IFAD for IFAD loan and GCF grant and loan. There will be two USD project accounts (one for MOWRAM and one for NCCD), which shall be opened at commercial banks to pay for project activities. The IFAD loan and GCF grant and loan disbursements will follow through the Revolving Fund Mechanism in which the project can withdraw/justify the advance based on the Interim Financial Reports (IFRs) following the procedures and conditions outlined in FMFCL. IFAD will send the FMFCL to MOWRAM and MEF with guidance on disbursement procedures; MEF will send IFAD the ICP letter providing the

delegation and authorization of the persons who can request and approve the submission of IFR and WA in ICP.

For IFAD funds, the Designated Account (DA) will be opened in any financial institution agreed between IFAD and PMU and the ceiling limit will be cash requirements for six months and replenishments based on paid expenses with supporting documentation.

There will be separate legal agreements with RGC: One for AIIB, another for IFAD. RGC's SOP for FM to be applied to the project are (i) GCF requires adoption of a Project Implementation Manual (PIM) as a withdrawal condition for IFAD financing, (ii) PIM includes FM Manuals for MOWRAM and NCDDS and (iii) MOWRAM's FM Manual outlines FM arrangements for AIIB and IFAD. AIIB will provide FM-related services to IFAD, including IUFR reviews and sharing annual audit results.

Accounting Software

Project accounts will be maintained using a suitable accounting software package to be agreed with IFAD and the AIIB. An online / web-based package is preferred. The same accounting software packages will be implemented in each Executing Entity.

The PMU uses Sage 50 Quantum Accounting Software to automate accounting under current projects financed by MDBs. The data capture and mapping of this system allows customization of financial reports and is found suitable for the Project. A similar or the same program shall be used to automate accounting for the proposed Project. The Project Chart of Accounts will reflect expenditure types and sources of financing. MEF's National Accounting Committee issued Guidance on Implementing the Cambodia Public Sector Accounting Standards "Cash Basis of Accounting" for Externally Financed Projects in October 2020. In compliance with this, the Project shall adopt the cash basis method for budgeting, accounting, and reporting. The Project shall record financial transactions and maintain the main Project accounts and records in US Dollars. All prime financial reports must be in US Dollars.

PMU and PIU accounting procedures will follow Standard Operating Procedures (SOP) for internationally funded projects. According to SOP, CAISAR will apply the Cambodia Public Sector Accounting Standard (cash basis), which is based on the International Public Sector Accounting Standards (IPSAS). Standard accounting software shall be used for PMU/PIU that will be compatible with IFAD and AIIB financial reporting requirements. Standard Government's chart of accounts will be set up in the accounting software to capture all payment transactions; in addition, project components, categories, sources of funds, and other segments will be set up and recorded for the transactions in the software to ensure financial reports and budget reports produced in accordance with IFAD/GCF, AIIB and Government requirements. The details of the accounting process and records are outlined in the SOP. All accounting records must be maintained in electronic format for 10 years after project closure. MOWRAM PMU will be responsible for the consolidation of financial reports from NCCD-PIU for each quarter; within 30 days, NCCD PIU will send to MOWRAM PMU the interim financial report (IFR) in the agreed format that will finally be consolidated and submitted to IFAD for justification of advance and requesting new advances.

Audit

To monitor project progress and financial performance, consolidated Interim Un-audited Financial Reports (IUFRs) will be prepared for the proposed project. NCDD-S will prepare its part

of IUFR and send it to MOWRAM. The PMU will enter its part into the IUFR file and finalize the consolidation of the IUFR. MOWRAM will submit the consolidated IUFRs every calendar quarter throughout the Project. The format of IUFRs will be agreed upon with the MOWRAM, NCDDS, and IFAD before the Bank's negotiations. It may include (a) Project Sources and Uses of Funds, (b) Uses of Funds by Project Activity, (c) Uses of Funds by Disbursement Category, (d) Designated Account Statements, and (e) Annex 1-Information about RGC in-kind contributions. IUFRs should be submitted to the Bank and IFAD within 45 days of the end of each quarter. The PMU shall submit the first report under the proposed Project after the end of the first calendar quarter of initial disbursement.

MOWRAM established its Internal Audit Department (IAD) in November 2006. The IAD was under the oversight and guidance of the General Department of Internal Audit of MEF (GDIA-MEF) until August 2023. The GDIA-MEF is responsible for developing and issuing guidelines for the internal audit function. The GDIA-MEF is also responsible for capacity building by providing continuous support and training. Since August 2023, the IAD reports to MOWRAM only and has twenty-seven staff members. The IAD designs its overall annual work program and selects the actual projects or sub-projects to be audited in coordination with MOWRAM management. The IAD does not typically conduct internal audits of projects financed by MDBs. The IAD's staff capacity can be strengthened through training activities funded through the proposed Project. This option can be further discussed during the Project implementation between AIIB and MOWRAM.

MEF is responsible for appointing external auditors for all donor-financed projects. The audits are conducted following the Cambodian Standards on Auditing and Assurance (CSAA), which conforms with the International Standards of Auditing (ISA). An independent auditor will conduct the external audit of the Project Financial Statements under ToR, which shall be acceptable to AIIB and IFAD. The audit costs are not charged to projects and are borne by the RGC. For Project purposes, separate audit reports will be issued for AIIB and IFAD financing. The first report will include the audited financial statements for AIIB parallel-financed sub-components and a management letter. The second report will include the audited financial statements for IFAD parallel-financed components and a management letter. The second audit report will be consolidated, consisting of NCDD-S and MOWRAM implemented IFAD's financed components. The PMU will furnish audited financial statements (and any accompanying Management Letters) to AIIB and IFAD, respectively, no later than six months after the end of each fiscal year.

Internal Audit will be conducted on an annual basis by the Internal Audit Department of the relevant ministries, if the Internal Audit Department has enough capacity for this task, as confirmed by IFAD and / or AIIB Supervision Mission. If the Internal Audit Department is not confirmed as having enough capacity, a private internal auditor will be hired to perform internal controls review, propose improvements, and issue recommendations. External audit will be conducted by a private audit firm hired by MEF, while IFAD and AIIB would provide NOL to the TORs.

The IFAD Policy on Anti-Corruption and Fraud requires that the staff of IFAD, (including beneficiaries of IFAD loans) as well as all bidders, suppliers, contractors, and consultants under IFAD-financed contracts observe the highest standard of ethics and integrity during the procurement and execution of such contracts. Mechanisms for whistle-blowers to access IFAD systems can be accessed under http://www.ifad.org/governance/anticorruption/how.htm. In line with IFAD policies on anticorruption, sexual harassment, sexual exploitation and abuse, all bidders and contractors/service providers/suppliers are required to sign self-certification forms as a part of bids and contract documents.

Based on the results of the financial management assessment, the current organizational structures of the implementing agencies are found appropriate to manage the new project. The funds flow arrangements are conducive for project implementation, especially in view of the direct fund transfer arrangement from provincial level to district level. The proposed accounting standards, policies, procedures, asset management, budgeting, audit, reporting, and accounting system are in place and considered effective for the existing organizations.

The project can rely on the prevailing structure and systems as regards fiduciary requirements and quality of outputs if the required mitigation measures are implemented to address identified weaknesses. Specifically, risk level could be lowered pending the actions of project management as follows:

i. To establish a control framework integrating periodic internal audits, independent external audits, and social safeguards based on IFAD policies;
ii. To adopt a good governance and mutual accountability framework to strengthen accountability and transparency in line with international best practices.
iii. To outline the project specific financial management procedures and disbursement
iv. To establish a Project Management Information System (MIS) in order to facilitate proper segregation of duties and overarching control of information and data flows and;
v. Recruitment of qualified consultants with relevant experience and educational background.
vi. Development of FMM with clear roles for supporting documents filing and accounting record keeping for all implementing partners.
vii. Customization of accounting software for accounting record keeping and financial reporting, considering GCF reporting requirements.
viii. Close coordination with MEF to ensure compliance with IFAD and AIIB audit requirements.

Taxation.

The IFAD financing proceeds must not be used to pay taxes. All taxes are to be borne by the Government.

Disbursements

AIIB will handle project disbursements according to its disbursement procedures. The Project will use direct payment and advance procedures for AIIB financing. The PMU plans to use the advance method of disbursement for consultancy and operating expenses, while the direct payment method will be used primarily for work payments. The PMU will prepare Withdrawal Applications and supporting documents and submit them to AIIB through MEF. After receiving the signed applications from MEF, AIIB will make the payments for the AIIB portion directly. For now, the applications will be delivered by post; later, AIIB may introduce electronic submission. Further details will be described in the Disbursement Letter (DL).

There will be a separate Designated Account in any commercial bank agreed between and held jointly by MEF and MOWRAM, which will be delegated to and administered by MOWRAM. Before opening the account, the PMU will email AIIB to confirm the acceptability of the selected bank.

The RGC's funding will follow the standard RGC system for cash contributions to development projects. A separate bank account in USD for the government counterpart financing will be opened in the National Bank of Cambodia (NBC). Whenever the PMU needs to receive funds from

the government counterpart financing, the PMU will prepare a cash request along with the cash forecast for 6 months or a replenishment request with paid expenses.

3. Social, Environmental and Climate Assessment Procedures

Environmental and Social Policy and Categorization. As some components of the Project will be parallel financed by AIIB, IFAD and GCF, the AIIB's Environmental and Social Policy (ESP, 2022), the IFAD's Social, Environmental, and Climate Assessment Procedures (SECAP) will be applied to the respective co-financiers' parts of the Project. IFAD's SECAP will be applied for Component 1, Component 2.2, and Component 2.3 and AIIB's ESP will be applied for Component 2.1, as the parallel financed components of the Project. For the joint co-financing component between AIIB, IFAD and GCF (Component 3), AIIB's ESP will be applied as AIIB is the lead financing agency. As two safeguard policies will be applied to the Project, coordination between the financiers to manage the environmental and social (ES) risks and impacts of the Project has been discussed and indicated in Annex 9. The AIIB's Environmental and Social Standard 1 (Environmental and Social Assessment and Management) and the Environmental and Social Standard 2 (Involuntary Resettlement) are applicable for Components 2.1, as construction activities will cause land acquisition and resettlement of local people. The Project is not situated in the areas where Ethnic Minorities/Indigenous Peoples are present; therefore, the policies relating to ethnic minority/indigenous peoples of the co-financiers are not triggered.

The Methodology for Risk Categorization included:

Project-related and inherent environmental, social, and climate risks were determined by: (i) screening the project activities against the International Fund for Agricultural Development's (IFAD's) Social, Environmental, and Climate Assessment Procedures (SECAP) requirements, the AIIB's Environmental & Social Framework (ESF), and the Green Climate Fund's (GCF's) Environmental & Social Policy; (ii) considering the findings of desk research on risks associated with similar projects and relevant background papers; and (iii) incorporating findings from the first round of ESCMF stakeholder consultations and previous stakeholder engagement efforts in the form of household surveys (630 households in total), 100 focus group discussions, and 100 key informant interviews. Numerous missions to the project areas and discussions with provincial and district agencies and communes enhanced understanding of project objectives.

The initial SECAP review identified patterns of existing issues inherent to the project area which could increase risk to the project, its personnel, and/or beneficiaries. Additional desk research highlighted further areas of potential inherent risk and lessons-learned from other projects. The screening of CAISAR project activities, together with the ESCMF stakeholder meetings, household survey responses, focus group discussions, key informant interviews, and field visits with consultations provided insight on the latest conditions which could affect the success of the project and the potential project-specific impacts (both positive and negative).

Framework Approach: The design team had agreed to use a framework approach consistent with IFAD's SECAP and GCF's ESS. Documentation is based on the format typically provided for a GCF project, rather than the typical IFAD SECAP note format, to simplify the approval process. This was agreed upon with AIIB and IFAD headquarters prior to development of the ESCMF.

Project Impacts & Inherent Risks: The safeguards categorization for CAISAR is high for both social and environmental impacts and risks. To address issues of climate-induced risks and impacts, the CAISAR project will apply several climate resilience measures and adaptation strategies including climate-informed planning, integrated water resources management, efficient irrigation practices, water storage and reservoir management, ecosystem-based approaches, early warning

systems, climate-resilient infrastructure, capacity building and awareness, stakeholder engagement and participatory approaches, and monitoring and evaluation. These measures will be financed under the project, as the project explicitly targets climate mitigation and adaptation by design.

Key social impacts to be considered as part of the ESCIA included: (i) potential contraction of diseases (e.g. sexually transmitted diseases such as HIV/AIDS, and/or other communicable diseases) due to labor influx; (ii) potential conflict with local communities due to construction workers who work and stay near the community; (iii) potential labour-related accidents for persons hired by the project construction companies to support seasonal construction work; (iv) gender based violence and/or sexual harassment and abuse (e.g. verbal and physical abuse, sexual harassment, violence against children) due to the influx of labour; (v) child labour/age inappropriate work, (vi) forced labour (e.g. coerced to work through the use of violence/intimidation, or by more subtle means such as debt manipulation, retention of identity papers, or similar threats); (vii) possible social exclusion (due to vulnerability, land tenure issues, disability, etc.); and (viii) lack of contract for EM workers, particularly for seasonal works of less than one month's duration.

The above risks evaluated as part of the ESCIA are not considered to be serious in nature and mitigation measures are included in the ESCMP. General mitigation measures are provided within Chapter IV of this Environmental, Social and Climate Management Framework (ESCMF).

Key environmental impacts to be considered as part of the ESCIA included: The project is expected to have largely positive environmental impacts, including improved ecosystem services, soil fertility/soil health, forest health, and natural resources management. Potential negative environmental impacts to be mitigated are related to small-scale infrastructure (e.g. construction/repair of small- scale rural roads, irrigation channels, small-scale reservoirs, etc.). These impacts may include: (i) erosion and run-off to water bodies during earthworks/construction; (ii) temporary traffic blocks and related safety issues during construction and operation; (iii) temporary pollution from construction (e.g. dust, noise, vibration, waste & wastewater generation from workers, campsites); (iv) potential water pollution from sourcing aggregates/construction materials (soil, gravels); and (v) increased water consumption. Additional environmental risks (not explicitly linked to construction activities) include: (i) presence of unexploded ordinances (UXOs) at project sites (an inherent risk listed below); and (ii) increased use of pesticides due to crop intensification/improved crop yields. As with the social risks and impacts, mitigation measures for the environmental risks and impacts are provided in Chapter IV of the ESCMF.

To mitigate issues pertaining to social exclusion and conflict over land use/land tenure/land management, related safeguards documents, like the Stakeholder Engagement Plan (SEP), Indigenous Peoples' Plan (IP Plan), and Gender Assessment and Action Plan (GAP), have been developed to supplement this ESCMF and improve overall project design. The Grievance Redress Mechanism (GRM) is also available for any project affected persons who feel they have been negatively impacted or excluded and is detailed in Chapter IX of the ESCMF.

Inherent Risks: There are inherent risks pertaining to presence of landmines and unexploded ordinances (UXOs) if construction occurs in new areas (i.e., areas without existing construction/infrastructure/activities). Inherent risks are addressed with project-related impacts under Chapter IV of the ESCMF.

Implementation: The ESCMF will be implemented with the support of two safeguards specialists with MOWRAM Project Management Unit. Further support at the commune level will be determined by inclusion of safeguards-related obligations within the Terms of Reference of the project staff/implementing agencies. For construction financed under the project, contractors will be obliged to abide by the GCF and AIIB and IFAD safeguards requirements, in addition to national legislation/regulations, and commit to Environmental and Social Management Plans (ESCMPs) and Environmental Codes of Practices (ECOPs) as part of their contract. Independent ESC monitoring will be conducted over the life of the project construction and implementation phase.

3.1 Annual Gender Action & Social Inclusion Plan (GASIP)

To ensure gender equality is promoted – through enhanced participation of female members in project activities as the first step, a Gender Action; Social Inclusion Plan template has been prepared at project level for PMU's use. During project implementation, PMU will undertake the followings:

Step 1 - Update the template of Gender Action & Social Inclusion Plan into PMU's annual GASIP

Step 2 - Submit the annual GASIP to IFAD and AIIB for prior review and clearance before implementation;

Step 3 - Implement approved GASIP in an integral manner with overall project implementation work plan and Annual IP Plan. Implementation of GASIP includes monitoring and evaluation of outputs and outcomes of GASIP activities towards pre-set development targets in Annual GASIP.

4. Procurement Procedure.

4.1 Procurement principles and arrangement.

Procurement using AIIB/GCF/IFAD funds will follow the Standard Operating Procedures on Procurement for All Externally Financed Projects/Programs in Cambodia (SOP) to the extent such are consistent with the IFAD Project Procurement Guidelines, and AIIB's Procurement Policy and AIIB's Interim Operational Directive on Procurement Instructions for Recipients. Procurement using AIIB financing (Sub-component 2.1) will be undertaken with oversight by AIIB. For activities which are financed by IFAD/GCF (Component 1, Sub-component 2.2-2.4, Component 3) and does not include joint co-financing from AIIB, IFAD Procurement Framework will be applied with oversight by IFAD. For activities which are co-financed between IFAD and AIIB (Project Management), AIIB procedures will be applied. For activities which are co-financed between IFAD and AIIB and subject to prior review, AIIB will lead the prior reviews, and IFAD will enforce in OPEN the prior review decisions taken by AIIB.

NCDD-S PIU will be directly responsible for project procurement activities of Component 1 and Sub-component 3.2. MOWRAM PMU will be directly responsible for project procurement activities of Component 2 and Sub-component 3.1. The NCDD-S PIU will recruit a national procurement specialist. MOWRAM PMU will have a procurement officer and procurement assistant(s) (government staff) and recruit a national procurement specialist.

The initial 18-month Procurement Plan, and subsequently the annual procurement plans in consistence with the AWPBs shall be prepared and obtained IFAD and AIIB no objection before proceeding with procurement activities. The procurement plans shall identify procedures that must be implemented by the borrower/recipient in order to ensure consistency with the IFAD and AIIB Procurement Guidelines. The project procurement plan will be prepared and monitored through the OPEN system. The first 18-month procurement plan and subsequently annual procurement plan must include as a minimum: (i) a brief description of each procurement activity to be undertaken during the period; (ii) the estimate value of each procurement activity; (iii) the

method of procurement or selection to be adopted for each procurement activity; and (iv) an indication as to whether IFAD or AIIB shall carry out prior or post review in respect of every procurement activity. The 18-month procurement plan and the project procurement strategy (PPS) were drafted.

A detailed Project Procurement Arrangement Letter (PAL) will be issued to establish the detailed procurement requirements and thresholds for procurement methods and IFAD prior review. IFAD's Online Procurement End-to-end System (OPEN) will be used for preparation and monitoring implementation progress of project procurement plans. Requests for IFAD prior review and no objection shall be routed through the OPEN system.

The Standard Procurement/Bidding Documents issued by IFAD and AIIB shall be adopted and used for ICB and for consulting services with international advertisement. The national standard procurement /bidding documents under the SOP/Procurement Manual can be used for other methods (NCB/NS, consulting services with national advertisement) with additional provisions to meet IFAD's and AIIB's SECAP standards and the IFAD's or AIIB's Project Procurement Guidelines and IFAD Procurement Handbook including the IFAD self-certification form at bidding and at contract stage. Data and information of all contracts and related payments must be listed and updated regularly in the OPEN system. The register of contracts must be kept up to date on a quarterly basis.

4.2 Procurement methods and prior review requirements.

The following procurement methods will be used:

a. Works and works-related Non-Consulting Services

- International Competitive Bidding (ICB): Always allowed. Under ICB, the borrower/recipient may apply a margin of domestic preference to local contractors of 7.5% excluding industrial plants;
- National Competitive Bidding (NCB): Always allowed;
- Shopping: might be applied to contracts estimated to cost USD 40,000 or less; and
- Direct Contracting: applies to the indicated contracts in the Procurement Plan. Direct contracts to cost more than USD 5,000 shall be subject to IFAD's prior review and no objection, and post review shall be applied for direct contacts of low value procurement valued below USD 5,000 up to an aggregate amount of USD 400 000 per annum.

b. Goods and goods-related Non-Consulting Services

- International Competitive Bidding (ICB): Always allowed. Under ICB, the borrower/recipient may apply a margin of domestic preference of 15%;
- National Competitive Bidding (NCB): Always allowed;
- Shopping: might be applied to contracts estimated to cost USD 40,000 or less; and
- Direct Contracting: applies to the indicated contracts in the Procurement Plan. Direct contracts to cost more than USD 5,000 shall be subject to IFAD's prior review and no objection, and post review shall be applied for direct contacts of low value

procurement valued below USD 5,000 up to an aggregate amount of USD 200 000 per annum.

c. Consulting Services and related Non-Consulting Services

- Quality and Cost Based Selection (QCBS): Always allowed;
- Quality Based Selection (QBS): Always allowed;
- Fixed Budget Selection (FBS) or Least Cost Selection (LCS): Always allowed;
- Consultants Qualification Selection (CQS): might be applied to contracts with firms estimated to cost USD 150,000 or less;
- Individual Consultants Selection (ICS): applies to contracts with individuals regardless of the value;
- Sole/Single Source Selection (SSS): applies to the indicated contracts (with firms or individuals) in the Procurement Plan. SSS contracts to cost more than USD 5,000 shall be subject to IFAD's prior review and no objection, and post review shall be applied for direct contacts of low value procurement valued below USD 5,000 up to an aggregate amount of USD 200 000 per annum for firm selections and USD 100,000 per annum for individual consultant selections.

In accordance with IFAD's and AIIB's Procurement Guidelines and IFAD's Procurement Handbook, the following are subject to prior review by IFAD and/or AIIB:

- Procurement Plans submitted as part of Annual Work Plans and Budget and any subsequent upgrade of these plans;
- Award of any contract for goods and goods-related non-consulting services estimated to cost USD 150,000 or more;
- Award of any contract for works and works-related non-consulting services estimated to cost USD 300,000 or more;
- Award of any contract for consulting services and related non-consulting services and/or Memorandums of Understanding/Agreement estimated to cost USD 80,000 or more;
- Award of any contract for an Individual Consultant estimated to cost USD 30,000 or more;
- Award of any Direct Contracting or Sole/Single Source Selection to cost more than USD 5,000. A sufficiently detailed justification shall be submitted to IFAD and shall include the rationale for the choice of direct contracting/single source selection instead of competitive procurement and the basis for recommending a particular contractor/service provider in all such cases.

While the above procurement and prior review threshold are not elaborated, a detailed PAL (Procurement Arrangement Letter) would be issued to establish the detailed procurement thresholds. These thresholds may be modified by IFAD or AIIB during the course of Project implementation. Requests for IFAD prior review and no objection, should be routed through IFAD's online procurement end-to-end system (OPEN).

4.3 Guidance on environmental and social safeguard measures in procurement.

SECAP Criteria	Risk Rating	Consequence	Guidance on safeguard measures in procurement
Resource Efficiency and Pollution Prevention			
2.1 Could the project involve or lead to the release of pollutants to the environment due to routine or non-routine circumstances with the potential for adverse local, regional, and/or transboundary impacts?	Moderate	Moderate Construction of irrigation systems and rural roads might cause (i) erosion and run-off to water bodies during earthworks/construction; (ii) temporary traffic blocks and related safety issues during construction and operation; (iii) temporary pollution from construction (e.g. dust, noise, vibration, waste & wastewater generation from workers' campsites); (iv) potential water pollution from sourcing aggregates/construction materials (soil, gravels).	Environmental and social management plans (ESCMP) will be prepared for sub-projects and included in the bidding documents. Contractors will be required to prepare and implement contractor's site-specific ESCMP.
2.6 Could the project involve inputs of fertilizers and other modifying agents?	Moderate	Minor The project only requires minimal amounts of fertilizer	Include a list of approved/certified chemicals in tender documents.
2.7 Could the project involve or lead to procurement, supply and/or result in the use of pesticides on crops, livestock, aquaculture or forestry?	Moderate	Minor The project only requires minimal amounts of pesticide.	Include in the technical specifications that the project will only use approved pesticides and respect WHO-FAO codes for safe labelling, packaging, handling, storage, application and disposals of pesticides. Include the list of approved pesticides in the tender documents.
Cultural Heritage			
3.1 Could the project be located in areas that are considered to have archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values or contains features considered as critical cultural heritage?	Moderate	Minor The project is thought to be close to an area that is considered to have archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values or contains features considered as critical cultural heritage. The site has been comprehensively surveyed, and all tangible and intangible cultural heritage is well known.	The bidder qualifications for contractors intervening in areas that have cultural heritage should include previous experience in carrying out works in similar settings. Contract conditions to include safeguards to protect chance finds. Adequate safeguards will be introduced in consultation with the Lead Implementing Agency.
3.2 Could the project directly or indirectly affect indigenous peoples' rights, lands,	Moderate	Minor Minor impact to indigenous population. No damage to/or loss of	Technical specifications to encourage use of local

SECAP Criteria	Risk Rating	Consequence	Guidance on safeguard measures in procurement
natural resources, territories, livelihoods, knowledge, social fabric, traditions, governance systems, and culture or heritage (tangible and intangible)?		access to indigenous land, assets, resources, and/or cultural heritage.	knowledge (intangible heritage). Bidder qualification to include previous work experience in similar projects in the vicinity or with likelihood of presence of tangible heritage sites. Adequate safeguards will be introduced in consultation with the Lead Implementing Agency. Based in FPIC and measure would be introduced to minimize impact.
Labor and Working Conditions			
5.4 Could the project: (a) operate in a sector, area or value chain where producers and other agricultural workers are typically exposed to significant occupational and safety risks, and/or (b) promote or use technologies or practices that pose occupational safety and health (OSH) risks for farmers, other rural workers or rural populations in general? (Note: OSH risks in agriculture might include: dangerous machinery and tools; hazardous chemicals; toxic or allergenic agents; carcinogenic substances or agents; parasitic diseases; transmissible animal diseases; confined spaces; ergonomic hazards; extreme temperatures; and contact with dangerous and poisonous animals, reptiles and insects. Psychosocial hazards might include violence and harassment.)	Moderate	Minor The project operates in a sector, area, or value chain where workers are occasionally exposed to significant OSH risks, and where regulation is known to be effective.	OSH measures to protect project's workers from injury, illness or impacts encountered in the workplace or while working to be included in the technical specifications. The safeguard provision shall be included in qualification and contract condition in consultation with the implementing agencies Bid evaluation criteria to favor contractors with a high-quality Health and Safety Management Plan (HSMP) be considered for high impact and high value civil works and other related industries.
Community Health, Safety and Security			

SECAP Criteria	Risk Rating	Consequence	Guidance on safeguard measures in procurement
6.5 Could the project involve or lead to transport, storage, and use and/or disposal of hazardous or dangerous materials (e.g. explosives, fuel and other chemicals during construction and operation)?	Low	Minor Possible presence of landmines and unexploded ordinances (UXOs) if construction occurs in new areas (i.e., areas without existing construction/infrastructure/activities)	Conduct UXO clearance by competent agency before handing the construction site to the contractor.
6.7 Could the project lead to the potential for gender-based violence, including sexual harassment, exploitation and abuse, as a result of labour influx, land redistribution, or other actions that alter community dynamics?	Moderate	Minor During implementation of infrastructure subprojects, there are potential impacts to community health, safety and security: (i) potential contraction of diseases (e.g. sexually transmitted diseases such as HIV/AIDS, and/or other communicable diseases) due to labor influx; (ii) potential conflict with local communities due to construction workers who work and stay near the community; (iii) potential labor-related accidents for persons hired by the project construction companies to support seasonal construction work; (iv) gender based violence and/or sexual harassment and abuse (e.g. verbal and physical abuse, sexual harassment, violence against children) due to the influx of labor.	Include in the general clauses of the bidding documents of suppliers, subcontractors and service providers compliance with IFAD's policy on preventing and responding to sexual harassment, exploitation and sexual abuse and mandatory references to security policies will be included in tender documents and concluded contracts as a mandatory self-certification. Code of Conduct for Contractor's Personnel Form will be included in the bidding document. The Code of Conduct for Contractor's Personnel will be signed by contractor's workers who working at the subproject site.
Financial intermediaries and direct investments			
8.1 Could the investment be granted to an institution that does not have an environmental and social policies and an associated environmental and social management system (ESMS) in place (transparent, publicly available)?	Moderate	Minor The institution has an ESMS in place. Reports are not publicly available.	Agreements with FIs should include a requirement for a functional ESMS. The agreement clauses should include the submission by FIs, in a form acceptable to IFAD, of annual environmental and social reports on the implementation of the ESMS and on-lending operations.
8.2 Could the investment be granted to an	Moderate	Minor	Agreements with FIs should include a

SECAP Criteria	Risk Rating	Consequence	Guidance on safeguard measures in procurement
institution with insufficient capacities (i.e. unqualified personnel e.g. ES Officer) to implement the ESMS?		The institution employs an ES Officer, and employs field staff to implement the ESMS.	requirement for a functional ESMS including capacity to effectively implement it.

4.4 Governance and Anti-corruption measures

Project staff, beneficiaries, and all bidders, suppliers, contractors and consultants under IFAD-financed contracts are expected to observe the highest standard of ethics and integrity during the procurement and execution of project activities. IFAD will not finance expenditures for goods, works or consulting services that have not been procured in accordance with IFAD Project Procurement Guideline and the Financing Agreement. In such cases, IFAD may, in addition, take other remedial action under the financing agreement, including cancellation of the amount in question from the loan account by declaring it ineligible. Even if the contract was awarded following IFAD's "no objection" statement, IFAD may still declare mis-procurement if it concludes that this statement was issued on the basis of incomplete, inaccurate or misleading information furnished by the Borrower/Recipient.

The Policy on Preventing Fraud and Corruption has been integrated into IFAD's legal framework (Project Procurement Guidelines, General Conditions for Agricultural Development Financing [1], IFAD's Code of Conduct [2]) and applies to all recipients of IFAD financing. In line with this, the implementing agencies will ensure that all project activities are implemented within a transparency framework. This framework will include measures to ensure that procurement activities are carried out in accordance with IFAD project procurement guidelines and the project implementation manual. Measures that form part of the framework for transparency include:

- Upload information on procurement plans, contract awards and resolution of procurement complaints on IAs/project websites;
- Annexes on Additional Provisions and Self-Certification Form to be included in bidding document/RFP and contract documents;
- Bidders and contractors signing the Self-Certification Forms on anticorruption, sexual harassment, sexual exploitation and abuse as a part of bids/proposals and contract documents;
- Debriefing and Protest procedures for all procurement activities based on the procedures laid down in the IFAD Procurement Handbook including the requirements to issue a Notice of Intent to Award and of a standstill period.
- Conduct prior and ex-post reviews to strengthen enforcement of the debarment system;
- IFAD's direct supervision to address fiduciary compliance;
- Involvement of Project stakeholders (and especially farmers and their organizations) in planning, implementation and M&E of project activities.

AIIB is similarly committed to preventing fraud and corruption in the projects it finances. It places the highest priority on ensuring that projects AIIB finances are implemented in strict compliance with

[1] https://www.ifad.org/web/guest/document-detail/asset/39500875

[2] https://www.ifad.org/web/guest/document-detail/asset/40186603

AIIB's Policy on Prohibited Practices (2016). The Policy on Prohibited Practices (2016) applies to all Bank-financed components of the Project. The Bank reserves the right to investigate, directly or indirectly through its agents, any alleged corrupt, fraudulent, collusive, coercive, or obstructive practices, and misuse of resources and theft relating to the project and to take necessary measures to prevent and address any issues in a timely manner, as appropriate.

4.5 Grievance Redress Mechanisms (GRM)

A harmonized project specific grievance redress mechanism (GRM) will be established to address concerns raised by stakeholders. The GRM follows the provisions of the Government's relevant laws and regulations – and meets the requirements of the joint financiers.

Unified GRM System: A single, coordinated GRM system will be used to track and resolve grievances, ensuring stakeholders have access to a transparent and effective process.

Accountability Mechanism: A clear accountability structure will define the roles and responsibilities of each partner in managing grievances to ensure timely resolution. Monthly virtual meetings will be organized to share the status of grievances, settlements for received cases, and discuss non-compliance issues related to ES between joint financiers.

Agreement between AIIB and IFAD will be prepared to outline the policies applicable to project components, independent accountability mechanisms, and the respective roles and responsibilities of each organization. AIIB's PPSF, available until December 31, 2026, will be utilized to prepare the DEDs for the sub-schemes a5 as early as possible to ensure readiness for the AIIB component.

A single project-specific Grievance Redress Mechanism (GRM) will be applied on the ground with sufficient resources allocated at both the provincial and PMU levels. However, if any affected household is not satisfied with the solution provided by the project-specific GRM, the Accountability Mechanism of the financier responsible for the component related to the ES complaint or grievance will be invoked. Information dissemination will be adequate and proper to ensure local people are informed about the appropriate accountability mechanisms, the co-financiers and their corresponding financed component(s). Monthly coordination meetings will facilitate ongoing alignment among financiers, tracking environmental and social compliance, discussing, and addressing emerging risks, and ensuring timely remedial actions. By fostering collaboration, mitigating risks, and enhancing long-term project sustainability, the investment streamlines both safeguards and operational procedures, ensuring efficiency and responsiveness in delivering development outcomes.

Bank's Project-Affected People's Mechanism. If any complainant is not satisfied with the responses and/or measures provided following the Project-level GRM, complainants can lodge their case using the Independent Accountability Mechanism (IAM) of the financier of the Project component related to the complaint. Information on IAM of the financiers will be disclosed to the Project communities so that the complainant, if any, can send their case to the IAM of the appropriate financier.

AIIB's project preparation support

AIIB's Project Preparation Special Fund (PPSF) is the main source for overall preparatory work, facilitating key deliverables such as the Climate Vulnerability Assessment Report, Hydrology and Hydraulic Report, Livelihood and Vulnerability Analysis, Funding Proposal for the GCF, and Detailed Engineering Designs for the AIIB investment and overall Project.

The detailed designs of five sub-schemes mentioned earlier are being produced under the AIIB PPSF grant which is supporting or providing a service by preparing the design of the sub component 2.2 flood-proofing and drainage improvements the civil works of which are financed by GCF. The preparatory work through the consulting firm involves preparing the designs and system layouts of not only modernization works but also control structures, drainage networks, flood diversion channels, flood control structures, polders, levees, and associated facilities and flood management plans. In addition to this, AIIB PCCF grant is supporting GCF in preparing the full funding proposal for its appraisal and approval by GCF.

AIIB's Implementation Support. As the lead co-financier, AIIB will proactively plan and coordinate with other partners on mission timing, objectives, and the key skills required for joint missions with IFAD and GCF, ensuring sufficient resources are allocated to the missions and reviews. A MoU or a Co-lenders Agreement between AIIB and IFAD will be prepared to outline the policies applicable to project components, independent accountability mechanisms, and the respective roles and responsibilities of each organization. AIIB's PPSF, available until December 31, 2026, will be utilized to prepare the DEDs for the five sub-schemes as early as possible to ensure readiness for the AIIB component.

Annexes

Annex 1: Procurement Plan

Project Name: Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR)
Country: Cambodia

Version of the Plan: Version 5.0 dated 29 March 2025

Period covered by this procurement plan: The first 18 months

This initial procurement plan is expected to cover at least the first 18 months of project/program implementation, or the full implementation period if available. Subsequent procurement plans (if needed) or substantial changes to this approved plan shall be communicated to the IFAD/GCF and AIIB upfront.

II. Procurement Methods and Prior Review Thresholds

	Procurement Category and Method[1]	Financial threshold applicable[2] / Threshold for use of method	Prior Review Threshold (applicable if the Executing Entity is not the AE)[3]	Remarks
A	**Goods and goods-related non-consulting services**			
1	International Competitive Bidding for Goods	Always allowed	US$ 150,000 or more	
2	National Competitive Bidding for Goods	Always allowed	US$ 150,000 or more	
3	Shopping for Goods	US$ 40,000 or less	US$ 150,000 or more	
4	Direct Contracting	With due justification	US$ 5,000 or more	

B	**Works and work-related non-consulting services**			
1	International Competitive Bidding for Goods	Always allowed	US$ 300,000 or more	
2	National Competitive Bidding for Goods	Always allowed	US$ 300,000 or more	
3	Shopping for Goods	US$ 40,000 or less	US$ 300,000 or more	
4	Direct Contracting	With due justification	US$ 5,000 or more	
C	**Consulting services and related non-consulting services**			
1	Quality and Cost Based Selection (QCBS)	Always allowed	US$ 80,000 or more	
2	Quality Based Selection (QBS)	Always allowed	US$ 80,000 or more	
3	Fixed Budget Selection (FBS) OR Lest Cost Selection (LCS)	Always allowed	US$ 80,000 or more	
4	Consultants Qualification Selection (CQS)	US$ 150,000 or less	US$ 80,000 or more	
5	Individual Consultant Selection (ICS)	Contracts with individuals regardless of the value	US$ 30,000 or more	
6	Single Source Selection (SSS) – Consulting Firm	With due justification	US$ 5,000 or more	
7	Single Source Selection (SSS) – Individual Consultant	With due justification	US$ 5,000 or more	

1. As per applicable procurement policy of the Accredited Entity. The procurement methods and procedures are specified under IFAD Procurement Handbook (accessible via https://www.ifad.org/en/w/document/ifad-procurement-handbook). The procurement thresholds will be inserted into IFAD's Online Procurement End-to-End system (OPEN) for plans and monitoring implementation of project procurement activities.
2. Financial threshold for which the indicated procurement method should be used.
3. Financial threshold above which the Accredited Entity will review and provide clearance prior procurement process is initiated (not applicable if AE is the executing entity).

III.Procurement activities

1	2	3	4	5	6	7	8	9	10	11	12	13
Item No.	**Activity/ Component Reference No.**	**Description of works, goods, non-consultancy and consultancy services to be procured**	**Required Delivery/ Commencement of Services time (weeks/ months after FP approval)**	**Procuring entity**	**Estimated cost (USD)**	**Procurement/ Selection method**	**Prequalification (Yes/No)**	**Review by AE (Prior/Post procurement process)**	**Tender issuing (e.g. weeks/months from the FP approval, etc)**	**Bid submission deadline (days/weeks after tender issuing day)**	**Evaluation and contract signing time (days/weeks after bid submission deadline)**	**Remarks**
A.		**Consultancy services (Firms)**			**28,343,545**							
1	1.1.1, 1.1.2, 1.1.3, 1.1.4	Service provider in charge of vegetables, poultry and aquaculture	11mths	NCDD PIU	1,195,208	QCBS	Yes	Prior	6mths	6wks	12wks	07 years
2	1.1.4, 1.1.5, 1.1.6	Service Provider to produce extension materials, conduct awareness raising and facilitate e-voucher	11mths	NCDD PIU	1,195,194	QCBS	Yes	Prior	6mths	6wks	12wks	07 years
3	1.1	Service Provider on rice (IRRI)	09mths	NCDD PIU	1,500,000	SSS	Yes	Prior	6mths	4wks	9wks	60 months over 07 years; IRRI recruited through SSS method. International Rice Research Institute (IRRI) has been continuously active in Cambodia since 1986. The organization has supported the government agencies in Cambodia in various aspects of rice sector development, including varietal development, seed systems, IPM, improved agronomic practices, mechanization and water management (please see more in HYPERLINK

												"http://books.irri.org/Cambodia_IRRI_brochure.pdf"). IRRI also maintains solid working relationships with other international crop research institutes belonging to the Consortium of International Agricultural Research Centers (CGIAR). Concerning the wide-ranging achievements in development of climate resilient rice varieties and dissemination of climate smart agricultural practices and technologies to various countries, and in recognition of outstanding contributions to advancements in Cambodian rice breeding programs, strengthening of rice seed systems, on-farm mechanization and capacity development of Cambodian scientists, extension workers and policymakers, IRRI is ideally placed to provide its services under the TA package for increasing farmer capacity on climate resilient rice production under Sub-component 1.1 in a comprehensive manner. The project plans to engage IRRI through a TA contract on several aspects of this Sub-component 1.1, including activities 1.1.1 - 1.1.5.
4	1.2.3	A consulting service for business development, capacity building for 4PF implementation	20mths	NCDD PIU	44,000	CQS	Yes	Post	6mths	3wks	4wks	PY2
5	1.4.2	Consulting service for Detail design and supervision of rural road	11mths	NCDD PIU	2,220,400	QCBS	Yes	Prior	6mths	6wks	12wks	PY1-3; Number of packages to be confirmed
6	2.1	Consulting services for the DD and work supervision of 6/7 schemes	11mths	PMU	9,351,529	QCBS	Yes	Prior	6mths	6wks	12wks	

7	2.3.1	Consultancy service to develop 9 FWUCs (3 in OTP, 4 in LH, 5 in KP)	11mths	PMU	4,550,000	QCBS	Yes	Prior	6mths	6wks	12wks	PY1-7, Number of packages to be confirmed
8	3.4.1	Project Management Consultant at MOWRAM	11mths	PMU	8,287,214	QCBS	Yes	Prior	6mths	6wks	12wks	83 months over FY1-7
B.		**Consultancy services (Individuals)**			**2,438,000**							
1	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #1	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
2	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #2	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
3	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #3	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
4	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #4	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
5	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #5	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
6	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable

		(national consultant) #6										
7	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #7	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
8	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #8	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
9	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #9	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
10	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #10	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
11	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #11	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
12	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #12	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
13	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #13	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
14	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #14	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable

15	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #15	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
16	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #16	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
17	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #17	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
18	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #18	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
19	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #19	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
20	1.1.1, 1.1.2, 1.1.4	Facilitator for Activity 1.1 (national consultant) #20	05mths	NCDD PIU	12,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2, extendable
21	1.2.1	National consultant to support VC study and planning	06mths	NCDD PIU	40,000	ICS	Yes	Prior	3mths	3wks	7wks	PY1
22	1.2.3	National consultant to support 4PF and value chain financing throughout the project lifespan (US$/year)	05mths	NCDD PIU	25,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable

23	1.2.3	Intermittent international consultants on 4PF, VC financing	06mths	NCDD PIU	50,000	ICS	Yes	Prior	3mths	3wks	7wks	PY2, Intermittent, extendable
24	1.3.1, 1.3.2, 1.3.3, 1.3.4	National consultant #1 for Activity 1.3 - Agro-meteorological information and services	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
25	1.3.1, 1.3.2, 1.3.3, 1.3.4	National consultant #2 for Activity 1.3 - Agro-meteorological information and services	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
26	1.3.2, 1.3.3	International consultant #1 for Activity 1.3 - Agro-meteorological information and services	06mths	NCDD PIU	144,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months over PY 1 and 2, extendable
27	1.3.2, 1.3.3	International consultant #2 for Activity 1.3 - Agro-meteorological information and services	06mths	NCDD PIU	144,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months over PY 1 and 2, extendable
28	1.4.1	National consultant - Engineer #1	05mths	NCDD PIU	25,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2

29	1.4.1	National consultant - Engineer #2	05mths	NCDD PIU	25,000	ICS	Yes	Post	3mths	3wks	4wks	12 months over PY 1 and 2
30	1.4.2	National consultant to facilitate detail design work #1	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
31	1.4.2	National consultant to facilitate detail design work #2	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
32	1.4.2	National consultant to facilitate detail design work #3	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
33	1.4.2	National consultant to facilitate detail design work #4	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
34	1.4.2	National consultant to facilitate detail design work #5	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
35	1.4.2	National consultant to facilitate detail design work #6	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
36	1.4.3	National consultant for construction supervision	18mths	NCDD PIU	30,000	ICS	Yes	Prior	15mths	3wks	7wks	12 months of PY2, extendable
37	3.1.1	National consultant #1 for Activity 3.1 - MOWRAM/PDo	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable

		WRAM capacity Support										
38	3.1.1	National consultant #2 for Activity 3.1 - MOWRAM/PDo WRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
39	3.1.1	National consultant #1 for Activity 3.1 - MOWRAM/PDo WRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
40	3.1.1	National consultant #2 for Activity 3.1 - MOWRAM/PDo WRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
41	3.1.1	National consultant #1 for Activity 3.1 - MOWRAM/PDo WRAM capacity Support	06mths	PMU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
42	3.1.1	International consultant for Activity 3.1, working 50% per year	06mths	PMU	150,000	ICS	Yes	Prior	3mths	3wks	7wks	6 months over PY 1, extendable
46	3.3.1	National consultant #1 for Activity 3.3 - NCDDS capacity Support	06mths	NCDD PIU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable

47	3.3.1	National consultant #2 for Activity 3.3 - NCDDS capacity Support	06mths	NCDD PIU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
48	3.3.1	National consultant #1 for Activity 3.3 - NCDDS capacity Support	06mths	NCDD PIU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
49	3.3.1	National consultant #2 for Activity 3.3 - NCDDS capacity Support	06mths	NCDD PIU	48,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
50	3.3.1	International consultant for Activity 3.3, working 5 months per year	06mths	NCDD PIU	125,000	ICS	Yes	Prior	3mths	3wks	7wks	5 months for FY1, extendable
51	3.4.1	NCDD-S National Project Management Advisor	06mths	NCDD PIU	72,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
52	3.4.1	NCDD-S National Finance Specialist	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
53	3.4.1	NCDD-S National Procurement Specialist	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
54	3.4.1	NCDD-S National M&E Specialist	06mths	NCDD PIU	30,000	ICS	Yes	Prior	3mths	3wks	7wks	12 months, extendable
55	3.4.1	NCDD-S Admin and Finance Assistant	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	7wks	12 months, extendable

56	3.4.1	Provincial Management Advisor - Kadal	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
57	3.4.1	Provincial Management Advisor - Kampong Speu	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
58	3.4.1	Provincial Management Advisor - Pursat	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
59	3.4.1	Provincial Management Advisor - Kampong Chhnang	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
60	3.4.1	Provincial Livelihood and Market Advisor - Kadal	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
61	3.4.1	Provincial Livelihood and Market Advisor - Kampong Speu	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
62	3.4.1	Provincial Livelihood and Market Advisor - Pursat	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
63	3.4.1	Provincial Livelihood and Market Advisor - Kampong Chhnang	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
64	3.4.1	Provincial Finance Advisor - Kadal	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable

65	3.4.1	Provincial Fiance Advisor - Kampong Speu	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
66	3.4.1	Provincial Finance Advisor - Pursat	05mths	NCDD PIU	24,000	ICS	Yes	Post	3mths	3wks	4wks	12 months, extendable
B		**Goods**			**4,569,000**							
1	1.1.2	Training materials, 1 set	5mths	NCDD PIU	45,000	NCB	No	Post	3mths	4wks	4wks	for PY 1
2	1.1.4	Input materials for FFS	17mths	NCDD PIU	100,000	NCB	No	Post	15mths	4wks	4wks	for PY 2
3	1.1.4	Rice demonstration inputs and materials	17mths	NCDD PIU	124,000	NCB	No	Post	15mths	4wks	4wks	for PY 2
4	1.1.4	Vegetable demonstration inputs and materials	17mths	NCDD PIU	124,000	NCB	No	Post	15mths	4wks	4wks	for PY 2
5	1.1.4	Poultry demonstration inputs and materials	17mths	NCDD PIU	124,000	NCB	No	Post	15mths	4wks	4wks	for PY 2
6	1.1.4	Aquaculture demonstration inputs and materials	17mths	NCDD PIU	124,000	NCB	No	Post	15mths	4wks	4wks	for PY2
7	1.1.5	LLL machinery	4mths	NCDD PIU	32,000	NS	No	Post	3mths	2wks	3w	for PY2
8	1.3.1	6 hydromet stations, 4 agromet stations, 4 automatic weather stations	18mths	NCDD PIU	500,000	NCB	No	Prior	15mths	4wks	8wks	FY2, Number of packages/lot to be confirmed after having detailed designs and cost estimation

9	2.4.1	Water Information and Management System	13mths	PMU	3,300,000	ICB	No	Prior	9mths	6wks	9wks	Number of packages/lot to be confirmed after having detailed designs and cost estimation
10	3.1.1	Input material for capacity building support	5mths	PMU	48,000	NCB	No	Post	3mths	4wks	4wks	for PY 1 and 2
11	3.3.1	Input material for capacity building support	5mths	NCDD PIU	48,000	NCB	No	Post	3mths	4wks	4wks	for PY 1 and 2
C		**Works**			**20,828,000**							
1	2.1.4	Construction of Kropeu Trom irrigation scheme	21mths	PMU	3,000,000	ICB	no	Prior	18mths	6wks	9wks	Number of lots/packages to be determined after having detailed design
2	2.1.5	Construction of Yotasast irrigation scheme	21mths	PMU	2,612,000	NCB	no	Prior	18mths	4wks	8wks	Number of lots/packages to be determined after having detailed design
3	2.1.6	Construction of Stoeung Krang Bat irrigation scheme	22mths	PMU	4,216,000	ICB	no	Prior	18mths	6wks	9wks	Number of lots/packages to be determined after having detailed design
4	2.2.3	Flood-proofing and Drainage improvements - Anlong Chrey River bassin	22mths	PMU	11,000,000	ICB	no	Prior	18mths	6wks	9wks	Number of lots/packages to be determined after having detailed design

Notes:

- PMU: Project Management Unit at MOWRAM
- PIU: Project Implementation Unite at NCDD-S

Annex 2: Results Monitoring Framework

Refer to Result Framework

Timeline and Reporting

Overall Goal: To strengthen the capacity of MOWRAM, NCDDS, its PMU, provincial departments (PDOWRAMs), Farmer Water Users' Communities (FWUCs) and sub-national administration at district and commune level in key areas to ensure the successful implementation and sustainability of the CAISAR investment, in full alignment with GCF's commitment to long-term transformational change.

Phase & Objective	Key Activities	Timeline (Relative to Project Start)	Outputs/Deliverables	Reporting Frequency & Recipient
Phase 1: Inception & Detailed Planning	1. Kick-off & Stakeholder Workshops: Introduce initiative, confirm needs, foster buy-in.	Month 1 - Month 2	Workshop reports, confirmed stakeholder engagement.	Annually (as part of overall project inception reporting)
Objective: Finalize detailed plans for all capacity building areas, including specific objectives, methodologies, resource allocation, and responsibilities.	2. Current Position Assessment: Inventory & review current formal procedures & actual practices (staffing, equipment, work procedures) for river basin & irrigation scheme management.	Month 1 - Month 3	Comprehensive "Current Capacity Assessment Report."	Annually (as part of overall project inception reporting)
	3. Define Future Position & Objectives: Define clear, measurable objectives, incorporating climate change considerations. Evaluate current effectiveness & identify desired/possible improvements.	Month 3 - Month 4	"Targeted Capacity Objectives Document."	Annually (as part of overall project inception reporting)
	4. Develop Detailed Change Plans: Prepare detailed plans for each capacity building area: methodologies, timelines, resources, responsibilities (Change Plan Managers, Monitors, Reporters). Include specifics for: training modules (climate-smart irrigation,	Month 3 - Month 5	Comprehensive "Detailed Capacity Strengthening Action Plans."	Annually (as part of overall project inception reporting)

	financial management, safeguards, SCADA, GIS), partnership agreements (e.g., ITC), competency-based systems, cross-level coordination, gender-responsive actions.			
	5. Obtain Endorsements: Secure all necessary approvals for detailed plans from MOWRAM, NCDDS & other relevant stakeholders.	End of Month 5	Endorsed Capacity Strengthening Plans.	Annually (as part of overall project inception reporting)
	Reporting (End of Phase 1): Submit "Inception Phase Report" summarizing all outputs. Outcomes will inform subsequent GCF reports.	End of Month 5	"Inception Phase Report."	GCF: Initial progress report (as part of first APR, if applicable)
Phase 2: Implementation (Core Project Duration)	1. Resource Acquisition: Procure necessary training materials, equipment, digital tools (SCADA, GIS licenses), and engage trainers/experts.	Month 6 - Year 7 (Ongoing as needed)	Acquired resources, contracts with trainers/experts.	Quarterly (as part of quarterly progress updates)
Objective: Execute the detailed capacity strengthening action plans across all identified areas, ensuring continuous capacity development and application.	2. Training Delivery: Conduct targeted training sessions (climate-smart irrigation, financial management, safeguards, SCADA, GIS) for MOWRAM, PMU, PDOWRAMs, FWUCs, private service providers. Implement gender-responsive actions. Note: Training will be phased, potentially with refresher courses or advanced modules.	Month 6 - Year 6 (Ongoing, phased delivery)	Training session reports, attendance records, participant feedback, follow-up assessments.	Quarterly (as part of quarterly progress updates)
	3. Institutionalization & Partnership Activities: Formalize partnerships (e.g., ITC) to integrate curricula into national frameworks. Note: Focus on sustainability beyond project life.	Month 7 - Year 7 (Ongoing, with key milestones in early years)	Formalized partnership agreements, curriculum integration plans, institutionalized training programs.	Quarterly (as part of quarterly progress updates)
	4. System Upgrades & Implementation (SCADA, GIS): Oversee upgrades/implementation of SCADA & other digital tools. Provide hands-on training & support for effective use. Note: Phased rollout of	Month 7 - Year 5 (Initial rollout & optimization), Year 6-7 (Sustained use &	Functional SCADA/GIS systems, user manuals, implementation reports, ongoing support logs.	Quarterly (as part of quarterly progress updates)

	technology and ongoing support.	minor updates)		
	5. Competency-Based Certification & Assessment: Conduct regular assessments & administer certifications to ensure knowledge application & retention.	Quarterly, from Month 9/10 (Ongoing throughout implementation)	Assessment reports, certification records, skills gap analyses.	Quarterly (as part of quarterly progress updates)
	6. Cross-Level Coordination Meetings/Workshops: Organize regular meetings/workshops across MOWRAM,, ,NCDDS PDOWRAMs, FWUCs, private sector to foster coordination & share best practices.	Quarterly, from Month 8 (Ongoing throughout project)	Meeting minutes, action plans, coordination outcomes, best practice sharing documents.	Quarterly (as part of quarterly progress updates)
	Reporting (During Phase 2 - Ongoing):			
	Covenant: The Accredited Entity shall monitor the implementation of the institutional capacity strengthening plan on a quarterly basis.	Quarterly	Quarterly Monitoring Reports on capacity plan implementation, including progress, challenges, and adjustments.	Quarterly (Accredited Entity to Project Management)
	GCF Reporting: The Accredited Entity shall inform the outcomes to the Fund in the Annual Performance Reports (APR). This will include summary of activities, progress vs. targets, challenges, mitigation, qualitative assessment of enhanced capacity, evidence of gender-responsive design.	Annually (as per GCF APR cycle)	GCF Annual Performance Reports (APR) sections on capacity strengthening.	GCF (via Accredited Entity)
Phase 3: Monitoring, Evaluation & Sustenance	1. Periodic Reporting/Review Meetings: Discuss progress, challenges, adjustments.	Quarterly throughout project implementation (Year 1 - Year 7)	Review meeting minutes, updated action plans.	Quarterly (PMU, Accredited Entity, Key Stakeholders)
Objective: Continuously monitor progress, evaluate effectiveness,	2. Post-Training Application Monitoring: Monitor actual application of newly acquired skills &	Ongoing, from Month 12 onwards	Application monitoring reports, case studies of	Quarterly (as part of quarterly progress

and ensure the sustainability of strengthened capacities throughout the project life and beyond.	knowledge in daily operations by MOWRAM, NCDDS, PDOWRAMs, & FWUCs.		impact.	updates)
	3. Mid-term & Final Impact Assessment: Periodically assess the broader impact of capacity strengthening on organizational performance, project results, & long-term transformational change. This includes formal mid-term and final evaluations.	Mid-term (e.g., end of Year 3/start of Year 4), Final (end of Year 7)	Mid-term Impact Assessment Report, Final Evaluation Report.	Annually (as part of APR, with dedicated reports for mid-term/final)
	4. Lessons Learned & Documentation: Continuously document lessons learned, best practices, & challenges throughout the project lifecycle.	Ongoing throughout the project (Year 1 - Year 7)	Lessons learned log, best practice guidelines, knowledge products.	Quarterly (as part of quarterly progress updates)
	Reporting (Post-Implementation & Sustenance):			
	GCF Reporting: Continuation of quarterly monitoring & annual reporting of outcomes through APRs until project closure.	Annually until project closure (Year 1 - Year 7)	GCF Annual Performance Reports (APRs).	GCF (via Accredited Entity)
	Final Capacity Assessment Report: Comprehensive report at project closure on overall impact, sustained improvements, & future recommendations.	At Project Closure (End of Year 7)	Final Capacity Assessment Report.	Annually (as part of final APR)

Annex 4: Terms of Reference – Project Management Implementation Consultants

Engineering consultancy

Component 2.1 include the contracting of a consortium of both, international and national companies to prepare the detailed design and tender documents of the 3 sub-projects (6 schemes) for component 2.1 and 2.2, support the MOWRAM in the procurement process, but also undertake the work supervision and commissioning of the scheme's rehabilitation/constructions.

Consultants' activities

The Consultant shall collect, review and analyse available documents on the project in order to undertake detailed designs for irrigation schemes and flood protection/drainage improvement.

The Consultant shall also undertake a specific study of the West Pursat hydraulic system of the irrigation schemes to implement the SCADA system.

Detailed design

Mains tasks for the detailed design studies

The main tasks of the consultancy services to be carried out within the detailed design work for all project components comprise, but are not necessarily limited to the following items:

1 Conduct additional geo-technical investigations, topographical survey, hydrological, if required;

2 Availability of borrow pits in the volumes and quality sufficient for construction;

3 Hydraulic and structural design of head works, reservoir repairs if necessary, its supporting structures, the irrigation scheme including secondary, tertiary and on- farm canals that include distributary canals/ structures, drainage system/structures and associated structure as community requirement: foot bridge, FWUC office, access roads, etc;

4 Hydraulic and structural design modelling, computation and design of the irrigation scheme (pipeline/canals system), simulation of operation, etc.

5 Structural calculation notes, preparation of detailed plans and drawings in appropriate scale;

6 Technical description of the projected system with justification of selected materials and equipment, implementation;

7 Specification of the necessary materials and equipment;

8 Preparation of technical conditions for delivery of materials, equipment, spare parts, repair material, equipment to be procured under the Project;

9 Preparation of technical conditions for the construction and the assembly works;

10 Detailed calculation of the overall costs, total calculation of the works (confidential cost estimate), separated in supply and construction works. Based on the findings, the Consultant shall submit a detailed cost breakdown including contingencies and other general costs. The cost estimate shall be divided in local and foreign costs.

11 Green House Gas (GHG) reductions: analysis of the potential of green-house gas (GHG) reductions in the frame of the current stage of the investment program.

The Consultant is required to work with the Board of Engineer of Cambodia (BEC) for the Khmer translation of the technical specifications that shall be in accordance to stated and agreed standards and codes of practice, that include also the specifications for environmental, social, health and safety management (ESHS) of the civil works.

Based on the findings, the Consultant shall assess the local/regional/international construction capacities and interest and submit a proposal for contract packaging. It is expected that all construction works shall be submitted to national bidding procedures.

The purpose of the drawings is to convey graphically to the bidders and later on to the construction engineers and contractors the work to be done. All information which can best be shown by reference to drawings and their accompanying dimensions and notes shall be shown on the plans. The consultant shall produce comprehensive engineering drawings to the standards of internationally accepted design practices using CAD. These drawings shall cover all features of the work and be of adequate detail for the bidding and award of contract.

The drawings will consist of general arrangement drawings, detailed drawings, longitudinal and cross-sections which indicate the dimensions of the works and the materials required for the execution. The detailed design drawings will become an integral part of the contract documents.

The confidential cost estimate shall comprise a comprehensive descriptive part which outlines and justifies in detail the assumptions taken and assessments made by the consultant for calculating and/ or defining important unit prices under full consideration of individual geographical and project specific aspects.

The relevant design calculations, supplementary maps and drawings, schedules, charts, notes and reports etc. which support the engineering designs and drawings shall be furnished to the PIU in English.

For irrigated schemes, the recommended criteria to overcome the detailed design study phase for each project, and move to tender preparation and implementation phase, are:

- Output : (i) Detailed design and tender documents, Scheme Design Agreement, (ii) Resettlement framework and COI and schedule (IRC)
- Water/Environment : (i) Water management Apex committee is appointed at basin or sub-basin level if required, (ii) Environmental mitigation measures in design, (iii) IEE is approved by the relevant authority
- Cost/Economic : there is no major increase in construction cost compared with the estimated costs at feasibility level, (ii) Reconfirmation that EIRR is > 9%, (iii) construction cost are around $2,500 per ha cropped in 1 year (including the tertiary canals)

- Social / Poverty : (i) resettlement: DMS is completed by IRC and compensation levels agreed by affected households, (ii) Resettlement framework is approved by RGC/IRC,
- Sustainability : (i) Construction Sub-Committee established, (ii) Design Layout, Beneficiaries' contribution to the construction and O&M costs and FWUC revision/creation are approved by 2/3 of beneficiaries and Local Authorities, (iii) Membership fees paid by 2/3 of the users/members of the FWUC, (iv) Design Agreement signed by local authorities and Construction sub-committee.

Deliverables

For each Irrigation scheme, reports to be delivered are listed here after. These reports should be fully reviewed by MoWRAM to ensure agreement on executive choices regarding the project. However, explicit approval is not required for every report scheduled. The following list gives the review level proposed to be considered for each report.

- Mid-term Detailed Design Report: Review only;
- Detailed Design Report (draft version): Review only;
- Detailed Design Report (final version): Review and approval required.
- Drawings: Design drawings will be submitted throughout the study. In a general way, drawings submitted while the studies are still on-going will be submitted under draft format. Drawings to be submitted as part of Detailed Design Report however will be considered as representative of the project development and submitted as such.

West Pursat hydraulic system analysis

In addition to the usual work for the rehabilitation/creation of irrigation schemes (FS, DED, procurement, work supervision), it is requested of the Consultant to perform a specific study of the West Pursat hydraulic system to have a better understanding of the hydraulic functioning of this area.

The analysis should include at least:

- An extensive data field collection: size of the structures, hydraulic measurements, etc

- A river basin modeling of the Pursat catchment of the water availability for irrigation, which depends from the basin characteristics (precipitation, runoff), the reservoirs infrastructures and management as well as non-agricultural needs; and,
- A scheme modeling with adequate software like SIC to be able to identify the structural limitation, which is dependent on the canals and gates capacities along the schemes, and integrate all the schemes within the study area and be a base for the development of the SCADA. The software should be able to design and management of a network of canals and / or rivers with a friendly interface and the calculations of hydraulic unidimensional steady and unsteady flows

The results of the study will be upgraded with the different scenarios to irrigate Ou Ta Paong scheme and confirm the feasibility study and be a base for the development of the SCADA system.

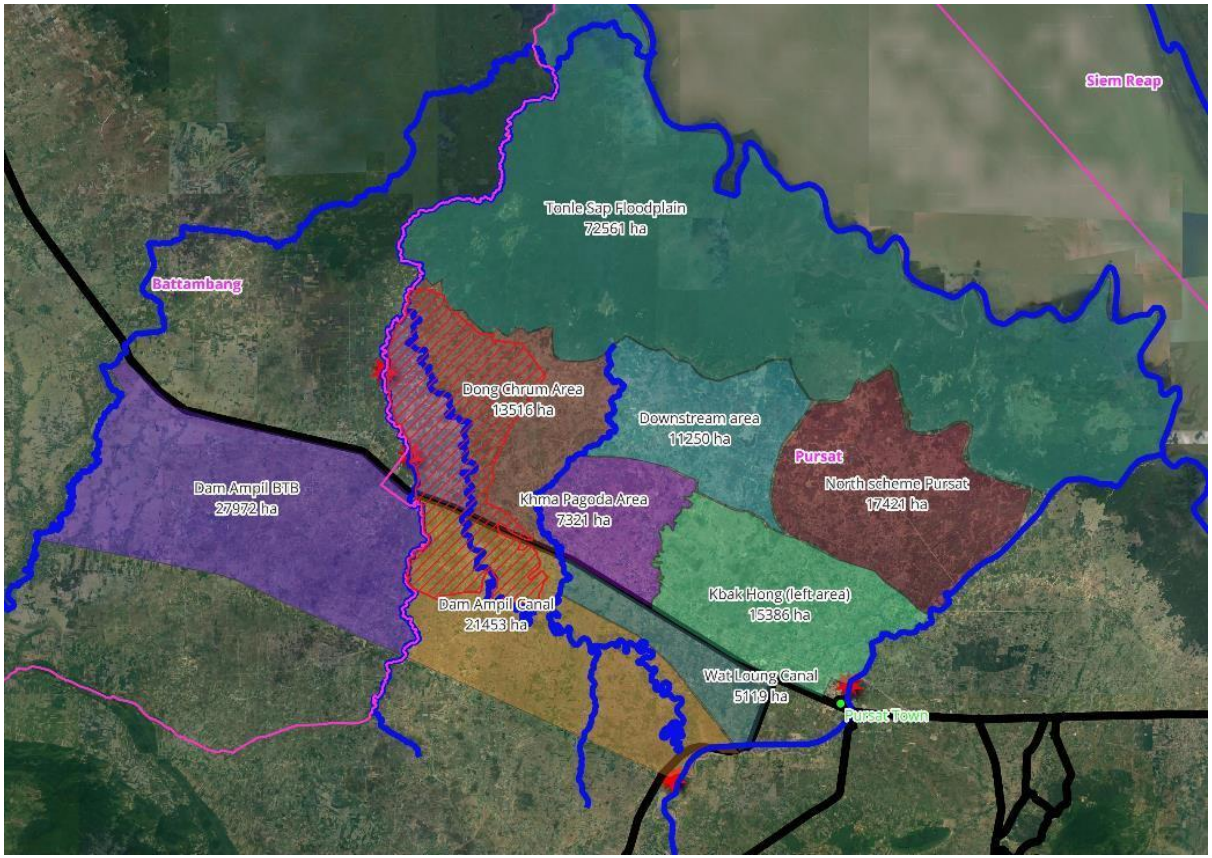


Figure 5-23. irrigation scheme of West Pursat Province

Preparation of tender documents and procurement support

The tender documents shall be prepared regarding packaging of tenders and based on the Detailed Design study. The tender documents shall be prepared in accordance with Standard Operating Procedures by the Sub-Decree No.74 ANK. BK dated 22 May 2012 which are the standard operating procedures of the Client, as amended from time to time, providing procedures applicable to all externally financed projects and programs.

Preparation of the tender documents

In order to assist in the tendering process, the tender documents should be prepared including clear specifications. The specifications shall describe the work to be done, supplementing the information shown on the drawings. The specifications shall cover all technical provisions of the future construction contracts. The design shall be sufficiently detailed for construction and leave for the Contractors the preparation of Final Design study (drawings). All technical specifications shall be fully described and the tender documents shall include the ESMP to be implemented by the Constructor.

Reference to brand names, catalogs or other details that limit any materials or equipment to a specific manufacturer shall be avoided. Where standard specifications or construction codes and practices are referred to, a statement shall follow that ISO shall be applied and other national or international standards that ensure equivalence will also be acceptable.

The bill of quantities shall provide sufficient information on the quantities of works to be performed in order to enable bidders to prepare accurate cost estimates and the owner or its consultant to make periodic evaluations of the executed works according to the detail provided in the bill of quantities. The bill of quantities shall divide the items into different classes (civil works, mechanical and electrical equipment and materials, etc.) and categories (earth works, concrete works, mechanicals, etc.).

In order to enable the PMU/PIU to allocate a budget for the implementation of the works, including any amounts to be allocated for any physical and price contingencies, the Consultant shall prepare the cost estimates of items listed in the bill of quantities. Similar contracts recently awarded in Cambodia may serve as a guideline for the evaluation of unit costs. The Consultant shall, however, carry out its own investigations on the local market for construction materials available there and the local labour skills and in foreign markets for any equipment and materials to be imported or any skilled labour where necessary.

For each lot, the Tender Documents for the works contractors shall contain at least the following sections:

- Invitation to tender;
- Instruction to tenderers;
- General and specific conditions;
- Form sheets;
- Form of contract agreement;
- Technical specifications;
- Description of works, subdivided in specific lots;
- Bill of quantities for each lot and in total;

- Maps and drawings;
- ESMP

Tender documents to be delivered are listed here after:

- Tender documents (draft version): Review only;
- Tender documents (final version): Review and approval required.

Support on the tender process

The consultant should assist MOWRAM in the following tasks:

- Assistance in Tender Announcement: The Consultant shall assist the Employer in all related activities regarding announcement of the project in national and international gazettes and on the internet.
- Assistance in Clarification Meeting: The Consultant shall assist the Employer in the site visits of the bidder and clarification meetings to be held in course of the tender process. Questions which might rise up during the clarification meeting shall be responded by the Consultant via PIU and shall be forwarded to all tenderers.
- Assistance in bids evaluation: The Consultant shall assist the Employer during bid opening, bids evaluation and selection of the technically and financially most favorable offer. The Consultant shall provide up to two members to each Evaluation Committee.
- Assistance in Contract Negotiations: The Consultant shall assist the Employer during contract negotiations for each Work Contract and shall assist the Employer in all preparations up to when the contracts are signed.

The Consultant shall submit inter alia the following:

- Copy of Announcement;
- Tender Opening Protocol for each Works Contract;
- Bids Evaluation Report for each Works Contract;

- Works Contract.

Work supervision

The Technical Supervisor's role shall include project management, technical, contractual, financial, environmental and social aspects as described in the following sections.

A key objective of the Technical Supervisor role is to ensure that all elements of the project implementation including the construction contracts and ESMP are coordinated, thus minimising the scope for completion and commissioning delays due to programming constraints or incompatibilities between individual components, while making sure that quality of works and equipment respect the final, approved design.

This includes assisting and advising the PMU and PIUs with smooth execution of all works under the investment program for its timely and successful completion without having cost overruns. This applies to supervising all works, surveys, field studies, investigations, trainings, and consulting services packages under the investment program. The consultant shall be responsible for documenting all the design drawings, reports, as-built drawings, and construction monitoring and quality certificates. The consultant shall develop an appropriate documentation plan for this purpose.

Direct liaison with FWUC for on-the-job training regarding work supervision and O&M. Khmer translation of BOQ, technical specification and designed drawings, reports, as-built drawings should be provided to FWUCs to ensure good appropriation by FWUCs of the designs and O&M tasks and to enhance their contribution to temporary and final reception of works.

The Consultant will supervise the construction of the works included under the Contract issued to the Contractor, to the standards and specifications detailed in the construction contract including checking layout and dimensions, quantities, material qualities, workmanship, safety and employment conditions and environmental standards.

The Consultant will keep the PMU fully informed of construction progress with regular monthly progress reports and will ensure that regular interim payment certificates (IPCs) for works completed on the contract are prepared and approved at the end of each period.

- The Consultant will summarize the construction works in (i) a brief monthly report, (ii) technical report including certification that the works were completed in compliance with the Agreement and notice of where works deviated from the Contract and (iii) comprehensive final Completion Report.
- Upon completion of the construction of the works included in the Contract, the Consultant shall notify the PMU in order that they can make a final inspection of the work for acceptance that will trigger the mechanism for release of payments to the Contractor subject to contract conditions.
- The Consultant shall submit detail scope of the service for the supervision of construction works prior to the delivery by PMU of the letter of commencement of work.

The Consultant will help administer the contractual responsibilities and obligations of the Client in the Contract and all related contracts for engineering, supervision, supply, erection and construction, to the extent allowed for in the construction and supply contracts.

Activities to be performed on site for the civil works will consist mainly of the following:

- Approve the contractors' construction methods;
- Check and approve the contractors' work, temporary installations and equipment;
- Coordinate, supervise and inspect all aspects of construction, fabrication and assembly;
- Check the conformity of the drawings with the contractual arrangements on site;
- Monitor defects reports and the corresponding replacement of damaged equipment;
- Check all final layouts of structures built by the contractors, on the basis of the layout drawings;
- Supervise the performance of all tests required to ensure the good quality of all materials used in construction, in particular soils, rocks, aggregates, cement, etc. and analyse test results to ensure good-quality construction;
- Check the quality control and safety procedures proposed by the contractors, paying special attention to the following tasks:
- Checking of preliminary tests prior to the works on the concrete mix designs proposed by the contractors;
- Checking of reinforcement drawings and assembly drawings;
- Perform the necessary checks to assess the progress of works and conformity with the corresponding regulations,
- Approve the equipment acceptance procedures to be followed on site by contractors,
- Issue payment certificates to contractors,
- Recommend any additional modification judged to be necessary in relation to the provisions set forth in the contract,
- Record all site activities,
- Assist the Client with all contractual aspects relating to contractors (guarantees, test certificates, insurance, claims, etc.),
- Check and supervise the measures needed to ensure safety and environmental protection,
- Draw up a Final Report on the works,
- Gather all information concerning the site, drawings and sketches and prepare “as- built” drawings of the civil engineering works,
- Issue completion and pre-commissioning certificates for the equipment,
- Ensure that all arrangements required by the environmental and social management plan have been made by the contractors responsible for carrying out the works.

The consultancy services to be rendered shall include but not be limited to the sub-tasks specified below.

Monitoring of Construction Progress

The Consultant shall monitor the progress of the construction and pursue compliance with the latest agreed version of the Master Programme for the Project. The Consultant shall arrange periodic co-ordination meetings with the contractors to discuss progress, and to assist in deriving suitable remedial action where necessary to address issues arising.

The Consultant shall report regularly to Client at least monthly and more frequently in the event of specific circumstances requiring immediate consideration.

Monitoring of Manufacture of Equipment

The Consultant shall monitor the manufacture of the hydro-mechanical equipment, electro- mechanical equipment including main factory acceptance tests. In particular, the Consultant shall:

- Monitor compliance with deadlines for manufacturing, testing, shipping and supplying equipment on site by performing systematic inspections;
- Ensure that equipment conforms with contract specifications and standards;
- Examine any modification in relation to the contract specifications that the contractors may wish to make. Any modification leading to additional costs must be submitted to the Client for approval;
- Examine and approve the programme for testing and works acceptance proposed by the contractors, participate in works acceptance procedures and draw up the reports for each works inspection.
- Ensure that the main items of equipment have been subjected to the prescribed tests on the basis of the corresponding test certificates, which must be submitted to the Technical Supervisor for approval;
- Participate in the routine tests for the main items of equipment.

Commissioning Tests and Works Completion Inspection

Commissioning tests shall be witnessed by the Consultant with the participation of the Client's employees. The Consultant shall ensure compliance with the procedures established in the specifications and contracts, and performance levels, check the quality and conformity of test reports, collect all documents, and approve the test reports drawn up by contractors. These reports shall be signed jointly by the Technical Supervisor, Client and the Contractors.

At the end of the construction works and commissioning the Consultant shall:

- Witness the specified acceptance procedures for all the structures and equipment (power generation plant and transmission lines) and issue the corresponding certificates in agreement with the PIU,
- Check and approve the as-built drawings and diagrams provided by contractors,
- Review and approve the operation and maintenance manuals provided by contractors.

Certification of Payments: The Consultant shall certify the Contractors' entitlement to payment based on regular monitoring of defined milestones achieved in the construction of the works.

Operation and Maintenance Manuals: The Consultant shall review and approve, if appropriate, the Operation and Maintenance Manuals provided by the Contractors and shall ensure that these are provided in good time prior to commissioning of the Works.

As-built Drawings of Hydro-mechanical and Electro-mechanical Equipment: The Consultant shall review and approve, if appropriate, the As-built Drawings provided by the Contractors and shall ensure that these are provided within 2 months after commissioning of the Works or as stated in the Contractors' Contracts.

Assistance to Client: The Consultant shall assist Client with regard to all questions relating to the Contracts, in particular compliance with performance bonds, insurance and claims, etc.

Assistance in Conflict Resolution: The Consultant shall provide assistance to Client in their efforts to settle any conflict arising between the Contractors and the Client.

Site Meetings and Reporting: The Consultant shall chair regular site meetings with the Contractors to be held at least once per month. The Consultant shall draw up minutes of meetings, periodic site monitoring reports and acceptance reports and shall issue such reports to the Client without delay.

Co-ordination of ESMP: The Consultant shall monitor progress by the Contractors in implementing the ESMP. The Consultant shall draw the immediate attention of the Client any slippage in the progress of these activities in order that remedial actions may be put in place in a timely manner to allow completion of critical activities prior to the planned date of reservoir impounding of the dam.

Supervision of Defect Correction: The Consultant shall supervise the activities of the Contractors in rectifying identified defects in the works and shall ensure that the final works are in accordance with the contract.

Reporting to MoWRAM PMU/PIU: The Consultant shall attend and shall chair regular site meetings with the Contractors to be held at least once per month. The Consultant shall draw up minutes of meetings, periodic defects correction status reports and shall issue such reports to the Client without delay. Before taking any action under the contracts designating the Consultant as "Technical Supervisor", for which action, pursuant to such contracts, the written approval of the Client as "Employer" is required.

Reporting: The Consultant shall report regularly to Client. These reports will primarily serve to record the status of each contractual element of the project with regard to progress of all aspects of the project, identifying any impending problems with respect to project coordination, time over-runs or any situations potentially having cost implications.

Reporting include:

Monthly reports

The Consultant will submit monthly progress reports (hard and soft copies) covering technical and financial matters pertaining to the contracts for construction of the project to the Client throughout the duration of the services. The Consultant shall also provide a monthly report of progress relating ESMP drawing upon information from monitoring of the activities of the implementing agencies. The reports will be submitted by the 7th day of the month following the reporting period. The monthly reports will document services performed by the Consultant during the reporting period. The reports will be structured

consistent with the separate contracts under the Consultant's supervision. Programming interface issues will also be addressed in the reports. The monthly report shall be drawn up in three (3) copies in English + 1 electronic copy.

Quarterly report

Throughout the duration of the main works, detailed quarterly reports (hard and soft copies) will be submitted two weeks after the end of each quarter. These reports shall be drawn up in three (3) copies in English + 1 electronic copy.

Preliminary completion report

At the end of the works and after provisional acceptance of the installations under the contracts, the Technical Supervisor shall send a preliminary completion report within a period of two months. This report shall take into account both technical and financial aspects and will be produced in three (3) copies in English + 1 electronic copy.

Final completion report

At the end of the guarantee period and after final acceptance under the contracts, the preliminary completion report drawn up after the provisional acceptance of the works shall be updated to form the final completion report for the works. This will then be sent in three (3) copies in English + 1 electronic copy.

Water Social Management Consultancy

A Consultant will be hired to provide service for the establishment of the operational FWUC from the participatory approach of FWUC creation in the design, development and sustainable use of the rehabilitated irrigation schemes and Preks to be rehabilitated by the Program to the signature of shared responsibility for the management and maintenance of irrigation infrastructure between FWUC and MOWRAM for all the irrigation schemes under the project area.
The support to the FWUC shall address the following issues:

- Institutional: dialogue with MoWRAM, legal recognition, responsibility sharing agreement,
- Organisational: governance, internal operating rules for water and scheme management, agricultural development and marketing,
- Technical: participation to the design of the irrigation networks, execution of maintenance and servicing tasks, farming practices;
- Financial: preparation of budgets, fundraising, accounting management, Irrigation Contribution Service (ISC) planning and collection, access to financial institutions,
- Gender focus with strong action for women's empowerment and their social participation.

MOWRAM gives a mandate to a Consultant for the establishment and support to the FWUCs in the irrigation schemes and Preks rehabilitated by the Program, to (i) assist farmers water users to create and organize one FWUC in each of the irrigation schemes to be rehabilitated under the project, and (ii) to build up the capacities of these FWUCs to fulfil their operation and maintenance responsibilities.
The consultant will work closely with the DED consultant on the specific topics:

- Technical design for the rehabilitation of irrigation schemes and Preks: (i) attempt to accommodate farmers' views in designing the irrigation scheme layout, (ii) define the appropriate consultation procedures with beneficiaries for establishment of farmers' water user community (FWUC) and for system design to enable the envisaged water allocation.
- Social water management: assist in the preparation of operation and maintenance (both routine and periodic) manuals (guidelines and procedures) for the subprojects at the detail design stage, and in their further improvement during the first years of operation and maintenance.

For each FWUC to be created, the services to be provided by the Consultant shall include the following steps:
<u>Phase 1: Consultation/validation on concept of irrigation system design:</u> The concept and design of irrigation systems will be presented, discussed and validated with and by farmers (or users). The main points to be discussed and agreed upon at this phase are: type of irrigation, irrigation method, canal alignment, scale of irrigation unit, estimation cost of this type of irrigation system per ha. This task will be conducted in close cooperation with the PDWRAM, DED consultant , who is in charge of the feasibility study and detail design of the schemes. It starts at the feasibility design phase of each scheme with main activities:

- Communicate with DED consultant to get information concerning with type of irrigation, irrigation method, canal alignment, scale of irrigation unit, estimation cost of this type of irrigation system per ha
- Prepare consultation meetings and tools

- Organize and facilitate consultation meetings with potential users and local authority
- Restitution meeting on consultation results with
- Approval by the farmer beneficiaries on design of irrigation system

Phase 2: FWUC establishment/registration and database of land owners: FWUC is established and officially registered with MoWRAM; the data base is built and available; social recognition of farmland ownership, database or list of plot owners. This phase begins immediately after Phase 1 and is scheduled, for each scheme/Prek, to take place during the rehabilitation works with main activities:

- Organize villagers meetings for consultation purpose
- Information sharing within the village concerned
- Coordination with the Service Provider in charge of detail measurement survey and the provincial Department of Land Management, Urban Planning and Construction for official delivery of farming land title to farmer beneficiaries.
- FWUC membership registration
- Draft and validate FWUC organizational structure
- Inform local authorities and organize the dialogue between the authorities and the FWUC
- Draft, validate and form a FWUC's supporting committee
- Organize the FWUC elections
- Validate FWUC election results during the first FWUC general assembly
- Develop a database system (soft and hard copy) including all information about members property and plot location and plot surface (with code system)
- Drawing interactive map by hand and develop into digital map

Facilitate the process of legal registration from local to national level.

Phase 3: Training and Technical Assistance: FWUC is able to perform its statutory functions (in particular water management) and to collect fees from members (up to a minimum of 70% of fees to be collected). Besides training sessions, there should be study tours organized to visit some FWUC of FWN members as well. The objectives of these study tours are to let farmers see performance of FWUC function and O&M etc. The phase may begin after Phase 2, but mainly after rehabilitation works with and will combine on-site training and technical assistance to the FWUC and groups of water users.

Phase 4: Responsibility sharing agreements support: In an irrigation system, water diversion and conveyance infrastructures are usually large hydraulic structures that the State, through MoWRAM, or the province, through PDWRAM, is in charge of construction and management operation and maintenance. The objective is:

- First to alleviate the burden of the State or the province,
- Second to make the farmer aware that water is a free gift of nature, but water service, that allows to get water on time, in place and in quantity required, requests investment and costs money that water users should pay for, at least partly,

- Third to assume that, once the farmers fully understand that irrigation infrastructures are one of their own production tools, they might take much care of them and take in charge their management operation and maintenance provided they have been involved and heard in the design and construction phases.

The question are: 1/ what are the works the communities are in charge of from on-farm canals up to what canal rank (tertiary, secondary, even primary), 2/ what are they responsible for (management, operation, seasonal maintenance, whole maintenance), 3/ what cost the farmers have to pay for.
These questions will be answered scheme-by-scheme, prek by prek. They will depend on two main factors: the size of the scheme or the prek and the capacity and willingness of the farmers. For those reasons, every scheme or prek will have its own specific Responsibility Sharing Agreement specific conditions that will be discussed and agreed with the local or national authority. Nevertheless general conditions of the RSA will be the same. The program will assist the parties in writing the general conditions and the frame of the specific conditions, possibly in the specific conditions themselves when major issues occur.
The consultant will bring a specific attention to gender during implementation:

- Assess and identify potential gender-differentiated impacts of each irrigation scheme.
- Collect sex-disaggregated baseline data that could be used to monitor potential gender impacts.
- Identify community-based organizations, and women's associations or groups whose work focuses on gender and the specific area of intervention that the Program can collaborate with during its implementation. Assess their capacity.
- Conduct gender-sensitive analyses to ensure the differential needs, constraints, capacities, priorities of women and men targeted by the Program are understood and addressed;
- Assess the obstacles that prevent women to get actively involved in the FWUC management and commercialisation of agricultural products and propose/implement the alleviation proposals to overcome those issues.

One of the objectives of the program regarding gender is to reach at least one-third of women as FWUC management/board member with roles and responsibilities identified. The consultant is required to support this objective by (i) identifying then providing direct coaching to potential active female candidates, (ii) promoting their candidacy and (iii) ensuring equal opportunity to women board members to attend vocational training in irrigation scheme operation and water management and other related training such as management skills and (iv) promoting female leadership in the water management, services, commercialisation of agricultural products.

PMU Individual Consultants Terms of Reference

Position	Type	Under	Duty Station
Water Resources Specialist/Team Leader	International	PMU	MOWRAM
Irrigation Engineer	International	PMU	MOWRAM
Climate Specialist	International	PMU	MOWRAM

Agriculture Value Chain Specialist	International	PMU/PIU	MOWRAM/NCDDS
Procurement Specialist	National	PMU	MOWRAM
M&E & Gender Specialist	National	PMU	MOWRAM

Position: International Water Resources Specialist/Team Leader

The specialists will, as the team leaders, provide overall direction and manage DED and relationships with MOWRAM, other relevant ministries, provincial governments, ADB, AIIB and other stakeholders, to ensure effective coordination and synergies between all concerned including MOWRAM's other consultants for the project.
He/she will be overall responsible for preparing the projects' outputs, manage all experts' inputs, activities, and outputs, and ensure the consistencies between project outputs, and the quality of the system wide planning exercises, feasibility studies and other reports.

He/she will also:

(v) ensure compliance of project outputs with ADB and AIIB guidelines;
(v) Manage the entire DED team, and ensure that all consultants will work closely with each other so that all individual outputs are well integrated and complement each other to ensure quality of the DED and relevant documentation for tendering.
(v) Ensure timely delivery of DED and tender package outputs, and of other outputs, in accordance with contract requirements.
(v) Review all aspects of implementation and construction to identify constraints, bottlenecks, concerns, and synergies; and
(v) At least quarterly meetings with the Project Director to update progress.

(v) The team leader will be expert in water resources, He/she shall have a master's degree or higher in WRM and FRM, civil engineering, or a related subject.
(v) He/she should have at least 15 years (10 years for national position) of work experience in both IWRM and hydraulic structure design and construction water use and flood risk management (FRM) projects.
(v) He/she should have experience as team leader (as deputy team leader for national position) in at least two project preparatory services or similar activities for both IWRM and FRM projects in Southeast Asia countries.

Position – International Irrigation Engineer

The position will be based at the PIU/MoWRAM office in Phnom Penh with periodic field supervision visits to the Sub-Projects implemented in targeted provinces under Project Component 2.

He/she will be responsible for:

- Provide technical assistance, guidance, and necessary documents to Implementing Agencies (IAs), including the PIU (MoWRAM) and Provincial Departments/Project Management Units (PD/PMUs).
- Support the preparation of recommendations for the approval of proposed Sub-Project Lists under Project Component 2.
- Review comments and reports submitted from PD/PMUs and the PMU (MoWRAM).
- Contribute to the preparation and updates of the Project Operations Plan, Financial and Procurement Plans.
- Conduct coordination, problem-solving, monitoring, and control of Component 2 project implementation.
- Coordinate field visits, site inspections, and spot checks at Sub-Projects and Civil Works sites in targeted provinces.
- Supervise and verify the completion of contracted Sub-Projects' works.
- Assist in the review of Work Contracts and Variation Orders, providing recommendations and decisions to avoid delays in the approval process.
- Coordinate investigations of irregularities, variations/changes, delays, and Force Majeure cases.
- Coordinate and support the preparation of designs, cost estimates, bills of quantities, and contracting documents for Sub-Project irrigation structures.
- Support the preparation and issuance of Consolidated Project Progress Reports, the Project Completion and Outcome Evaluation Report, and other necessary reports.
- Maintain accurate records, correspondence, and diaries.
- Assist the Employer and IAs with the updating and implementation of manuals and guidelines.
- Provide on-the-job training to staff members of PMU (MoWRAM) in irrigation works, small irrigation system construction and rehabilitation, and other professional engineering skills.
- Undertake other activities as necessary within the area of responsibility, as instructed by the Team Leader, Project Manager, and Project Director.

Minimum Qualifications:

- Bachelor's Degree in Civil Engineering or equivalent.
- At least 5 years of professional experience in civil engineering.
- At least 2 years of public sector project experience in the design, management, construction, and supervision of small and medium-scale irrigation systems and rehabilitation.
- Working experience with Government Implementing Agencies/Ministries and rural communities is an advantage.

Position - International Climate Specialist -

The Climate Expert will be responsible for:

The consultant will assess the current policy and institutional landscape in Cambodia to assess and identify priority actions to deliver short and long-term climate targets. The policy assessment will include, but not be limited to, the following activities: Gather existing policy and institutional actions aimed at climate action in Cambodia. Leverage existing analyses, including the climate policy diagnostic. Evaluate the robustness of existing policy actions under different scenarios. Assess the potential impact of current policies on achieving climate targets. Engage with key stakeholders to assess the effectiveness and feasibility of existing policy actions. Gather diverse perspectives and insights to inform policy improvements. Determine the most critical policy and institutional changes needed to support Cambodia's transition to a carbon-neutral and climate-resilient future.

Support policymakers in designing effective policy and institutional instruments to deliver ambitious climate action. This will include the design of legal, financial, economic, regulatory, and market-based instruments required to design and implement policy actions.

Key activities will include:

- Across all project activities, ensure aspects related to climate, environment and biodiversity are mainstreamed and adequately considered.
- (i) Particularly, (i) ensuring livelihood activities are climate resilient, (ii) promoting integration of climate-proofed design in infrastructure (iii) ensuring awareness of early warning and climate information system among all project stakeholders, including appropriate content and dissemination mechanisms, (iv) ensuring (ESCMP) exclusion criteria are enforced and avoiding adverse impacts of project activities on the ecosystem and biodiversity, and (v) promoting mainstreaming of climate change, environment and biodiversity considerations in all investments and trainings of the PMU.
- (ii) Undertake site visits, on-ground review, and check and document implementation of climate change and environmental activities.
- Coordinate with Design Engineers, and other specialists to provide expert guidance to ensure that infrastructure design is climate-proof.
- Coordinate with project partners on the development and implementation of the Early Warning System.
- Ensure that the timing, content, and medium of communication for CIEWS are context specific; periodically engage in focus group discussions and provide inputs to M&E surveys to get feedback on the community and households in order to improve content / dissemination of CIEWS.
- ● Develop partnerships with other IFAD (and non-IFAD) projects to promote wider uptake of Early Warning system.
- Conduct in-depth analysis of legal, regulatory, financial, and institutional aspects of policy implementation. Guide the policy design process based on the findings of the policy assessment.
- Develop and draft specific policy instruments (e.g., legislation, regulations, fiscal incentives) to support the implementation of climate action plans.
- Support on embedding the developed policy instruments into existing systems.
- Work with the policy working group to develop a comprehensive implementation strategy for the prioritized policy instruments.

- Provide training and capacity building to relevant government officials and other stakeholders on the application of the new policy instruments.
- Create and disseminate policy briefs to enhance understanding of policy actions and their implications.
- Support capacity and knowledge strengthening through consultations, dissemination workshops, and the production of knowledge products (e.g., policy briefs).
- Share knowledge and best practices on successful climate policies implemented in other countries. Analyze the potential impacts of these approaches in the Mongolian context.
- Policy briefs will be developed and circulated during stakeholder dissemination workshops to share key findings and recommendations.

Qualifications and Experience

The consultant will have

- Master's degree, preferable in the Water Resource Management, Hydrology, Environmental or Climate Science, or equivalent professional qualifications appropriate to the Consultancy Services requested.
- A minimum of 12 years of demonstrable experience in implementing and monitoring rural infrastructure and agriculture livelihood projects.
- The consultants must also have at least 12 years of relevant professional experience in climate policy and strategy development and has demonstrated experience in drafting climate mitigation and adaptation policies and strategies is highly desirable.
- Excellent knowledge of climate policy and finance issues under the UNFCC, particularly the Paris Agreement and the NDCs; sector expertise in the key economic sectors covered in DMC NDCs is preferred;
- Excellent oral and written communication skills in English; strong analytical skills; and proven track record in producing high quality technical reports.

<u>Position: International Agriculture/Value Chain Specialist</u>

The Specialist together with the Team Leader will serve as the main focal points for liaisons between the implementing agency (IA), The Agricultural and Value Chain Specialist will lead efforts to develop sustainable value chains across the project's five prioritized value chain : Rice, Vegetable, Chicken, and aquaculture. This role requires close collaboration with stakeholders to drive commercialization, improve production practices, enhance market access, and ensure that all value chain activities are both socially and environmentally sustainable.

- Provide Strategic and Technical Guidance: Support the project team in developing comprehensive project plans, management frameworks, and implementation strategies to ensure effective and efficient delivery;
- Value Chain Development: Lead the design and execution of Value Chain Accelerators tailored to each value chain, enhancing market integration and growth potential;
- Agri-Business and Entrepreneurship Promotion: Design and implement targeted activities to foster agribusiness skills and entrepreneurial practices among farmers;

- Capacity Building for SMEs: Strengthen the capacity of farmer and small- to medium-sized enterprises (SMEs) in sustainable agricultural practices, climate resilience, and productivity-enhancing methods across the value chain;
- Stakeholder Engagement: Collaborate with the Business Specialist to identify and establish partnerships with key stakeholders, including off-takers, financial institutions, and relevant industry actors;
- Market Research and Analysis: Work with relevant Ministries, Departments, and Agencies to conduct market research, gathering insights on consumer preferences, market needs, and enterprise selection to guide business-related activities of the Project;
- Project Management and Resource Optimization: Develop and monitor project timelines, budgets, and resource allocation to maximize efficiency and achieve project targets;
- Policy and Market Solutions: identify market bottlenecks, assess risks, and devise solutions that address challenges and leverage opportunities within project interventions;
- Training and Mentorship: Provide comprehensive training, coaching, and mentorship to agricultural workers and other value chain participants, enhancing their knowledge of agribusiness and modern agricultural practices;
- District-Level Support: Assist district staff with budgeting, planning, and translating project objectives into actionable activities for local implementation;
- Planning and Reporting: In coordination with other specialists, ensure timely preparation and submission of quarterly, annual, and other required project reports. Lead the preparations of activity plans, review of budget and facilitates approval of national and district level activities;
- Facilitate project monitoring and progress reviews with the project team, providing actionable recommendations to the project manager for continuous improvement

Position: Procurement Specialist – National MOWRAM PMU

The National Procurement Specialist will be based in the CAISAR PMU and responsible for providing professional assistance to CAISAR PMU to implement, coordinate, and monitor project procurement activities under the project in accordance with the agreed and applicable procurement procedures, guidelines, and the financing agreement of the project. In doing so, he/she must work in close consultation and cooperation with PMU staff, consultants and all concerned entities of CAISAR. The National Procurement Specialist will work under the supervision and guidance of the PMU Project Director and Project Manager.

 Scope of Work

In close collaboration and consultation with the PMU procurement staff, the National Procurement Specialist is expected to carry out the following tasks:

3.1 Capacity-building

Develop and implement a procurement capacity building program for training of relevant government staff of the departments and ministries under the Project, particularly the MOWRAM procurement unit, to enable them to successfully carry out procurement activities. Develop a ‘learning culture’, including regular learning opportunities and application of the learning and on-the-job training in the workplace;

3.2 Support for Procurement carried out by MOWRAM

- Undertake and support MOWRAM PMU in identifying the procurement requirement and provide necessary inputs for the procurement plan. The Procurement Plan will include contract packaging, cost estimates & delivery time, procurement methods, IFAD/AIIB prior/post review arrangements, and key procurement processing dates until completion of each contract;
- Undertake and support MOWRAM PMU in updating the Procurement Plan;
- Undertake and support MOWRAM PMU in preparing the project's necessary procurement documents for goods and works including the preparation of Invitation for Bid advertisements, bidding/Request for Quotation documents, organizing and conducting bid openings, evaluation reports, obtaining the necessary clearances (from the Procurement Review Committee (PRC) and No Objection Letters from IFAD/AIIB where required, arranging for the contract signing, and distribution to appropriate authorities;
- Undertake and support MOWRAM PMU in preparing procurement documents for consultant services including the preparation of requests for Expressions of interest (EOI) advertisements, evaluation of EOIs and shortlisting, liaising with technical teams on the preparation of terms of reference, preparation of request for proposal documents, proposal evaluations, preparation of draft contracts, obtaining the necessary clearances from the PRC and IFAD/AIIB where required, assisting in contract negotiations, arranging for the contract signing, and distribution to appropriate authorities;
- Undertake and support MOWRAM PMU in ensuring that all procurement is carried out in accordance with the agreed procedures, procurement guidelines and the Financing Agreements for the project;
- Undertake and support MOWRAM PMU in monitoring the timeliness of the procurement and delivery of goods, works, and services in accordance with the approved Procurement Plan, the AWPB, and contracts between MOWRAM and contractors, suppliers, and consultants;
- Undertake and support MOWRAM PMU in ensuring that a proper filing/record keeping system is established for the procurement to be done by MOWRAM. Maintain a contract register with updated key procurement information of all contracts procured under the Project.
- Provide guidance to involving Ministry staff to enable them to successfully carry out activities relating to procurement (i.e., preparation of technical specifications, among others);
- Collaborate with the concerned units where necessary to ensure smooth procurement process and contract management;
- Other tasks as may be assigned and/ or delegated by the PMU Project Manager and Project Director.

 Location, Timing and Duration

The duration of the contract is 12 months from the contract signing date and renewable subject to the annual performance assessment and availability of funds and the needs for project.

The National Procurement Specialist will be based at CAISAR PMU office located in MOWRAM.

 Supervision and Reporting

The National Procurement Specialist will report to CAISAR Project Director. The Procurement Specialist will prepare and submit monthly performance reports on the tasks performed by him/her to the Project Director.

In collaboration with the procurement staff of MOWRAM PMU, the National Procurement Specialist will undertake and support MOWRAM in monitoring the procurement progress and updating procurement progress in Procurement Tracking Form on the monthly basis.

- Qualification and Experience Requirements

Bachelor's degree Business Administration & Management, Civil Engineering, Law or relevant field.

Familiarity and experience in carrying out public procurement of goods, works and consultant services. Experience working with Government's Public Services/ Projects/Programs is an advantage.

Have demonstrated at least 5-year professional experience with donor financed projects in the areas of procurement implementation and management.

Familiarity with IFAD/AIIB or other Development Partner' Procurement Procedures, Policy and Guidelines for Consultants' Services, Goods and Civil Works.

Having attended and obtained a certificate of the BUILDPROC training course organized by IFAD/ITC-ILO is an advantage.

Ability and demonstrated experience in providing procurement training is giving an advantage.

Fluency in written and spoken English and Khmer.

Comprehensive computer skills with minimum in use of Microsoft Office.

Position: M&E and Gender Specialist (National)

Duty Station - PMU

Responsibilities:

The MOWRAM PMU will have a senior and experienced staff member responsible for M&E and reporting. S/he will report to the Project Director and Team Leader responsible for planning and executing agency related functions. The TORs are as follows:

- Assist in the consolidation of the annual work plan and budget through the participatory planning workshops conducted at district, provincial and national level.
- Develop a work plan and schedule for monitoring and evaluation of specific Implementation contracts in accordance with approved criteria.
- Review the quarterly monitoring reports received from each of the implementing agencies and assist in the consolidation of the Quarterly Progress Reports for submission to the MOWRAM Project Manager in accordance with reporting guidelines and procedures.
- Provide training in planning, budgeting & reporting systems & procedures to staff of the MOWRAM & NCDDS at sub-national level.
- Mainstream M&E practices to technical staff particularly the qualitative aspects e.g., impact assessment, comparison of farmers' practices and new technologies, satisfaction of the services provided.
- Provide the Project Team with regular status reports, including information on progress made, issues outstanding and action recommended.
- Provide support and training to relevant staff at subnational level to ensure that the design and implementation of project financed implementation contracts address monitoring and evaluation concerns.

- Mainstream the M&E practices to the technical staff particularly the qualitative aspects e.g., impact assessment, comparison of farmers' practices and new technologies, satisfaction of the services provided.
- Undertake other tasks assigned by the Project Director.

- Act as the Gender Focal Point. S/he will have the following responsibilities:
    - (i) Monitor the implementation of the gender action plan in relation to the activities under the responsibility of the project.
    - (ii) Ensure that the relevant information on gender relating to the activities under NCDDs responsibility are updated at the sub-national level in the Gender Monitoring Framework on a quarterly basis.
    - (iii) Assist in the updating of the gender action plan reported for inclusion in the Quarterly Progress Report that is compiled by the PMU Team.
    - (iv) Ensure that gender sessions are included in relevant technical and capacity building trainings and where needed act as a resource person during the training to ensure that gender concerns are addressed.

Qualifications and Experience:

- A relevant post-graduate university degree in an agricultural or appropriate social science discipline: postgraduate study an advantage.
- Preferably five years of experience of planning, monitoring and reporting in rural development projects/programs; experience with government planning process, M&E systems and reporting procedures at the national and sub-national levels and working at sub-national level would be an advantage.
- Knowledge of the government's ongoing reforms of sub-national government.
- Knowledge of government and development partners procedures, policies and financial rules and regulations.
- Knowledge of computer information system, word processing, database and financial and project management software.
- Excellent English communication skills, written and spoken.
- Availability and willingness to undertake visits to the target communes.

Annex 5: Terms of Reference – NCDD Project Implementation Unit

PIU Individual Consultants Terms of References -

Position	Type	Under	Duty Station
Project Advisor	National	PIU	NCDD
Project management Specialist	National	PIU	NCDD
Procurement Specialist	National	PIU	NCDD
M&E & Gender Specialist	National	PIU	NCDD
Admin and Finance Assistant	National	PIU	NCDD

Position: Project Advisor (National)
Duty Station - NCDD

The Project Advisor, working with the Project Management Specialist, will report to the NCDD Project Director and Project Manager. S/he will be based at NCDD office but will work at NCDD and MOWRAM on an agreed work plan. S/he will carry out the following tasks:

- Advise NCCD Project Directors and Project Managers, and staff on project management and implementation related issues regularly to ensure that the project implementation is in line with government policies, guidelines and the evolving framework for sub-national government and follows the provisions of the loan and grant agreements.
- Advise the Project Directors and Project Managers of NCCD & MOWRAM continuously to ensure that the project achieves the outcome and outputs envisaged in the project design and monitoring framework.

- Mentor the Project Directors, Project Manager of NCCDS and regularly assist them in the management of the team of staff and consultants (either under firm or individual) so that the Project Directors and Project Manager NCCDS and the Project Management Specialist can manage the Project Advisor's tasks when s/he is absent.
- Provide technical advice to the sub-national agencies and consultants responsible for supporting the infrastructure, agricultural value chain investments.
- Ensure that appropriate quality assurance measures are established and effective so that the design and construction of the infrastructure investments are fit for purpose and are practically and operationally sustainable throughout their design life.
- Assist NCDD in the recruitment of supervision consultants, individual consultants and all special service providers, monitor and support the service teams, provide capacity building training and mentoring, deliver value chain improvements to market improvement and support commune councils to facilitate value chain improvement, support agricultural productivity improvement and diversification on irrigated areas constructed under the project with double cropping, and diversified cropping.
- Provide continuous guidance to subnational team in the implementation of the agricultural productivity enhancement program with a particular focus on strengthening the rice and vegetable and livestock and fish value chains.
- Support the rural ICT interventions, in particular the CIEWS.
- Advise the project in matters relating to planning and preparation of the annual work plan and budgets and establishing and operating the monitoring and evaluation system and the associated reporting requirements.
- Assist all project consultants and the MOWRAM and NCDDS project management units in ensuring that there is good coordination with MEF, MOWRAM, and NCDDS and all project consultants and special service providers in all policy and major operational matters related to the project implementation e.g., flow of funds to national agencies supporting implementation, provincial, district, and commune councils and propose revisions to the arrangements, if necessary.
- Ensure that the Project Directors, Project Managers and staff of the MOWRAM and NCDDS project management units will be able to provide secretariat services to the Project Steering Committee with regular physical and financial progress reports, including information on progress made, issues outstanding and actions recommended.
- Assist MOWRAM and NCDDS project management units in preparing quarterly physical and financial progress reports for submission to AIIB and IFAD.
- Oversee and coordinate the work of the project consultants under PIU, ensure that they are fulfilling their terms of reference and handle all administrative matters relating to the consulting company's or individual contractual arrangements with the executing and implementing agencies.
- Provide the Project Directors and the Project Managers of NCDDS with regular physical and financial progress reports, including information on progress made, issues outstanding and actions recommended.
- Coordination with the consulting firm on contracts and personnel of the consulting services.
- Work with the Project Management Specialist to produce at least three project knowledge products to be shared with project stakeholders.
- Work with the M&E & Gender Specialist to ensure the implementation and monitoring of the gender action plan.

- Work with the Social Safeguards and Environmental Safeguards/Climate Change Specialist to ensure the implementation and monitoring of the environmental assessment and review framework, resettlement framework, and indigenous peoples planning framework, as well as applicable initial environmental examination, environmental management plans, land acquisition and resettlement plans, and indigenous peoples plans.
- Undertake other tasks as requested by the Project Directors and Project Managers.

Minimum qualifications are:

- A relevant post-graduate university degree; formal qualifications in agriculture with a major of agronomy or a related agricultural subject.
- Preferably 15 years of experience in the management of large-scale agricultural and rural development projects financed by the international financial institutions; wide experience of participatory agricultural development, including irrigation.
- Experience of agribusiness and value chain development will be an advantage.
- Sound knowledge of current development partner procedures, policies and financial rules and regulations; and government financial management and administrative procedures.
- Proven planning, management and reporting skills.
- Knowledge of computer information management systems, Microsoft Office applications, database management systems and financial and project management software and of the internet and digital communications including the use of mobile telephone, email, and mobile devices.
- Excellent English communication skills, written and spoken.
- Proven track record as team leader for at least two development partner-financed projects.
- Availability and willingness to undertake visits to the target communes.

Position: Project Management Specialist (National)
Duty Station – PIU

The Project Management Specialist, working with the Project Advisor/service providers, will report to the NCDD Project Director and Project Manager. S/he will be based at NCDD office but will work at NCDD, MOWRAM, MoE, on an agreed work plan. S/he will carry out the following tasks:

- Advise the Project Directors and the Project Managers of NCDD and MOWRAM on project management and implementation related issues to ensure that the project implementation is in line with government policies, guidelines and the evolving framework for sub-national government and follows the provisions of the loan and grant agreements.
- Advise the Project Directors and Project Managers of NCDD and MOWRAM to ensure that the project achieves the outcome and outputs envisaged in the project design and monitoring framework.
- Ensure that the executing and implementing agencies and sub-national agencies implement the Gender Action Plan.

- Advise the project in matters relating to planning and preparation of the annual work plan and budgets and establishing and operating the monitoring and evaluation system and the associated reporting requirements.
- Assist all project consultants and NCDD and MOWRAM project management units in ensuring that there is good coordination among MEF, NCDD, MoE in all policy and major operational matters related to the project implementation e.g., flow of funds to national agencies supporting implementation, provincial, district, and commune councils and other stakeholders and propose revisions to the arrangements, if necessary.
- Ensure that the Project Director, Project Managers and NCDD staff will be able to provide the secretariat services to the Project Steering Committee with regular physical and financial progress reports, including information on progress made, issues outstanding and actions recommended.
- Provide support to the NCDD and MOWRAM in managing service provider contracts to support value chain development and validate the technical content of training modules to be delivered by service providers to the target groups.
- Assist in the design and deliver of training on marketing, value chain analysis and agribusiness (farm as a business as well as small and medium enterprises) approaches for the sub-national project teams and advisors and provide ongoing guidance in the use of these tools to improve marketing efficiencies and increased returns to the target group members.
- Oversee and coordinate the work of the other consultants, ensure that they are fulfilling their terms of reference and handle all administrative matters relating to the consulting company's contractual arrangements with NCDD.
- Provide the Project Directors and Project Managers of NCDD and MOWRAM with regular physical and financial progress reports, including information on progress made, issues outstanding and actions recommended.
- Coordinate with the firm on contracts and personnel of the consulting services.

14. Minimum qualifications are:

- A relevant post-graduate university degree in agriculture or combination of education and appropriate agricultural and rural development experience.
- 10 years' experience of project management experience in the management of large-scale agricultural and rural development projects financed by the international financial institutions.
- Five years' experience of Cambodian private sector agribusiness development and knowledge of value chains.
- Good up to date knowledge of AIIB/IFAD procedures, policies, and financial rules and regulations; and government financial management and administrative procedures.
- Proven planning, management and reporting skills.
- Computer literacy: word processing, spreadsheets, power point and database programs.
- Excellent English communication skills, written and spoken.
- Availability and willingness to undertake visits to the target communes.

Position: Monitoring & Evaluation Specialist (National)
Duty Station - PIU
Responsibilities:
The NCDDs will have a senior and experienced staff member responsible for M&E and reporting. S/he will report to the NCDDs Project Advisor and Project Manager responsible for planning and executing agency related functions. The TORs are as follows:

- Assist in the consolidation of the annual work plan and budget through the participatory planning workshops conducted at district, provincial and national level.
- Develop a work plan and schedule for monitoring and evaluation of specific Implementation contracts in accordance with approved criteria.
- Review the quarterly monitoring reports received from each of the implementing agencies and assist in the consolidation of the Quarterly Progress Reports for submission to the MOWRAM Project Manager in accordance with reporting guidelines and procedures.
- Provide training in planning, budgeting & reporting systems & procedures to staff of the NCDDs at sub-national level.
- Mainstream M&E practices to technical staff particularly the qualitative aspects e.g., impact assessment, comparison of farmers' practices and new technologies, satisfaction of the services provided.
- Provide the NCDDs Project Team with regular status reports, including information on progress made, issues outstanding and action recommended.
- Provide support and training to relevant NCDDs staff at subnational level to ensure that the design and implementation of project financed implementation contracts address monitoring and evaluation concerns.
- Mainstream the M&E practices to the technical staff particularly the qualitative aspects e.g., impact assessment, comparison of farmers' practices and new technologies, satisfaction of the services provided.
- Undertake other tasks assigned by the Project Director.

- Act as the NCDDs Gender Focal Point. S/he will have the following responsibilities:
  (i) Monitor the implementation of the gender action plan in relation to the activities under the responsibility of the NCDDs.
  (ii) Ensure that the relevant information on gender relating to the activities under NCDDs responsibility are updated at the sub-national level in the Gender Monitoring Framework on a quarterly basis.
  (iii) Assist in the updating of the gender action plan reported for inclusion in the Quarterly Progress Report that is compiled by the PMU Team.
  (iv) Ensure that gender sessions are included in relevant technical and capacity building trainings and where needed act as a resource person during the training to ensure that gender concerns are addressed.

Qualifications and Experience:

- A relevant post-graduate university degree in an agricultural or appropriate social science discipline: postgraduate study an advantage.

- Preferably five years of experience of planning, monitoring and reporting in rural development projects/programs; experience with government planning process, M&E systems and reporting procedures at the national and sub-national levels and working at sub-national level would be an advantage.
- Knowledge of the government's ongoing reforms of sub-national government.
- Knowledge of government and development partners procedures, policies and financial rules and regulations.
- Knowledge of computer information system, word processing, database and financial and project management software.
- Excellent English communication skills, written and spoken.
- Availability and willingness to undertake visits to the target communes.

Position - Procurement Specialist (National)
Duty Station – PIU

The National Procurement Specialist will be based in the NCDD-S PIU and responsible for providing professional assistance to NCDD-S PIU to implement, coordinate, and monitor project procurement activities under the project in accordance with the agreed and applicable procurement procedures, guidelines, and the financing agreement of the project. In doing so, he/she must work in close consultation and cooperation with PIU staff, consultants and all concerned entities of CAISAR. The National Procurement Specialist will work under the supervision and guidance of the NCDD-S PIU Project Director and Project Manager.
Scope of Work

In close collaboration and consultation with the PMU procurement staff, the National Procurement Specialist is expected to carry out the following tasks:
3.1 Capacity-building
Develop and implement a procurement capacity building program for training of relevant government staff of the departments and ministries under the Project, particularly the NCDD-S procurement unit, to enable them to successfully carry out procurement activities. Develop a 'learning culture', including regular learning opportunities and application of the learning and on-the-job training in the workplace;

3.2 Support for Procurement carried out by NCDD-S

Undertake and support NCDD-S PIU in identifying the procurement requirement and provide necessary inputs for the procurement plan. The Procurement Plan will include contract packaging, cost estimates & delivery time, procurement methods, IFAD/AIIB prior/post review arrangements, and key procurement processing dates until completion of each contract;

Undertake and support NCDD-S PIU in updating the Procurement Plan;

Undertake and support NCDD-S PIU in preparing the project's necessary procurement documents for goods and works including the preparation of Invitation for Bid advertisements, bidding/Request for Quotation documents, organizing and conducting bid openings, evaluation reports, obtaining the necessary clearances (from the Procurement Review Committee (PRC) and No Objection Letters from IFAD/AIIB where required, arranging for the contract signing, and distribution to appropriate authorities;
Undertake and support NCDD-S PIU in preparing procurement documents for consultant services including the preparation of requests for Expressions of interest (EOI) advertisements, evaluation of EOIs and shortlisting, liaising with technical teams on the preparation of terms of reference, preparation of request for proposal documents, proposal evaluations, preparation of draft contracts, obtaining the necessary clearances from the PRC and IFAD/AIIB where required, assisting in contract negotiations, arranging for the contract signing, and distribution to appropriate authorities;
Undertake and support NCDD-S PIU in ensuring that all procurement is carried out in accordance with the agreed procedures, procurement guidelines and the Financing Agreements for the project;
Undertake and support NCDD-S PIU in monitoring the timeliness of the procurement and delivery of goods, works, and services in accordance with the approved Procurement Plan, the AWPB, and contracts between NCDD-S and contractors, suppliers, and consultants;
Undertake and support NCDD-S PIU in ensuring that a proper filing/record keeping system is established for the procurement to be done by NCDD-S. Maintain a contract register with updated key procurement information of all contracts procured under the Project.
Provide guidance to involving Ministry staff to enable them to successfully carry out activities relating to procurement (i.e., preparation of technical specifications, among others);
Collaborate with the concerned units where necessary to ensure smooth procurement process and contract management;
Other tasks as may be assigned and/ or delegated by the PMU Project Manager and Project Director.
Supervision and Reporting
The National Procurement Specialist will report to the NCDD-S PIU Project Director. The Procurement Specialist will prepare and submit monthly performance reports on the tasks performed by him/her to the Project Director.
In collaboration with the procurement staff of NCDD-S PIU, the National Procurement Specialist will undertake and support NCDD-S PIU in monitoring the procurement progress and updating procurement progress in Procurement Tracking Form on the monthly basis.
Qualification and Experience Requirements

Bachelor's degree Business Administration & Management, Civil Engineering, Law or relevant field.
Familiarity and experience in carrying out public procurement of goods, works and consultant services. Experience working with Government's Public Services/ Projects/Programs is an advantage.
Have demonstrated at least 5 years professional experience with donor financed projects in the areas of procurement implementation and management.
Familiarity with IFAD/AIIB or other Development Partner' Procurement Procedures, Policy and Guidelines for Consultants' Services, Goods and Civil Works.
Having attended and obtained a certificate from the BUILDPROC training course organized by IFAD/ITC-ILO is an advantage.
Ability and demonstrated experience in providing procurement training is an advantage.
Fluency in written and spoken English and Khmer.
Comprehensive computer skills with minimum in use of Microsoft Office./.

Position: Admin & Finance Specialist (National)
Duty station - PIU
The Finance and Administration Specialist will be responsible for the management and coordination of the administrative and finance support to the Project implementation activities within the PIU/NCDDS; in coordination with all PD and with other agencies involved. Under the supervision and overall guidance of the Project Manager the specialist will work closely with the Financial and Accounting team; with the Procurement and Contracts Team, coordinating project activities with PD/ PIU, along with other agencies involved, to manage administrative support in the project implementation following the Project procedures. The specialist will report to the Project Manager and the Project Director.
He/she will be responsible for:

- ensuring provision to PIUs and PD and other agencies involved support, advice, guidance and all documents necessary for the successful Project implementation;
- ensuring and coordinating support to efficient operations of the PIU, and other project offices in terms of day-to-day administration and administrative support
- ensuring administrative support in preparation of the recommendations for the approval of the proposed Sub-Projects Lists
- ensuring efficient support in preparation and update of the Project plans, such as the Operations Plan; the Financial and the Procurement Plans ensuring the establishment and maintaining a sound system of the Project documentation filing, classification, storing and backing up of the essential hard and soft copies
- Maintain sound finance and accounting systems throughout the project;
- Assist the PIU to maintain the project accounts for efficient project implementation;
- Maintain the books of accounts, monitor the project cash flow accounts, and manage the daily cash transactions at the PIU;
- Prepare the financial statements of the project account;
- Prepare imprest account reconciliation for 2nd generation imprest account;
- Assist and provide on the job-training to IAs in maintaining the imprest accounts;
- Assist in managing finance and accounting records for the project;
- Maintain the project bank accounts, including the preparation of monthly bank reconciliations;

Minimum Qualification Requirements

- The specialist will have at least a Bachelor's degree (or equivalent) in business administration /accounting/ economics and at least 8 (eight) years of relevant professional experience.
- The Consultant is required to have at least 5 (five) years of work experience on public sector projects in the same professional areas and with similar responsibilities, as mentioned below.

- Substantial working experience in administrative management of the Government projects at national and sub-national levels; and/or experience with the RGC Implementing Agencies/ Ministries in a professional support capacity, especially in agriculture and 2 rural development sectors, will be an advantage.
- The specialist should be familiar with the Royal Government financial and procurement management regulations and procedures.
- Demonstrated advanced computer skills related to the MIS/ databases, spreadsheets and project planning tools are required.
- Excellent English language skills, and ability to translate written and oral work communication in both English and Khmer languages, are preferable.

Investing in rural people

Cambodia

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex 10: Integrated Project Risk Matrix

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

Overall Summary

Risk Category / Subcategory	Inherent risk	Residual risk
Country Context	**Moderate**	**Moderate**
Political Commitment	*Moderate*	*Moderate*
Governance	*Moderate*	*Low*
Macroeconomic	*Moderate*	*Moderate*
Fragility and Security	*Low*	*Low*
Sector Strategies and Policies	**Moderate**	**Moderate**
Policy alignment	*Low*	*Low*
Policy Development and Implementation	*Moderate*	*Moderate*
Environment and Climate Context	**High**	**High**
Project vulnerability to environmental conditions	*High*	*High*
Project vulnerability to climate change impacts	*Substantial*	*Substantial*
Project Scope	**Moderate**	**Moderate**
Project Relevance	*Low*	*Low*
Technical Soundness	*Moderate*	*Moderate*
Institutional Capacity for Implementation and Sustainability	**Moderate**	**Moderate**
Implementation Arrangements	*Moderate*	*Moderate*
Monitoring and Evaluation Arrangements	*Moderate*	*Moderate*
Project Financial Management	**Substantial**	**Substantial**
Project Organization and Staffing	*Substantial*	*Substantial*
Project Budgeting	*Substantial*	*Moderate*
Project Funds Flow/Disbursement Arrangements	*Moderate*	*Moderate*
Project Internal Controls	*Substantial*	*Substantial*
Project Accounting and Financial Reporting	*Substantial*	*Substantial*
Project External Audit	*Substantial*	*Substantial*
Project Procurement	**Moderate**	**Moderate**
B.1 Assessment of Project Complexity	*Moderate*	*Moderate*
B.2 Assesment of Implementing Agency Capacity	*Low*	*Low*
Project Procurement Overall	*Moderate*	*Moderate*
A.1 Legal, Regulatory and Policy Framework	*Moderate*	*Moderate*
A.2 Institutional Framework and Management Capacity	*Moderate*	*Moderate*
A.4 Accountability, Integrity and Transparency of the Public Procurement System	*Moderate*	*Moderate*
A.3 Public Procurement Operations and Market Practices.	*Low*	*Low*
Environment, Social and Climate Impact	**High**	**High**
Biodiversity Conservation	*Moderate*	*Moderate*
Resource Efficiency and Pollution Prevention	*High*	*High*
Cultural Heritage	*Moderate*	*Moderate*
Indigenous People	*Moderate*	*Moderate*
Labour and Working Conditions	*Moderate*	*Moderate*
Community health, safety and security	*Moderate*	*Moderate*

Risk Category / Subcategory	Inherent risk	Residual risk
Physical and Economic Resettlement	*High*	*High*
Greenhouse Gas Emissions	*Low*	*Low*
Vulnerability of target populations and ecosystems to climate variability and hazards	*Substantial*	*Substantial*
Stakeholders	**Moderate**	**Moderate**
Stakeholder Engagement/Coordination	*Moderate*	*Moderate*
Stakeholder Grievances	*Moderate*	*Moderate*
Overall	**Substantial**	**Substantial**

Country Context	**Moderate**	**Moderate**
Political Commitment	***Moderate***	***Moderate***
Risk: Change in the Government of Cambodia (GoC) commitment to agriculture development and/or prioritization regarding climate action. The current Cambodian political situation, after election in mid-2023, has a low likelihood of major change of policy towards agriculture.	Moderate	Moderate
Mitigations: The project is strongly aligned with Cambodia's Nationally Determined Contributions (NDCs) priority actions, the Cambodia Climate Change Strategic Plan (CCCSP) 2014 – 2023 and the National Adaptation Programme of Action (NAPA) 2006. The project's focus on smart and climate resilient irrigation and flood control infrastructure; institutional development of the Farmer Water User Cooperatives (FWUCs); and to strengthen GoC agencies water rights management and ensure policies are aligned with the Climate Change Action Plans of the Ministry of Water Resources and Meteorology (MOWRAM) and Ministry of Agriculture, Forestry and Fisheries' (MAFF's) Agriculture Sector Master Plan 2030. The project proposal aligns with RGC's National Water Resources Management and Sustainable Irrigation Road Map and Investment Program (2019 -2023), providing a Strategic Framework for the Irrigation Sector.		
Governance	***Moderate***	***Low***
Risk: Private agribusiness unwilling to invest because of governance concerns such as hidden transaction costs associated with agriculture processing and exporting.	Moderate	Low
Mitigations: The project design assumes a willingness to invest consistent with experience and survey observations. Through policy engagement, IFAD continues to support GoC to improve ease of doing business in the agriculture sector.		
Macroeconomic	***Moderate***	***Moderate***
Risk: International economic recession reduces market opportunities. There is a risk that current economic trends lead to a reduction in demand for the export commodities targeted by the project, impacting on the viability of investments financed by the project	Moderate	Moderate

Mitigations: The project will target domestic and export markets, with domestic demand for safe vegetables and chicken; and export markets for rice. The project design is to maintain flexibility, so that production and marketing channels can be reoriented with changing trade conditions, demand, and partners. IFAD will be in touch with WB/ ADB/ Ministries and other partners to anticipate and address any risks. The IFAD country team is in close and regular contact with senior officials of the Ministry of Economy and Finance and will anticipate and try and ensure the program is protected from any such risks.		
Risk: Impact of Ukraine conflict on prices worsens Cambodia's terms of trade. Cambodia imports all its fuel and fertiliser and most capital equipment, so increases in costs of these items are likely to harm Cambodia's competitiveness. Conversely, increased food prices could favour Cambodia as a food exporting country.	Moderate	Moderate
Mitigations: (1) The project design includes monitoring and adjustment strategy in the event either recession changes demand or important materials' cost inflate to a level that impacts the project stakeholders. (2) The project's financial analysis includes possible price fluctuation and inflation rate conditions at the time at the time of implementation.		
Fragility and Security	***Low***	***Low***
Risk: Insecurity (political conflict, corruption) pose a risk to project implementation. Despite a history as a fragile state, Cambodia has a 25-year history of good internal security, so the risk is assessed low.	Low	Low
Mitigations: IFAD team and project supervision consultants will monitor any emerging situation closely and take necessary actions on time.		
Sector Strategies and Policies	**Moderate**	**Moderate**
Policy alignment	***Low***	***Low***
Risk: Change in government policy regarding climate action. Government commences a new policy to be guided by a Pentangular Strategy from mid-2023 (after the election); however the key themes of KAISAR: water infrastructures, rural roads, and technical skills training are remain as high priorities.	Low	Low
Mitigations: Project aligned with Cambodia's current Climate Change Strategic Plan 2014 – 2023 and associated action plans developed by each relevant GoC ministry. The project is included into the "National Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019 - 2033" issued in July 2019 by MOWRAM, with the assistance of the development partners. These align also with Pentangular Strategy phase 1. There are no significant changes expected.		
Policy Development and Implementation	***Moderate***	***Moderate***
Risk: Key policies on irrigation and climate adaptation not effectively implemented.	Moderate	Moderate

Mitigations: (1) Project interventions approach development objectives by using diverse approaches and not over dependent on a single policy. (2) The combination of project partners with IFAD, FAO, AIIB, and GCF work as a team to monitor and advise the GoC on relevant policies and their implementation.		
Environment and Climate Context	**High**	**High**
Project vulnerability to environmental conditions	***High***	***High***
Risk: Issues related to mono-cropping, excessive application of chemical fertilizers and pesticides and poor soil fertility are common in the Cambodian agricultural sector.	High	High
Mitigations: The project will promote good agricultural practices such as crop diversification, intercropping, use of bio compost and innovative soil carbon sequestration options that have multiple benefits on soils structure, microbiological activity and water retention capacity. In turn this soil management approaches have proven positive impacts on plant health that ensure higher tolerance to pests and diseases.		
Project vulnerability to climate change impacts	***Substantial***	***Substantial***
Risk: Observed impacts of climate change trends in recent years have already manifested in longer dry seasons and more intense “El Niño” related droughts, delayed onset of the monsoon season, increased rainfall intensity and frequency – leading to floods and unexpected dry periods during the rainy season. These trends and future climate variability / extreme events may have significant adverse impacts on food and nutrition security, access to markets, increased pest / disease incidence with effects on target population’s livelihoods and the ecosystem services they rely on. Extreme intensity floods have also resulted in damage to rural infrastructure, including irrigation and drainage canals and roads. Hence, the SECAP Review Note classifies as the project as Substantial under Climate Risk category.	Substantial	Substantial
Mitigations: The project design is informed by detailed analysis of climate risks for all interventions and relevant stakeholders. The assessment of risks informed the selection of climate-adaptive investments in irrigation infrastructure, agricultural development and institutional strengthening; analysis of climate hazards, vulnerability and exposure will continue to inform planning and prioritization processes during implementation to ensure reduced vulnerability of irrigation and agricultural system to climate change and enhanced livelihoods of rural populations dependent on agriculture.		
Project Scope	**Moderate**	**Moderate**
Project Relevance	***Low***	***Low***
Risk: MORWAM’s technical and management capacities are insufficient to deliver the project objectives.	Low	Low
Mitigations: MOWRAM’s PMU has the required technical staff in-place to deliver the project. The PMU is currently implementing ADB, EIB, and WB irrigation projects and has experience with project delivery. Using a centralized PMU to implement all DPs irrigation programmes and using the IFAD Programmatic Approach lowers the risk of issues with multiple project deliverables.		

Risk: Inaccurate climate risks assigned to the project. They include: (1) reduction in precipitation during rainy season and an increase in dry periods; (2) rapidly increasing temperatures causes deteriorating suitability conditions for many crops, poor water quality, and further drying in the wet season; and (3) increasing risk of heavy precipitation, flooding, and landslides cause destruction of crops, livestock, and infrastructures.	Low	Low
Mitigations: The design team's GCF project design experience ensures up-to-date IPCC models; and local and elevation meteorological data. GCF's review of the project design and climate risk assessment further reduces an error in assessing climate risk.		
Technical Soundness	***Moderate***	***Moderate***
Risk: Uncertainty regarding buy-in from the project beneficiaries and sustainability of service fee payment by water user committee.	Moderate	Moderate
Mitigations: Under component 1, the project will collaborate with all key stakeholders, including the agriculture development and financial institution in the target area to ensure that ultimate benefit is provided directly to the farmer. The project includes consultation directly with farmers on the benefits and on financing operations and maintenance (O&M).		
Risk: Institutional challenges in hiring government staff or procurement of feasibility studies. Delays in mobilization of consultants, consultation and surveys because of poor weather or COVID-19 containment measures.	Moderate	Moderate
Mitigations: Consider relevant modalities for staffing in project design and put in place necessary agreements and external staff to ensure effective delivery. Consultation with the stakeholders will take place before the start of the monsoon season (May) and surveys as part of the detailed design after the rainy season (from November). Consulting services for the feasibility study will take place during the monsoon months. Consultation and surveys are conducted by national consultants not affected international border closures due to COVID-19 containment.		
Institutional Capacity for Implementation and Sustainability	**Moderate**	**Moderate**
Implementation Arrangements	***Moderate***	***Moderate***
Risk: Insufficient project management capacity to successfully deliver project.	Moderate	Moderate
Mitigations: Component 2 includes technical support, training, and capacity development for PMU and PIUs (enhancing the institutional capacity of MOWRAM and PDWRAM).		
Risk: Financial management, Environment & Social and Procurement risks caused by significant turnover of staff as well as new PMU and PIUs	Moderate	Moderate

Mitigations: MOWRAM will consider additional stipend for provincial staff to secure stable human resources for the project. AIIB grant to MORWAM includes capacity building for procurement, noting that this is a key bottleneck for project delivery.		
Risk: Decentralized management in four provinces of mostly national contractors.	Moderate	Moderate
Mitigations: The PMU (at MOWRAM) organizationally directs the four PIUs located. The national contractors working for the PMU are explicitly directed by MOWRAM to work with the PIU's on local issues and consultations. The project includes an overall project management consultant based at the PMU and in the PIUs.		
Monitoring and Evaluation Arrangements	***Moderate***	***Moderate***
Risk: Insufficient capacity to collect sufficient / reliable data on project outcomes and impacts.	Moderate	Moderate
Mitigations: The Project includes a monitoring and evaluation (M&E) program that aligns with AIIB, IFAD's, GCF's and the GoC requirements. Consultants will be recruited to support the project implementation; to undertake detailed design services and construction supervision; and provide project management support to the PMU and the PIUs, including M&E. Third party evaluations verify the M&E data.		
Project Financial Management	**Substantial**	**Substantial**
Project Organization and Staffing	***Substantial***	***Substantial***
Risk: • Lack of experience in IFAD-funded operations/projects • Delay of recruitment of PMU/PIU staff, including finance staff. • Staff needs training on IFAD FM and disbursement procedures.	Substantial	Substantial
Mitigations: • Competitive and transparent selection of candidates. • Start-up training for FO. • Networking of FOs of IFAD-funded projects in Cambodia.		
Project Budgeting	***Substantial***	***Moderate***
Risk: • MOWRAM does not have experience in IFAD AWPB preparation • Delay of AWPB preparation due to challenges related to coordination between PMU and PIU. • Budget may not be closely monitored due to lack of expertise and necessary systems.	Substantial	Moderate
Mitigations: • Training on preparation of AWPB. • Customized accounting software to monitor budget vs actual will be introduced within 6 months of the entry into force of the project.		
Project Funds Flow/Disbursement Arrangements	***Moderate***	***Moderate***

Risk: • Delay in the preparation and submission of IFR and WA to IFAD •	Moderate	Moderate
Mitigations: • MOWRAM and NCCD will cooperate to prepare and consolidate IFR, and then WA can be submitted to IFAD promptly. • Training on IFR and ICP will be conducted at the start-up.		
Project Internal Controls	***Substantial***	***Substantial***
Risk: • PEFA: Effectiveness of internal audit was rated C Internal Audit Department be established in each ministry and state enterprise and report to its head, with a copy to the National Audit Authority. • Risk of unclear role, responsibility, and delegation. • Risk of insufficient controls for detecting fraud.	Substantial	Substantial
Mitigations: • PIM will be approved at the project inception. • IFAD anti-corruption training will be conducted at the start-up. • PMU and PIU will follow the internal control procedures from Government Standard Procedures (SOP) for internationally funded projects. • PMU/PIU will be subject to line-ministry inspection on internal control and procurement.		
Project Accounting and Financial Reporting	***Substantial***	***Substantial***
Risk: • PMU/PIU will apply the Cambodia Public Sector Accounting Standard (cash basis). • Standard accounting software shall be used for PMU/PIU and be compatible with IFAD and other donors' financial reporting requirements.	Substantial	Substantial
Mitigations: • Ensure the Accounting software is installed, customized, and capable of providing the financial information for IFR. • IFR training will be conducted at the project start-up.		
Project External Audit	***Substantial***	***Substantial***
Risk: • External Auditors may not follow standard TOR and audit contract requirements.	Substantial	Substantial
Mitigations: • Audit TOR will be reviewed by IFAD and cleared. Coordination with MEF will be essential to ensure compliance with IFAD audit requirements.		
Project Procurement	**Moderate**	**Moderate**
B.1 Assessment of Project Complexity	***Moderate***	***Moderate***

Risk: - There are some medium/large irrigation infrastructure and facility investments (with the estimated cost above US$ 10 million per irrigation system) using AIIB financing under Sub-component 2.1. – Modernization of irrigation scheme and ponds. - The project is classified with High SECAP risks, based on the SECAP screening tool.	Moderate	Moderate
Mitigations: - Procurement using AIIB financing will be oversight by AIIB and will comply with AIIB's Procurement Policy (2016) and AIIB's Interim Operational Directive on Procurement Instructions for Recipients (2016). - The PIM shall include a clear list of procurement actions needed to address the project's environmental, social and climate risks and adverse impacts, as identified in the SECAP review note. Each of the risks flagged as relevant for procurement in the ORMS SECAP Screening Tool need to be addressed in the PIM.		
B.2 Assesment of Implementing Agency Capacity	***Low***	***Low***
Risk: - Procurement planning process is in general effective and in consistence with IFAD's requirements, except constraints in preparation of procurement strategy. - Procurement Management and Contract Administration systems and internal control /audit procedures are generally in consistence with IFAD's requirements.	Low	Low
Mitigations: - Conduct prior reviews of the draft procurement plans to ensure compliance with the PAL, addressing procurement risks and value for money. The project procurement strategy developed at the project design stage will be updated and used for preparation of annual procurement plans. - Include IFAD's templates of self-certification forms and in the bidding document/RFP and contract documents. - Incorporate IFAD SECAP requirements into Standard bidding documents and contract documents.		
Project Procurement Overall	***Moderate***	***Moderate***
Risk: - Public procurement in Cambodia is governed by well-drafted legislation, rules and guidelines, designed to create a coordinated and robust procurement framework consistent with international best practices. All public procurement is organized by the Committee of Public Procurement at each relevant institution. These institutions include government ministries, national bodies, public enterprises, administrative institutions and sub-national administrations. - Overall, the public procurement system operates with integrity, that has appropriate controls, and that has anti-corruption measures in place. There are some constraints on application of e-procurement, access to information by the public, monitoring procurement performance, effective sanction and enforcement system, and training to conduct procurement audit. - There are some medium/large irrigation infrastructure and facility investments (with the estimated cost above US$ 10 million per irrigation system) using AIIB financing under Sub-component 2.1. – Modernization of irrigation scheme and ponds. - The project is classified with High SECAP risks, based on the SECAP screening tool. - Procurement planning process is in general effective and in consistence with IFAD's requirements, except constraints in preparation of procurement strategy.	Moderate	Moderate

Mitigations: - Upload information on procurement plans, contract awards on IAs/project websites. - Using IFAD's online procurement end-to-end system (OPEN) and ICP Contract Monitoring Tool for monitoring project procurement activities. - Include IFAD's templates of self-certification forms for bidders and contractors in the bidding document/RFP and contract documents. - Conduct capacity building programs for internal auditors at government agencies. - Procurement using AIIB financing will be oversight by AIIB and will comply with AIIB's Procurement Policy (2016) and AIIB's Interim Operational Directive on Procurement Instructions for Recipients (2016). - Each of the risks flagged as relevant for procurement in the ORMS SECAP Screening Tool need to be addressed in the PIM. - Conduct prior reviews of the draft procurement plans to ensure compliance with the PAL, addressing procurement risks and value for money. - Include IFAD's templates of self-certification forms and in the bidding document/RFP and contract documents. - Incorporate IFAD SECAP requirements into Standard bidding documents and contract documents.		
A.1 Legal, Regulatory and Policy Framework	***Moderate***	***Moderate***
Risk: The legal, regulatory and policy framework is sufficiently clear and integrated into international procurement practices. There are certain constraints on the application of electronic public procurement and sustainable public procurement.	Moderate	Moderate
Mitigations: IFAD may assist MEF to prepare a mandatory nationwide program for procurement staff training in public procurement, and contract management. Procurement Law may be amended to require procuring agencies regularly update reports and disclose information related to procurement processes including contract awards on their website and such information may be made available to interest bidders, when required. - Upload information on procurement plans, contract awards and resolution of procurement complaints on IAs/project websites. - Using IFAD's web-based procurement management and tracking systems (OPEN and ICP Contract Monitoring Tool) for monitoring project procurement activities. - IFAD SECAP policy and procedures to be integrated in the national bidding documents.		
A.2 Institutional Framework and Management Capacity	***Moderate***	***Moderate***
Risk: The institutional framework and public procurement management capacity are moderately satisfactory, taking into account the existing constraints in terms of e-procurement, centralized procurement body and monitoring of procurement performance. The MEF serves as the Center and focal point of all the public procurement and oversights the procurement carried out by the respective agencies. The role of MEF, in addition to the responsibility to manage and control public procurement, is to provide guidance and support and play a mentor and facilitator's role in the identification, formulation, implementation and completion of development projects in Cambodia.	Moderate	Moderate
Mitigations: Training, capacity building and the use of IFAD procurement tools can improve the implementation of funded projects. - Develop the online national procurement portal including a module for procurement data management. - Using IFAD's online procurement end-to-end system (OPEN) and ICP Contract Monitoring Tool for monitoring project procurement activities.		
A.4 Accountability, Integrity and Transparency of the Public Procurement System	***Moderate***	***Moderate***

Risk: Overall, the public procurement system operates with integrity, has appropriate controls and anticorruption measures. There are some constraints in terms of public access to information, engagement of civil society in the consultative process for the development of procurement policies, provisions on fraud, corruption and others prohibited practices in accordance with IFAD policies, and training to conduct procurement audits.	Moderate	Moderate
Mitigations: IFAD to collaborate with MEF to establish best practices across Cambodia; namely transparent and open institutions, citizen participation, private sector engagement, collaboration with oversight institutions as well as inclusive and fair competition to facilitate the multi-stakeholder approach. - Include IFAD's templates of self-certification forms for bidders and contractors in the bidding document/RFP and contract documents. - Conduct capacity building programs for internal auditors at government agencies. - Upload information on procurement plans, contract awards on IAs/project websites.		
A.3 Public Procurement Operations and Market Practices.	***Low***	***Low***
Risk: There is a reasonably well functioning private sector, but competition for large contracts is concentrated in a relatively small number of firms. Associations of consultants and contractor also exist in the country.	Low	Low
Mitigations:		
Environment, Social and Climate Impact	**High**	**High**
Biodiversity Conservation	***Moderate***	***Moderate***
Risk: Project activities entail risks to biodiversity conservation, as infrastructure upgrades could contribute to habitat disturbance and fragmentation, particularly during the construction phase. For instance, road rehabilitation and increased traffic flow may disrupt ecological corridors or lead to indirect effects such as increased human intrusion or wildlife collisions. Similarly, the use, storage, and disposal of hazardous materials pose risks of soil and water contamination that could degrade sensitive ecosystems and aquatic habitats, especially near community fish refuges and biodiversity hotspots identified around the project's subcommand areas.	Moderate	Moderate
Mitigations: To address the risks in relation to biodiversity, the project incorporates a comprehensive set of mitigation measures within the sub-project ESCMPs, including the application of environmental codes of practice during construction, strict controls on the handling and disposal of hazardous materials, and careful planning of rural road alignments to avoid ecologically sensitive areas. Additionally, the project will implement a Biodiversity Management Planning Framework to guide site-specific assessments and protection measures during subproject preparation. The SECAP instruments developed—such as the Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plans (ESMPs), and screening checklists—ensure that biodiversity considerations are integrated into all stages of project design and implementation. These tools help prevent or minimize habitat disturbance, protect critical ecosystems, and promote compliance with national legislation and international best practices.		
Resource Efficiency and Pollution Prevention	***High***	***High***

Risk: The project activities include the potential release of pollutants from construction activities and agricultural intensification, such as fuel, wastewater, dust, and agrochemical runoff, which may degrade soil and water quality. The development and rehabilitation of irrigation infrastructure will result in significant extraction or diversion of surface and groundwater, with possible consequences for local ecosystems and water availability downstream. The use of agrochemicals further amplifies the risk of contamination, particularly if not managed through integrated pest and nutrient management practices. Additionally, the project involves energy and material consumption for infrastructure and agricultural production, raising resource efficiency challenges.	High	High
Mitigations: The project includes several targeted actions in its ESCMF to address this risk, including the development and implementation of site-specific Environmental and Social Management Plans (ESMPs) that mandate proper handling, storage, and disposal of hazardous substances such as fuels, agrochemicals, and wastewater. Integrated Pest and Nutrient Management Plans will be promoted to reduce dependence on harmful agrochemicals and minimize runoff into water bodies. Water use efficiency will be enhanced through the adoption of climate-smart irrigation technologies, such as alternate wetting and drying (AWD) for rice and drip irrigation systems, which help conserve water and reduce over-extraction from surface and groundwater sources. Energy and raw material use will be optimized by promoting renewable energy solutions and low-carbon infrastructure designs. Contractors will be required to follow Environmental Codes of Practice (ECOPs) and conduct regular monitoring to ensure compliance with pollution prevention measures. These actions are complemented by farmer training, awareness campaigns, and institutional capacity building to ensure long-term adoption of sustainable practices.		
Cultural Heritage	***Moderate***	***Moderate***
Risk: The project presents moderate risks to cultural heritage, primarily due to its potential to inadvertently affect sites or landscapes of historical, archaeological, or spiritual significance. Construction-related activities—such as earthworks, canal excavation, and infrastructure development—could disturb or damage archaeological remains, sacred sites, or culturally significant natural features. There is also the possibility of altering culturally important landscapes or triggering adverse impacts even in areas not previously identified as heritage-sensitive.	Moderate	Moderate
Mitigations: To address this risk, the project will implement a set of preventive and responsive measures embedded in the ESCMF, including the application of a Chance Finds Procedures. Site selection and infrastructure design will be informed by pre-construction cultural heritage assessments, conducted in close coordination with local authorities and communities to identify and avoid culturally significant areas. Contractors will be trained on heritage sensitivity and required to follow Environmental Codes of Practice that incorporate heritage protection protocols. Moreover, the project will maintain continuous community engagement, especially with Indigenous Peoples and local custodians of cultural knowledge, to ensure that traditional practices, sacred sites, and intangible heritage are respected and integrated into planning decisions. These actions are designed to prevent damage, foster cultural inclusion, and uphold national and international standards on heritage protection.		
Indigenous People	***Moderate***	***Moderate***
Risk: The project recognizes the presence of Indigenous Peoples in project area of influence, which may require proactive measures to safeguard their rights, territories, and traditional livelihoods. Although the likelihood of adverse impacts on Indigenous Peoples is considered unlikely, the potential severity of impacts is moderate, particularly concerning land access, cultural integrity, and resource use.	Moderate	Moderate

Mitigations: To address these risks, the project requires the preparation and implementation of a Free, Prior, and Informed Consent (FPIC) Implementation Plan. The FPIC plan will ensures meaningful consultation in culturally appropriate ways, and that consent is obtained prior to any activity affecting them. Additionally, the Indigenous Peoples Planning Framework (IPPF) provides the basis for inclusive planning, outlining procedures for social screening, engagement, and tailored benefit-sharing mechanisms. Mitigation actions include documenting customary land tenure, safeguarding cultural sites, and incorporating Indigenous knowledge into project design and implementation. Where needed, specific Indigenous Peoples Plans (IPPs) will be developed for subprojects, ensuring culturally appropriate mitigation and development benefits .		
Labour and Working Conditions	***Moderate***	***Moderate***
Risk: The project presents risks related to labor and working conditions, particularly concerning child labor, forced labor, and occupational health and safety (OHS). Working conditions may expose workers to hazardous substances, dangerous equipment, or extreme environmental conditions. Specific risks include the potential employment of children under the national minimum age in farming activities, informal labor with no contractual protections, and unsafe exposure to pesticides or mechanized tools by smallholder farmers and laborers.	Moderate	Moderate
Mitigations: To mitigate these risks, the project will implement a suite of measures, in line with IFAD's labor standards and national regulations. These include: (i) mandatory compliance with national labor laws and international labor conventions, particularly on minimum age and forced labor; (ii) the preparation of labor management procedures that define standards for recruitment, grievance redress, and working conditions; (iii) training and awareness-raising for implementing partners, contractors, and farmers on acceptable labor practices and occupational safety protocols; and (iv) the promotion of safe and mechanization-appropriate technologies and personal protective equipment (PPE). In addition, the ESCMF calls for due diligence across the value chain, including subproject screening for labor risks, integration of mitigation measures in Environmental and Social Management Plans (ESMPs), and active monitoring of labor practices during implementation. The project will also establish worker grievance mechanisms to report labor-related concerns anonymously and without retaliation.		
Community health, safety and security	***Moderate***	***Moderate***
Risk: The project activities entail risks to community health and safety, primarily due to potential exposure to hazardous materials, increased traffic, labour influx, and gender-based violence (GBV). The transport and use of hazardous substances (e.g., fuel, agrochemicals) during construction and agricultural activities could pose risks of spills, contamination, or accidental exposure to local populations. Rehabilitation of rural roads is expected to lead to increased traffic and changes in flow patterns, which may heighten the risk of accidents and road-related injuries. Additionally, the anticipated influx of project workers—although assessed as low in scale—could disturb local social dynamics and elevate the risk of sexual harassment, exploitation, and GBV, particularly in vulnerable or remote communities. Public health concerns are also flagged due to the possible transmission of vector-borne and communicable diseases, especially in areas with poor waste and water management.	Moderate	Moderate

Mitigations: The project includes measures to address and manage the risks in this aspect. Specific mitigation measures, including: the adoption of hazardous materials management protocols, road safety and traffic management plans, community sensitization on health and safety, and the development of a GBV Action Plan with survivor-centered support mechanisms and grievance pathways will be implemented, as well as continuous stakeholder management activities to ensure consultation wilth local stakeholders consistently address these issues.		
Physical and Economic Resettlement	***High***	***High***
Risk: The project is expected to involve both physical and economic displacement due to land acquisition for irrigation schemes, rural roads, and related infrastructure. According to the risk screening, physical displacement is considered almost certain and severe, particularly for households without legally recognized land rights, while economic displacement—such as loss of access to land, water, or livelihood resources—is deemed substantial. Although forced evictions are not anticipated, the project may lead to changes in land tenure arrangements and impact customary or community-based property rights.	High	High
Mitigations: The project has developed a Land Acquisition and Resettlement Planning Framework (LARPF) which outlines all measures that will be implemented to ensure that the risks in relation to resettlement are systematically identified and managed consistent with the requirements of IFAD, AIIB and national requirements, Tge LARPF also provides guidance regarding Voluntary Land Donation (VLD), to ensure it is conducted under strict conditions. The preparation of Resettlement Action Plans (RAPs) for subprojects involving displacement, and compensation at full replacement cost will also consider livelihood restoration for affected persons and recognize customary tenure systems, particularly for vulnerable groups such as Indigenous Peoples and ethnic minorities. Continuous stakeholder engagement specific to address this risk will be maintained with all relevant stakeholders, and affected communities in particular to ensure their needs and views are considered throughout the process.		
Greenhouse Gas Emissions	***Low***	***Low***
Risk: Rice is a major source of GHG emissions in the AFOLU sector in Cambodia, owing to the practice of continuous flooding in the cultivation season (water is drained only when there are threats of floods) and the use of fertilizers in excess and unadjusted to local soil conditions. There is also some use of compost. Sustainable intensification practices are limited, and rice yields are also the lowest in Asia – implying that GHG emission intensity is on the higher end (i.e., yield-scaled emissions are likely high). Fertilizer use for non-rice crops also contributes to Cambodia's agricultural GHG emissions. Finally, farmers resort to using diesel pumps to irrigate their rice fields because (a) gravity systems is insufficient / unfeasible or (b) meet irrigation requirements during the dry season and dry days of the wet season.	Low	Low

Mitigations: The project aims to support rice and other agricultural production to achieve food security and agricultural sector growth, without compromising on Cambodia's GHG emission reduction targets outlined in its NDCs. The project will enable increased cropping intensity and rice productivity through (a) management practices (e.g., increased and appropriate use of compost, system of rice intensification - SRI, alternate wetting and drying - AWD, drip irrigation, land leveling), (b) deployment of solar irrigation as an alternate to diesel pumping systems, and (c) timely and relevant CIEWS, improved irrigation schemes, and water user governance capacity to inform irrigation scheduling and improve water-use efficiency, which can improve yields without increasing rice cultivation area and underpin practices such as AWD. Innovations such as the reclamation of rice straw for production of mushrooms will also be supported. Similarly, diversification into, and sustainable intensification of, non-rice crops and aquaculture / poultry production will also be promoted. The combination of these transitions is expected to reduce GHG emissions, in addition to contributing to climate change adaptation and resilience. EX-ACT analysis has been completed, with a clear outline of assumptions.		
Vulnerability of target populations and ecosystems to climate variability and hazards	***Substantial***	***Substantial***
Risk: The target populations and ecosystems are highly vulnerable to the impacts of climate change.	Substantial	Substantial
Mitigations: The project objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities. The project activities will be informed by a rigorous climate risk analysis and climate rationale to ensure a good integration of locally adapted resilient practices and technologies and avoid any risks of maladaptation. This is presented in the Climate Context section of GCF proposal (IFAD Targeted Adaptation Assessment), including identification and prioritization of relevant adaptation measures. The project will not increase the exposure or vulnerability of target populations' livelihoods, ecosystems, economic assets or infrastructure to climate variability and hazards.		
Stakeholders	**Moderate**	**Moderate**
Stakeholder Engagement/Coordination	***Moderate***	***Moderate***
Risk: Insufficient consultation / engagement with stakeholders on key project interventions	Moderate	Moderate
Mitigations: Stakeholder engagement based on ACs, with governance benchmarks including consultation and engagement to be achieved as criteria for investments.		
Stakeholder Grievances	***Moderate***	***Moderate***
Risk: No effective channel established for investigation and redress of stakeholder grievances.	Moderate	Moderate
Mitigations: Multi-level grievance redress mechanism to be established and information made available to project affected persons through multiple channels (online, information leaflets, meetings).		

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex 11: Country Level Policy Engagement

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

IFAD Design Guidelines Annex XVII: Green Climate Fund (GCF) Cofinancing Projects

Requirement for DRM Meetings:

1. Updated Decision Memo for co-financing GCF projects for DRM
2. GCF Funding Proposal (FP)
3. Results framework from GCF (with IFAD core indicators clearly integrated)
4. Annex (IFAD standard requirement at DRM): Theory of change
5. Annex (IFAD standard requirement at DRM): First Annual Work Plan and Budget (AWPB) for first 18 months
6. Annex (IFAD standard requirement at DRM): Integrated Project Risk Matrix (IPRM)
7. Annex (IFAD standard requirement at DRM): Exit Strategy
8. Annex (IFAD standard requirement at DRM): Mainstreaming Tool
9. GCF Annex 1: NDA no-objection letter(s) (template provided) (mandatory)
10. GCF Annex 2: Feasibility study - and a market study, if applicable (mandatory)
11. GCF Annex 3 (and also IFAD standard requirement at DRM): Economic and Financial Analysis (mandatory)
12. GCF Annex 4 (and also IFAD standard requirement at DRM): Detailed budget plan (template provided) (mandatory)
13. GCF Annex 5. Implementation timetable including key project/programme milestones (template provided) (mandatory)
14. GCF Annex 6: SECAP (ESS disclosure form provided): Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (ESMP) or Environmental and Social Management System (ESMS), or Others (e.g. Resettlement Action Plan, IP Plan, Gender Plan, Land Acquisition Plan, etc.) (mandatory)
15. GCF Annex 7: Summary of consultations and stakeholder engagement plan (mandatory)
16. GCF Annex 8: Gender assessment and project level action plan (template provided) (mandatory)
17. GCF Annex 9: Legal Due Diligence (Regulation, Taxation and Insurance) (mandatory)
18. GCF Annex 10 (and also IFAD standard requirement at DRM): Procurement Plan for first 18 months (template provided) (mandatory)
19. GCF Annex 11: Monitoring and evaluation plan (template provided) (mandatory)
20. GCF Annex 12: AE fee request (template provided) (mandatory)
21. GCF Annex 13: Co-financing commitment letter, if applicable (template provided) (mandatory)
22. GCF Annex 14: Term sheet including a detailed disbursement schedule and, if applicable, repayment schedule (mandatory)
23. GCF annex 21 (and also IFAD standard requirement at DRM): Project Implementation Manual (PIM)
24. GCF Annex 22. Assessment of GHG emission reductions and their monitoring and reporting (for mitigation and cross cutting-projects) (Annex 22 is mandatory for mitigation or cross-cutting projects)

Inputs needed for ORMS

1. Project Identification Form (PIF)
2. Integrated Integrated Project Risk Matrix (IPRM)
3. Logframe core IFAD indicators
4. Mainstreaming Validation (done after DRM, before final endorsement)

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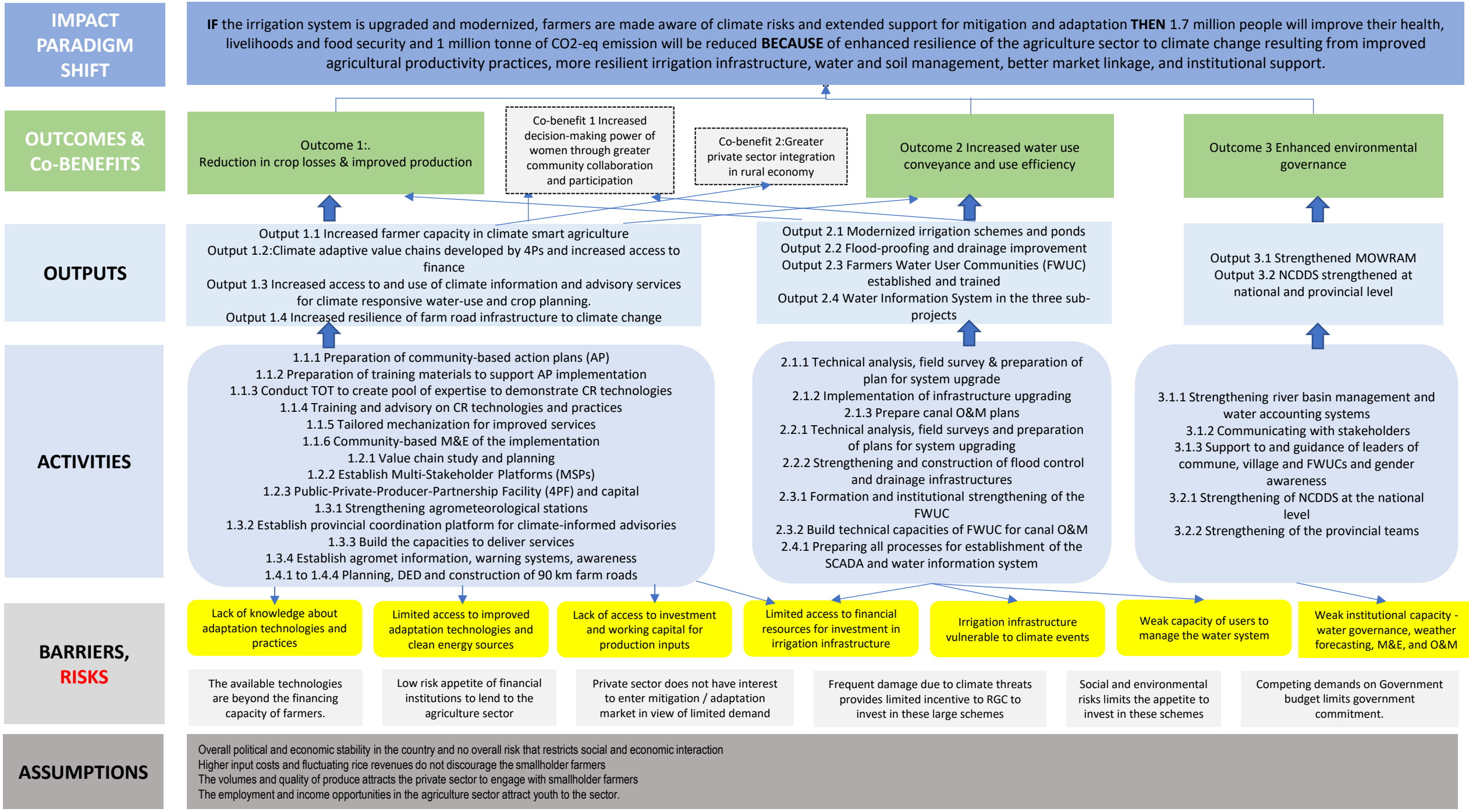
Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: Theory of Change GCF approved

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department


IMPACT PARADIGM SHIFT
IF the irrigation system is upgraded and modernized, farmers are made aware of climate risks and extended support for mitigation and adaptation THEN 1.7 million people will improve their health, livelihoods and food security and 1 million tonne of CO2-eq emission will be reduced BECAUSE of enhanced resilience of the agriculture sector to climate change resulting from improved agricultural productivity practices, more resilient irrigation infrastructure, water and soil management, better market linkage, and institutional support.
OUTCOMES & Co-BENEFITS
Outcome 1:. Reduction in crop losses & improved production
Co-benefit 1 Increased decision-making power of women through greater community collaboration and participation
Co-benefit 2:Greater private sector integration in rural economy
Outcome 2 Increased water use conveyance and use efficiency
Outcome 3 Enhanced environmental governance
OUTPUTS
Output 1.1 Increased farmer capacity in climate smart agriculture
Output 1.2:Climate adaptive value chains developed by 4Ps and increased access to finance
Output 1.3 Increased access to and use of climate information and advisory services for climate responsive water-use and crop planning.
Output 1.4 Increased resilience of farm road infrastructure to climate change
Output 2.1 Modernized irrigation schemes and ponds
Output 2.2 Flood-proofing and drainage improvement
Output 2.3 Farmers Water User Communities (FWUC) established and trained
Output 2.4 Water Information System in the three sub-projects
Output 3.1 Strengthened MOWRAM
Output 3.2 NCDDS strengthened at national and provincial level
ACTIVITIES
1.1.1 Preparation of community-based action plans (AP)
1.1.2 Preparation of training materials to support AP implementation
1.1.3 Conduct TOT to create pool of expertise to demonstrate CR technologies
1.1.4 Training and advisory on CR technologies and practices
1.1.5 Tailored mechanization for improved services
1.1.6 Community-based M&E of the implementation
1.2.1 Value chain study and planning
1.2.2 Establish Multi-Stakeholder Platforms (MSPs)
1.2.3 Public-Private-Producer-Partnership Facility (4PF) and capital
1.3.1 Strengthening agrometeorological stations
1.3.2 Establish provincial coordination platform for climate-informed advisories
1.3.3 Build the capacities to deliver services
1.3.4 Establish agromet information, warning systems, awareness
1.4.1 to 1.4.4 Planning, DED and construction of 90 km farm roads
2.1.1 Technical analysis, field survey & preparation of plan for system upgrade
2.1.2 Implementation of infrastructure upgrading
2.1.3 Prepare canal O&M plans
2.2.1 Technical analysis, field surveys and preparation of plans for system upgrading
2.2.2 Strengthening and construction of flood control and drainage infrastructures
2.3.1 Formation and institutional strengthening of the FWUC
2.3.2 Build technical capacities of FWUC for canal O&M
2.4.1 Preparing all processes for establishment of the SCADA and water information system
3.1.1 Strengthening river basin management and water accounting systems
3.1.2 Communicating with stakeholders
3.1.3 Support to and guidance of leaders of commune, village and FWUCs and gender awareness
3.2.1 Strengthening of NCDDS at the national level
3.2.2 Strengthening of the provincial teams
BARRIERS, RISKS
Lack of knowledge about adaptation technologies and practices
Limited access to improved adaptation technologies and clean energy sources
Lack of access to investment and working capital for production inputs
Limited access to financial resources for investment in irrigation infrastructure
Irrigation infrastructure vulnerable to climate events
Weak capacity of users to manage the water system
Weak institutional capacity - water governance, weather forecasting, M&E, and O&M
The available technologies are beyond the financing capacity of farmers.
Low risk appetite of financial institutions to lend to the agriculture sector
Private sector does not have interest to enter mitigation / adaptation market in view of limited demand
Frequent damage due to climate threats provides limited incentive to RGC to invest in these large schemes
Social and environmental risks limits the appetite to invest in these schemes
Competing demands on Government budget limits government commitment.
ASSUMPTIONS
Overall political and economic stability in the country and no overall risk that restricts social and economic interaction
Higher input costs and fluctuating rice revenues do not discourage the smallholder farmers
The volumes and quality of produce attracts the private sector to engage with smallholder farmers
The employment and income opportunities in the agriculture sector attract youth to the sector.

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 09. Annex 1 No Objection Letter From Moe Nda

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Report No.	7034-KH

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Programme Management Department

KINGDOM OF CAMBODIA
Nation Religion King

Ministry of Environment
Nº :.....1452/0225.....MoE

Phnom Penh, 24 - February - 2025

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Yeonsu-gu, Incheoun 22004
Republic of Korea

Re: Funding proposal for the GCF by IFAD regarding Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR)

Dear Ms. Duarte,

We refer to the project titled CAISAR in Cambodia as included in the funding proposal submitted by IFAD to us on 18 February 2025. The undersigned is the duly authorized representative of Ministry of Environment, the National Designated Authority of Cambodia. Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the project as included in the funding proposal.

By communicating our no-objection, it is implied that:

(a) The government of Cambodia has no-objection to the project as included in the funding proposal;
(b) The project as included in the funding proposal is in conformity with the national priorities, strategies and plans of Cambodia;
(c) In accordance with the GCF's environmental and social safeguards, the project as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the project as included in the funding proposal has been duly followed.

We acknowledge that this letter will be made publicly available on the GCF website.

Please, **Ms. Duarte**, accept the assurances of my consideration and regards.

Sincerely Yours,
Minister

EANG Sophalleth

IFAD
Investing in rural people

Cambodia

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: Annex 6 Caisar Escmf

Document Date:	28/07/2025
Project No.	2000003926
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Asia and the Pacific Division
Programme Management Department

KING DOM OF CAMBODIA

Nation − Religion − King

MINISTRY OF WATER RESOURCES AND METEOROLOGY

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience Project

Annex 6

ENVIRONMENTAL, SOCIAL AND CLIMATE MANAGEMENT FRAMEWORK

Version 2

30 September 2023

ACKNOWLEDGEMENTS

The CAISAR project is composed of three sub-project command areas – Ou Ta Paong, in Pursat Province, Lum Hach, in Kampong Chhnang Province and Krang Ponley in Kampong Chhnang, Kapong Speu and Kandal This ESCMF report was submitted by the Cambodia Ministry of Water Resources and Meteorology (MOWRAM) (Accredited Entity) for GCF financing under the CAISAR project. The report was prepared by Ron Livingston (CAISAR SECAP Team Leader) with key inputs from Tuan Anh Le (CAISAR SECAP Gender and Social Safeguards Expert); Sopheak Kong (CAISAR SECAP National Deputy Team Leader) and Socheat Penh (CAISAR SECAP National Environmental Expert under the overall guidance of his H.E. Chann Sinath, MOWRAM AIIB Project Director; Ms. Bo Zhang, CAISAR Project Team Leader, Investment Operations Officer, AIIB; and Mr. Frew Behabtu, Country Director for Cambodia, IFAD.

The ESCMF report should be read in conjunction with the other safeguards documents (Stakeholder Engagement Plan, Resettlement Planning Framework, Indigenous Peoples Planning Framework, Gender Assessment & Social Action Plan, and Environmental and Social Impact Assessment).

Assessment of environmental and social risks and impacts, both inherent and project-related, was based on supporting background reports, desk reviews of literature and similar projects, and extensive consultation during the project design. Many consultations with National, Provincial and District agencies and community members in project communes have been undertaken on the various aspects of the CAISAR project. The first round of consultations specific to the ESCMF were conducted during June 2023. We are grateful to the focal points of four project provinces who worked hard to support the introduction of the planned projects and discussions on the planned objectives, outcomes and benefits. Without their commitment and active support in leading the extensive consultation effort, the consultations would not have been possible.

We are grateful to each and every member of the target communities from the communes and districts of the four project provinces who participated in various consultation sessions. Their important insights about their respective communities and suggestions to the project's design are key to its success. The information they provided was extremely helpful for guiding the focus, design, and planned implementation of the project interventions.

We also thank colleagues and reviewers for their insights, comments, and suggestions, including: Mr. Sheikh Naveed Ahmed, AIIB Social Safeguard Specialist, Ms. Xinchen Zhang, AIIB Environmental Safeguard Specialist, Mr. Rahul Srivastava, AIIB Senior Environment Specialist, Ms. Alessandra Gage, FAO Environment Officer (Climate Change), and Susmita Bandyopadhyay, IFAD Safeguards Specialist for Asia & Pacific Region and many other colleagues whose comments and suggestions have enhanced the quality of the safeguard reports.

ABBREVIATIONS

4P	Public–Private–Producer Partnership
AIIB	Asian Infrastructure Investment Bank
AVC	Agricultural Value Chain
BAU	Business-as-usual
CFM	Community Forest Management
CIG	Community Interest Group
COVID-19	Severe Acute Respiratory Syndrome Coronavirus 2
EM	Ethnic Minority
ESMP	Environmental & Social Management Plan
ESS	Environmental & Social Standards
FA	Farmers Association
FC	Farmers' Cooperative
FAO	Food and Agriculture Organization of the United Nations
FLA	Forest Land Allocation
FGD	Focus Group Discussion
FHH	Female-Headed Household
FPIC	Free, Prior, Informed Consent
FWUC	Farmer Water Users Community
GASIP	Gender Action and Social Inclusion Plan
GCF	Green Climate Fund
GBV	Gender Based Violence
GRM	Grievance Redress Mechanism
HHS	Household Survey
IEC	Information, Education and Communication
IFAD	International Fund for Agricultural Development
IPP	Indigenous Peoples' Plan
KII	Key Informant Interview
MOWRAM	Ministry of Water Resources and Meteorology
NDC	Nationally Determined Contribution

NTFP	Non-Timber Forest Products
OCOP	One Commune, One Product
OHS	Occupation Health and Safety
PFES	Payment for Forest Environmental Services
PMU	Project Management Unit
SDP	socio-economic development planning
SEA/SH	Sexual Exploitation and Abuse/Sexual Harassment
SECAP	Social, Environmental, and Climate Assessment Procedures
SEP	Stakeholder Engagement Plan
PMU	Project Management Board
VAC	Violence Against Children

Table of Contents

Acknowledgements ii

Abbreviations iii

List of Figures ix

Executive Summary x

1. Introduction 1

1.1 Project Rationale 1

1.2 Country & Project Context 1

1.2.1 Climate Change Impacts and Vulnerability of the Agriculture Sector 4

1.3 Purpose and Application of the ESCMF 7

1.4 Scope of the ESCMF 8

2. Project description 10

2.1 Project Objective, Components, Area and Beneficiaries 10

2.2 Component 1: Improving farm-level climate adaptation, resilience, and water use efficiency 10

2.3 Component 2. Upgrading and climate-proofing water infrastructure for increased resilience 12

2.4 Component 3. Institutional Strengthening 14

3. Policy, Legal and Administrative Framework 15

3.1 Applicable National Laws and Regulations 15

3.1.1 Laws/Sub-Decrees relevant to Environment and Natural Resources Management 15

3.1.2 EIA Classification 22

3.1.3 Occupational and Community Safety and Health 23

3.1.4 Applicable Evaluation Ambient Quality Standards 24

3.1.5 International Conventions 26

3.2 Application of AIIB, IFAD and GCF Environmental, Social, and Climate Risks Standards/Procedures 26

3.2.1 AIIB's Environmental and Social Framework 26

3.2.2 AIIB's Environmental and Social Standards 27

3.2.3 Environmental and Social Standard 1: Environmental and Social Assessment and Management Scope and Application 27

3.2.4 Environmental and Social Standard 2: Land acquisition and involuntary resettlement 27

3.2.5 Environmental and Social Standard 3: Indigenous Peoples 27

3.2.6 Application of IFAD and GCF Environmental, Social, and Climate Risks Standards/Procedures 28

3.2.7 SECAP's Environment and Social Standards (ESSs) are described as below: 28

3.3 Gap Analysis and Gap Filling Measures 31

3.3.1 Environmental, Social and Climate Assessment in Cambodia 33

3.3.2 Labor and Working Conditions in Cambodia 33

4. ENVIRONMENT, SOCIAL & CLIMATE ASSESSMENT **35**

4.1 Project Objective, Components, Areas and Beneficiaries *35*

4.2 Project Area *35*

4.3 Project target areas and beneficiaries *41*
4.3.1 Krang Ponley 41
4.3.2 Lum Hach 41
4.3.3 Ou Ta Paong 41

4.4 Socio-economic context and vulnerability *43*

4.5 Agriculture *44*

4.6 Water Resources *45*

4.7 Irrigation *46*

4.8 Biodiversity *47*
4.8.1 Designated areas and species of interest 47
4.8.2 IBAT Initial Biodiversity Assessment 51
4.8.3 Protected Areas, Key Biodiversity Areas and IUCN Threatened Species 52

4.9 Assessment of Environmental, Social and Climate Risks, Impacts and Mitigation Measures *56*
4.9.1 Pre-Construction Phase 56
4.9.1.1 Environmental Risks and Impacts (Pre-construction Phase) 56
4.9.1.2 Social Risks and Impacts (Pre-construction Phase) 56
4.9.1.3 Climate Risks and Impacts (Pre-construction Phase) 57
4.9.1.4 Environmental Mitigation Measures (Pre-construction Phase) 57
4.9.1.5 Social Mitigation Measures (Pre-construction Phase) 58
4.9.1.6 Climate Mitigation and Adaptation Measures (Pre-construction Phase) 58
4.9.2 Construction Phase 59
4.9.2.1 Environmental Risks and Impacts (Construction Phase) 59
4.9.2.2 Social Risks and Impacts (Construction Phase) 59
4.9.2.3 Climate Risks and Impacts (Construction Phase) 59
4.9.2.4 Environmental Mitigation Measures (Construction Phase) 60
4.9.2.5 Social Mitigation Measures (Construction Phase) 60
4.9.2.6 Climate Mitigation and Adaptation Measures (Construction Phase) 61
4.9.3 Operations Phase 61
4.9.3.1 Environmental Risks and Impacts (Operations Phase) 61
4.9.3.2 Social Risks and Impacts (Operations Phase) 62
4.9.3.3 Climate Risks and Impacts (Operations Phase) 62
4.9.3.4 Environmental Mitigation Measures (Operations Phase) 63
4.9.3.5 Social Mitigation Measures (Operations Phase) 63
4.9.3.6 Climate Mitigation and Adaptation Measures (Operations Phase) 63
4.9.4 Positive Environmental, Social and Climate Impacts 64
4.9.4.1 Positive Environmental Impacts 64
4.9.4.2 Positive Social Impacts 64
4.9.4.3 Positive Climate Impacts 65

5. PROCEDURES FOR REVIEW, CLEARANCE, AND IMPLEMENTATION OF SUBPROJECT E&S INSTRUMENTS **66**

5.1 Objective and Approach *66*

5.2 Key Steps *66*

5.3 E&S Risk and Impact Assessment *68*

5.4 Development of E&S Documents *68*
5.5 Review, Approval, and Disclosure of E&S Documents *68*
5.6 Implementation, Supervision, Monitoring, and Reporting *69*

6. IMPLEMENTATION ARRANGEMENTS **70**
6.1 Responsibility for ESCMF Implementation *70*
6.2 Project Implementation Organizations (Component 2) *70*
6.3 Project Implementation Organizations at Sub-National Level *73*
6.4 Provincial Department of Water Resources and Meteorology (PDWRAM) *73*
6.5 Project Implementation Organizations at Scheme Level *73*
6.6 Procurement *74*
6.7 Monitoring and Reporting Arrangements *75*
6.8 Incorporation of ESCMF into Project Operational Manual *76*

7. CAPACITY BUILDING, TRAINING, AND TECHNICAL ASSISTANCE **77**
7.1 Capacity Building for Efficient Project Management *77*
7.2 MOWRAM/ PMU and PDWRAM *77*
7.3 FWUC/FWUG/FWUSG *77*
7.4 Training and Technical Assistance *78*
7.5 Technical Assistance on E&S Capacity Building *78*

8. ESCMF IMPLEMENTATION BUDGET **80**

9. GRIEVANCE REDRESS MECHANISM (GRM) **83**
9.1 Objectives of the Project GRMs *83*
9.2 Summary of national legislation related to grievance and complaint *85*
9.3 Principles of the Project GRMs *85*
9.4.1 Redress Procedure for Complaints related to Land Acquisition 86
9.4 Project's Redress Procedures *86*
9.4.2 Redress Procedure for Complaints related to Labor and Working Conditions 87
9.4.3 Redress Procedure for Complaints related to SEA/SH/GBV 87
9.4.4 Redress Procedure for General Complaints 88
9.5 Registration of Project Grievance *88*

10. ESCMF STAKEHOLDER CONSULTATION AND DISCLOSURE **90**
10.1 Consultation Requirements *90*
10.2 Consultation Process Summary *90*
10.3 Initial Stakeholder Consultation Results *90*
10.3.1 Missions 1 and 2 90
10.3.2 Mission 3 91
10.3.3 Ou Tapoung Feasibility Study Consultations 91

10.3.4 First Round of Stakeholder Engagement Meetings 92
10.4 Information Disclosure *92*
ANNEX 1: EXCLUSION LIST **94**
ANNEX 2: IUCN RED LIST OF THREATENED SPECIES **95**
ANNEX 3: TERMS OF REFERENCE FOR E&S SAFEGUARDS MONITORING CONSULTANT **108**
ANNEX 4: CHANCE FINDS PROCEDURE **111**
ANNEX 5: E & S CODES OF PRACTICE FOR CONSTRUCTION **112**
ANNEX 6: GUIDELINES FOR WORKERS' CAMPS **116**
ANNEX 7: CONTRACTORS' COVID-19 GUIDELINE **118**
ANNEX 8: WORKERS' CODE OF CONDUCT **119**
ANNEX 9: SAMPLE TORS FOR AN ENVIRONMENT & CLIMATE SAFEGUARDS SPECIALIST **122**
ANNEX 10: SAMPLE TORS FOR A GENDER & SOCIAL SAFEGUARDS SPECIALIST **124**
ANNEX 11: MISSION 3 LIST OF PARTICIPANTS **126**
ANNEX 12: TOR BIODIVERSITY MANAGEMENT SPECIALIST **129**
ANNEX 13: CAISAR CLIMATE CHANGE IMPACT RATIONAL **132**
ANNEX 14: INDIGENOUS PEOPLES PLANNING FRAMEWORK **132**

List of Figures

Figure 1-1 Map of the project area and total percentage of poor households by 2016 (AF, 2018) 3
Figure 1-2: SPEI in the high warning scenario (RCP4.5) 6
Figure 4-1: Map showing the location of the CAISAR project areas and& Provincial Boundaries 37
Figure 4-2: Ou Ta Paoung Project Layout 37
Figure 4-3 Lum Hach Feasibility Level Canal Layouts and Storage (excluding JICA System) 38
Figure 4-4: Krang Ponley overview schematic 39
Figure 4-5: Location of Krang Ponley Irrigation Schemes 39
Figure 4-6 Krang Ponley Subproject - Chhean Loeung area canals do not exist, ... 40
Figure 4-7 The Outlet of the Krang Ponley to the Tonle Sap is through Krang Bat area 40
Figure 4-8 Tonle Sap Agricultural Protection Zones 48
Figure 4-9 Community Fish Refuges in the CAISAR Command Areas 50
Figure 4-10 Key Biodiversity Areas 51
Figure 4-11 IBAT Biodiversity Features around Lum Hach Scheme 52
Figure 4-12 IBAT Biodiversity Features around Krang Ponley Scheme 54
Figure 4-13 IBAT Biodiversity Features around Ou Ta Paong Scheme 55
Figure 5-1: Flowchart for Safeguard Actions for Subprojects 67
Figure 6-1: CAISAR Project (Component 1) Structure Chart 72
Figure 6-2 PMU Structure Chart 72

List of Tables

Table 3-1: Environmental and Natural Resource Management Policies, Laws & Guidelines 15
Table 3-2: ESIA Classification for Development ProjectsClassification for Development Projects 23
Table-3-3: Key National and International Environmental Standards and Guidelines 24
Table-3-4: Water quality standard in public water areas for public health protection 24
Table-3-5: Water quality standard in public water areas for bio-diversity conservation 25
Table-3-6: Ambient Air Quality Standard 25
Table-3-7: Maximum permitted noise level in public and residential area (dB (A)) 25
Table-3-8: Scope of Safeguards Standards 28
Table-4-1: Summary of the Sub Project Elements 42
Table 6-1: PSC Management Arrangement 71
Table 6-2: Distribution Network & Name of FWUC to be established in the CAISAR Scheme. 73
Table 6-3: Reporting Procedures 75
Table 8-1: Estimated ESCMF Implementation Cost 82

EXECUTIVE SUMMARY

1. **Project Rationale**: The CAISAR project covers a total command area of 45,000ha and is composed of three sub-project command areas – Ou Ta Paong, in Pursat Province, Lum Hach, in Kampong Chhnang Province and Krang Ponley in Kampong Chhnang, Kapong Speu and Kandal. The project objective is to improve agriculture productivity by providing irrigation and flood protection in the project areas. The project design is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia (Pursat, Kampong Chhnang, Kampong Speu, and Kendal). Mitigation is a co-benefit of this adaptation project, as it will also contribute to reduce GHG emissions, including methane emissions from rice fields. These objectives will be achieved by implementing three components that aim at addressing climate change vulnerabilities, increasing agriculture productivity, and developing institutional capacities. The investments to be implemented will (i) combine robust climate-resilient water management and agricultural practices at the farm level, (ii) establish climate-proofed irrigation and flood control infrastructure and (iii) develop institutional capacity to plan, maintain and operate irrigation and flood control infrastructure in a changing climate context. The CAISAR project has a broad positive impact benefitting 120,000 households (500,000 rural people) directly while its effect will propagate to over 3 million people in the region. The project will be executed through the Ministry of Water Resources and Meteorology (MOWRAM) and the National Committee for Sub-National Democratic Development Secretariat (NCDD-S), a Direct Access Accredited Entity to the GCF. The expected timelines for the approval of the co-financing by IFAD and AIIB Executive Boards are respectively September 2024 and January 2024, with the inception of the project is expected to take place in December 2024.

2. **Methodology for Risk Categorization:** Project-related and inherent environmental, social, and climate risks were determined by: (i) screening the project activities against the International Fund for Agricultural Development's (IFAD's) Social, Environmental, and Climate Assessment Procedures (SECAP) requirements, the AIIB's Environmental & Social Framework (ESF), and the Green Climate Fund's (GCF's) Environmental & Social Policy; (ii) considering the findings of desk research on risks associated with similar projects and relevant background papers; and (iii) incorporating findings from the first round of ESCMF stakeholder consultations and previous stakeholder engagement efforts in the form of household surveys (630 households in total), 100 focus group discussions, and 100 key informant interviews. Numerous missions to the project areas and discussions with provincial and district agencies and communes enhanced understanding of project objectives.

3. The initial SECAP review identified patterns of existing issues inherent to the project area which could increase risk to the project, its personnel, and/or beneficiaries. Additional desk research highlighted further areas of potential inherent risk and lessons-learned from other projects. The screening of CAISAR project activities, together with the ESCMF stakeholder meetings, household survey responses, focus group discussions, key informant interviews, and field visits with consultations provided insight on the latest conditions which could affect the success of the project and the potential project-specific impacts (both positive and negative).

4. **Framework Approach:** Given that site locations for project implementation have not been finalized, the design team agreed to use a framework approach consistent with IFAD's SECAP and GCF's ESS. Documentation is based on the format typically provided for a GCF project, rather than the typical IFAD SECAP note format, to simplify the approval process. This was agreed upon with AIIB and IFAD headquarters prior to development of this ESCMF.

5. **Project Impacts & Inherent Risks:** The safeguards categorization for CAISAR is high for both social and environmental impacts and risks. To address issues of climate-induced risks and impacts, the CAISAR project will apply several climate resilience measures and adaptation strategies including climate-informed planning, integrated water resources management, efficient irrigation practices, water storage and reservoir management, ecosystem-based approaches, early warning systems, climate-resilient

infrastructure, capacity building and awareness, stakeholder engagement and participatory approaches, and monitoring and evaluation. These measures will be financed under the project, as the project explicitly targets climate mitigation and adaptation by design.

6. **Key social impacts to be considered as part of the ESCIA** include: (i) potential contraction of diseases (e.g. sexually transmitted diseases such as HIV/AIDS, and/or other communicable diseases) due to labor influx; (ii) potential conflict with local communities due to construction workers who work and stay near the community; (iii) potential labour-related accidents for persons hired by the project construction companies to support seasonal construction work; (iv) gender based violence and/or sexual harrassment and abuse (e.g. verbal and physical abuse, sexual harrassment, violence against children) due to the influx of labour; (v) child labour/age inappropriate work, (vi) forced labour (e.g. coerced to work through the use of violence/intimidation, or by more subtle means such as debt manipulation, retention of identity papers, or similar threats); (vii) possible social exclusion (due to vulnerability, land tenure issues, disability, etc.); and (viii) lack of contract for EM workers, particularly for seasonal works of less than one month's duration.

7. The above risks to be evaluated as part of the ESCIA are not considered to be serious in nature and mitigation measures will be included in the ESCMP. General mitigation measures are provided within Chapter IV of this Environmental, Social and Climate Management Framework (ESCMF).

8. **Key environmental impacts to be considered as part of the ESCIA include:** The project is expected to have largely positive environmental impacts, including improved ecosystem services, soil fertility/soil health, forest health, and natural resources management. Potential negative environmental impacts to be mitigated include are related to small-scale infrastructure (e.g. construction/repair of small-scale rural roads, irrigation channels, small-scale reservoirs, etc.). These impacts may include: (i) erosion and run-off to water bodies during earthworks/construction; (ii) temporary traffic blocks and related safety issues during construction and operation; (iii) temporary pollution from construction (e.g. dust, noise, vibration, waste & wastewater generation from workers' campsites); (iv) potential water pollution from sourcing aggregates/construction materials (soil, gravels); and (v) increased water consumption. Additional environmental risks (not explicitly linked to construction activities) include: (i) presence of unexploded ordinances (UXOs) at project sites (an inherent risk listed below); and (ii) increased use of pesticides due to crop intensification/improved crop yields. As with the social risks and impacts, mitigation measures for the environmental risks and impacts are provided in Chapter IV of this ESCMF.

9. To mitigate issues pertaining to social exclusion and conflict over land use/land tenure/land management, related safeguards documents, like the Stakeholder Engagement Plan (SEP), Indigenous Peoples' Plan (IP Plan), and Gender Assessment and Action Plan (GAP), have been developed to supplement this ESCMF and improve overall project design. The Grievance Redress Mechanism (GRM) is also available for any project affected persons who feel they have been negatively impacted or excluded and is detailed in Chapter IX of this ESCMF.

10. **Inherent Risks:** There are inherent risks pertaining to presence of landmines and unexploded ordinances (UXOs) if construction occurs in new areas (i.e., areas without existing construction/infrastructure/activities). Inherent risks are addressed with project-related impacts under Chapter IV of the ESCMF.

11. **Implementation:** The ESCMF will be implemented with the support of two safeguards specialists with MOWRAM Project Management Unit. Further support at the commune level will be determined by inclusion of safeguards-related obligations within the Terms of Reference of the project staff/implementing agencies. For construction financed under the project, contractors will be obliged to abide by the GCF and AIIB and IFAD safeguards requirements, in addition to national legislation/regulations, and commit to Environmental and Social Management Plans (ESCMPs) and Environmental Codes of Practices (ECOPs) as part of their contract. Independent ESC monitoring will be conducted over the life of the project construction and implementation phase. A socio-economic and census survey will be conducted to support the development of the Resettlement Plan.

1. INTRODUCTION

1.1 Project Rationale

1 The CAISAR project covers a total command area of 45,000ha and is composed of three sub-project command areas – Ou Ta Paong, in Pursat Province, Lum Hach, in Kampong Chhnang Province and Krang Ponley in Kampong Chhnang, Kapong Speu and Kandal. The project objective is to improve agriculture productivity by providing irrigation and flood protection in the project areas. The project design is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia, including Pursat, Kampong Chhnang, Kampong Speu, and Kendal provinces. Mitigation is a co-benefit of this adaptation project, as it will also contribute to reduce GHG emissions, including methane emissions from rice fields. These objectives will be achieved by implementing three components that aim at addressing vulnerabilities of farming communities to climate change, increasing agriculture productivity, and developing institutional capacities. The investments to be implemented will (i) combine robust climate- resilient water management and agricultural practices at the farm level, (ii) establish climate-proofed irrigation and flood control infrastructure and (iii) develop institutional capacity to plan, maintain and operate irrigation and flood control infrastructure in a changing climate context. The CAISAR project has a broad positive impact 'enefitting 120,000 household (500,000 people) directly while its effect will propagate to over 3 million people in the region. The project will be executed through the Ministry of Water Resources and Meteorology (MOWRAM) and the National Committee for Sub-National Democratic Development Secretariat (NCDD-S), a Direct Access Accredited Entity to the GCF. The expected timelines for the approval of the co-financing by IFAD and AIIB Executive Boards are respectively September 2024 and January 2024, with the inception of the project is expected to take place in December 2024.

1.2 Country & Project Context

2 The CAISAR Feasibility Study noted that Cambodia is highly vulnerable to climate change and natural disaster risks. It is ranked 151 out of 181 countries in the 2020 ND-GAIN Index, was the 12th most disaster-prone country among 172 countries for 1999–2018 and remains one of the few Least Developed Countries (LDCs) in Asia. Annual economic losses resulting from natural disasters in the country were estimated at 0.7% of GDP in 2011. The World Risk Index of 15.8% indicates a very high risk of disaster because of extreme natural events, with an exposure index of 27% and a vulnerability index of 59%. Approximately 80% of the country is within the Mekong River and Tonle Sap basins, increasing exposure to floods, storms, and droughts. Identified hazards are assessed as high across the whole country for river floods and coastal floods, cyclones, extreme heat, and wildfires. By mid-century, climate change will result in more frequent heavy precipitation days, from 2.4 days to 4.9 days in the rainy season, and an increase in the number of consecutive dry days in the same season from 0.8 days to 4.4 days. The median temperature is projected to increase by 1.6°C by 2060.

3 Cambodia has approximately 4.5 million ha of cultivated land, 70% of which is rice production, as well as industrial crops (20%), rubber plantations (7%), and permanent crops (4%). Cambodia maintains a high reliance on the agriculture sector, which accounts for nearly 22% of the country's GDP while the rural population represents 75.8% of the national population[1]. In Cambodia, relatively low yields, coupled with frequent natural disasters, contribute to temporary food shortages for vulnerable communities. Based on food availability and food access, a mapping of food security has been conducted for the country. Seven of Cambodia's 25 provinces (including Phnom Penh) are classified as acutely food insecure, and an additional seven are moderately insecure. Livelihoods rely heavily on rain-fed agriculture and non-poor households are vulnerable to falling back into poverty in the event of extreme or frequent climate shocks[2].

[1] UNDESA (2018) The Least Developed Country Category: 2018 Country Snapshots. Available at: https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/Snapshots2018.pdf.

[2] https://docs.wfp.org/api/documents/WFP-0000147767/download/?_ga=2.188002408.1116277075.1681899242-636470978.1669479646

4 Women and children are among the most vulnerable groups to climate change. Climate adaptation among rural populations and national institutions remains low as many households face rising debt caused by coping with natural disasters and the COVID-19 pandemic. Since 2020, the negative impacts of climate change and the pandemic led to a 10% loss in Gross Domestic Product (GDP). In addition to negative climate impacts, the stagnating global agricultural commodity prices, rising labor costs and the limited scope for cropland expansion in the country will challenge the agriculture sector (WB, 2015)[3].

5 Farming remains mostly subsistence-based and rain-fed, with low productivity. Only 7 – 8% of the total potential agricultural land area is under full irrigation in Cambodia. Further, only 15% of the cultivated rice area is irrigated (compared to 28% in Thailand and 46% in Viet Nam), and 85% of the rice cropping area is vulnerable to changing rainfall patterns[4]. Therefore, while rice accounts for 50% of agricultural GDP, yields are lower than neighboring countries. The lack of water for irrigation is a crucial barrier for farmers to deal with climate change-induced water shortages, and to cultivate more than a single crop per year – limiting their resilience and adaptive capacity. Studies suggest that shifting to irrigated cultivation could result in annual overall production increases of up to 40%. The lack of timely information on droughts and floods (seasonal forecasts, the changing length) is another barrier. Furthermore, farmers lack the knowledge and tools to adapt their farming practices / production techniques to climate change; they are largely unaware of climate resilient practices (e.g., alternatives to flooded rice cultivation or application of AWD methods in rice), stress-tolerant seed varieties and improved planting materials, efficient input management, and the benefits of applying such practices. The labor shortage in rural areas has increased due to migration to urban areas, which in turn has led to a rise in agricultural wages. Other significant barriers for small-scale farmers include access to credit on attractive and appropriate terms, and market intelligence. Cambodia is unlikely to achieve 5% of their annual agricultural growth target by 2030, without more investment in climate adaptation, sustainable irrigation, and flood control and drainage schemes. Persistent poverty, limited access to finance, and insufficient institutional capacities have left the rural agrarian population vulnerable to the negative impacts of climate change, economic slowdown, and environmental degradation.

6 The local private sector also fails to offer technologies that farmers need (e.g., stress tolerant seeds, bio-inputs) and engage in value addition (e.g., rice milling prior to exports) adequately and sufficiently. Production and distribution costs of agricultural products are high compared to the neighboring countries, largely due to high energy and transport costs. Private sector investment in water saving micro technologies in irrigation and extension services remains low due to an unfavorable agri-business environment, such as access to appropriate finance, poor communication and cooperation between government and private sector, and the absence of a clear regulatory framework for the establishment, operation and pricing for the private management of water. Large agri-businesses face high costs and shortages of working capital. Many agri-business firms operate below capacity and potential new investors are reluctant to invest due to low profitability and high risk of failure.

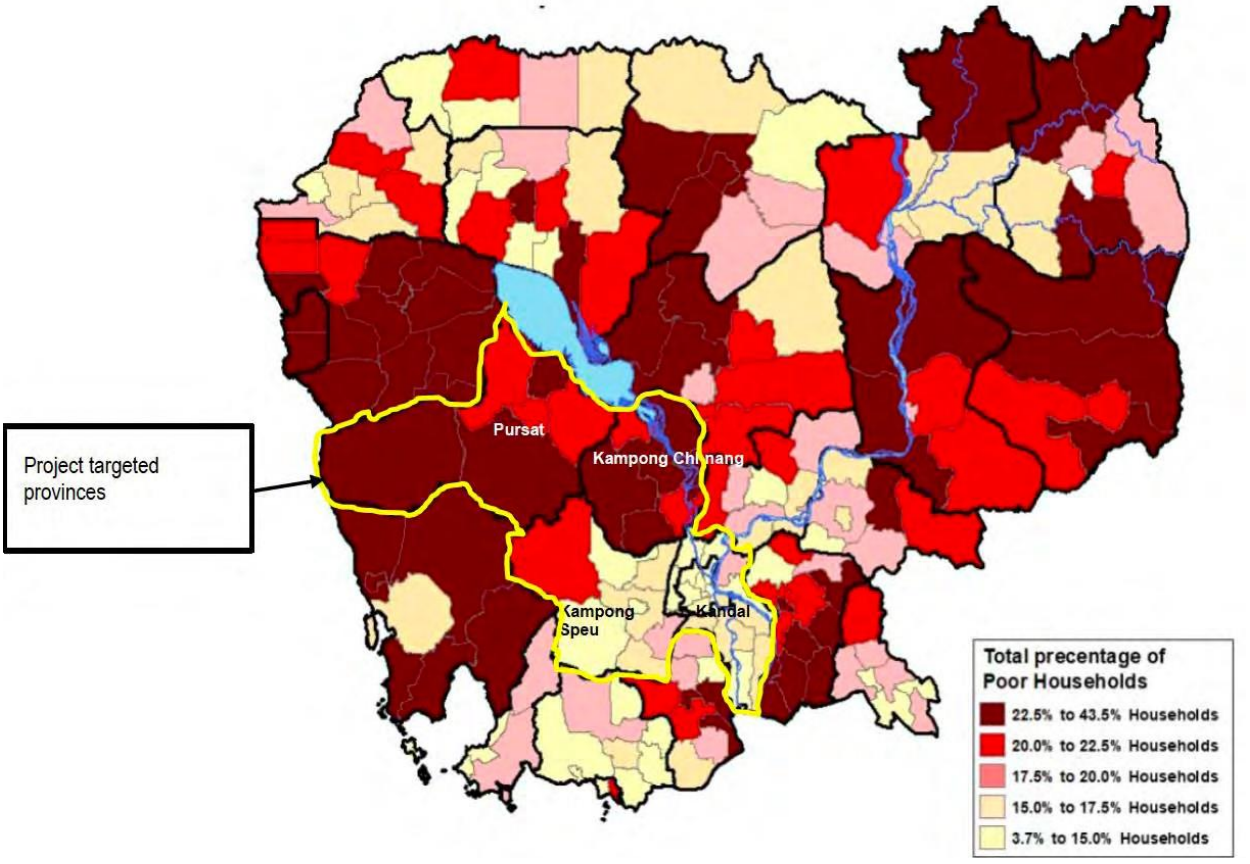
7 There are several obstacles to women's economic empowerment in Cambodia, including (i) the amount of time and responsibility for unpaid domestic and care work, (ii) low levels of literacy and education, and (iii) a lack of access to resources necessary for economic empowerment, and (iv) resilience to climate risks. Women have higher participation in agriculture than men but receive lower benefits and have lower access to land, extension services, financial services, markets, and technologies. Rural youth face difficulties in accessing land, which also limits access to credit, as financial institutions generally require land as collateral and a high proportion migrate to urban areas in search of work. Poverty incidence among ethnic minorities is not significantly higher than among the majority, but they suffer disadvantages in access to health, education and other services.

[3] https://openknowledge.worldbank.org/entities/publication/78d3d276-3a5f-5bf2-915d-2d0381a13930

[4] Kono, A. and Chey, T. 2019. Rapid assessment of upland cashew, mango, organic rice, and vegetable production. Actions for Climate-resilient and Sustainable Agricultural Production in the Northern Tonle Sap Basin. FAO.

8 In Cambodia, GHG emissions are dominated by the Forestry and Other Land Uses (FOLU) sector (60.90%) and agriculture (16.9%), followed by energy (12.10%), IPPU (7.90%) and waste (2.20%) sectors. Under a business-as-usual (BAU) scenario, Cambodia forecasts an increase in emissions from 125.2 MtCO2eq in 2016 to 155.0 MtCO2eq in 2030. While the emissions reduction scenarios (by 2030) in the NDCs largely target AFOLU and energy sectors, owing to the links between FOLU (land-use and forest conversion) and agriculture, actions to increase productivity of agricultural lands and interventions such as home gardens are likely to have indirect effect on AFOLU targets[5].

9 The CAISAR target provinces include: Kampong Speu, Kampong Chhnang, Kandal, and Pursat. These provinces[6] have the highest population density, high total percentage of poor households, and a high percentage of women-headed households (Figure 1). The livelihoods of the poorest and most vulnerable people in the region depend mainly on agricultural production and water availability through precipitation, river flow, and irrigation schemes. This area and its population is particularly vulnerable to climate risks due to changing weather patterns and flooding.



Source: CAISAR Feasibility Study

Figure 1-1 Map of the project area and total percentage of poor households by 2016 (AF, 2018)

[5] RGC, 2020. Cambodia's Updated NDC. Retrieve from: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Cambodia%20First/20201231_NDC_Update_Cambodia.pdf

[6] The Asia Foundation (2018). cambodia-atlas-on-gender-and-environment.pdf.pdf (opendevelopmentmekong.net)

10 The project area was already under stress prior to the COVID-19 pandemic with small-scale farmers and larger food producers struggling to produce food and access markets. Food shortages face, additional pressure from climate change with serious droughts[7] during the dry months and heavy monsoon during the rainfall season. Rural communities highlight major water problems with competition in irrigation due to aging/lack of infrastructure and reduced water availability in rivers and ponds, which poor communities and households depend on. The proposed underlying investment project will support the government's efforts to sustain food security and rural livelihood after the COVID-19 crisis through the restoration and enhancement of climate-smart and climate-resilient irrigation systems under the "Build Back Better" approach in the target provinces.

1.2.1 *Climate Change Impacts and Vulnerability of the Agriculture Sector*

11 The concept note stated that similar to other monsoon-dependent countries, climate change is altering Cambodia's and project areas' monsoon calendar, increasing total drought days and shifting the start of the rainy season. While annual rainfall is expected to increase, the number of days with rain is decreasing and daily rain intensity is increasing, resulting in extreme rainfall events and flooding risks. The World Resource Institute (WRI) rates the upper and lower Tonle Sap watershed as extremely high for water risk (WRI, Aqueduct). Inter-annual variability in rainfall significantly influences river discharges and between one and four million hectares of Cambodia's floodplain, of which about 25% falls in the project areas, may be submerged during the wet season, reaching critical thresholds for irrigation and ecosystem stability.

12 Flooding in the project areas generally occurs between July and October, driven by rainfall as well as high water levels in the Mekong River and Tonle Sap Lake. With the increased intensity of wet-season rainfall, the duration and extent of flooding have increased in some areas. While local rainfall patterns are important for both irrigated and rainfed agricultural systems, the Mekong-Tonle Sap flood impulse dominates the flooding pattern and hence plays an important role in the overall water management.

13 Observed impacts of climate change trends in recent years have manifested by longer dry seasons and more intense "El Niño" related droughts, delayed onset of the monsoon season, increased rain intensity and frequency, leading to floods, and unexpected dry periods during the rainy season. Annual mean temperature anomaly has increased at a rate of 0.23 °C per decade since 19508, with a stronger signal of increase during the dry season. The rate of temperature change is notable in the dry season (December, January and February) followed by pre-monsoon (March, April and May) and, to a minor extent, by wet season months (June, July and August). The increase in mean annual temperature and decrease in dry season rainfall has manifested in droughts and water shortages significantly impacting rainfed agriculture due to a late start and early ending of the wet season.9

14 On average, annual damages and loss of wet season rice caused by floods and droughts is approximately 120,501 hectares, of which 70 percent of the damage and loss is due to floods and 30 percent is the result of droughts. Flooding occurs frequently and extensively in Cambodia. The source of these floods can be the Mekong River including the Tonle Sap Great Lake, tributary flash floods, urban flooding, and failure of structures such as protection levee and storages. In terms of the population affected, Cambodia is one of the world's most flood-exposed countries in the world. By 2050, population exposed to flood is expected to reach 19% of the population. Projected climate change trend indicates more severe floods and droughts, which is expected to affect Cambodia's GDP by nearly 10% by 2050[10]

[7] Kampong Spoeu, one of the four target provinces, reported the highest number of droughts (one of the eight main natural hazards in Cambodia) between 1996 and 2013. (https://www.unccd.int/sites/default/files/country_profile_documents/1%2520FINAL_NDP_Cambodia%255B1157%255D.pdf).

[8] Thoeun, H. C. (2015) Observed and projected changes in temperature and rainfall in Cambodia. Weather and Climate Extremes. 7:61. [old reference]

[9] MAFF (2017) MAFF Annual Report 2016-17

[10] Climate risk country profile, Cambodia. 2021. https://climateknowledgeportal.worldbank.org/sites/default/files/2021-08/15849-WB_Cambodia%20Country%20Profil

15 Drought has significant social and economic impacts in Cambodia, in particular in the project areas. According to the Ministry of Environment. (2002). Report on the Impact of Drought in Cambodia, the drought in 2002 affected 43 districts in eight provinces. Some 442,419 families (2,017,340 individuals) were affected. The total estimated damage was US$ 9 million. Rice and crop production was affected in all provinces and about half a million rural people faced food insecurity. Droughts events have become more frequent as further explained in annex 1, and are expected to intensify in future. According to the International Rice Research Institute, rice grain yield will decline by 10% for each 1°C increase in growing-season minimum (night) temperature in the dry season. In Cambodia, drought has been negatively impacting rice production, and is widely recognized as one of the most serious climate risks for the agriculture sector.

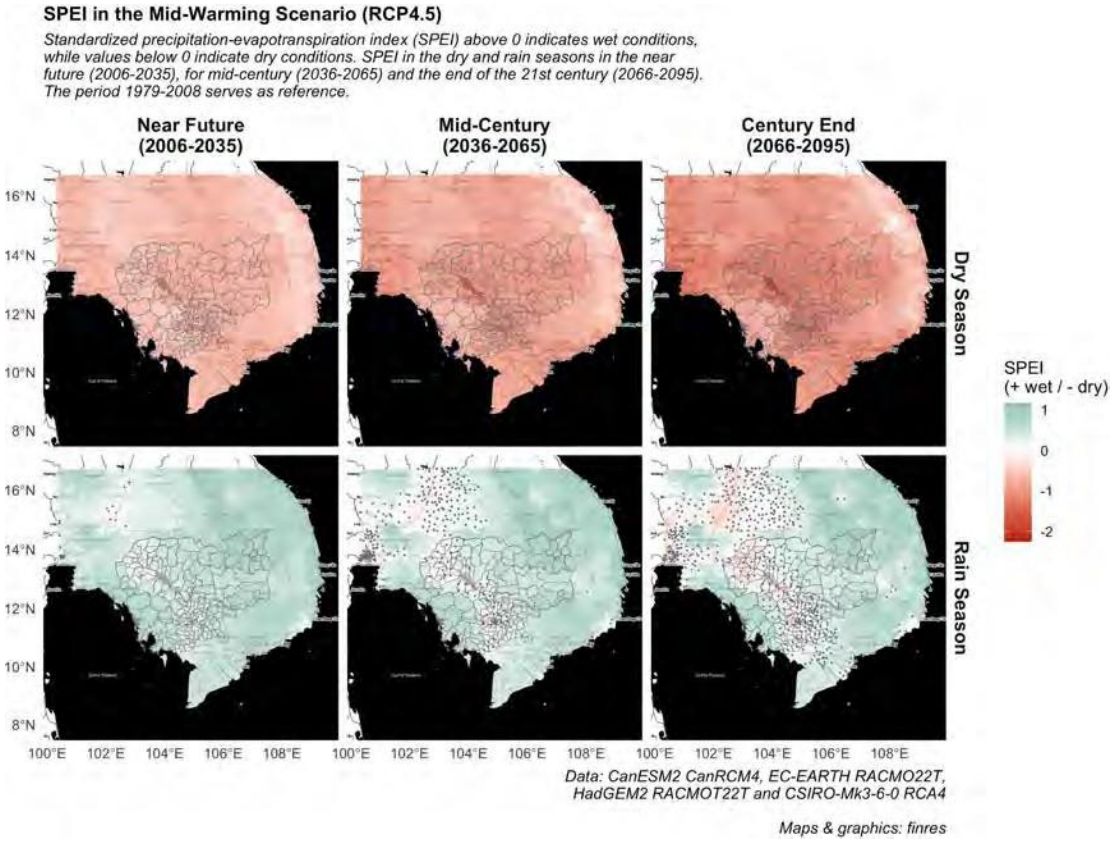
16 The Climate Risk Country Profile, Cambodia 2021 noted that future projections of climate change in the project area under the RCP4.5 scenario (Figure 1-1) indicate a temperature increase of 1.6°C by mid-century (2036-2065) and up to 2.2°C by the end of the 21st century (2066-2095)[11]. Nights exposed to high temperatures are projected to become more frequent during the 21st century (+114 nights by mid- century and +151 nights by the 2080s). Population, crop and livestock systems will also experience heat extremes more frequently in comparison to the reference period (42 days by mid-century and reaching 62 days by the 2080s) and IFAD is expecting a drastic reduction in the productivity of crops and livestock (IFAD's preliminary climate analysis). Out of all the rivers within the Mekong River Basin, the water levels of the Tonle Sap Lake tributaries are anticipated to experience the greatest water decline. These changes in water levels are attributed to shifts in seasonal rainfall distribution and prolonged dry periods (IPCC, 2021).

17 The changes in precipitation and temperature patterns induced by climate change in the project area could affect the climatic suitability of cereals, vegetables and starchy crops produced. On average, for most crops analysed for this project, the temperature suitability could progressively decrease with some crops falling outside their optimal temperature levels. Overall, this change in patterns could contribute to a reduction in crop yield for both irrigated and non-irrigated crops. For example, in the Kampong Chhang region, rice yield could decrease from 9 to 12%, with and without irrigation, respectively, by 2050 (a period of 20 years centred around 2050) compared to 2020 (Climate Risk Country Profile, Cambodia, 2021). These projections are for the RCP8.5 scenario and without CO2 fertilization. As smallholder farmers' incomes are largely dependent on their yield, it is anticipated that farmers' income could become more volatile with a decreasing trend over time. It is projected that vegetables will be increasingly exposed to heat-stress conditions during the pre-monsoon and early wet-season months (March-June). Over these months, heat-stress conditions (>36ºC) will be exceeded more than 50 days during the growing season, lasting approximately 90 days.

18 Climate change affects women, men, and vulnerable people differently, and their responses to its impacts also differ, including in relation to safeguarding food security and livelihoods and coping with hazards and risks. In the project area, women have significantly less access than men to financial instruments, land, natural resources, climate change resources and technologies, education, and other development services for successful adaptation to climate change. Cambodia's Women's Resilience Index, ActionAid, 2022 found women less resilient in times of disaster than men due to women's unstable and insecure sources of income, limited access to shelters or safe places, inadequate early warning information, poor housing, weak social safety nets and absence of emergency networks. Furthermore, women's responsibilities in household resources position them well to contribute to livelihood strategies adapted to

[11] Climate risk country profile, Cambodia. 2021. https://climateknowledgeportal.worldbank.org/sites/default/files/2021-08/15849-WB_Cambodia%20Country%20Profil

changing environmental realities. However, lack of information, access to planning processes, and care obligations, limit their ability to contribute.



Source: GCF Concept Note

Legend: Above 0 indicates wet conditions, while values below 0 indicate dry conditions.

Figure 1-2: SPEI in the high warning scenario (RCP4.5)

19 Agriculture is central to the economic and social life of Cambodia. With 76% of the population currently living in rural areas, Cambodia's populace and economy rely heavily on agriculture and fisheries, contributing 22% of GDP and employing 34% of the country's labour force[12]. As a result, Cambodia has a high dependency on natural resources and climate-sensitive sectors of the economy, which makes it particularly vulnerable to inter-annual and intra-annual changes in climatic conditions. Natural hazards have significant effects on Cambodia's population and pose a serious challenge for water resource management and poverty alleviation in the country. This vulnerability to hazards combined with high exposure to climatic extremes, means that Cambodia is faced with a heightened disaster risk from both floods and droughts.

20 Current climate models project that these climatic extremes will worsen over the coming century, meaning that they must be considered when addressing poverty reduction and economic development. The Royal Government of Cambodia is making efforts to devise strategies that decrease this vulnerability through improved flood and drought proofing, natural disaster preparedness and climate adaptation strategies to reduce risks from floods and droughts. Reducing the impacts of floods and droughts are key priorities for sustainable development (IPCC, **2021**).

[12] Data for 2020, World Bank, World Development Indicators

21 The Royal Government of Cambodia is committed to meetings its greenhouse gas emission targets and ensuring that appropriate mitigation and adaptation efforts are adopted across key sectors of the economy. The Climate Change Strategic Plan 2014 – 2023 sets out the main strategic objectives and directions for climate-smart development in Cambodia over the coming decade and the agriculture sector will be a key player to ensure that the objectives of the plan are met (National Climate Change Strategic Plan 2014-2023, Royal Government of Cambodia, 2013). The agricultural sector therefore has significant potential to reduce poverty, food insecurity and ensure rural populations are resilient and adapted to climate change.

22 The CAISAR project will support the RGC's effort to improve and strengthen the disaster resilience of the populations of four provinces in Cambodia. Through combining irrigation rehabilitation with climate smart and resilient design, the project will build a low carbon and climate resilient future, enabling rural populations to adequately adapt to current and future climate impacts and increase their food security and livelihoods whilst also enabling the RGC to meet its climate targets.

23 **Stakeholder Engagement:** To support development and design of this project, extensive stakeholder engagement was conducted to discern potential positive and negative project impacts, as well as key design opportunities to improve accessibility and participation. In July and September of 2023 stakeholder meetings were conducted with potential communities affected in each project area as well as with key NGOs. Continued stakeholder engagement must involve iterative consultations throughout the project's life cycle with particular attention to vulnerable populations and groups prone to exclusion, be that for reasons of gender, orientation, age, ability, religious beliefs, and/or ethnicity. The guidelines for stakeholder engagement are available in the Stakeholder Engagement Plan (SEP).

24 **Indigenous Peoples/Ethnic Minorites, Women, and Vulnerable, Disadvantaged Persons:** to ensure adequate inclusion of ethnic minorities, women, and other vulnerable persons, an Indigenous Peoples' Plan (IP Plan) and Gender Assessment & Action Plan (GAP) have been prepared to guide project implementers and ensure that considerations for the differentiated needs of ethnic minority (EM) communities, women, and vulnerable persons are built into the project design and monitoring indicators.

25 **Environmental, Social and Climate Management Framework (ESCMF)** serves as the primary guidance document for management and mitigation of environmental, social, and climate risks and impacts throughout the project cycle.

1.3 Purpose and Application of the ESCMF

26 The project objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia (Pursat, Kampong Chhnang, Kampong Speu, and Kendal). Mitigation is a co-benefit of this adaptation project, as it will also contribute to reduce GHG emissions, including methane emissions from rice fields. These objectives will be achieved by implementing three components that aim at addressing climate change vulnerabilities, increasing agriculture productivity, and developing institutional capacities. The investments to be implemented will (i) combine robust climate-resilient water management and agricultural practices at the farm level, (ii) establish climate-proofed irrigation and flood control infrastructure and (iii) develop institutional capacity to plan, maintain and operate irrigation and flood control infrastructure in a changing climate context.

27 The CAISAR project involves numerous subprojects and activities where specific locations are still to be identified during further design and implementation. Based on the inability to confirm specific sub-projects prior to project appraisal, this Environmental and Social Management Framework (ESCMF) has been prepared. Given small discrepancies in the format of the environmental, social, and climate risks/impacts documentation required for IAAB, FAO, IFAD and GCF funded projects, the Government of Cambodia agreed with IFAD's SECAP specialists based in headquarters to follow the standard GCF documentation, rather than developing two separate sets of documents. According to IFAD's Social, Environmental and Climate Assessment Procedures (SECAP) and the Green Climate Fund's (GCF's)

Environmental and Social Standards, the Lead Agency of the proposed project must prepare and disclose this ESCMF[13] before appraisal.

28 The purpose of the ESCMF is to ensure that the project has concrete plans and processes in place to avoid, minimize, and/or mitigate the risks and potentially adverse project-related environmental and social (E&S) impacts, including climate risks, once the CAISAR activities and/or subprojects are identified, planned, and implemented. This living document: (i) assesses and summarizes project-related risks and impacts; and (ii) sets out the principles, rules, guidelines, and procedures to assess any potential risks and impacts of future subproject and activities identified at a later time. It provides measures to reduce, mitigate, and/or offset those adverse risks and impacts from the project and highlights information about areas where subprojects are expected to be located (including any specific E&S-related vulnerabilities of those areas; potential impacts that may occur; and mitigation measures that might be used). Specific objectives of this ESCMF are to:

- Assess the potential environmental, social, and climate-related risks and impacts of the project, both positive and negative, and propose mitigation measures which will effectively address these risks and impacts;
- Establish clear procedures for the E&S planning, review, approval, and implementation of subprojects and other activities to be financed under the project;
- Specify appropriate roles and responsibilities and outline the necessary reporting procedures for managing and monitoring E&S issues/concerns related to subprojects, TA, and activities;
- Determine the training, capacity building, and technical assistance needed to successfully implement the provisions of this ESCMF;
- Outline and address mechanisms for public consultation and disclosure of project documents, as well as redress of possible grievances; and
- Establish the budget requirements for implementation of this ESCMF.

29 This ESCMF provides information on (i) items ineligible for Project funding; (ii) how to conduct the E&S screening; (iii) risks and impacts classifications; (iv) identification of various E&S documents to be prepared (both prior to and after project approval) and the process to be followed for their preparation (including the clearance process); (v) implementation arrangements; (vi) training and capacity building; (v) grievance redress mechanism; (vi) estimated costs and budget requirements; and (vii) guidelines and specific forms for preparation of the identified E&S documents required. This ESCMF will be applied to all subprojects and activities to be financed by CAISAR.

1.4 Scope of the ESCMF

30 This ESCMF was developed based on a review of project-relevant government laws, regulations, ordinances, and other legal documents; various background papers and reports pertaining to environmental and social conditions of the proposed project areas and potential subproject sites, including feasibility studies; as well as numerous field visits, 630 interviews through Livelihood Household Surveys, 100 focus group discussions, 100 key informant interviews, and other consultations (community meetings) in those areas. Safeguards documents prepared for similar projects and/or projects in related areas (e.g. others financed by AIIB, IFAD, World Bank, FAO, etc.) were also taken into consideration.

31 This ESCMF follows the requirements of AIIB, IFAD's SECAP and the GCF's Environmental & Social Policy, taking into consideration the related guidance notes and documents. Information is presented in ten sections, as follows:

1. Introduction
2. Project Description
3. Policy, Legal, and Administrative Framework
4. Environmental and Social Assessment and Proposed Mitigation Measures

[13] The ESCMF examines the risks and impacts when a project consists of a program and/or a series of subprojects, and the risks and impacts cannot be determined until the program or subproject details have been identified.

5. Procedures for Review, Clearance, and Implementation of Subproject E&S Instruments
6. Implementation Arrangements
7. Capacity Building, Training, and Technical Assistance
8. ESCMF Implementation Budget
9. Grievance Redress Mechanism (GRM)
10. ESCMF Consultation and Disclosure

Other information to be considered includes: (i) ineligible activities; (ii) list of banned and restricted pesticide in Cambodia; (iii) Pesticide Management plan; (iv) Chance Find Procedures; (v) List of Consultations & Attendance; (vi) ESCIA Timeline; (vii) ESCIA Budget; (viii) Environmental and Social Screening Checklist; (ix) Indigenous Peoples Planning Framework; (x) Biodiversity Management Planning Framework; (xi) Resettlement Planning Framework; (xii) Gender Assessment & Social Inclusion Plan; (xiii) Climate Management Framework; (xiv) Stakeholder Engagement Plan

32 **Associated facilities.** This ESCMF is also applied to activities or facilities that are, in the judgement of the AIIB, associated activities and/or facilities as defined in the AIIB's ESF. When this is the case, this ESCMF will be applied to such associated activities and/or facilities – to the extent that MoWRAM has influence over such activities and facilities.

2. PROJECT DESCRIPTION

2.1 Project Objective, Components, Area and Beneficiaries

33 The project's focus is on low-carbon and climate resilient at the farm-level, combined with efficient irrigation and flood control infrastructure and their climate proofing, and institutional development of the FWUCs and the government agencies to strengthen water rights, irrigation fees, and enhance sustainability. Thus, disaster resilience compensation is expected to significantly contribute towards achieving climate change adaptation policy objectives outlined in the NDC, and the individual climate change action plans of the Ministry of Water Resources and Meteorology (MOWRAM). The Project originated from the RGC's National Water Resources Management and Sustainable Irrigation Road Map and Investment Program (2019 -2023), which provides a Strategic Framework for the Irrigation Sector.

The CAISAR project is focusing on climate change adaptation with cross-cutting benefits through the reduction of GHG emissions linked to the use of high-efficiency smart irrigation systems, the use of renewable energy for pumping, and cover techniques to reduce evaporanspiration and enhance GHG reduction. While rice production is a major source of GHG emissions in the AFOLU sector in Cambodia, and the project aims to support production to achieve food security and sector growth, target GHG reduction actions in the project aim to support intensification and diversification without compromising GHG emission reduction targets. This is achieve through adoption of water saving technologies such as alternative wet dry, drip irrigation). A full greenhouse gas accounting will be prepared during the project formulation phase. However, a preliminary analysis of GHG in the target provinces has estimated a reduction of GHG of 90,000 Mt CO2-eq annually and 1,800,000 Mt CO2-eq over the life span of 20 years. The investment in agricultural practices and a whole-of-system irrigation approach will irrigate approximately 40,000 hectares (ha) in the rainy monsoon season and about 20,000 ha in the dry season and, as a result, improve energy efficiency by reducing the water and the carbon footprints.

34 The planned CAISAR project has the following planned components

2.2 Component 1: Improving Farm-level climate adaptation, resilience, and water use efficiency

35 The objective of this component is to build climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. This component is designed to address the lack of knowledge and skills to deploy technologies and practices at farm level by farmers and the lack of appropriate extension services to propagate them. It will introduce farmers with various climate resilient technologies and practices for both rice and non-rice activities such as vegetable production, poultry and aquaculture.

Sub-component 1.1 Deployment of farm-level climate adaptation and water use efficiency measures

Output 1.1: Increased capacity of farmers to deploy climate resilient (CR) practices at farm level

This output will focus on developing farmer's capacity in deploying CR technologies and practices to transform the agricultural production system to adapt to the changing climate context. Farmer's will be trained to first develop Action Plans (AP) to re-orient farmer behaviour and assist them in transforming the agriculture production system in a manner that is better adapted to factoring in the agro-ecological context and expected climate change impacts.

- Activity 1.1.1 Preparation of community-based action plans (AP) to transform agriculture with CR practices.
- Activity 1.1.2 Preparation of training materials to support implementation of the AP.
- Activity 1.1.3 Conduct trainings to create a pool of expertise to demonstrate and propagate the CR technologies and practices.
- Activity 1.1.4 Train farmers on applying CR technologies using the FFS approach.
- Activity 1.1.5 Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery.
- Activity 1.1.6 community-based monitoring and evaluation (CBME) of implementation

Sub-Component 1.2 Climate adapted, value added, and market led agricultural investments

Output 1.2 CR value added, and market led agriculture investments secured.

This output involves improving and enhancing some value chains that are key for the project area and include rice, vegetable, chicken and aquaculture value chains, through the use of Public Private Producer Partnerships (4Ps) and increased access to finance, which will improve market access, climate adaptability, and ensure increased income for smallholders in the value chains.

- Activity 1.2.1 Value chain study and planning
- Activity 1.2.2 Establish District Multi-Stakeholder Platforms (MSPs)
- Activity 1.2.3 Public Private Producer Partnership Facility (4PF)

Sub-component 1.3 Improve enabling conditions, capacities and disaster risk management strategies

Output 1.3. Increased access to and use of climate information and advisory services for climate responsive agriculture planning

This sub-component will strengthen the production and dissemination of tailored agro-meteorological information to inform climate responsive management and planning of agriculture in the project target areas through ICT technologies. The aim is to ensure that agro-meteorological services are accessible and useful to farmers to manage climate risks, access to and use of water and efficient cropping systems.

- Activity 1.3.1 Establish ICT based multi-disciplinary platform at provincial level.
- Activity 1.3.2 Building the capacities of the platform to deliver services.
- Activity 1.3.3. Establish the agromet information systems and the outreach mechanisms.
- Activity 1.3.4 Awareness raising and capacity building of farmers and stakeholders in applying the services.

Sub-component 1.4 Rural roads

Output 1.4: Increased resilience of farm road infrastructure to climate change

- Activity 1.4.1 Initial planning and identification
- Activity 1.4.2 Technical survey and design considerations, preparation of cost estimation
- Activity 1.4.3 Improve 50 Kilometers of farm roads.
- Activity 1.4.4 Handing over of the completed works.

2.3 Component 2. Irrigation Infrastructure for increased resilience

Component 2 is linked with Component 1 such that it facilitates the implementation of CR on farm crop and water management practices through improved field level water supply delivery and drainage. It will focus on rehabilitating and modernizing of irrigation and flood protection/drainage infrastructure in the six sub-projects, including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions.

Sub-Component 2.1: Modernization of irrigation scheme and ponds

Sub-Component 2.2: Flood-proofing and Drainage improvements

Sub-Component 2.3: Establishments and training of Farmers Water User Communities (FWUC)

- Activity 2.3.1 Formation of institutional strengthening of the FWUC
- Activity 2.3.2 Build technical capacities of FWCU for canal structure O&M
- Activity 2.3.3 prepare long term financing plan for O&M of the systems including the WUAS.

Sub-Component 2.4: Water information and Management (SCADA)

2.4 Component 3. Institutional Strengthening

36 This component aims to strengthen Government institutions, mainly the MoWRAM, MoE and the NCDD and local institution, the FWUC. While the focus for MoWRAM will be on upgrading technical capacity in various aspects of CR irrigation design and management, key focus area for MoE will be on strengthening climate policies and strategies and in building capacities for monitoring climate actions at national level. It will have three sub-components.

Sub-Component 3.1 MOWRAM capacity Support.

Output 3.1 Strengthened MOWRAM Capacity

Sub-Component 3.2 Strengthening of NDA and NCDD.

Output 3.2 Improved capacities for climate action monitoring

- Activity 3.2.1 Preparation of Loss and Damage Strategy
- Activity 3.2.2 Strengthen national M&E process for climate action
- Activity 3.2.3 Enhancing Capacity of NDA and other stakeholders.

37 **Proposal consistent with Government Framework and priorities and existing investments:** The proposed Project is in line with the national policies of the RGC, especially the "National Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019 - 2033" issued in July 2019 by MOWRAM with the assistance of the development partners. The proposed Project, with its disaster and climate change adaptation design features, will be upscaled to other provinces. RGC and MOWRAM appreciate that water is a limited resource and is taking an integrated water resource management (IWRM) approach to manage water nationwide. MOWRAM is establishing the Water Resources Data Management Center (NWRDMC) and a National Water Resources Information System (WRIS) with ADB assistance. WRIS is an adaptive system housed in the MWRDMC facility that integrates spatial information, CISIS and IAMS, meteorological data, hydrological data, ground measurements, satellite-derived remote sensing data, and Lidar. All data generated on the CAISAR, and all watersheds, are coalesced in WRIS and used to model water availability, use, and floods across entire watersheds.

38 For this project, AIIB requested IFAD to co-finance and assist with the project design, the project implementation, the country's knowledge to maximize people's resilience to climate change impacts and support the reduction of GHG emissions in agriculture.

3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Applicable National Laws and Regulations

39 In 1993, the Royal Government of Cambodia confirmed a new Constitution in which environmental considerations were included for the first time. Specifically, Article 59 requires the State to protect the environment and balance of abundant natural resources and to establish a precise plan for the management of land, water, air, wind, geology, ecological systems, mines, energy, petrol and gas, rock and sand, gems, forests and forestry products, wildlife, and fish and aquatic resources. It was within this constitutional context that the Ministry of Environment (MOE) was established.

40 The hierarchy of legislation in Cambodia is:

- Royal Decree signed by the King;
- Sub-decree signed by the Prime Minister;
- Ministerial Decision signed by a Minister; and
- Regulation issued by Ministry.

41 A Royal Decree ratifies laws passed by parliament. These can be supplemented by "Prakas" or ministerial decisions. These laws allow sub-decrees and regulations to be passed which can stipulate procedures and standards to be met in order to ensure compliance with the law. Many sub-decrees and standards have been drafted but not yet ratified by parliament.

3.1.1 Laws/Sub-Decrees relevant to Environment and Natural Resources Management

42 The Government of Cambodia has established laws and regulations for forests, protected areas, and land management to ensure sustainable development that are relevant to environmental protection and natural resources management. The key elements of the legal and policy framework for the project are summarized in Table 3-1 below.

Table 3-1: Environmental and Natural Resource Management Policies, Laws & Guidelines

Law/Regulation/Guideline	Year	Summary
Royal Decree on the Protection of Natural Areas	1993	Classified 23 protected areas in Cambodia into four categories: (i) natural parks; (ii) wildlife sanctuaries; (iii) protected landscapes; and (iv) multiple-use areas. Designated the Tonle Sap (316,250 ha) as a multiple-use area or area necessary for the stability of the water, forestry, wildlife and fishery resources, for tourism, and for conservation of long-term existing natural resources with a view to assure sustainable economic development.
Royal Decree on the Establishment and Management of Tonle Sap Biosphere Reserve (Royal Decree No. NS/RKT/0401/070)	2001	Establishes the Tonle Sap Biosphere Reserve (TSBR) in accordance with the statutory framework of the World Network of Biosphere Reserves. Divides the TSBR into 3 zones: (i) core areas; (ii) buffer zone and (iii) flexible transition zone. Core area: set aside for long term protection, human activity is limited to monitoring and research. Buffer zone: area surrounding the core areas helping to protect the environment. It may accommodate education and training activities. Transition area: may contain a variety of agricultural activities and human settlements. Here all stakeholders have to cooperate to achieve sustainable development.

Law/Regulation/Guideline	Year	Summary
Royal Decree No. NS/RKM/0208/007 on Protected Areas	2008	Defines the framework of management, conservation & development of protected areas to ensure the conservation of biodiversity, & sustainable use of natural resources in protected areas. The Law gives the Royal Government of Cambodia the authority to establish or modify Protected Areas (Article 9 and 10). A Protected Area shall be established by sub-decree. Article 11 divides the protected area into 4 zones namely, core zone, conservation zone, sustainable use zone & community zone. Article 36 strictly prohibits all types of public infrastructure in the Core Zone & Conservation Zone; & allows development of public infrastructures in the Sustainable Use Zone & Community Zone with approval from the Royal Government at MoE's request. Article 41 provides for the protection of each protected area against destructive/harmful practices, such as destroying water quality in all forms, poisoning, using of chemical substances, disposing of solid and liquid wastes into water or on land. Article 44 requires all proposals & investments within or adjacent to protected area boundary an Environmental and Social Impact Assessment. The law defines Protected Area as **"***An area of the State's public properties in land or water territories, including coasts and sea, located in the area established by a Royal Decree or a new area established in the jurisdiction of the Ministry of Environment. These areas are of physical and biological importance which requires management by law with the purpose of protecting and maintaining biological, natural and cultural resources, and shall be sustainably managed in every generation for environmental, social and economic benefits*". Each protected area shall be divided into four (4) management zoning systems: **1. Core zone:** management area(s) of high conservation value containing threatened and critically endangered species, and fragile ecosystems. Access to the zone is prohibited except for the Nature Conservation and Protection Administration's officials and researchers who, with prior permission from the Ministry of Environment, conduct nature and scientific studies for the purpose of preservation and protection of biological resources and natural environment with the exception of national security and defence sectors. **2. Conservation zone:** management area(s) of high conservation value containing natural resources,

Law/Regulation/Guideline	Year	Summary
		ecosystems, watershed areas, and Natural landscape located adjacent to the core zone. Access to the zone is allowed only with prior consent of the Nature Conservation and Protection Administration at the area with the exception of national security and defence sectors. Small-scale community uses of Non-Timber Forest Products to support local ethnic minorities' livelihood may be allowed under strict control, provided that they do not present serious adverse impacts on biodiversity within the zone. **3. Sustainable use zone:** management area(s) of high economic value for national economic development and management, and conservation of the protected area(s) itself thus contributing to the local community, and indigenous ethnic minorities' livelihood improvement. After consulting with relevant ministries and institutions, local authorities, and local communities in accordance with relevant laws and procedures, the Royal Government of Cambodia may permit development and investment activities in this zone in accordance with the request from the Ministry of Environment. **4. Community zone:** management area(s) for socio-economic development of the local communities and indigenous ethnic minorities and may contain existing residential lands, paddy field and field garden or swidden (Chamkar).
Law on Environmental Protection and Natural Resources Management	1996	The Law was enacted by the National Assembly and launched by the Preah Reach Kram/NS-RKM-1296/36. It was enacted on 24 December 1996. This law has the following objectives: i. To protect and promote environment quality and public health through prevention, reduction and control of pollution; ii. To assess the environmental impacts of all proposed projects prior to the issuance of a decision by the government; iii. To ensure the rational and sustainable conservation, development, management and use of the natural resources of the Kingdom of Cambodia; iv. To encourage and provide possibilities for the public to participate in the protection of environment and the management of the natural resources; and v. To suppress any acts that cause harm to the environment.
Law on the Protection of Cultural Heritage (NS/RKM/0196/26)	1996	Regulates the protection of national cultural heritage and cultural property in general against illegal destruction, modification, alteration, excavation, alienation, exportation or importation. Its Article 37 stipulates that in case of chance find of a cultural property during construction, work should be stopped and the person who found the property should immediately make a declaration to the

Law/Regulation/Guideline	Year	Summary
		local police, who shall, in turn, transmit the property to the Provincial Governor without delay.
Law on Forestry	2002	Article 1: This law defines the framework for management, harvesting, use, development and conservation of the forests in the Kingdom of Cambodia. The objective of this law is to ensure the sustainable management of these forests for their social, economic and environmental benefits, including conservation of biological diversity and cultural heritage.
Law on Water Resources Management (NS/RKM/0607/016)	2007	Requires license/permit/written authorization for the: (i) abstraction & use of water resources other than for domestic purposes, watering for animal husbandry, fishing & irrigation of domestic gardens and orchards; (ii) extraction of sand, soil & gravel from the beds & banks of water courses, lakes, canals & reservoirs; (iii) filling of river, tributary, stream, natural lakes, canal & reservoir; and (iv) discharge, disposal or deposit of polluting substances that are likely to deteriorate water quality and to endanger human, animal and plant health. (Articles 12 & 22) Its Article 24 stipulates that Ministry of Water Resources and Meteorology (MOWRAM), in collaboration with other concerned agencies, may designate a floodplain area as flood retention area.
Law on the Management of Pesticides and Fertilizers	2012	The Law on the Management of Pesticides and Fertilizers was enacted on 14 January 2012. This law has the following objectives: i. To support a policy promoting the effectiveness potentiality of agriculture sector, for the development of social and national economy; ii. To ensure the safe and effective control of pesticides and fertilizers, whether in consistent with the international standards; iii. To enhance public awareness on the implementation of standard requirements of pesticides and fertilizers for all relevant activities related to these products; and iv. To reduce risks caused by the use of pesticides and fertilizers, for beneficiary of farmers and people in the nationwide, by ensuring food security, food safety, public health, and the sustainability of environment. The scope of the law shall apply to the management and the implementation of standard requirements for: i. All type of pesticides and fertilizers, raw materials or active ingredients and other compositions of pesticides and fertilizers which are used as inputs in agricultural production. ii. All activities of natural persons or legal entities who are traders, formulators, pests control services operators, advertisers, donors, and users of all types of pesticides and fertilizers.
Sub-decree on Environmental Impact Assessment Process	1999	The Sub-decree No. 72 ANRK.BK in the Law on Environmental Impact Assessment Process dated 11 August 1999 sets out EIA procedures. The main objectives of this sub-decree are:

Law/Regulation/Guideline	Year	Summary
		i. To determine an EIA for every private and public project or activity, through review by the MOE, prior to the submission for a decision from the government; ii. To determine the type and size of the proposed project(s) and activities, including existing and ongoing activities in both private and public sector prior to undertaking the process of EIA; and iii. To encourage public participation in the implementation of the EIA process and take into account their input and suggestions for reconsideration prior to theimplementation of any project.
Sub-decree No. 36 ANK/BK on Solid Waste Management	1999	Article 1: Regulates solid waste management to ensure the protection of human health and the conservation of biodiversity through using appropriate technical approaches. Article 2: This sub-decree applies to all activities related to disposal, storage, collection, transport, recycling, dumping of garbage and hazardous waste. Article 4: The Ministry of Environment shall establish guidelines on disposal, collection, transport, storage, recycling, minimizing, and dumping of household waste in provinces and cities in order to ensure the safe management of household waste. The authorities of the provinces and cities shall establish the waste management plan in their province and city for short, medium and long-term.
Sub-decree No. 27 ANRK/BK on Water Pollution Control	1999	Regulates activities that cause pollution in public water areas in order to sustain good water quality so that the protection of human health and the conservation of biodiversity are ensured. Annex 2 contains effluent standards. Discharge of landfill leachate shall comply with the effluent standards for discharge of wastewater to public water area and sewer. Annex 13 contains ambient water quality standards for biodiversity conservation, and annex 6 includes ambient water quality standards for public health.
Sub-decree No. 42 ANK/BK on Control of Air Pollution and Noise Disturbance	2000	Regulates air and noise pollution from mobile and fixed sources through monitoring, curb and mitigation activities to protect the environmental quality and public health. It contains the following relevant standards: (i)) ambient air quality standard (Annex 6); and (ii) maximum allowable noise level in public and residential areas (Annex 6). Article 3 A. “Source of pollution” is defined and separates mobile sources (including transport) and fixed sources such as factories and construction sites. Article 3 B. “Pollutant” is defined as smoke, dust, ash particle substance, gas, vapour, fog, odour, radio-active substance.
		-The goal of this sub-decree is to enhance the management of garbage and solid waste of downtowns with effectiveness, transparency and accountability,

Law/Regulation/Guideline	Year	Summary
Sub-decree on Garbage and Urban Solid Waste Management	2015	referring to ensure aesthetics, public health and environmental protection -This sub-decree covers separating, storing, cleaning, collecting, transporting, recycling and management of landfills of garbage and solid waste of downtowns in the Kingdom of Cambodia
Sub-decree N0. 235 on Management of Drainage and Wastewater Treatment System	2017	-Aims to improve the management of drainage and wastewater treatment systems in term of efficiency, transparency, and accountability to ensure safety, public health, and biodiversity conservation. -The scope of this Sub-Decree applies to the management of drainage and wastewater treatment systems in capital, provincial, district, khan and resorts or recreation centers in the Kingdom of Cambodia. Its annexes 1 and 2 provide Effleunt Discharge Standards from Commercial Building, Borey, Satellite City and Resort or Recreation Center Discharges Directly to the Drainage/Sewerage System connected to Centralized Wastewater Treatment Plant, and to the Public Waterbody or Drainage/ Sewerage System
Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed	2015	This Parkas includes the standards of the quantity of toxic chemicals or hazardous substances contained in hazardous waste which is allowed to be disposed in sanitary landfills and standards of the quantity of toxic chemicals or hazardous substances allowed in soils. Any disposal of chemical waste or hazardous substances as stipulated in the Parkas out of sites determined by the ministry and competent institutions shall be absolutely prohibited and deemed as the infringement of law.
Prakas on Environmental Impact Assessment Classification for Development Projects No. 21 PRK.BST	2020	The Prakas determines the types and sizes of projects that are required to prepare environmental impact assessments. Projects having minor environmental impacts are required to prepare an Environmental Protection Agreement together with an Environmental Management Plan. Projects having medium impacts shall prepare an Initial Environmental Impact Assessment report, and projects with significant impacts are required to prepare a full EIA. All sizes of rubbish disposal sites are required to undertake an IESIA and all sizes of industrial waste disposal sites are required to undertake an EIA.
Environmental Guidelines on Solid Waste Management	2006	Contains a Landfill Ordinance that regulates landfill requirements to: (i) reduce as far as possible the adverse effects of waste disposal on the environment; (ii) preserve groundwater, surface water & air quality & to reduce emissions of greenhouse gases (iii) ensure waste is not harmful to human, natural & animal health during operation & decommissioning; and (iv) provide information and technical recommendation on the construction, operation, closure and aftercare management of landfills to ensure public health and safety and environmental protection.

Law/Regulation/Guideline	Year	Summary
Technical Guideline on Garbage and Urban Solid Waste Management	2016	The technical guideline provides standards for all activities related to disposal, storage, collection, transportation, recycling, dumping of municipal and hazardous waste as well as management of final dumpsite (closing Landfill) and continued management. The technical guidelines list the requirements to be implemented within 90 days for landfill closing (e.g. monitoring, gas management).
National Integrated Pest Management Program		The Integrated Pest Management (IPM) Program in Cambodia was established in 1993 after conducting national workshop on "Environment and IPM". The overall goal of National IPM Program is to promote food security in Cambodia by enhancing the sustainability of intensified crop production system through the promotion of integrated crop management (ICM) skills at farm level. The objectives of this program are: i. to reduce dependence on agricultural chemical, especially pesticides, in agricultural production and to minimize hazards to the human health, animals and environment; ii. to develop the capacity of farmers and agricultural technical officers in conducting training and experiments so that they are able to identify problems occurring in agricultural production and find appropriate solution to deal with the problem by themselves; and iii. Educate farmers on agricultural technology by enhancing their knowledge on field ecology and by developing skills among farmers in monitoring and analyzing field situations that enable them to manage crops properly. At the national level the position of the IPM program was strengthened by a Prakas (Ministerial Declaration) in July 2002, recognizing the National IPM Program as coordinating body for all IPM related activities in Cambodia. The Prakas also established a steering committee and a deputy director to act as the national coordinator

Law/Regulation/Guideline	Year	Summary
Labour Law (1997) Decree No. CS/RKM/0397/01 On October 5, 2021, Cambodia enacted the third amendment to the country's main employment legislation, the Labor Law of 1997, revising the rules governing individual labor dispute resolution, work shifts, and public holidays falling on Sundays.	1997	This law governs relations between employers and workers resulting from employment contracts to be performed within Cambodia. The key sections relevant to this project include: **<u>Chapter VIII Health and Safety of Worker</u>** The key provisions relate to the quality of the premises; cleaning and hygiene; lodging of personnel, if applicable (such as workers camps); ventilation and sanitation; individual protective instruments and work clothes; lighting and noise levels in the workplace. Article 230: Workplaces must guarantee the safety of workers. However, the only specific occupational health and safety Prakas relates to the garment industry and brick manufacture. **<u>Chapter IX Work-Related Accidents</u>** Article 248: All occupational illness, as defined by law, shall be considered a work-related accident. The law sets out how accidents should be managed in terms of compensation.

Law on Land (NS/RKM/0801/14)	2001	Provides that: (i) unless it is in the public interest, no person may be deprived of ownership of his immovable property; and (ii) ownership deprivation shall be carried out according to legal forms and procedures and after an advanced payment of fair and just compensation. (Article 5)
Expropriation Law	2010	Defines the principles, mechanisms, and procedures of expropriation, and defining fair and just compensation for any construction, rehabilitation, and public physical infrastructure expansion project for the public and national interests and development of Cambodia.
The Law on Road Traffic	2015	The law is intended to ensure road traffic safety and order, and protection of human and animal health and lives, properties and environment. Its establishment a requirement for all motor vehicles, trailers, and semi-trailers moving on the road to obtain a technical inspection certificate. It also outlines road safety requirements.
National Policy on the Development of Indigenous Peoples		1. The guiding document to address Indigenous Peoples' issues in Cambodia is the National Policy on the Development of Indigenous Peoples. The Policy, prepared starting in 1994, was approved by the Council of Ministers on April 24, 2009 and sets out government policies related to indigenous peoples concerning culture, education, vocational training, health, environment, land, agriculture, water resources, infrastructure, justice, tourism, industry and mines and energy. The Policy provides principles for formal registration of indigenous communities as legal entities with their own bylaws and enables their participation in economic development that affects their lives and cultures. It states: "Indigenous Peoples shall be fully entitled to express their comments and opinions and to make any decisions on the development of the economy, society and their cultures towards growth in the society
Policy on Registration and Right to Use of Indigenous Communities		The policy was approved by the Council of Ministers on April 24, 2009, and a Sub-Decree on procedures of registration of Land of Indigenous communities was signed on June 9, 2009 by the Prime Minister. This policy takes as its basis the recognition in the Land Law of 2001, of the right of indigenous communities to possess and use land as their collective ownership. The policy states that the registration of indigenous communities as collective ownership is different from the registration of individual privately owned land parcels because the land registration of the indigenous communities is the registration of all land parcels belonging to the communities as a whole, consisting of both State Public Land and State Private Land in accordance with the articles 25, 26, and 229 of the Land Law and related Sub-decrees. These land parcels are different in size and can be located within the same or different communes/sangkat

3.1.2 EIA Classification

43 In order to provide guidelines on effective implementation of sub-decree No 72 ANRK.BK on environmental impact assessment Procedures for development projects, MoE promulgated sub- decree No. 21 on Environmental Impact Assessment Classification for Development Projects.

44 According to this sub-decree, environmental impact assessment for projects is classified into three categories.

- Projects requiring full environmental impact assessment (full ESIA), equivalent to AIIB's

environmental category A, and IFAD's high risk
- Projects that require initial environmental impact assessment (IEIA), equivalent to AIIB's environmental category B, and IFAD's substantial risk
- Projects requiring the Contract on Environmental Protection (EPC), equivalent to AIIB's environmental category C plus simple EIA analysis and EMP, equivalent to IFAD's moderate/low risk

45 The sub-decree includes an annex listing projects under various sectors and their categorization on the basis of their nature, type and size. The sector and EIA classification for irrigation project is summarized in Table 3-2 below.

Table 3-2: ESIA Classification for Development ProjectsClassification for Development Projects

No.	Project Type	ESIA (Equiv. to AIIB's A	IESIA (Equiv. to AIIBB's B	Env. Protection Contract
142	Irrigation systems		≥5000ha	1000-5000ha
143	Water diversion systems		≥5000ha	1000-5000ha
176	All building construction	Build area>45000m^2	15000 – 45000m^2	3000-15000m^2
179	Road construction (new)	>100km	≥30 – 100km	10-<30km
180	Railroad and road expansion	>100km	≥50 – 100km	10-<50km
181	Road in protected areas	>30km	≥ 10-30 Km	10km
182	Road widen in protected area	>50km	≥ 10-50 km	10km

Source: Prakas No. 021 PRK.BST dated 03 February 2020.

3.1.3 Occupational and Community Safety and Health

46 Government Occupational and Community Safety and Health (OHS) guidelines follow the OHS Program for Cambodia (2010-2013) that was developed by the International Labor Organization (ILO). The draft guidelines provide the framework for instituting OHS at the workplace and in the community. The OHS guidelines for Cambodia will likely need to be supplemented with the international the IFC EHS/OHS Guidelines for Construction and Decommissioning, Waste Management Facilities, and Toll Roads.

47 Additionally, the National MoH's guideline on Covid-19 and National Guideline for Infection prevention and control for healthcare facilities of Cambodia will be applied due to the current situation in respect of the Covid-19 outbreak to reduce the incidence and risk of preventable Nosocomial Infection (NI). Occupational and community health and safety, as laid out in the EHS guidelines, will be a cross-cutting assessment for the subprojects.

48 The Ministry of Labor and Vocational Training (MLVT) has the following guidelines which will be implemented during the construction phase of the Project:

- MLVT Prakas2 No. 075/11 K.B/BR.K (March 2011) - Sanitation at the Construction Site: The Prakas sets to ensure that the sanitation and safety conditions are fulfilled for workers at construction sites by owners, directors, contractors or sub-contractors of construction establishments or construction companies. Articles 3 and 4 ensure that workers are provided with shelter, sanitation facilities and safe potable water for drinking and washing.

- MLVT Prakas No. 076/11 K.B/BR.K (March 2011) - The Protection of Risk Resulting From Climate Change at Construction Sites. Articles of this Prakas require safety measures and break times for workers at the construction site during extreme weather events.

- MLVT Prakas No. 077/11 K.B/BR.K (March 2011) - Providing of Information at the Construction Site. This Prakas states requirements for owners or responsible persons of a construction site to provide information, i.e. name and address of the owner of enterprise, construction establishment, Construction Company, name and address of architect, nature of construction, date for the start of the construction, estimated time

to finish the construction works, and estimated number of workers to be employed for construction activities.

- MLVT Prakas No. 078/11 K.B/BR.K (March 2011) - Stock of Materials, Waste Disposal and Clearance at Construction Site. This Prakas provides safety guidelines and requirements for the safe storage of construction of materials and hazardous substances/objects that can pose health and safety risks to workers.

49 The key national environmental quality standards applied to the subproject are listed in Table-3-3 below together with relevant international guidelines.

Table-3-3: Key National and International Environmental Standards and Guidelines

Environmental Issue	National Standards	International Guidelines
Ambient air quality	Annex 1, Ambient Air Quality Standard, of Sub-decree on Control of Air Pollution and Noise Disturbance, 2000	WHO Air Quality Guidelines, global update 2005
Noise	Annex 6, Max. Standard of Noise Level Allowable in the Public and Residential Areas, of Sub-decree on Control of Air Pollution and Noise Disturbance, 2000	WHO Guidelines for Community Noise, 1999
Surface water quality	Sub-decree No. 27 ANRK/BK 1999 on Water Pollution Control: Annex 4, Water Quality Standards for Public Waters for the Purpose of Biodiversity Conservation, and Annex 5, Water Quality Standards for Public Waters and Health	US EPA National Recommended Water Quality Criteria Mekong River Commission (MRC)_ Technical Guidelines for the Protection of Aquatic Life MRC Technical Guidelines for the Protection of Human Health

3.1.4 Applicable Evaluation Ambient Quality Standards

50 Water quality standard in public water area for public health protection is shown in Table-3-4 below.

Table-3-4: Water quality standard in public water areas for public health protection

No.	Parameter	Unit	Surface water Standard
1	Carbon tetrachloride	µg/l	< 12
2	Hexachloro-benzene	µg/l	< 0.03
3	DDT	µg/l	< 10
4	Endrin	µg/l	< 0.01
5	Diedrin	µg/l	< 0.01
6	Aldrin	µg/l	< 0.005
7	Isodrin	µg/l	< 0.005
8	Perchloroethylene	µg/l	< 10
9	Hexachlorobutadiene	µg/l	< 0.1
10	Chloroform	µg/l	< 12
11	1,2 Trichloroethylene	µg/l	< 10
12	Trichloroethylene	µg/l	< 10
13	Trichlorobenzene	µg/l	< 0.4
14	Hexachloroethylene	µg/l	< 0.05
15	Benzene	µg/l	< 10
16	Tetrachloroethylene	µg/l	< 10
17	Cadmium	µg/l	< 1

Source*:* Annex 5 of Sub-decree No 27 ANRK.BK on Water Pollution Control, 2009

51 Water quality standards in public water areas for biodiversity conservation is shown in Table-3-5 below.

Table-3-5: Water quality standard in public water areas for bio-diversity conservation

Parameter	Unit	Standard Value		
		River	Lake/Reservoir	Coastal Water
pH		6.5-8.5	6.5-8.5	7.0-8.3
BOD5	mg/l	1-10	NV	NV
Suspended Solid	mg/l	25-100	1-15	n/a
Dissolved Oxygen	mg/l	2.0-7.5	2.0-7.5	2.0-7.5
Coliforms	MPN/100ml	<5000	<1000	<1000
COD	mg/l	NV	1-8	2-8
Total Nitrogen	mg/l		0.1 – 0.6	0.2– 1.0
Total Phosphorus	mg/l		0.005– 0.05	0.02 – 0.09
Oil content	mg/l	NV	NV	0

NV=No value
Source: Annex 4 of Sub-decree on No 27 ANRK.BK Water Pollution Control, 2009.

52 Ambient Air Quality Standards are shown in Table-3-6below.

Table-3-6: Ambient Air Quality Standard

Parameters	Cambodia[a]				IFC-EHS[b] Guidelines WHO
	Period 1h Average mg/m3	Period 8h Average mg/m3	Period 24h Average mg/m3	Period 1year Average mg/m^3	interim target1 ug/m3
Carbon monoxide (CO)	40	20	-	-	
Nitrogen dioxide (NO2)	0.3	-	0.1	-	40（1yr.） 200 (1 hr.)
Sulfur dioxide (SO2)	0.5	-	0.3	0.1	500 (10 min) 125 (24hr.)
Ozone (O3)	0.2	-	-	-	100 (8 hr. daily)
Lead (Pb)	-	-	0.005	-	
Particulates	-	-	0.33	0.1	150 (PM10 24hr) 75 (PM2.5 24hr)

[a] Sub-decree N0 42 ANRK.BK on Air Pollution Control and Noise Disturbance.
[b] Environmental, Health, and Safety Guidelines, IFC.

Maximum permitted noise levels in public and residential areas are shown in Table-3-7 below.

Table-3-7: Maximum permitted noise level in public and residential area (dB (A))

Location	Cambodian Standard			IFC-EHS Guidelines	
	06:00 to 18:00	18:00 to 22:00	22:00 to 6:00	Day 7:00 to 22:00	Night 22:00 to 7:00
Silence Area Hospital; Library, School, Nursery	45	40	35	55	5
Resident Area Hotel; Administration place, House	60	50	45		

Commercial, Services Areas and mix	70	65	50	70	70
Small Industrial factories intermingling in residential areas	75	70	50		

Note: This standard is applied to control of noise level of any source of activity that emitted noise into the public and residential areas.
Source: Annex 6 of Sub-Decree on Air Pollution Control and Noise Disturbance, 2000

3.1.5 International Conventions

53 Cambodia is a signatory to many international environmental treaties and conventions which provide a comprehensive legal framework. These include:

- Biodiversity Convention in 1994;
- Convention on International Trade in Endangered Species of Fauna and Flora (CITES) in 1997;
- Ramsar Convention in 1999;
- United Nations Framework Convention on Climate Change (UNFCC), 1992, entered into force on 21 March 1994 (Cambodia ratified on 18 December 1995);
- Kyoto Protocol 1997, entered into force on 16 February 2005 (Cambodia accessed on 22 August 2002);
- Vienna Convention for the Protection of the Ozone Layer, entered into force on 22 September 1988 (Cambodia accessed on 27 June 2001);
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, entered into force on 1 January 1989 (Cambodia accessed on 27 June 2001);
- The International Convention for the Prevention of Marine Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto “MARPOL 73/78”, fully entered into force on 2 October 1983 (Cambodia ratified on 1994);
- Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, entered into force on 5 May 1992 (Cambodia accessed on 02 March 2001);
- United Nations Convention to Combat Desertification, entered into force on 26 December 1996 (Cambodia ratified on 18 August 1997);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora, entered into force on 01 July 1975 (Cambodia ratified on 04 July 1997);
- Cambodia joined the UNESCO Network of Biosphere Reserves in 1997. It committed to the Millennium Development Goals and subsequently endorsed the Sustainable Development Goals at the UN General Assembly in 2015;
- At the regional level, it ratified the following ASEAN Agreements: (a) on Transboundary Haze Pollution in 2006; and (b) on Disaster Management and Emergency Response, which entered into force in 2009; and
- At the subregional level, Cambodia, along with Lao PDR, Thailand and Viet Nam, signed the “Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin” (or the Mekong Agreement) in April 1995.

3.2 Application of AIIB, IFAD and GCF Environmental, Social, and Climate Risks Standards/Procedures

3.2.1 AIIB’s Environmental and Social Framework

54 The objectives of this ESF are to:

- Reflect institutional aims to address environmental and social risks and impacts in Projects (defined below in *Section II, Definitions,* of the ESP).
- Provide a robust structure for managing operational and reputational risks of the Bank and its shareholders in relation to Projects’ environmental and social risks and impacts.
- Support the environmental and social soundness and sustainability of Projects.

- Facilitate the integration of environmental and social aspects of Projects into the decision-making process by all parties.
- Provide a mechanism for addressing environmental and social risks and impacts in Project identification, preparation and implementation.
- Enable Clients (defined below in *Section II, Definitions,* of the ESP) to identify and manage environmental and social risks and impacts of Projects, including those of climate change.
- Provide a framework for public consultation and disclosure of environmental and social information in relation to Projects.
- Provide a grievance redress mechanism designed to enable Project-affected people to voice their concerns and grievances in connection with the environmental and social aspects of Projects.
- Improve development effectiveness and impact to increase results on the ground, in both the short and long term.
- Support Clients, through Bank financing of Projects, to strengthen their environmental and social management systems.
- Support Clients, through Bank financing of Projects, to implement their obligations under national environmental and social legislation (including under international agreements adopted by the Member) governing these Projects, including commitments relating to climate change.
- Support Clients, where feasible and appropriate, to mobilize resources for technical assistance for the preparation of environmental and social documents and capacity enhancement.
- Facilitate cooperation on environmental and social matters with development partners.

3.2.2 *AIIB's Environmental and Social Standards*

3.2.3 *Environmental and Social Standard 1: Environmental and Social Assessment and Management Scope and Application:*

55 Environmental and Social Standard (**ESS**) 1 applies if the Project is likely to have adverse environmental risks and impacts or social risks and impacts (or both). The scope of the environmental and social assessment and management measures are proportional to the risks and impacts of the Project. ESS 1 provides both for quality environmental and social assessment and for management of risks and impacts through effective mitigation and monitoring measures during the course of Project implementation.

- **Environmental coverage:** Environmental Risks and Impacts, Biodiversity Consideration, protected areas, ecosystem services, sustainability of land and water use, precautionary approach, pollution prevention, resource efficiency, climate change and greenhouse gases.
- **Social coverage:** Social Risks and Impacts, Scope of Social Coverage, Vulnerable/Disadvantaged Groups and Discrimination, Gender, Gender-based violence, Land and Natural Resource Access Loss of access to assets or resources or restriction on land use, Cultural resources
- **Heath and safety:** health and safety of workers and communities, occupational heath and safety, labor influx, building safety, traffic and road safety, security personnel, safety of dam.
- **Labor and Working conditions:** labor management relationships, civil servants, child labor and forced labor,

3.2.4 *Environmental and Social Standard 2: Land acquisition and involuntary resettlement*

56 **Scope and Application.** ESS 2 applies if the Project would or may involve Involuntary Resettlement (including Involuntary Resettlement of the past or foreseeable future that the Bank determines is directly linked to the Project).

3.2.5 *Environmental and Social Standard 3: Indigenous Peoples*

57 **Scope and Application:** ESS 3 applies if Indigenous Peoples are present in, or have a collective attachment to, the proposed area of the Project, and are likely to be affected by the Project.

The term Indigenous Peoples is used in a generic sense to refer to a distinct social and cultural group possessing the following characteristics in varying degrees:2 (a) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; (b) collective attachment to geographically distinct habitats, ancestral territories or areas of seasonal use or occupation in the Project area and to the natural resources in these areas; (c) customary cultural, economic, social or political institutions that are distinct or separate from those of the dominant society or culture; and (d) a distinct language or dialect, often different from the official language or languages of the country or region in which they live. In considering these characteristics, national legislation, customary law and any international conventions to which the Member in whose territory the Project is located is a party may be taken into account. A group that has lost collective attachment to geographically distinct habitats or ancestral territories in the Project area because of forced severance remains eligible for coverage as an Indigenous People, under ESS 3.

3.2.6 *Application of IFAD and GCF Environmental, Social, and Climate Risks Standards/Procedures*

58 Based on the IFAD SECAP and GCF ESS, the following safeguards documents were prepared: (i) Environmental and Social Management Framework (ESCMF) including climate considerations; (ii) Indigenous Peoples' Plan (IP Plan); (iii) Stakeholder Engagement Plan (SEP); and (iv) Gender Assessment & Action Plan (GAP). The documents have been publicly disclosed in advance of implementation and board approval to respect the Pelosi Amendment[14] as a best practice, even though the project is not high or substantial risk (the risk rating is only moderate), and the documents collectively respond to the standards described below.

3.2.7 SECAP's Environment and Social Standards (ESSs) are described as below:

- Standard 1: Biodiversity Conservation;
- Standard 2: Resource Efficiency and Pollution Prevention;
- Standard 3: Cultural Heritage
- Standard 4: Indigenous Peoples
- Standard 5: Labour and Working Conditions
- Standard 6: Community Health and Safety;
- Standard 7: Physical and Economic Resettlement;
- Standard 8: Financial Intermediaries and Direct Investments;
- Standard 9: Climate Change

59 Not explicitly listed as a standard, but considered a vital part of project design, implementation, and safeguarding is stakeholder engagement. Provisions to ensure meaningful engagement are provided within the Stakeholder Engagement Plan and initial feedback and engagement was mainstreamed into the project design.

The scope of the safeguard standards are detailed in Table-3-8.

Table-3-8: Scope of Safeguards Standards

Safeguards Standard	Scope
Standard 1: Biodiversity Conservation	**Scope:** In accordance with the Convention on Biological Diversity (CBD), this standard recognizes that biodiversity is about more than plants, animals and micro-organisms, and includes people and their need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment. Key objectives include: • Maintain and conserve biodiversity

[14] The 1989 Pelosi Amendment requires disclosure of environmental impacts at least 120 days prior to board approval for high- and sometimes substantial-risk projects (URL: https://www.gao.gov/archive/2000/ns00192.pdf)

Safeguards Standard	Scope
	• Ensure the fair and equitable sharing of benefits from the utilization of generic resources; • Respect, preserve, maintain, and encourage knowledge, innovations, and practices of indigenous peoples and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources; and • Adopt a precautionary approach to natural resource conservation and management to ensure opportunities for environmentally sustainable development.
Standard 2: Resource Efficiency and Pollution Prevention	**Scope:** This Standard recognizes that economic activity and development can often pollute the air, water, and land. They may also result in the consumption of finite resources, which may in turn threaten people, ecosystem services and the environment. It advocates for a precautionary approach with the following objectives: • Avoid, minimize and manage the risks and impacts associated with hazardous substances and materials, including pesticides; • Avoid or minimize project-related emissions of short- and long-lived climate pollutants; • Promote more sustainable use of resources, including energy, land and water; and • Identify opportunities for improving resource efficiency.
Standard 3: Cultural Heritage	**Scope:** This Standard recognizes that cultural heritage is central to individual and collective identity and memory, providing continuity between the past, present, and future. Objectives include: • Preserve and safeguard cultural heritage; • Ensure that active efforts are made to prevent IFAD-supported projects from altering, damaging or removing any tangible or intangible cultural heritage; • Promote the equitable sharing of benefits from the use of cultural heritage; and • Promote meaningful consultation on matters related to cultural heritage.
Standard 4: Indigenous Peoples	**Scope:** This standard focuses on the rights of Indigenous Peoples and promotes the following objectives: • Support indigenous peoples to determine priorities and strategies for exercising their right to development; • Ensure that each project is designed in partnership with indigenous peoples and with their full, effective and meaningful consultation, leading to FPIC; • Ensure that indigenous peoples obtain fair and equitable benefits and opportunities from project-supported activities in a culturally appropriate and inclusive manner; and • Recognize and respect the rights of indigenous peoples to the lands, territories, waters and other resources that they have traditionally owned, used or relied upon.
Standard 5: Labour and Working Conditions	**Scope:** This standard is focused on fostering inclusive, diversified, and productive rural economies that create opportunities for decent work and higher incomes. Objectives of this standard are to: • Promote direct action to foster decent rural employment;

Safeguards Standard	Scope

	• Promote, respect and realize fundamental principles and rights by:
	  ○ Preventing discrimination and promoting equal opportunities for workers;
	  ○ Supporting freedom of association and the right to collective bargaining; and
	  ○ Preventing the use of child labour and forced labour;
	• Protect and promote the safety and health of workers;
	• Ensure that projects comply with national employment and labour laws, and international commitments;
	• Leave no one behind by protecting and supporting workers in disadvantaged and vulnerable situations, including women (e.g. maternity protection), young workers, migrant workers, workers in the informal economy and workers with disabilities.

Standard 6: Community Health and Safety	**Scope:** These standard stresses avoiding – and where avoidance is not possible, minimizing and mitigating – health-related and safety-related risks and impacts that may arise from IFAD-supported projects, with special attention to marginalized and disadvantaged groups. Objectives include to: • Ensure quality and safety in the design and construction of programming-related infrastructure, preventing and minimizing potential safety risks and accidents; • Avoid or minimize community exposure to disaster risks, diseases and hazardous materials associated with project activities; • Ensure that the safeguarding of personnel and property minimizes risks to communities and is carried out in accordance with international human rights standards and principles; and • Have in place effective measures to address emergency events, whether human-made or natural hazards.
Standard 7: Physical and Economic Resettlement	**Scope:** This Standard not only considers resettlement as the physical relocation of people but as economic, social and cultural displacement restricting people's access to livelihoods and culturally important sites. Objectives include to: • Avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring alternative project designs and sites; • Avoid forced eviction; • Ensure that resettlement activities are planned and implemented collaboratively with the meaningful participation of affected people; • Enhance and restore the livelihoods of all displaced peoples; and • Provide explicit guidance to borrowers/recipients/partners on the conditions that need to be met regarding involuntary resettlement.
Standard 8: Financial Intermediaries and Direct Investments	**Scope:** This Standard recognizes that investments in FIs (indirect investments) and private-sector companies (direct investments) are critical for promoting sustainable financial markets and providing financial products and services to farming businesses and rural micro, small and medium-sized enterprises. Objectives include to:

Safeguards Standard	Scope
	• Promote sound environmental, social and climate practices, and sound human resource management with FIs and direct investees; • Ensure that FIs and direct investees assess and manage any environmental and social risks and impacts of subprojects; and • Promote good environmental and social management practices by direct investees and in the subprojects financed by FIs.
Standard 9: Climate Change	**Scope:** This standard is focused actively considering, planning for, and responding to projected climate changes. Objectives include to: • Ensure alignment of IFAD-supported projects with the Nationally Determined Contributions of countries and the goals of the Paris Agreement and other international frameworks; • Ensure that proposed activities are screened and assessed for climate change and disaster risks and impacts, including both impacts of projects and on them; • Apply the mitigation hierarchy in project design; • Strengthen the resilience of communities to address the risk of climate change impacts and climate-related disasters; and • Increase the ability of communities to adapt to the adverse impacts of climate change, and foster climate resilience and low GHG-emitting projects that do not threaten food production.

3.3 Gap Analysis and Gap Filling Measures

60 IFAD classifies projects and subprojects into one of four classifications: *high risk*, s*ubstantial risk*, *moderate risk* or *low risk* and discloses a project's risk classification and basis for that classification in project documents and on the IFAD website. GCF classifies projects and subprojects into one of three classifications: high risk, moderate risk, or low risk, however the GCF accepts the standards and risk classifications of Accredited Entities, like IFAD, thus for this project (and to simplify approval for IFAD-funded activities) the ESCMF utilizes the IFAD classifications.

61 The assessment identified key gaps between the county's legal system and international recognized environmental and social standards (e.g. AIIB, IFAD, GCF) and priority needs to ensure full compliance of the ESSs. The conclusion was that Cambodia has a comprehensive regulatory framework that in many cases meets the requirements of the ES standards, and key issues are more associated with implementation and differentiated capacities between the central and provincial PMUs and the provinces. There are opportunities to accelerate implementation of recent improvements in the country system, especially on labour, community safety, and stakeholder engagement.

62 Based on the project's high or category A risk rating for environment, social, and climate considerations, national regulations are adequate for most of the investments, while additional gap-filling measures will be applied for the preparation of an Environmental, Social and Climate Impact Assessment (ESCIA) for the overall project particularly related to the civil works so that contractors and implementation partners can adequately address issues related to contract management, safety of local communities, and workers. Capacity building efforts pertaining to regulation and oversight are also incorporated as part of the safeguards management of the CAISAR project and as part of the project design (e.g. under Component 2 activities).

63 There are key gaps between the environmental, social, and climate assessment requirements of the Asian Infrastructure Investment Bank (AIIB), International Fund for Agricultural Development (IFAD), Green Climate Fund (GCF), and the Cambodian Government.

64 One key difference is the scope of their assessments. The AIIB and GCF focus on infrastructure and climate projects, while IFAD focuses on agricultural development. As a result, the types of environmental and social risks and impacts that are assessed may differ.

65 Another difference is the level of detail required in the assessments. The AIIB requires a comprehensive Environmental and Social Framework (ESF) that covers all projects, while the GCF requires a simplified Environmental and Social Management System (ESMS) that is tailored to each project. IFAD requires an Environmental and Social Assessment (ESA) that is specific to each project.

66 In terms of climate assessments, the GCF requires a detailed assessment of the project's potential greenhouse gas emissions and its contribution to climate change mitigation and adaptation. The AIIB also considers climate risks and opportunities in its project assessments but does not require a specific climate assessment. Cambodia's Environmental Impact Assessment (EIA) requirements do not explicitly specify climate assessment procedures. However, the EIA process does consider the potential impacts of projects on the environment, which includes climate-related factors. The assessment typically covers aspects such as air quality, water resources, biodiversity, and social impacts, which indirectly address climate considerations.

67 Overall, while there are some similarities in the environmental, social, and climate assessment requirements of these institutions, there are also key differences that reflect their different mandates and priorities.

68 A detailed list of the Green Climate Fund's climate assessment requirements for an irrigation and flood protection project in Cambodia require:

1. Project description: The project description should include a detailed description of the irrigation and flood protection project in Cambodia, including the location, size, and scope of the project, as well as the expected benefits and impacts.
2. Climate rationale: The project should have a clear climate rationale that explains how it will contribute to climate change mitigation and adaptation. This should include an analysis of the project's potential greenhouse gas emissions and its contribution to reducing emissions.
3. Baseline emissions: The project should include a baseline emissions assessment that estimates the greenhouse gas emissions that would occur in the absence of the project.
4. Project emissions: The project should estimate the greenhouse gas emissions that will be generated by the project, including direct and indirect emissions.
5. Mitigation potential: The project should assess its potential to reduce greenhouse gas emissions and contribute to climate change mitigation. This should include an analysis of the project's potential to reduce emissions compared to the baseline scenario.
6. Adaptation potential: The project should assess its potential to contribute to climate change adaptation, including an analysis of the project's ability to increase resilience to climate change impacts such as flooding and drought.
7. Co-benefits: The project should identify and assess any co-benefits that may result from the project, such as improved food security, increased access to water, or improved livelihoods.
8. Risks and uncertainties: The project should identify and assess any risks and uncertainties associated with the project, including potential environmental, social, and economic risks.
9. Monitoring and evaluation: The project should include a monitoring and evaluation plan that outlines how the project's greenhouse gas emissions, climate change mitigation and adaptation impacts, and co-benefits will be monitored and evaluated over time.

69 Overall, the Green Climate Fund's climate assessment requirements for an irrigation and flood protection project in Cambodia are designed to ensure that the project is aligned with the Fund's climate change objectives and that its potential greenhouse gas emissions and contributions to climate change mitigation and adaptation are carefully evaluated.

70 It is important to ensure that the environmental, social, and climate assessments of an irrigation and flood control project in Cambodia meet both the requirements of the international organizations as well as the legal requirements of the Cambodia government. This will help to ensure that the project is implemented in a way that is legally compliant and meets international standards for environmental and social sustainability and climate change mitigation and adaptation.

3.3.1 *Environmental, Social and Climate Assessment in Cambodia*

71 The Environmental Impact Assessment (EIA) process in Cambodia faces several issues that hinder its effectiveness and transparency. Some of the key issues include:

1 Limited public participation: The EIA process in Cambodia often lacks meaningful public participation. Communities and affected stakeholders are not adequately informed or involved in decision-making processes, limiting their ability to provide input, voice concerns, and influence project outcomes.
2 Inadequate assessment quality: The quality of environmental impact assessments conducted in Cambodia is often criticized for being insufficient and not meeting international standards. This can result in inaccurate or incomplete assessments, leading to inadequate identification and mitigation of potential environmental and social impacts.
3 Lack of independence: The EIA process in Cambodia suffers from a lack of independence, as project proponents are often responsible for conducting and financing their own environmental impact assessments. This can create conflicts of interest and raise concerns about the credibility and objectivity of the assessment process.
4 Weak enforcement and compliance: Despite having regulations in place, the enforcement of EIA requirements and conditions is often weak in Cambodia. This can lead to non-compliance by project developers, with inadequate monitoring and enforcement mechanisms to ensure adherence to environmental safeguards.
5 Limited capacity and resources: Cambodia faces challenges in terms of limited technical capacity and resources for conducting robust environmental impact assessments. Insufficient expertise and resources can result in inadequate assessments and monitoring, compromising the effectiveness of the EIA process.
6 Lack of transparency and accountability: The EIA process in Cambodia lacks transparency, with limited public access to information and documentation related to environmental impact assessments. This lack of transparency hampers accountability and the ability of affected communities to understand and challenge project decisions.

72 While climate change is not explicitly mentioned in the Cambodian EIA requirements, the government has recognized the importance of climate change mitigation and adaptation. The country has developed policies and strategies to address climate change, such as the National Adaptation Plan and the National Climate Change Strategic Plan. These initiatives aim to integrate climate change considerations into various sectors, including infrastructure development and land use planning.

73 In recent years, there has been recognition globally of the need to include climate change considerations in the EIA process. This includes assessing the potential greenhouse gas emissions, vulnerability to climate impacts, and the resilience of projects to climate change.

74 In conclusion the ESCIA requirements of AIIB, IFAD, GCF and the Cambodian government are similar intent and must include the specific climate assessment requirements as defined by GCF.

3.3.2 *Labor and Working Conditions in Cambodia*

75 Cambodia’s labor law does address various aspects related to child labor, gender equality, forced labor, and occupational health and safety. However, it is important to note that there are still challenges in effectively enforcing these laws and ensuring full compliance across all sectors.

76 Regarding child labor, Cambodia’s labor law prohibits the employment of children under the age of 15 in any economic activity. However, there are exceptions for light work that is not harmful to their health and development, and the law also allows for children aged 12 to 15 to engage in light work with certain restrictions. Despite these regulations, child labor remains a concern in Cambodia, particularly in sectors such as agriculture, construction, and informal work.

77 In terms of gender equality, Cambodia’s labor law prohibits discrimination based on gender in recruitment, remuneration, promotion, and other employment-related matters. It also guarantees equal

pay for equal work. However, gender-based discrimination and disparities in the labor market, including lower wages for women and limited representation in higher-level positions, continue to persist.

78 Regarding forced labor, Cambodia's labor law explicitly prohibits any form of forced or compulsory labor. It also prohibits debt bondage and human trafficking. However, forced labor remains a significant issue, particularly in sectors such as agriculture, construction, and domestic work. The government has taken steps to combat this problem, including establishing mechanisms for reporting and addressing cases of forced labor.

79 Occupational health and safety is another area addressed by Cambodia's labor law. The law requires employers to provide a safe and healthy working environment, including measures to prevent accidents, injuries, and occupational diseases. It also mandates the establishment of workplace safety committees and the provision of training on occupational health and safety. However, the enforcement of these regulations and the implementation of effective safety measures can be challenging, particularly in sectors with informal or hazardous working conditions.

80 In summary, while Cambodia's labor law does address child labor, gender equality, forced labor, and occupational health and safety, there are still gaps in enforcement and compliance. Efforts are needed to strengthen the implementation of these laws and ensure the protection of workers' rights in practice.

81 Systematic labor inspection heavily relies on self-reporting, especially when construction contractors and primary suppliers are involved. For this reason, a template for labor management procedures must be included in bidding documents of contracted workers. For primary suppliers of materials, the practice of conducting due diligence on labour and working conditions among potential sources of aggregate material is uncommon. Therefore, a monitoring procedure must be established prior commencement of related works, and the site-specific ESA must assess potential labor issues, including risks of child and forced labour for suppliers and in the value chains relevant for the CAISAR project, and other health hazards on workers due to waste management and handling of any related hazardous materials during construction to ensure compliance with national laws and Standards. MOWRAM as the Lead Agency of the CAISAR project must ensure that OHS procedures and a working grievance redress mechanism are stipulated within the contract, including the system for monitoring third party contractors' compliance with the agreed OHS procedures and GRM.

4. ENVIRONMENT, SOCIAL & CLIMATE ASSESSMENT

4.1 Project Objective, Components, Areas and Beneficiaries

82 The project rationale is provided in Section 1.1. The Country and project context is provided in Section 1.2, and the CAISAR Project components are outlined in Chapter 2.

83 The CAISAR project has a broad positive impact benefitting approximately 120,000 households (500, 000 rural people) directly while its effect will propagate to over 3 million people in the region (CAISAR Feasibility Study 2023). The project will be executed through the Ministry of Water Resources and Meteorology (MOWRAM) and the National Committee for Sub-National Democratic Development Secretariat (NCDD-S), a Direct Access Accredited Entity to the GCF. The expected timelines for the approval of the co-financing by IFAD and AIIB Executive Boards are respectively September 2024 and January 2024, with the inception of the project is expected to take place in December 2024.

4.2 Project Area

84 The CAISAR project aims to enhance Cambodia's resilience against climate change through investments in innovative practices such as flood protection, drainage, and solar pumping, with a total estimated budget of $280 million. The costs are distributed among different CAISAR objectives, with flood and drainage costing $47.4 million, solar and raised tertiary costing $82.1 million, and irrigation and storage costing $150.6 million. The project is divided into three sub-projects, each with different requirements and costs. The CAISAR scheme is expected to improve yields and provide better drought resilience over the 25-year asset life, with the project expecting significant yield improvements in all three sub-project areas.

85 The core benefits of the project include food security in the face of climate change as well as significant economic contributions to poor rural households by enabling climate change resilient and adaptive agriculture as well as nationally important greenhouse gas emission reductions. The scheme will bring several indirect benefits improving the socio-economic situation for communities living within the command areas such as improved access to transport links, education and community strengthening through the establishment of FWUCs. The project is expected to be economically viable even under pessimistic assumptions, with the baseline internal rate of return for the project at 17%.

86 Through nature-based approaches including river restoration and rehabilitation and creation of natural ponds, the CAISAR project is expected to provide several environmental enhancements whilst ensuring that the environmental impacts of the construction and operational phases of the project are limited and mitigated where possible. In addition to this, the use of innovative climate-smart solutions will reduce the overall climate impact of the scheme and endeavor to reduce the emission of greenhouse gases from the existing and proposed agricultural practices with the introduction of solar pumps and Alternate Wetting and Drying techniques.

87 The character and existing farming systems differ widely in each sub project as will be described below. The CAISAR feasibility study covers a total command area of 45,000ha and is composed of three sub-project command areas – Ou Ta Paong, in Pursat Province, Lum Hach, in Kampong Chhnang Province and Krang Ponley in Kampong Chhnang, Kapong Speu and Kandal Province as shown in
Source: CAISAR Feasibility Study

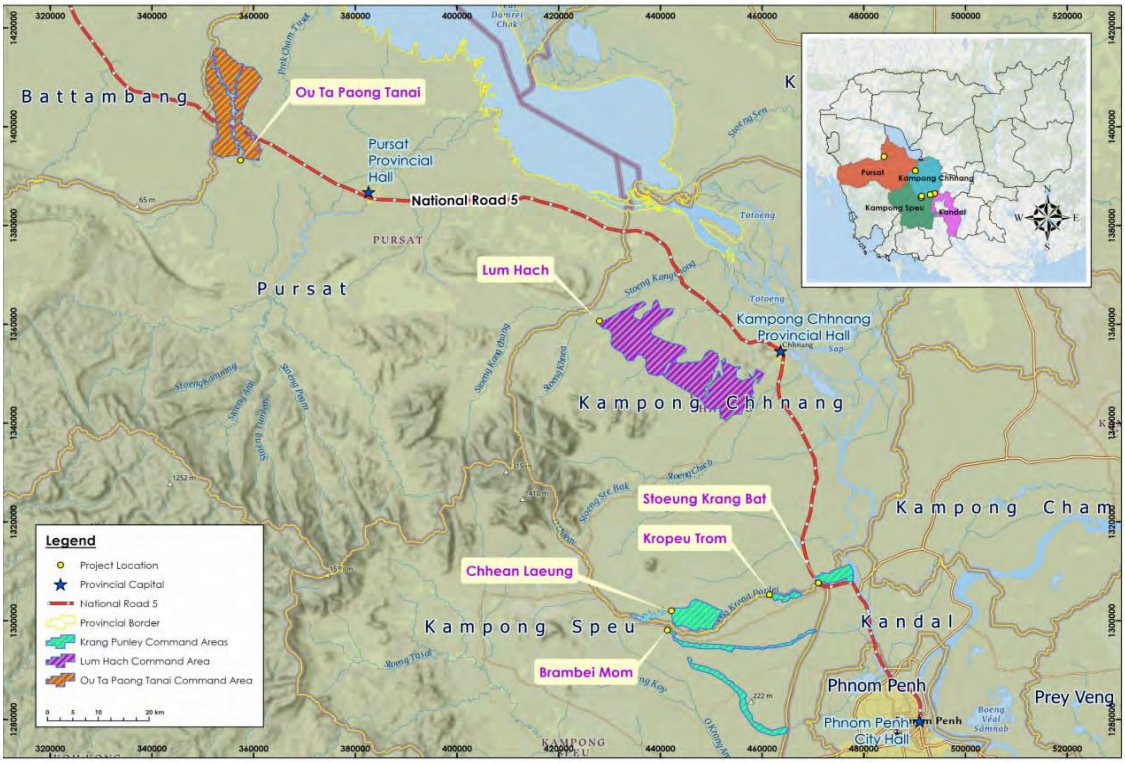
Figure 4-1: Map showing the location of the CAISAR project areas and& Provincial Boundaries

88 .

89 Detailed characteristics of the different sub-project command areas, with respect to historical and present-day conditions, temperature, precipitation, agricultural cover, and current water resources are presented in each Feasibility report for the corresponding projects which will be available to the team.

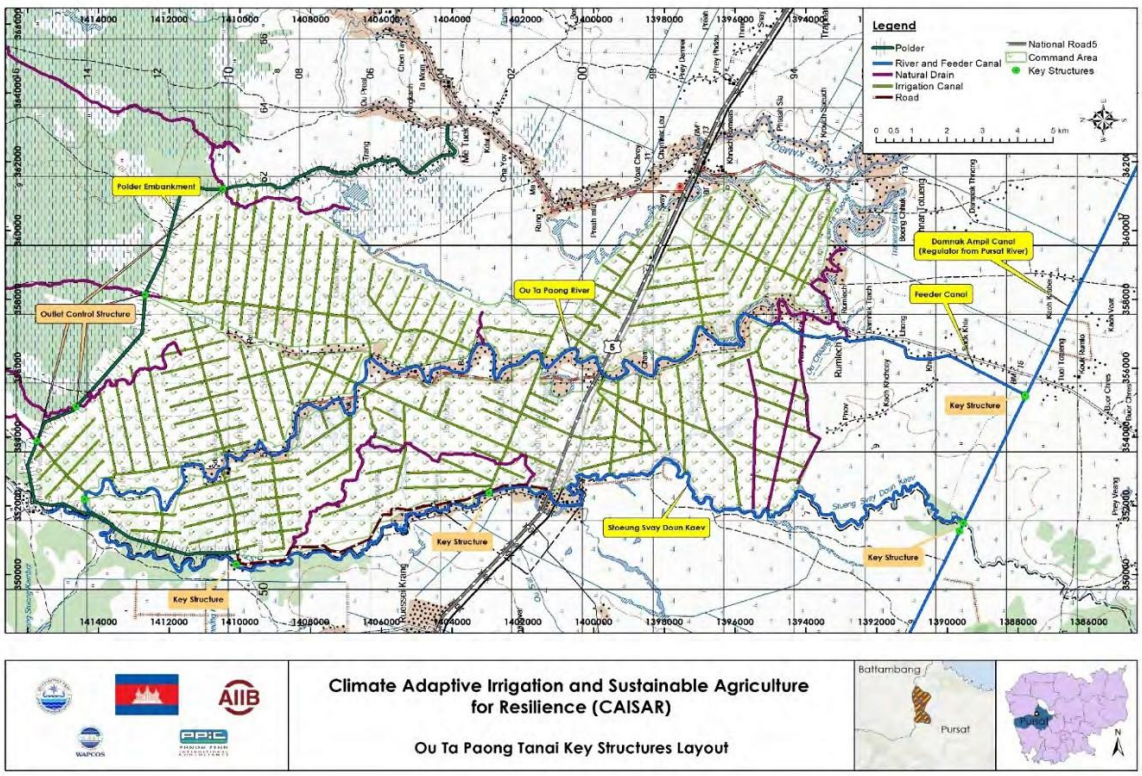
90 The sub-project areas, except for Kampong Chhnang, each have existing irrigation infrastructure which needs rehabilitation and/or has a suitable nearby water source that could enhance the agricultural output from the area and make it more resilient to the effects of climate change. The final command areas were then established based on field surveys and stakeholder consultations and

target areas that require the greatest assistance. Each sub-project area is currently experiencing or projected to experience challenges because of climate change and is therefore in need of climate adaptation and resilience measures. This work has been conducted in consultation with MOWRAM and the PDWRAM to ensure that local information is considered at each project stage.



Source: CAISAR Feasibility Study

Figure 4-1: Map showing the location of the CAISAR project areas and& Provincial Boundaries



Source: CAISAR Feasibility Study 2023

Figure 4-2: Ou Ta Paoung Project Layout - Some irrigation exists, others depend on flood recession or rainfall.

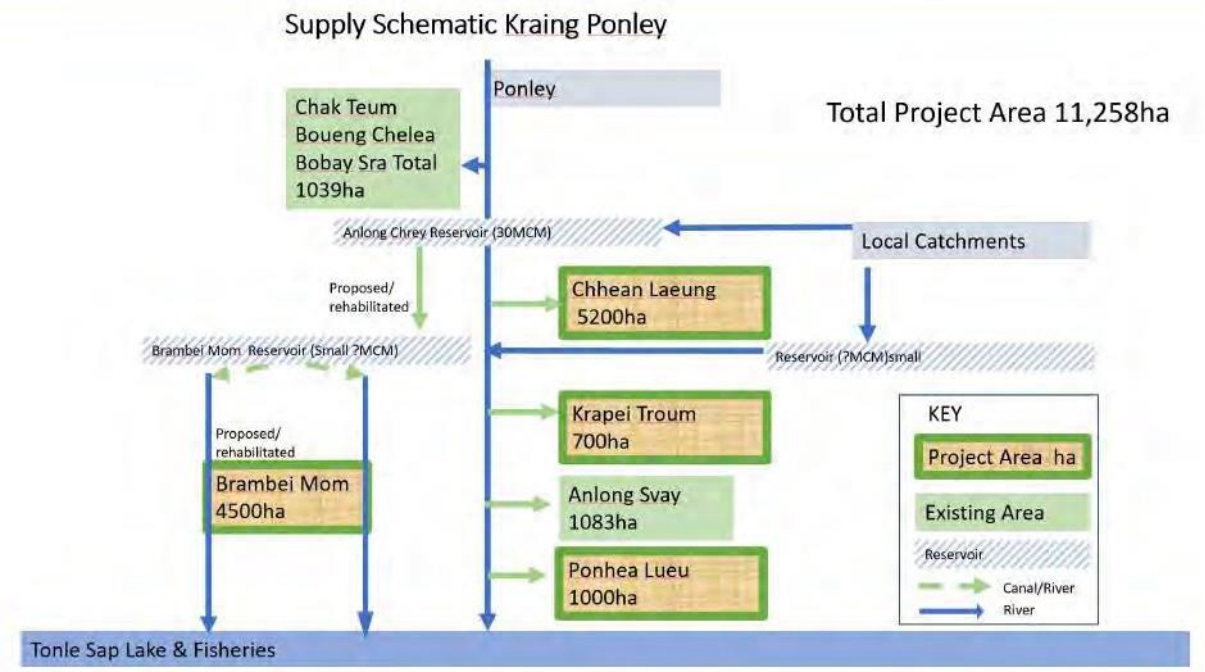
Source: CAISAR Feasibility Study 2023

Figure 4-3 Lum Hach Feasibility Level Canal Layouts and Storage (excluding JICA System)

91 Krang Ponley scheme differs from the Ou Ta Paong and Lum Hach schemes in that it consists of 4 separate command areas. These are grouped according to their hydrological connectivity via the Ponley River and geographical proximity in the North East of the Kampong Speu province and crossing slightly into Kampong Chhnang and Kandal (Source: CAISAR Feasibility Study 2023

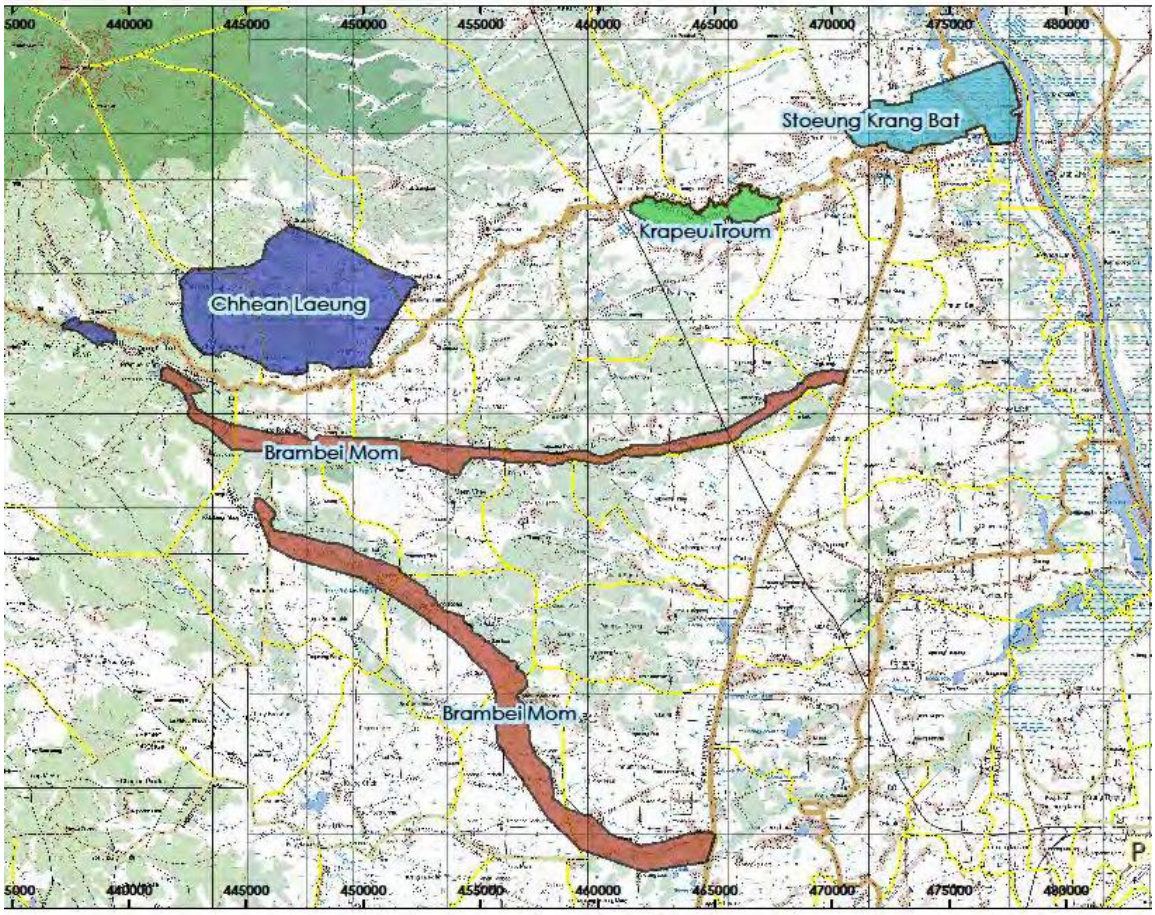
92 Figure 4-3 to Source: CAISAR Feasibility Study

93 Figure 4-7).



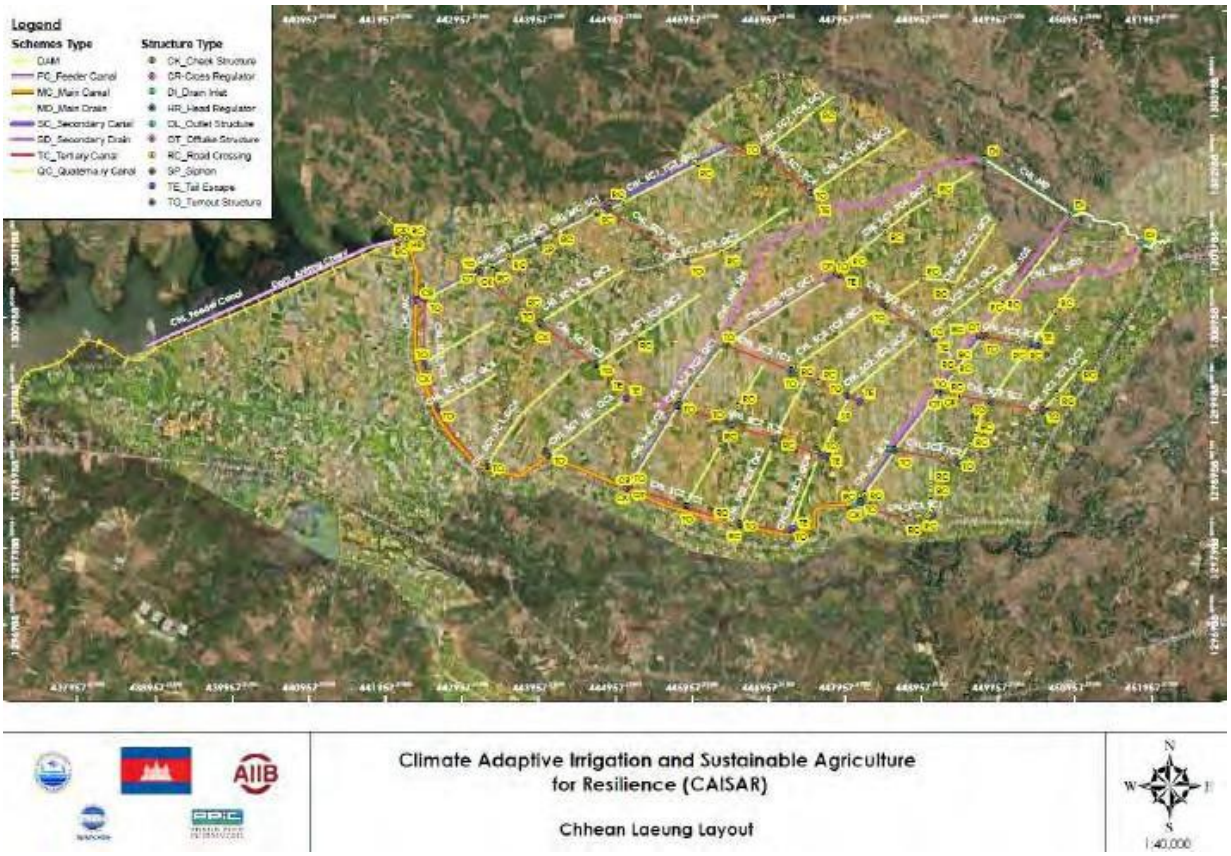
Source: CAISAR Feasibility Study

Figure 4-4: Krang Ponley overview schematic



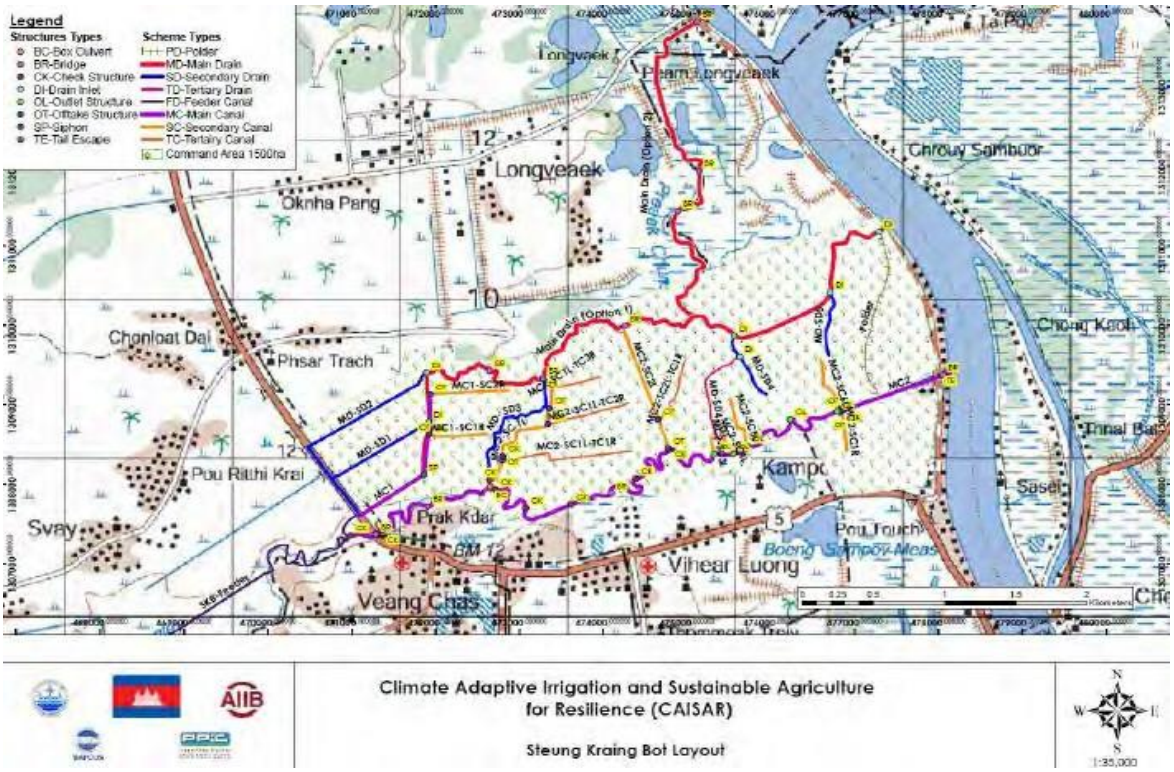
Source: CAISAR Feasibility Study

Figure 4-5: Location of Krang Ponley Irrigation Schemes



Source: CAISAR Feasibility Study

Figure 4-6 Krang Ponley Subproject - Chhean Loeung area canals do not exist,



Source: CAISAR Feasibility Study

Figure 4-7 The Outlet of the Krang Ponley to the Tonle Sap is through Krang Bat area

4.3 Project target areas and beneficiaries

94 The following section describes the CAISAR sub-projects and their beneficiaries.

4.3.1 *Krang Ponley*

95 The Krang Ponley sub-project is located within the Krang Ponley catchment and is made up of four sub areas: Brambei Mom, Krapeu Troum, Krang Bat and Cheung Luong. The Krang Ponley river is long and fed from the Anlong Chrey Reservoir. The reservoir has a storage capacity of 30M m3 and was rehabilitated by KOICA in 2012 as part of the *Krang Ponley Water Resources Development Project*. With the exception of Chhean Laeung, each of the sub-project areas has existing irrigation infrastructure. These were largely constructed under the Khmer Rouge (1975 – 1979) and have since fallen into disrepair despite farmers excavating and maintaining some main and branch canals. Severe sedimentation and embankment erosion resulting from a lack of maintenance has resulted in damaged concrete structures and an inefficient irrigation system.

96 The proposed works are expected to benefit 3 communes across the four separate sub-schemes, making use of both the Anlong Chrey reservoir and the Brambei Mom reservoir. Pond and storage area rehabilitation and excavation, upgrading main, secondary, and tertiary canals as well as a new scheme at Chhean Leung will be hugely beneficial to local communities, increasing their resilience to climate change and enabling them to increase their agricultural outputs resulting in a number of indirect social benefits. In total there are 47,000 households in the Krang Ponley sub-project area. Dry season yields are expected to increase from 4.5 tons/ha to 6.5 tons/ha and during the wet season, they are expected to increase from 3.9 tons/ha to 5.8 tons/ha.

4.3.2 *Lum Hach*

97 The Lum Hach irrigation scheme is in close proximity to the work undertaken by JICA as part of the West Tonle Sap Irrigation Project (2022). Unfortunately, due to the infilling of the 1st January canal from discarded excavated material and the lowering of the headworks on the main canal, the CAISAR Lum Hach scheme can no longer make use of the existing main canal as a water source for irrigation. Therefore, alternative water sources have been assessed and analysed to determine if they are available and sufficient for the new scheme (Annex 1).

98 The existing irrigation infrastructure has received limited farm maintenance by farmers and others. This has resulted in sedimentation, embankment erosion and damaged concrete structures making the current system unreliable.

99 The proposed works are expected to benefit people living in four communes across three districts of Kampong Chhnang Province. The overall design will enhance the existing irrigated area to enable farmers to increase yields during the wet season from 2.5 tons/ha to 4.5 tons/ha. Additionally, with the provision of a reliable water source during the dry season and sufficient training provided through the proposed FWUCs, dry season cropping will be feasible with an estimated yield of 5 tons/ha.

100 Overall there are 18000 households in the Lum Hach sub-project area.

4.3.3 *Ou Ta Paong*

101 The Ou Ta Paong sub-project lies within Pursat Province. The area is highly climate vulnerable due to its proximity to the Tonle Sap lake and the Svay Donkeo river which have shown erratic flood patterns in recent years.

102 The existing irrigation scheme at Ou Ta Paong was constructed during the Khmer Rouge. Some sections have been rehabilitated by farmers and from social funds but due to an overall lack of maintenance and finance, many sections of canal have been damaged from sedimentation and erosion. The main water source is from the Don Nak ChheKrom canal which receives water from the Steng Pursat River.

103 The proposed scheme will include flood defense investment around the command area to enable the community to protect it's farming livelihood from future flood events from the Tonle Sap but taking into consideration the importance of local fisheries.

104 The current irrigation system is not connected to upstream water sources and current farming practices are heavily dependent on rainfall and flood recession agriculture. The design proposals will reduce this climate dependence and vulnerability to climatic changes by providing a reliable source of water for irrigation from the Svay Donkeo River via the Damnak Ampil Canal. 40km of Main Canal will convey water from the Damnak Ampli Head Works via the China Main Canal to feed the irrigation scheme.

105 The scheme will benefit communities living within two communes in the Bakan and Pursat Province and overall, there are 6000 households in the sub-project area. Dry season yields are expected to increase from 5.8 tons/ha to 6.5 tons/ha and wet season yields are expected to increase from 3.9 tons/ha to 5.8 tons/ha.

106 The following provides a summary of the three irrigation and flood control schemes.

Table-4-1: Summary of the Sub Project Elements

Sub Project	Ou Ta Paoung	Lum Hach	Krang Ponley
Area Cultivated (ha)	13,000	17,000	15,000
Water Source	Pursat River and Svay Don Keo	Local Streams and diversion of Boribo tributary	Krang Ponley River with existing storage at Anlong Chrey and Brambei Mom
Nature Based Solution	Restoration of Ou Ta Paoung River, fish passage on Donkeo and OTP, Natural Management of TS floods.	Enhancement of Main Canal environmental features, local storages and riparian corridors along local rivers. 200 Ponds	Control of flood regime at Krang Bat for flood recession and fisheries. Rehabiltate 31 major ponds.
Solar Pump Installations	35 (Not suitable in flood areas)	179	110(BBM)+47(CL)+27(KPT)
Main/Feeder Canals C/L(km)/N	1_8.0km_29	1_30.0_52	
Secondary Canal C/L (km)/N (Exist and New)	8_30.0km_ 13_35.8km_108	12_12.2km_673	
Tertiary Canal C/L (km)/N Exist and New	34_47.5km 139_151.0km_1452	179_107km_1487	
Main/Secondary Drains (C/L km/N)	7_36.3km_15	12_107km_99	
Existing Land Area (Ha)	300	66	144
New Land Area Required (Ha)	278	532	249

Note: (L=km C= Number of Canals, N= Number of Structures)

4.4 Socio-economic context and vulnerability

107 As part of the feasibility study for the CAISAR project, WAPCOS conducted a comprehensive livelihoods and vulnerability study of the target population. The study conducted surveys across more than 630 households in the project areas, 100 focus groups and 100 key informant interviews to understand the social and economic issues affecting the target population in the areas where CAISAR will be implemented. Issues such as poverty rates, land ownership, access to goods, education and health care as well as institutional capacities and gender related issues were all explored and analyzed by the WAPCOS team. It was important for the CAISAR project to assess such issues to get an improved understanding of the social society living in the command areas and any long-standing social inequalities which may impact their ability to adapt and be resilient to climate change. This could then assist the design and implementation of targeted and area specific aspects of both Component 1 and 2.

108 The survey results were assessed and found that the populations of all command areas follow similar social economic indicators, in terms of poverty, income, household debt, education levels, health and vulnerabilities.

109 Most of the population are rural farmers (rice typically), whilst some also supplement their income via alternative jobs such as working in the service sector. Households typically do not have stable annual incomes or expenditures due to the annual cycle of the wet and dry season and the impact this has on agricultural yields and livelihoods. This correlated with the vulnerability analysis which found that the majority of the population is at the edge of poverty despite most respondents having incomes above traditional poverty lines (the World Bank or UNDP thresholds are between 2-8 USD per day). The WAPCOS survey found that based on responses to the monthly income section in the livelihood analysis for the four provinces, the highest proportion of households earn between 200 to 300 USD/month (17.1%) and then 300 to 400 USD/month (16.0%). The high-income band per household of over 1000 USD/month was only attributed to 4.8% of households and the lowest income band of less than 50$/month was attributed to 7% of households. These average income values hide the variability between provinces, for example in Kandal province, 3% of households earn less than $50/month whereas in Kampong Chhnang the number is much higher at 10%. The low number of low-income households in Kandal may be due to the proximity to good transport links and towns/cities such as Phnom Penh. There are less alternative income sources in rural areas, such as selling produce and groceries, business, or service providers, so most households are dependent on agriculture for their livelihoods which typically does not generate large monthly incomes.

110 Since 2007, Cambodia has made significant progress in terms of educating its Children. The number of children enrolled in primary education increased from 82% in 1992 to 97% in 2017/8. However, the country still faces a number of challenges, particularly educating those living in poor rural areas as children are not reaching standards appropriate for their age.

111 At primary level, nearly 25% of children in Grade 3 cannot write a single word in a dictation test. Only 27% of 3 to 5 year old's are developmentally on track in literacy and numeracy and by the time they are 17 years old, 55% of adolescents will have dropped out of school. Overall, large numbers of girls and boys remain out of school at all levels of education, from early childhood through to adolescence. Most children drop out before reaching secondary school. Girls and boys from disadvantaged groups are struggling to realize their potential as they face difficulties getting to, and staying in, school.

112 Across the CAISAR project areas, high school dropout rates are common. The highest education level attained for 59% of households questioned during the survey was primary school. Only 22% had been to secondary school and less than 1% to university. 12% of households had never been to school and of these, 82% could not read or write. It must be noted that these average values hide the range of results which varied by province and sub project area. In Ou Ta Paong, 17% of households had never been to school. For 54% of the households questioned, primary school was their highest education level with 22% going to secondary school and 3% to university. Low education levels in this area will make it more challenging to implement climate resiliency measures.

113 By contrast, in Lum Hach, 7% of households had never been to school and 43% had been to primary school, 13% to secondary school and 2% to university. The variable educational levels attained by the households across the sub-project areas highlights the potential social inequalities experienced by local communities. There are various reasons why children may drop out of school such as cost, distance from home, engagement in agricultural activities. In most provinces of Cambodia, upper secondary schools are mainly located in district or provincial centers. Students in remote areas may therefore not be able to access them due to poor quality roads or general lack of transport. Long distances to schools and bad road conditions often require students to make use of accommodation in another district but this is not possible for the majority of poor rural families, limiting their capacity to meet their potential.

114 High school dropout rates are common in the CAISAR project areas and are typically experienced in these rural areas due to the cost, long travel times and bad road conditions. This is a social issue that the CAISAR project could address by providing good quality roads adjacent to canals and within the command areas.

115 In recent years, consecutive annual crop failures have led to household individuals sourcing other, more profitable non-farm incomes. In 2018, an estimated 1,000,000 Cambodian migrants were registered in Thailand looking for other income sources to support their families. However, the COVID19 pandemic resulted in a backflow of mostly rural labor migrants which posed its own challenges to the agricultural sector in Cambodia (ADB, 2022).

116 There continues to exist a large disparity between the rural and urban populations of Cambodia. In 2016, the estimated average monthly household income was $717 in Phnom Penh and $607 in other urban areas. By contrast, monthly incomes were on average $374 in rural areas (Government of Cambodia, Socio-Economic Survey, 2016). Rural incomes are therefore only about 50% - 60% of all urban areas although the gap does appear to be closing with the disparity in 2012 being 40% - 55% (ADB, 2022).

117 This section has discussed several direct and in-direct beneficiaries living in the project areas. It highlights the importance of surveying communities to identify any existing social inequatlies and looking for opportunities to reduce these. The CAISAR project will look to improve the general wealth, well-being, priorities, and opportunities of communities living within the command areas through providing a reliable irrigation system that is resistant to climate change and will enable farmers to improve their livelihoods.

4.5 Agriculture

118 Agriculture is the primary source of livelihood for the communities living in most provinces of Cambodia and it accounts for 22.5% of the country's Gross Domestic Product and employs over 3 million people. Rice is the dominant food crop grown on an estimated 4.5 million hectares or 70% of the country's total cultivated area (ADB, 2022). The cultivated area of rice in Cambodia increased from 3.2 million ha in 2017 to 3.3 million ha in 2018, comprising of 2.7 million ha of wet-season rice and 0.6 million ha of dry-season rice (ADB, 2022).

119 Each sub-project command area has unique climatic conditions and geology which results in different soil qualities. This in turn affects land use and farming practices as communities have adapted over time to the areas in which they live and the resources that they have.

120 Access to transport and agricultural co-operations additionally influences farming practices. Where there are agricultural co-operations, a network is already established between the farmers growing and selling the vegetables and those buying them. This facilitates vegetable cultivation and marketability, encouraging farmers to move away from rice farming to more diverse horticultural agriculture. Krang Ponley for example is very accessible and close to the city of Phnom Penh. Farmers there produce more vegetables than in other provinces as they have better access to the cities markets to sell their produce.

121 In May-June 2022, the CAISAR team conducted an agronomy survey. Based on the findings, the agronomy experts have suggested proposed cropping patterns for each sub-project area which are discussed below.

122 **In Lum Hach**, the soil quality is particularly low due to the dominance of sandy surface soils. As a result the land is not considered suitable for agricultural use. Crops can be particularly vulnerable to drought stress due to the high hydraulic conductivity of the soils resulting in fast runoff and drainage. In conjunction with insufficient water resources and irrigation supply, this results in high rates of nutrient leaching and low crop yields. The agronomy survey and livelihood survey conducted by WAPCOS found that crop yields in the Lum Hach Command Area are water limited to one annual wet season crop of rice. Interviewed farmers reported average annual yields of 1.5 to 2 tons/ha whereas district statistics report crop yields of 3.2 to 3.8 tons/ha but it is thought that this dataset does not account for failed crop years. Currently only 30% of the Command Area is agricultural land but this is expected to change under the CAISAR project, once a more reliable source of water is provided. With a more reliable water supply, dry season rice cropping would be possible but farmers in Lum Hach explained they have limited technical experience and understanding of dry season rice so in order for this to be a success, it is critical that the CAISAR project provides adequate training.

123 As highlighted in the agronomy survey, the low soil quality in Lum Hach significantly limits crop yields and opportunities for expansion. Therefore, the CAISAR scheme proposes that between wet season rice crops, farmers grow cover crops such as mung bean to improve soil organic matter and fertility. This will have an indirect benefit to crop yields by improving soil productivity and therefore enhancing rice crop yields over time. Using cover crops has a further benefit of reducing input costs as farmers are required to use less fertilizer once the cover crops improve soil fertility. Crop rotation has the added benefit that it reduces the number of pests and diseases thereby reducing crop yield losses.

124 Additionally, farmers in Lum Hach could diversify to alternative horticultural crops such as cucumber, watermelon, pumpkin etc. between wet season crops to help increase soil organic content and interrupt the intensive rice cropping which inhibits the soil from rejuvenating.

125 **The Ou Ta Paong** Command Area is dominated by agricultural land (80%). Soil fertility is high, made up of 69% high productivity soil and 31% medium productivity soil. This is largely due to the low-land nature of the command area with the northern part lying within the active floodplain of the Tonle Sap which floods annually. There are two to three crops per year, producing 3.9 tons/ha in the wet season and 5.8 tons/ha in the dry season. Dry season rice crops typically produce more yield per hectare due to the rice variety that is used during this cropping period and the additional fertilizer that is applied.

126 The improved drainage and more reliable water supply to Ou Ta Paong will enable up to three rice crops per year. In addition, between rice crops, it may be possible for famers to cultivate vegetables. Currently, the majority of farmers are reluctant to do this due to the lack of reliable water source. Once this is resolved by the CAISAR project, farmers have said they would be willing to try vegetable cultivation.

127 The dominant cropping pattern in **Krang Ponley** consists primarily of wet season rice cropping. There is however variation between the provinces depending on soil quality and water availability. Where possible, a dry season recession crop is planted with a typical yield of 4.5 tons/ha. The wet season rice yields are slightly lower at 3.9 tons/ha. However, flood inundation of the command areas can result in crop failures and reduced yields, particularly during the wet season.

128 In Krang Ponley, the overall soil quality is medium and similar to Ou Ta Paong due to the low-lying topography and annual flood inundation (particularly in Krang Bat) of the command area. Due to the proximity to markets in Phnom Penh, more farmers in this sub-project area have moved away from rice farming to horticultural produce such as watermelon, long bean, corn, eggplant and pumpkin. Farmers can either rely solely on vegetables throughout the year or grow vegetables outside of the wet season rice cropping period.

4.6 Water Resources

129 Rainfall is extremely variable across Cambodia both spatially and temporally. The Southwest monsoon in Cambodia provides 87% of the yearly rainfall during the months of May to October (Salvadore

et al, 2020). As a result, Cambodia receives an abundant amount of water during this part of the year but can also experience extreme water shortages during the dry season. The extreme volumes of water during the wet season can lead to extensive flooding which can result in crop and infrastructure damage. This is particularly an issue where flood waters inundate irrigation command areas. On the other hand, prolonged periods of dry days can lead to drought in the dry season. In areas where there are limited areas for water storage, crops can become water stressed and crop yields may be reduced or entire crops may fail. Water scarcity is therefore primarily a result of a lack of water management and water storage capacity rather than an insufficient volume of water available annually (ADB, 2022).

130 The extreme variability in rainfall results in serious challenges for rice farmers, particularly during the first few months of the wet season, when rainfall is most erratic and early season droughts are common. Short droughts can occur prior to the wettest period at the end of August to the end of November. Such short droughts can last 15 days but occasionally they can be prolonged and last up to 60 days after the first monsoon rains (ADB, 2014). This causes additional difficulties for rice farmers, particularly those who are dependent on rain-fed irrigation. Irrigation infrastructure is often lacking or is damaged due to lack of investment and maintenance which should otherwise provide reliable water supplies during these dry periods.

131 Across the three CAISAR project command areas, the majority of rice farmers are reliant on rain-fed irrigation or recession rice which brings both challenges and opportunities. Due to the erratic and unpredictable nature of the climate, farmers are reluctant to take more risks and diversify their cropping patterns as they have no reliable water source to support their crops if a period of drought occurs. In addition, there is a lack of drainage and flood protection which additionally inhibits farmers from meeting their yield potentials. Climate Change will impact Cambodia's water resources and it is critical that this is taken into account at each stage of the CAISAR project including project design and hydrological and hydraulic modelling.

132 Extensive modelling has been undertaken as part of this feasibility study to ensure that there are sufficient water resources both under current and future scenarios, taking uncertainty into account. This is summarized in detail in the D4 modelling report and the results show that the project is feasible in terms of the available of water resources both now and in the future, to support the proposed yield increases in the 45,000 ha CAISAR project command areas.

4.7 Irrigation

133 Access to water is a challenge, particularly for those with irrigation schemes located close to the Tonle Sap as flooding in the wet season and shortage in the dry season can limit annual cropping intensity. Successful water resource management is therefore critical to ensuring that the CAISAR irrigation schemes are a success.

134 Rehabilitation and climate proofing of existing irrigation infrastructure will be key. Constructing irrigation ponds also forms part of an integrated and smart water resource management plan. Climate proofing involves securing the irrigation system's resilience and sustainability against longer droughts in the dry season and to mitigate the impacts of flood events.

135 Irrigation has the potential to increase Cambodia's potential rice yields. Currently, the dominance of low wet-season rice yield limits the productivity and profitability of Cambodian farmers. For example, Cambodia's wet-season rice is about 30% less than that of Thailand's Central Plains region (ADB, 2022). There are opportunities for crop diversification that are being explored but this is likely to be on a smaller scale than rice production.

136 The infrastructure proposed is a full package for water management improvements including storage, gravity supply without repumping where possible and use of solar pumping where it is not, drainage and flood control including allowance for aquatic animals and fish.

4.8 Biodiversity

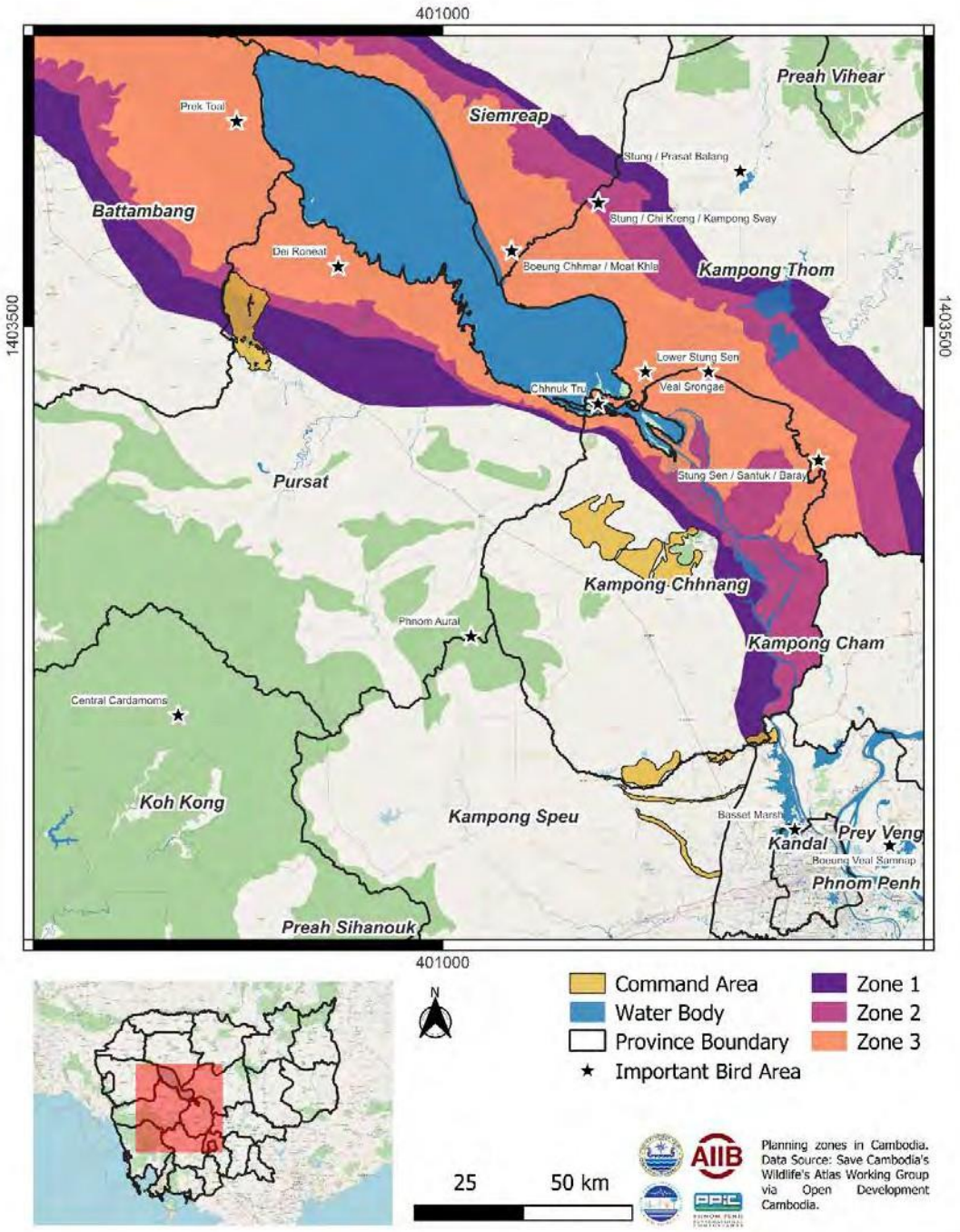
4.8.1 Designated areas and species of interest

137 The Feasibility Studies have noted the unique ecosystem in Tonle Sap lake and floodplain which is protected as a UNESCO Biosphere Reserve. The Great Lake itself if one of the most productive fisheries systems in the world, providing key breeding grounds for fish and 60% of Cambodia's protein intake. In addition, it is home to some of the largest breeding colonies of some of the world's most threatened water birds. This unique ecosystem faces unprecedented threats from population increases and pressure on natural resources. As a result, there are a number of conservation projects taking place to protect this precious environment and in 2021, the conservation areas surrounding the Tonle Sap Great Lake were updated and re-instated.

138 The agricultural protection zones are shown in Source: CAISAR Feasibility Study

139 Figure 4-8. The Zone 1 and 2 are areas where farming is allowed. In zone 1, people can live and obtain land title certificates. In zone 2, local communities are allowed to do land cultivation. In Zone 3, closest to the lake is where agriculture and fishing are officially banned and the areas of flooded forest must be protected and conserved. This re-zoning allows the government an opportunity to restore the Tonle Sap's unique forests.

140 The CAISAR command areas lie outside of zone 3. Most of the Ou Ta Paong command area falls within zones 1 and 2 where agricultural practices are permitted. The majority of the Lum Hach command area lies outside of the protection zones, with a small section to the north falling within zone 1. The majority of the Krang Ponley scheme falls outside of the protection zones although a small section of Krang Bat lies within zone 1. Based on this, there are no limitations on agricultural practices required by the Tonle Sap Agricultural Protection Zones.



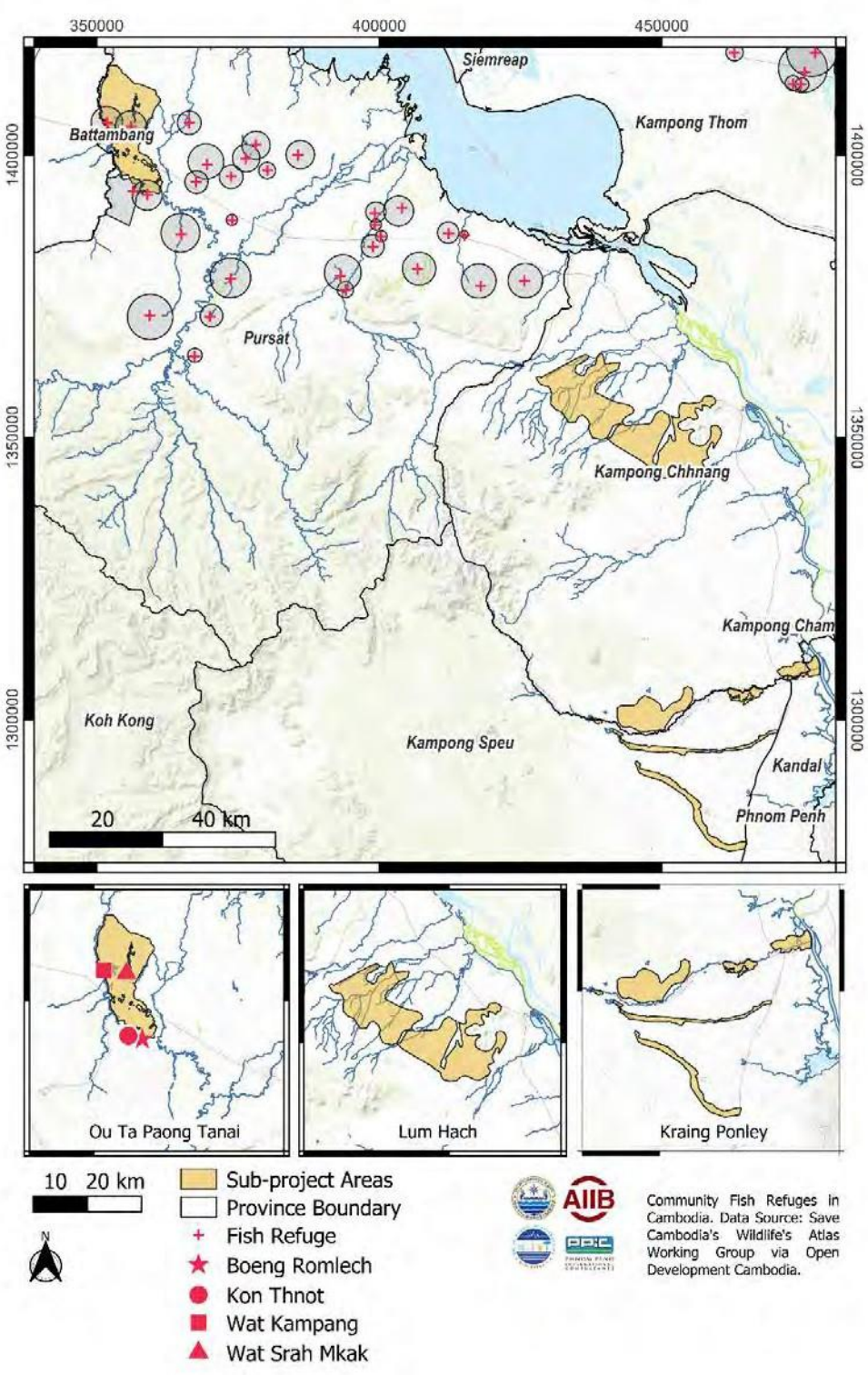
Source: CAISAR Feasibility Study

Figure 4-8 Tonle Sap Agricultural Protection Zones

141 Rice Field Fisheries are a vital source of food and income for almost all rural households in Cambodia. Fishing typically occurs during the wet season from July to February and takes place in and around flooded rice fields. Despite contributing 20-25% of the country's inland fish catch, community fish refuges are often poorly managed and have low productivity. Several projects, such as the USAID-funded Enhancing Rice Field Fisheries project, have been implemented to increase the productivity of these vital food production systems. Through improved management and inclusion of best-practice methods amongst local communities, the projects can ensure that fish are available and accessible to all poor and rural families. The location of Community Fish refuges in the CAISAR Command Areas are shown in
142 Figure 4-9. There are only 2 refuges in the Ou Ta Paong Command Area which should be considered during DED stage and allowance made in the scheme design to expand and enhance the number of fish refuges and the linkage through canals and rice fields.

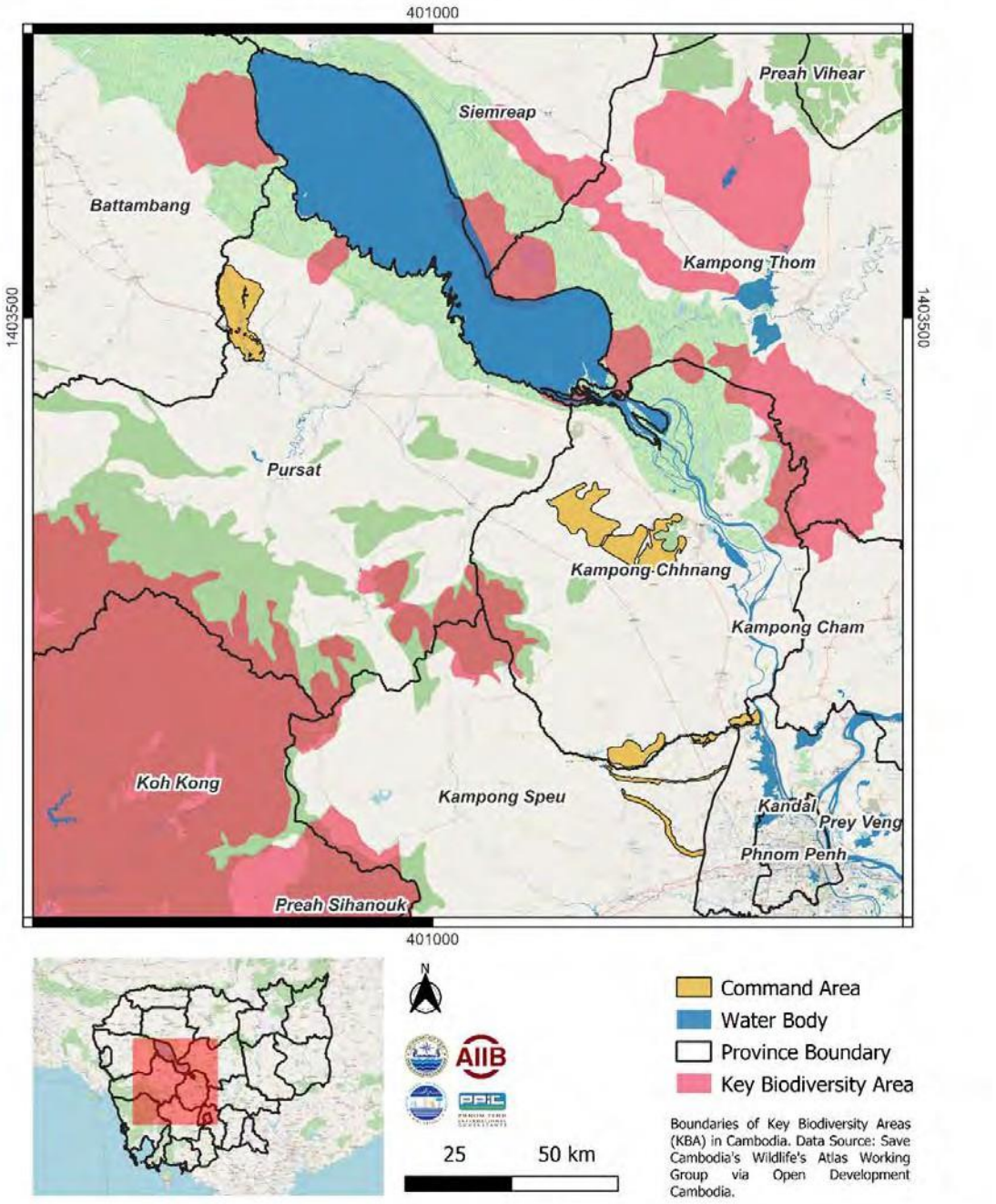
143 The key biodiversity areas are shown in Figure 4-10. The CAISAR Command Areas fall outside of these areas. However, due to the proximity, it is recommended that further analysis is undertaken during the SECAP analysis and DED to determine whether any further environmental considerations are needed.

144 The CAISAR Command areas are located largely outside of all the protected areas. The surrounding land use is dominated by paddy field thus, potential impact on local ecological features is not envisaged although this will be investigated further as part of the ESCIA.



Source: CAISAR Feasibility Study

Figure 4-9 Community Fish Refuges in the CAISAR Command Areas



Source: CAISAR Feasibility Study

Figure 4-10 Key Biodiversity Areas

4.8.2 IBAT Initial Biodiversity Assessment

145 The initial biodiversity assessment utilized the IBAT system. IBAT offers rapid visual screening for critical biodiversity. The tool is used as basic risk screening on biodiversity. This review provides an indication of the potential biodiversity related features including protected areas, key biodiversity areas and species close to the proposed project locations. It provides an early indication of potential biodiversity concerns and can provide valuable guidance in making decisions. The IBAT screening does not provide details of potential indirect, downstream, or cumulative impacts. This information may be helpful when assessing the potential environmental risk and impact of a site, categorizing investments/projects, preparing the terms of

reference or an impact assessment, focusing attention on key species of conservation concern and sites of known conservation value.

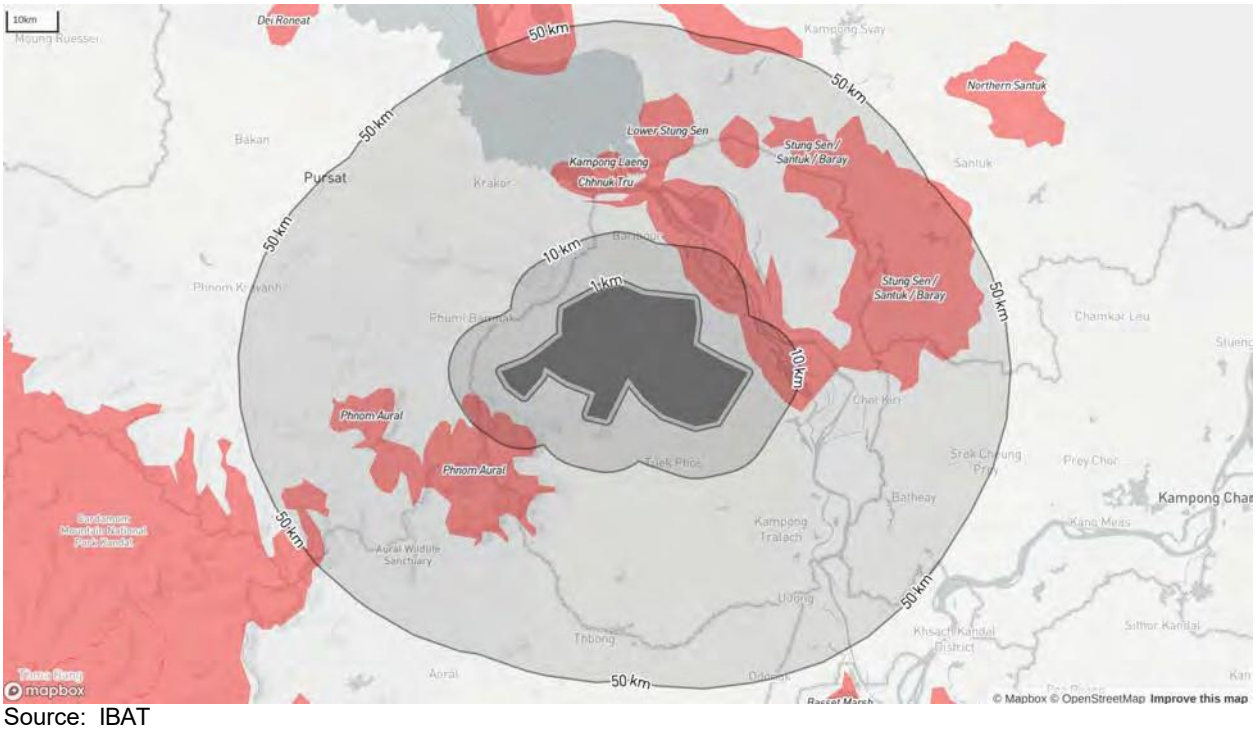
146 IBAT provides information on key biodiversity areas (KBA) which are sites contributing significantly to the global persistence of biodiversity in terrestrial, freshwater and marine ecosystems: information available from the World Database on Protected Areas (WDPA); and information form the IUCN Red List of Threatened Species (also known as the IUCN Red List) which is a compendium of information on threats, ecological requirements, and habitats and on conservation actions that can be taken to reduce or prevent extinctions (Figure 4-11, Figure 4-12, Figure 4-13).

4.8.3 Protected Areas, Key Biodiversity Areas and IUCN Threatened Species

Lum Hach Scheme

147 The IBAT assessment identified the following biodiversity features within a 5 km, 20 km and 50 km distance from the Lum Hach Irrigation and flood protection scheme.

- Protected Areas - 12
- Key Biodiversity Areas - 9
- IUCN Red List of Threatened Species – 96 (Annex ___)



Source: IBAT

Figure 4-11 IBAT Biodiversity Features around Lum Hach Scheme

148 The following protected areas were identified within a 5 km, 20 Km and 50 km radius of Lum Hach Scheme.

LH Protected Areas

Area Name	Within Buffer of KPL Project Area
Phnom Aoral – Wildlife Sanctuary	5 km
Phnom Krang Dey Meas – Protected Landscape	5 km
Tonle Sap – UNESCO-MAB Biosphere Reserve	5 km
Phnom Neang Kong Rey- Phnom Touk Meas – Multiple Use area	20 km
Boeng Chhmar Core Area (Ramsar Site)	50 km
Cardamom Corridor	50 km
Central Kravanh	50 km
North Tonle Sap	50 km
Stung Sen Core Area (Ramsar Site)	50 km

149 Key Biodiversity Areas within 5 km, 20 Km and 50 km of the Lum Hach Scheme included:

LH Key Biodiversity Areas

Area name	Distance
Kampong Laeng	5 km
Phnom Aural	5 km
Chhnuk Tru	20 km
Lower Stung Sen	20 km
Stung Sen / Santuk / Baray	20 km
Boeung Chhmar / Moat Khla	50 km
Central Cardamoms	50 km
Stung / Chi Kreng / Kampong Svay	50 km
Veal Srongae	50 km

150 The IBAT system identified 19 Critically Endangered Species and 31 Endangered Species in the IUCN Red List of Threatened Species within the 5 km, 20 and 50 km buffer areas of the Lum Hach Scheme.

Krang Ponley Scheme

151 The IBAT assessment identified the following biodiversity features within a 5 km, 20 km and 50 km distance from the Krang Ponley Irrigation and flood protection scheme.

- Protected Areas - 6
- Key Biodiversity Areas - 7
- IUCN Red List – 104 (Annex __)



Source: IBAT

Figure 4-12 IBAT Biodiversity Features around Krang Ponley Scheme

152 The following protected areas were identified within a 5 km, 20 and 50 km radius of Krang Ponley Scheme.

KPL Protected Areas

Area Name	Within Buffer of KPL Project Area
Cardamom Corridor	50 km
North Tonle Sap	50 km
Phnom Aoral	50 km
Phnom Krang Dey Meas	50 km
Phnom Neang kong Rey – Phnom Touk Meas	50 km
Souther Kravanh	50 km

153 Key Biodiversity Areas within 5 km, 20 and 50 km of the Krang Ponley Scheme included:

KPL Key Biodiversity Areas

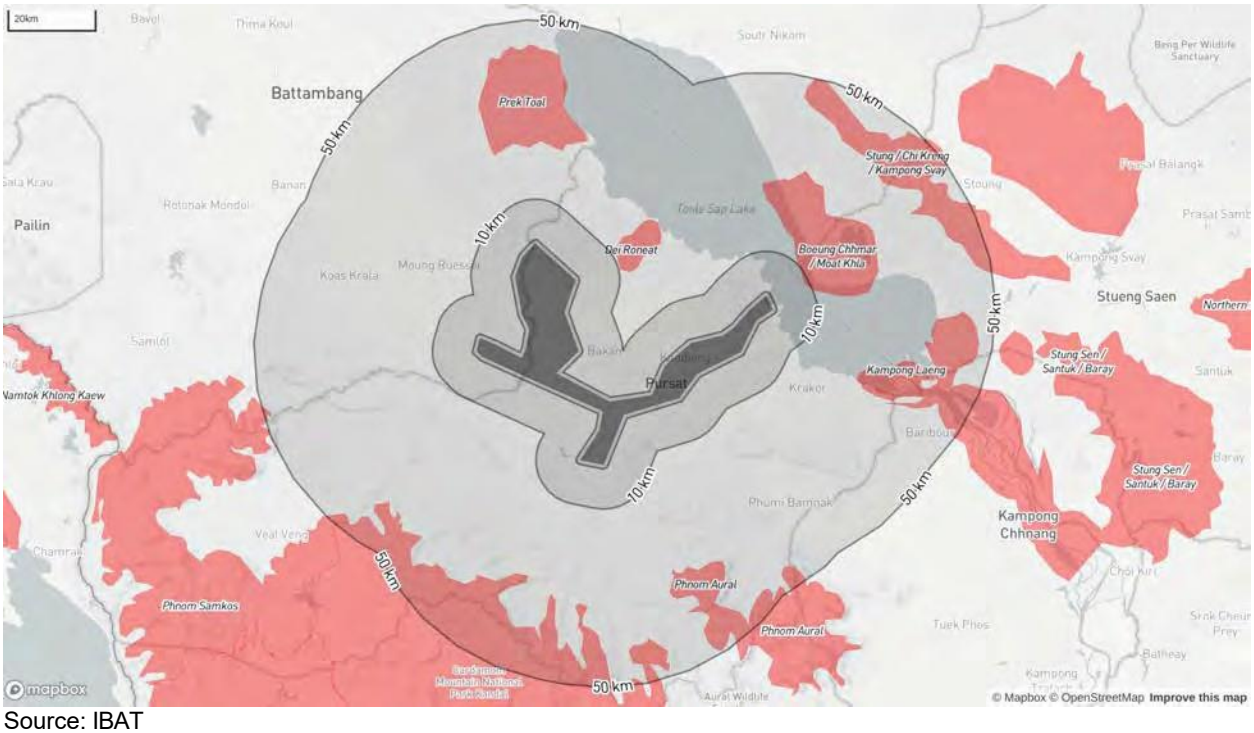
Area name	Distance
Basset Marsh	5 km
Boeung Veal Samnap	20 km
Bassac Marsh	50 km
Kampong Laeng	50 km
Phnom Aural	50 km
Southern Cardamoms	50 km
Stung Sen / Santuk / Baray	50 km

154 The IBAT system identified 18 Critically Endangered Species and 35 Endangered Species in the IUCN Red List of Threatened Species within the 5 km, 20 and 50 km buffer areas of the Krang Ponley Scheme.

Ou Ta Paong Scheme

155 The IBAT assessment identified the following biodiversity features within a 5 km, 20 km and 50 km distance from the Ou Ta Paong Irrigation and flood protection scheme.

- Protected Areas - 13
- Key Biodiversity Areas - 10
- IUCN Red List of Threatened – 97



Source: IBAT

Figure 4-13 IBAT Biodiversity Features around Ou Ta Paong Scheme

156 The following protected areas were identified within a 5 km, 20 Km and 50 km radius of Ou Ta Paong Scheme.

Protected Areas

Area Name	Within Buffer of KPL Project Area
Tonle Sap – UNESCO-MAB Biosphere Reserve	5 km
Boeng Chhmar Core Area (Ramsar Site)	20 km
Cardamom Corridor – Biodiversity Area of Protected Area	20 km
Central Kravanh	50 km
North Tonle Sap	50 km
Phnom Aoral	50 km
Phnom Somkos	50 km
Prek Toal Core Area (Ramsar Site)	50 km
Stung Sen Core Area (Ramsar Site)	50 km

157 Key Biodiversity Areas within 5 km, 20 Km and 50 km of the Ou Ta Paong Scheme included:

Key Biodiversity Areas

Area name	Distance
Boeung Chhmar / Moat Khla	20 km
Dei Roneat	20 km
Central Cardamoms	50 km
Chhnuk Tru	50 km
Kampong Laeng	50 km
Lower Stung Sen	50 km
Phnom Aural	50 km
Phnom Samkos	50 km
Prek Toal	50 km
Stung / Chi Kreng / Kampong Svay	50 km

158 The IBAT system identified 7 Endangered Species in the IUCN Red List of Threatened Species within the 5 km, 20 and 50 km buffer areas of the Ou Ta Paong Scheme.

159 The IBAT system analysis of biodiversity near the project areas suggests that a more detailed biodiversity assessment is required.

4.9 Assessment of Environmental, Social and Climate Risks, Impacts and Mitigation Measures

160 Potential risks, impacts and mitigation measures have been identified for the CAISAR irrigation and flood control protection schemes during the Pre-Construction Phase; Construction Phase and the Operations Phase in the provinces of Kampong Speu, Kampong Chhnang, Kandal, and Pursat Cambodia.

4.9.1 Pre-Construction Phase

161 Potential environmental, social, and climate-related risks and impacts to be considered specifically associated with the pre-construction phase of the planned CAISAR irrigation and flood protection project include:

4.9.1.1 Environmental Risks and Impacts (Pre-construction Phase):

1. **Habitat Assessment:** Before construction begins, there should be a thorough assessment of the project area's habitats to identify potential impacts on local flora and fauna.
2. **Vegetation Clearance**: Clearing land for construction can lead to habitat destruction and loss of biodiversity. Pre-construction activities like land clearing should be carefully planned and managed.
3. **Soil Erosion**: Pre-construction activities like excavation and grading can increase soil erosion, potentially affecting nearby water bodies and ecosystems.
4. **Land Use Changes**: Conversion of land for project purposes may alter local land use patterns, impacting agricultural and forestry activities.
5. **Waterbody Alteration:** The assessment of water bodies like rivers, streams, and wetlands should be conducted to understand potential impacts on aquatic ecosystems.
6. **Waste Management -** increase in volume of hazardous and non-hazardous waste requiring safe disposal.

4.9.1.2 Social Risks and Impacts (Pre-construction Phase):

1. **Land Acquisition:** The process of acquiring land for the project can disrupt local communities, potentially leading to land tenure issues and conflicts.
2. **Livelihood Disruption**: Even before construction starts, the anticipation of project impacts can disrupt local livelihoods as residents may alter their activities or move.

3. **Cultural Heritage**: Pre-construction surveys should identify any cultural heritage sites or traditions that may be affected, and appropriate measures should be taken to protect them.
4. **Community Engagement:** Engaging with local communities during the pre-construction phase is critical to understanding their concerns and needs, helping to design mitigation measures.
5. **Indigenous Peoples Exclusion –** Potential disbenefit to IP's or lack of inclusion in project benefits and opportunities.
6. **Gender Inequities –** Potential inequities and lack of project opportunities and benefits.

4.9.1.3 Climate Risks and Impacts (Pre-construction Phase) (See Annex 13: CAISAR Climate Change Impact Rationale)

1. **Climate Data Analysis:** It's important to analyze historical climate data during the pre-construction phase to identify climate-related risks that may affect project design and location.
2. **Future Climate Projections**: Understanding future climate projections, such as changes in rainfall patterns or increased frequency of extreme weather events, can inform the project's design for resilience.
3. **Adaptation Planning:** Pre-construction phase should involve planning for climate change adaptation measures, ensuring the project can withstand anticipated climate impacts.
4. **Mitigation Strategies:** Identifying opportunities to reduce greenhouse gas emissions associated with pre-construction activities, such as transportation or energy use, is important for climate mitigation.
5. **Data Collection**: Establishing baseline data on environmental conditions, community demographics, and climate variables during the pre-construction phase is crucial for monitoring and evaluation throughout the project's lifecycle.

162 During the pre-construction phase, thorough assessments, community consultations, and climate resilience planning should be integrated into the project's design to minimize environmental, social, and climate-related risks. This will help lay the foundation for a more sustainable and resilient project during the construction and operational phases.

163 Mitigation measures to address the environmental, social, and climate-related issues associated with the **pre-construction** phase of the CAISAR irrigation and flood protection project include:

4.9.1.4 Environmental Mitigation Measures (Pre-construction Phase):

1. **Habitat Assessment and Preservation:**
   - Conduct a detailed habitat assessment and implement measures to preserve critical habitats, such as wetlands and forests, by avoiding or minimizing construction within these areas.
2. **Revegetation and Reforestation**:
   - Implement reforestation and revegetation programs in areas where land clearance is necessary. Use native species to restore habitats.
3. **Soil Erosion Control**:
   - Implement erosion control measures, such as silt fences, erosion control blankets, and sediment basins, to prevent soil erosion during pre-construction activities.
4. **Sustainable Land Use Planning**:
   - Work with local authorities and communities to develop land use plans that minimize negative impacts on agriculture and forestry.
5. **Water Management:**
   - Develop and implement a water management plan to minimize waterbody alteration during pre-construction activities.
6. **Waste Management**:

- Prepare and implement waste management plan.

4.9.1.5 Social Mitigation Measures (Pre-construction Phase):

1. **Land Acquisition and Resettlement:**
   - Follow Resettlement Planning Framework and develop a fair and transparent land acquisition and resettlement plan, ensuring affected communities are adequately compensated and resettled, if necessary.
2. **Livelihood Restoration**:
   - Implement livelihood restoration programs, such as vocational training and alternative income generation activities, to mitigate disruptions caused by pre-construction activities.
3. **Cultural Heritage Protection**:
   - Identify and protect cultural heritage sites and traditions through measures like site preservation, documentation, and community involvement.
4. **Community Engagement**:
   - Engage in meaningful consultations with local communities to gather their input and concerns and incorporate their feedback into project planning and design.
5. **Indigenous Peoples:**
   - Implement IPP and ensure full participation of vulnerable or disadvantages groups (e.g., ethnic minorities).
6. **Gender Participation**:
   - Implement Gender Action Plan and measures to promote female beneficiaries for improved participation in project planning and implementation, and economic empowerment.

4.9.1.6 Climate Mitigation and Adaptation Measures (Pre-construction Phase):

1. **Climate-Resilient Design**:
   - Incorporate climate resilience into the project design by considering future climate projections and ensuring infrastructure can withstand extreme weather events and changing climate conditions.
2. **Low-Carbon Practices**:
   - Minimize greenhouse gas emissions from pre-construction activities by using energy-efficient machinery, promoting green transportation, and reducing construction-related emissions.
3. **Adaptive Management:**
   - Develop adaptive management plans that can be adjusted based on changing climate conditions, ensuring the project's long-term viability.
4. **Baseline Data Collection**:
   - Establish baseline data for environmental, social, and climate variables during the pre-construction phase to enable effective monitoring and evaluation throughout the project's lifecycle.
5. **Climate Risk Assessments:**
   - Regularly assess climate risks and vulnerabilities during the pre-construction phase to identify emerging issues and adjust plans accordingly.
6. **Community Resilience**:
   - Support local communities in building resilience to climate change through capacity-building programs, education, and access to climate-resilient livelihood options.
7. **Green Infrastructure:**
   - Consider the use of green infrastructure solutions, such as natural flood management techniques, to complement traditional engineering approaches and enhance climate resilience.

164 It's essential that these mitigation measures are integrated into the project's planning and design from the early stages of the pre-construction phase. Collaboration with relevant stakeholders, including local communities, environmental experts, and climate specialists, is crucial to ensure the successful implementation of these measures and the overall sustainability of the project. Regular monitoring and evaluation is also essential to assess the effectiveness of these mitigation efforts and make necessary adjustments as needed.

4.9.2 Construction Phase

165 The potential environmental, social, and climate-related risks and impacts to be considered that are associated with the construction phase of the CAISAR irrigation and flood protection project include:

4.9.2.1 Environmental Risks and Impacts (Construction Phase):

1. **Habitat Destruction:** Construction activities can result in the direct destruction of natural habitats, including wetlands, forests, and aquatic ecosystems.
2. **Soil Erosion and Sedimentation:** Excavation, grading, and land clearing can increase soil erosion, leading to sedimentation in nearby water bodies, affecting water quality and aquatic ecosystems.
3. **Water Pollution**: Construction machinery, equipment, and runoff from construction sites can introduce pollutants, such as sediment, oil, and chemicals, into nearby water bodies.
4. **Noise and Air Pollution:** Construction activities generate noise pollution and emissions from heavy machinery, impacting local air quality and disturbing wildlife.
5. **Resource Consumption**: Construction materials, water, and energy are often consumed in large quantities, leading to resource depletion and increased carbon emissions.
6. **Waste Management** – increase in volume of hazardous and non-hazardous waste requiring safe disposal.

4.9.2.2 Social Risks and Impacts (Construction Phase):

1. **Displacement and Resettlement:** The construction phase may require the displacement of local households leading to potential land tenure issues and disruption of livelihoods.
2. **Traffic and Access Disruption**: Increased construction-related traffic can disrupt local transportation networks, impacting communities and businesses along transportation routes.
3. **Health and Safety:** Construction sites pose health and safety risks to workers and nearby communities. Accidents and exposure to construction-related hazards can have serious consequences.
4. **Cultural Heritage:** Construction activities and in migration of labor may threaten cultural heritage sites or disrupt local traditions and practices, leading to social and cultural impacts.
5. **Indigenous Peoples Exclusion –** Potential disbenefit to IP's or lack of inclusion in project benefits and opportunities.
6. **Gender Inequities –** Potential inequities and lack of project opportunities and benefits.

4.9.2.3 Climate Risks and Impacts (Construction Phase):

1. **Emissions**: Construction machinery and transportation can generate significant greenhouse gas emissions, contributing to climate change if not properly managed.
2. **Climate-Related Disruptions**: Extreme weather events, such as heavy rainfall or flooding, can disrupt construction activities, leading to delays and increased costs.
3. **Water Management**: Managing water resources during construction, including temporary diversion of rivers or drainage, can impact local hydrology and potentially lead to downstream flooding.
4. **Infrastructure Vulnerability:** The construction phase may expose infrastructure to climate risks, such as flooding or storm damage, if proper precautions and design considerations are not taken into account.
5. **Temperature Extremes**: Construction workers may be exposed to temperature extremes, including heat stress in hot seasons and cold stress during cooler months, affecting worker health and productivity.

166 To address these risks and mitigate negative impacts during the construction phase, it's essential to implement environmental and social management plans. These plans will include measures to minimize habitat destruction, control pollution, ensure worker safety, and engage with local communities.

167 Additionally, climate resilience measures will be integrated into the construction process to mitigate climate-related risks and ensure the infrastructure's long-term sustainability. Regular monitoring and adherence to best practices will be implemented to minimize adverse effects during this phase of the project.

168 Suggested mitigation measures to address the potential environmental, social, and climate-related risks and impacts associated with the **construction phase** of the CAISAR irrigation and flood protection include.

4.9.2.4 Environmental Mitigation Measures (Construction Phase):

1. **Habitat Protection and Restoration:**
   - Establish construction exclusion zones around sensitive habitats to prevent disturbance.
   - Implement habitat restoration programs in areas where construction has occurred.
2. **Erosion and Sediment Control:**
   - Install erosion control measures such as silt fences, sediment basins, and check dams to prevent soil erosion.
   - Implement best management practices for construction site runoff, including sediment ponds.
3. **Water Pollution Control:**
   - Properly manage construction chemicals, fuels, and waste to prevent water pollution.
   - Use environmentally friendly construction materials and techniques to reduce the risk of pollution.
4. **Noise and Air Pollution Management:**
   - Implement noise barriers and schedule noisy activities during non-sensitive hours.
   - Ensure construction equipment meets emissions standards and maintain equipment properly.
5. **Resource Efficiency:**
   - Reduce resource consumption by optimizing construction material use and recycling where feasible.
   - Implement energy-efficient construction practices and use renewable energy sources where possible.
6. **Waste Management**
   - Implement waste management plan

4.9.2.5 Social Mitigation Measures (Construction Phase):

1. **Community Engagement:**
   - Maintain ongoing communication with affected communities to address concerns and keep them informed about construction activities.
   - Implement grievance mechanism to address community complaints and issues promptly.
2. **Displacement and Resettlement:**
   - Implement resettlement plans, ensuring affected communities receive fair compensation, land, and livelihood restoration support.
   - Support affected households in finding alternative housing and income opportunities.
3. **Health and Safety:**
   - Enforce strict health and safety regulations on construction sites to protect both workers and nearby communities.
   - Provide appropriate training and personal protective equipment to workers.
4. **Cultural Heritage Protection:**

- Conduct archaeological surveys before construction in culturally sensitive areas.
- Develop mitigation strategies to protect cultural heritage sites and involve local communities in preservation efforts.

5. **Indigenous Peoples:**
   - Implement IPP and ensure full participation of vulnerable or disadvantages groups (e.g., ethnic minorities).
6. **Gender Participation:**
   - Implement Gender Action Plan and measures to promote female beneficiaries for improved participation in project planning and implementation, and economic empowerment.

4.9.2.6 Climate Mitigation and Adaptation Measures (Construction Phase):

1. **Emission Reduction:**
   - Use low-emission construction equipment and vehicles.
   - Minimize idling time for construction machinery to reduce emissions.
   - Promote sustainable transportation options for workers and materials.
2. **Climate-Resilient Construction:**
   - Incorporate climate-resilient design features into infrastructure construction to withstand climate-related risks.
   - Implement flood and stormwater management measures to prevent construction site flooding.
3. **Temperature Extremes:**
   - Implement heat stress prevention measures for workers, such as shaded rest areas and hydration stations in hot weather.
   - Provide adequate clothing and equipment for workers during cold weather.
4. **Community Resilience Building:**
   - Support local communities in building climate resilience by providing training and resources for climate adaptation.
5. **Monitoring and Compliance:**
   - Establish regular monitoring and reporting mechanisms to ensure compliance with environmental, social, and climate mitigation measures.
   - Conduct periodic audits to assess the effectiveness of mitigation efforts and make necessary adjustments.

169 These mitigation measures should be integrated into the construction management plan and closely monitored throughout the construction phase. Collaboration with relevant stakeholders, including local communities, environmental experts, and safety professionals, is essential to ensure successful implementation and the overall sustainability of the project.

4.9.3 Operations Phase

170 The potential environmental, social, and climate-related risks and impacts associated with the operations phase of the planned CAISAR irrigation and flood protection project include:

4.9.3.1 Environmental Risks and Impacts (Operations Phase):

1. **Water Management**: Inadequate water management during operations can lead to over-extraction of water resources, which may cause downstream water scarcity, altered hydrology, and harm to aquatic ecosystems.

2. **Water Quality**: The irrigation system's operations can affect water quality, with potential risks of contamination from agricultural runoff, pesticide use, or improper wastewater disposal.
3. **Erosion and Sedimentation:** Ongoing maintenance and operation activities can contribute to soil erosion and sedimentation in water bodies, impacting water quality and aquatic habitats.
4. **Invasive Species:** Poorly managed water flows can facilitate the spread of invasive aquatic species, potentially harming native ecosystems.
5. **Energy Use:** The energy requirements for pump stations, flood control systems, and other infrastructure elements can result in increased carbon emissions if not managed efficiently.
6. **Waste Management -** increase in volume of hazardous and non-hazardous waste requiring safe disposal.

4.9.3.2 Social Risks and Impacts (Operations Phase):

1. **Land Use Conflicts**: Conflicts over water allocation and land use may arise among competing stakeholders, such as farmers, leading to disputes and social tensions.
2. **Access to Water:** Unequal access to water resources during the operations phase can exacerbate social inequalities, impacting vulnerable communities and livelihoods.
3. **Health and Safety:** Ongoing maintenance and operations work can pose health and safety risks to workers and nearby communities, particularly if safety measures are inadequate.
4. **Community Engagement**: Maintaining effective communication and engagement with local communities is crucial to address their concerns and ensure the equitable distribution of benefits.
5. **Indigenous Peoples Exclusion –** Potential disbenefit to IP's or lack of inclusion in project benefits and opportunities.
6. **Gender Inequities –** Potential inequities and lack of project opportunities and benefits.

4.9.3.3 Climate Risks and Impacts (Operations Phase):

1. **Climate Variability:** Changes in rainfall patterns, increased temperature, or more frequent extreme weather events can affect water availability and the effectiveness of flood protection systems.
2. **Extreme Events**: The irrigation and flood protection infrastructure must be resilient to withstand extreme weather events, including floods, droughts, and storms.
3. **Maintenance Challenges**: Climate-related impacts, such as increased sedimentation or infrastructure damage from extreme events, can pose challenges for ongoing maintenance and operations.
4. **Energy Efficiency**: Climate mitigation efforts should focus on optimizing energy use and transitioning to cleaner energy sources to reduce greenhouse gas emissions associated with ongoing operations.
5. **Adaptive Management:** The operations phase should include adaptive management strategies to respond to changing climate conditions and ensure infrastructure remains effective.
6. **Community Resilience**: Local communities will require support to build resilience to climate-related risks, such as training in climate-smart agriculture or flood preparedness.
7. **Water Management**: Climate-related changes may necessitate adjustments in water management practices to ensure sustainable and equitable water distribution.

171 Addressing these potential risks and impacts during the operations phase requires proactive planning, ongoing monitoring, and adaptive management. Sustainable water management practices, efficient energy use, and community engagement are crucial components of mitigating these issues and ensuring the long-term success and resilience of the irrigation and flood protection project. Regular maintenance and assessment of the infrastructure's performance under changing climate conditions are essential for its continued effectiveness.

172 Suggested mitigation measures to address the potential environmental, social, and climate-related risks and impacts during the operations phase of the CAISAR irrigation and flood protection project include:

4.9.3.4 Environmental Mitigation Measures (Operations Phase):

1. **Sustainable Water Management:**
   - Implement efficient water management practices to prevent over-extraction and ensure equitable water distribution.
   - Monitor water quality regularly and implement measures to reduce contamination, such as the responsible use of pesticides and proper wastewater treatment.
2. **Erosion and Sedimentation Control:**
   - Develop and implement erosion control measures to minimize soil erosion and sedimentation in water bodies.
   - Regularly maintain sediment basins and silt fences to manage sediment runoff.
3. **Invasive Species Management:**
   - Implement monitoring and control programs to prevent the spread of invasive aquatic species in irrigation and flood protection infrastructure.
4. **Energy Efficiency:**
   - Optimize energy use through efficient pump systems, renewable energy integration, and regular maintenance of energy-consuming equipment.
5. **Waste Management**
   - Implement waste management plan.

4.9.3.5 Social Mitigation Measures (Operations Phase):

1. **Stakeholder Engagement:**
   - Maintain transparent and ongoing engagement with local communities and stakeholders to address concerns and ensure the equitable distribution of water resources.
   - Establish mechanisms for conflict resolution and dispute management related to land use and water allocation.
2. **Access to Water:**
   - Ensure that water access is fair and inclusive, with mechanisms in place to support vulnerable and marginalized communities in accessing water resources.
3. **Health and Safety:**
   - Continue to enforce strict health and safety regulations for workers and nearby communities during ongoing maintenance and operation activities.
   - Provide ongoing safety training and personal protective equipment to workers.
4. **Indigenous Peoples:**
   - Implement IPP and ensure full participation of vulnerable or disadvantages groups (e.g., ethnic minorities).
5. **Gender Participation:**
   - Implement Gender Action Plan and measures to promote female beneficiaries for improved participation in project planning and implementation, and economic empowerment.

4.9.3.6 Climate Mitigation and Adaptation Measures (Operations Phase):

1. **Climate-Resilient Infrastructure:**
   - Regularly assess and maintain flood protection and irrigation infrastructure to ensure its resilience to changing climate conditions.
   - Develop flood and drought management strategies based on climate projections.
2. **Maintenance and Repairs:**

- Implement a robust maintenance program to promptly address damage or sedimentation issues caused by climate-related events.
- Ensure that infrastructure components remain in good working condition to maintain their effectiveness.

3. **Energy Transition:**
   - Transitioning to cleaner energy sources for operation, implement and maintain solar solar pumps to reduce carbon emissions.
   - Promote energy-efficient practices within the operational phase.
4. **Adaptive Management:**
   - Establish adaptive management plans that allow for adjustments in water management and infrastructure operations in response to climate variability and extreme events.
5. **Community Resilience Building:**
   - Support local communities in building climate resilience through education, capacity-building programs, and climate-smart agriculture practices.
   - Encourage community-led initiatives for flood preparedness and disaster risk reduction.
6. **Water Management Adjustments:**
   - Be prepared to adjust water management practices, such as reservoir release schedules, in response to changing climate conditions and hydrological patterns.
7. **Monitoring and Reporting:**
   - Continue regular monitoring and reporting on environmental, social, and climate-related factors to assess the effectiveness of mitigation efforts and make necessary adjustments.

173 These mitigation measures will be integrated into the ongoing operation and maintenance plan for the CAISAR irrigation and flood protection infrastructure. Collaboration with relevant stakeholders, including local communities, environmental experts, and climate specialists, is essential to ensure the successful implementation of these measures and the long-term sustainability and resilience of the project during the operations phase. Regular evaluation and adaptation are critical components of managing risks and impacts effectively.

174 The CAISAR irrigation and flood protection project is planned to have the following positive environmental, social, and climate impacts:

4.9.4 Positive Environmental, Social and Climate Impacts:

4.9.4.1 Positive Environmental Impacts:

1. **Improved Water Management:** Irrigation systems help optimize water use, reducing wastage and ensuring efficient distribution of water resources. This will mitigate water scarcity issues and enhance ecosystem health.
2. **Increased Crop Yields**: Irrigation can significantly increase agricultural productivity, reducing the need to expand agricultural land into forests and natural habitats, thereby preserving biodiversity.
3. **Reduced Soil Erosion:** Flood protection measures can prevent soil erosion caused by heavy rains and floods, which helps maintain soil fertility and prevents sedimentation in rivers and water bodies.
4. **Enhanced Ecosystem Services**: Sustainable water management will positively impact wetland ecosystems by maintaining water levels and preserving habitats for aquatic plants and wildlife.

4.9.4.2 Positive Social Impacts:

1. **Improved Food Security**: Increased agricultural productivity due to irrigation will lead to greater food security for local communities, reducing dependence on external food sources.
2. **Poverty Alleviation**: Higher crop yields will enhance the income and livelihoods of local farmers, potentially reducing poverty rates in the region.
3. **Health Benefits**: Access to clean water for irrigation will improve public health by reducing waterborne diseases and improving sanitation practices.
4. **Employment Opportunities:** The construction and maintenance of irrigation and flood protection infrastructure will generate employment opportunities for local communities.
5. **Infrastructure Development:** The project will improve transportation and connectivity, making it easier for people to access markets, healthcare, and educational facilities.

4.9.4.3 Positive Climate Impacts:

1. **Climate Resilience:** Flood protection infrastructure will help communities adapt to climate change by reducing the impacts of extreme weather events and flooding.
2. **Carbon Sequestration**: Irrigation will enhance the carbon sequestration capacity of soils, contributing to climate change mitigation efforts.
3. **Reduced Emissions**: By increasing agricultural productivity and reducing the need for land conversion, the project will indirectly help reduce greenhouse gas emissions associated with deforestation and land-use changes.
4. **Improved Water Efficiency**: Efficient irrigation practices will reduce the energy and water requirements for agriculture, which can lower greenhouse gas emissions associated with water pumping and distribution.

175 The success of the CAISAR project depends on effective planning, sustainable practices, and community engagement. Environmental impact assessments and social safeguards will be in place to mitigate any potential negative consequences and ensure the long-term sustainability of these positive impacts.

5. PROCEDURES FOR REVIEW, CLEARANCE, AND IMPLEMENTATION OF SUBPROJECT E&S INSTRUMENTS

5.1 Objective and Approach

176 Since some of the activities and subprojects will be identified during implementation, this ESCMF was prepared to apply to all subprojects and investment activities. The main objective of the ESCMF process is to ensure that the subprojects and activities financed by the project will not create adverse impacts on the local environment and communities, and the residual and/or unavoidable impacts are mitigated in line with the IAAB, IFAD and GCF safeguards standards.

177 During implementation, identified activities/subprojects will be screened for and given a risk classification based on their E&S issues and applicable safeguards standards (ESSs), after which any necessary environmental and social assessment (ESA) and other E&S instruments will be prepared based on the requirements laid out in this ESCMF. The assessments, instruments, and mitigation measures will be proportionate to the nature and scale and the potential risks and impacts of the project and consistent with the requirements of IAAB, IFAD, the GCF, and national laws/regulations. The safeguards plans prepared for subprojects may include but are not limited to: Environmental and Social Management Plans (ESCMPs); including health and workers issues related to sexual exploitation and abuse (SEA); and IP Plans. Terms of reference, work plans, and documents defining the scope and outputs of any site-specific safeguard's capacity building activities (for example, through the annual Information, Education, and Communication program) will be drafted so that the advice and support provided is also consistent with the IAAB, IFAD and GCF safeguards standards. Based on the initial sub-project safeguards screening, any subsequent ESA would: (i) cover the requirements established under the relevant safeguard standard for that subproject; and (ii) identify the environmental and social risks and impacts including direct, indirect, cumulative, and residual impacts.

5.2 Key Steps

178 The ESCMF process is comprised of four steps, as depicted in **Figure 7** and summarized below:

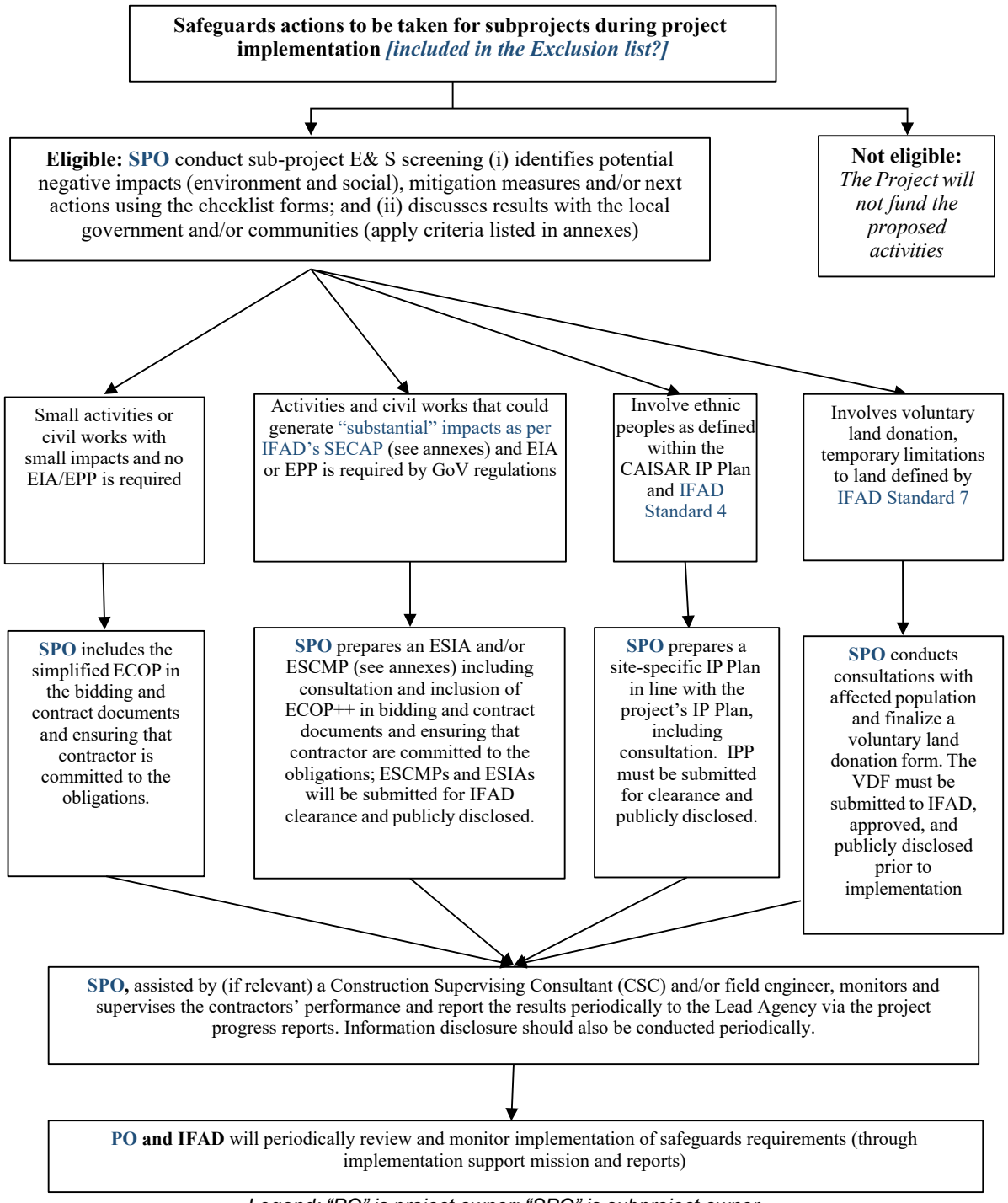
STEP 1: Screening for eligibility and E&S issues including risks and impacts using screening criteria, application of ESSs, and identification of and needs for preparation and implemenation of E&S documents/instruments.

STEP 2: Prepare E&S documents, including the development of mitigation measures in the ESCMP, IP Plan, and RP to be incorporated into bidding and contractual documents and subjected to close monitoring of the contractor performance. ESCMPs clearly identify mitigation measures for potential negative impacts during site clearance and construction, including the management of contractors, chance finds, EHS application, and workers' Codes of Conduct.

STEP 3: Clearance and disclosure of E&S documents; and

STEP 4: Implementation, monitoring, and reporting.

179 The risk analysis, impact assessment, and preparation of E&S documents for all subprojects will be carried out during implementation. A full ESIA is being conducted for the project. Preparation of a subproject ESCMP occurs when the subproject activities have been clearly identified and locations are known. During the preparation of the ESCMP, due attention will be given to address the issues of biodiversity conservation and sustainable management of living natural resources, resource efficiency and pollution prevention, labour and working conditions, community health and safety, indigenous persons/ethnic minorities, women, cultural heritage, and stakeholder engagement and information disclosure.



Legend: "PO" is project owner; "SPO" is subproject owner

Figure 5-1: Flowchart for Safeguard Actions for Subprojects

180 Key safeguards actions can be highlighted as follows:

- Small works to be carried out under Component 2 will incorporate a site-specific ESCMP requirements and an ECOP into the bidding documents and consultant contracts, with contractor performance closely monitored by the responsible persons of the implementing agencies.
- If screening highlights the need for voluntary land donation or temporary disruption to land use, a Voluntary Land Donation form must be prepared and consulted upon (in line with the VGGT principles and IFAD Standard 7), as well as approved and disclosed prior to sub-project implementation.
- If the ethnic minorities are present in the subproject, a site-specific IP Plan will be prepared and implemented according to IFAD Standard 4 and the guidelines can found in the project's overarching IP Plan.
- All the major E&S documents of a given subproject will be submitted for IFAD clearance before their respective approval and implementation.

5.3 E&S Risk and Impact Assessment

181 This step (Step 1) aims to confirm the eligibility of subproject and/or activities to be financed by the Project as well as identify the potential E&S issues and assess potential impacts of the subprojects/activities including needs for preparation of E&S documents as required by IFAD/GCF standards using an E & S screening checklist. The agencies responsible for implementing the subproject/activity will be responsible for undertaking and signing the screening forms. PPMUs will each be responsible for screening their own activities. Consultation with IFAD safeguards specialists can be made as needed, depending on subproject complexity.

5.4 Development of E&S Documents

182 This step (Step 2) is focused on preparing safeguards documents in relation to the issues identified in Step 1. Guidelines for the preparation of an ESCMP are provided in the annexes, whereas a project-level SEP and IP Plan have been developed separately. Again, PPMUs will be responsible for their own activities and subprojects, and their corresponding safeguards specialists will be responsible for the preparation of E&S documents. Consultation with IFAD safeguards specialists for complex subprojects will be made as needed.

183 It is also crucial that the implementing agencies of the subprojects and activities are responsible for preparation of E&S documents (e.g. EPP, EIA, etc.) required by the Government of Cambodia's EIA regulation and secure approval of responsible agencies.

5.5 Review, Approval, and Disclosure of E&S Documents

184 **IFAD review and clearance:** Before approval and commencement of subproject works, the Subproject Officer (SPO) will submit all key E&S documents to IFAD for review, clearance, and public disclosure. For CAISAR, it is suggested that IFAD conduct reviews of the first three ESCMPs prepared by each province and may then reduce (or increase) frequency as needed. The approval process described herein may also be reviewed occasionally, particularly once the E&S capacity of the implementation partners has been built with the support of the E&S capacity-building consultants/project safeguards specialists. At that point, IFAD may choose to review ESCMPs selected at random.

185 All E&S documents will be posted on the official websites of MOWRAM and the project provinces, and hardcopies in the Khmer language will be available at the CPMU, PPMU, and subproject sites. The CPMU and PPMUs must publish a notification of disclosure of information and solicit comments within the month following that disclosure date. The English version of the ESCMPs will be disclosed on the IFAD (and potentially GCF) website(s).

186 Government approval: Responsible agencies are also required to approve the ESIA or EPP documents as required by Government regulation. Any prepared EIA (in Khmer or English) as well as the approval conditions will be provided to IFAD for information and will be disclosed to the public.

5.6 Implementation, Supervision, Monitoring, and Reporting

187 ESCMF implementation, supervision, monitoring, and reporting is an integral part of project and subproject implementation. Each E&S staff is responsible for specific activities. IFAD SECAP specialists also supervise and monitor the implementation of safeguards activities during IFAD project supervision missions. Delegation of responsibilities is as follows:

- ***Gender Action Plan and IP Plan monitoring:*** The PPMU will hire a social inclusion/gender specialist to monitor the implementation of the IP Plan and GAP and report results to IFAD.
- ***E&S monitoring of contractor performance during construction:*** To ensure compliance with the national laws and regulations as well as some specific requirements of the IFAD SECAP standards at subproject level, PPMUs will hire a qualified national consultant to conduct monthly monitoring and reporting while assigning the Construction Supervision Consultant (CSC) or field engineers to be responsible for monitoring and reporting of contractor's compliance to the construction-focused ESCMPs on a day-to-day basis. At the project level, the PPMU Environmental Safeguards Specialist will ensure monitoring of environmental and social performance at sub-project sites and of the construction contractor throughout construction. The Environmental Safeguards Specialist will report their findings in the Project E&S monitoring reports for IFAD and GCF (this will be done on a six-month basis, or as agreed with IFAD and GCF in accordance with the legal agreement). The PPMU will also be responsible for monitoring and evaluating implementation of the Stakeholder Engagement Plan, including responses to grievances and/or complaints of the project/subproject affected peoples as well as the project workers (see Section 10).
- ***E&S monitoring during implementation of activities/operation of infrastructure:*** Specialized training will be provided on risks inherently associated with project activities that involve waste management, occupational health and safety, and community health and safety. E&S staff must pay extra attention – proportional to the more substantial risks – to those activities during implementation. To ensure sustainability after project closure, the awareness and capacity of MOWRAM/PDWRAM staff and related implementing agencies must be increased through trainings and during implementation supervision. This will require E&S capacity building consultants (including extension staff). PPMUs will detail safeguards progress in the subprojects' E&S monitoring reports for submission to the CPMU. The CPMU will then aggregate and submit the information to IFAD and the GCF.

6. IMPLEMENTATION ARRANGEMENTS

6.1 Responsibility for ESCMF Implementation

188 The feasibility study included recommendations on how the CAISAR Project should be implemented and is summarized in the following paragraphs. The CAISAR project has a clear objective related to both climate and poverty, but the ambitious scope requires cooperation between government agencies. The project will be adopted by the existing country program steering committee chaired by the Ministry of Economy and Finance (MEF). The executing agency, the Ministry of Water Resources and Meteorology (MOWRAM) will provide overall management of the project and implementation of Component 2 (Infrastructure). The National Committee for Sub National Democratic Development (NCDD) will be the implementing agency for component 1.

189 The Project Management Unit (PMU) will consist of personnel from MOWRAM, the Department of Hydrology and River Works (DHRW) of MOWRAM, and Provincial Departments of Water Resources and Meteorology (PDWRAMs) of four provinces.

190 The NCDD working with the International Fund for Agricultural Development (IFAD) will lead Component 1, which involves providing farm level support, capacity building and training of FWUCs, and promoting the adoption of efficient and climate resilient farming practices. IFAD will also be responsible for communications and visibility throughout the project's implementation.

191 Other key phases of implementation include a pilot program for solar pumping and geofabrics to identify any inefficiencies before the full construction phase, with a budget of $60k. Surveys will also be carried out on dam structures and river sections and structures to determine where work is required to rehabilitate and climate-proof the infrastructure, with a budget of $70k managed by the PMU. It is known that the Anlong Chrey dam has limited freeboard and MOWRAM wish to improve safety of the structure.

192 Monitoring and evaluation will be a crucial aspect of the project's success, with engagement at the FWUC level monitoring and reporting to ensure capacity is being increased in time to realize the significant benefits expected upon completion of construction. Material effectiveness and quality of design will also be monitored and evaluated to ensure the scheme is delivered to a standard consistent with at least a 25-year asset life.

193 The roles and responsibilities of each organization have been clearly outlined, with MOWRAM responsible for overall supervision and guidance, and the DFWUC responsible for preparing the annual work plan and budgets, initiating, and coordinating communication, coordinating with the Ministry of Agriculture, Forestry and Fisheries (MAFF) on agriculture support activities, and implementing social and environmental safeguards, among other tasks. The PDWRAM will assist the PMU in disseminating information and coordinating with the Ministry of Economy and Finance-General Department of Resettlement (MEF-GDR) to implement the resettlement plan, among other tasks.

194 The project steering committee (PSC), chaired by the Minister of MOWRAM, will provide policy guidance and oversee project implementation, while the Inter-Ministerial Resettlement Committee (IRC), chaired by MEF, will manage resettlement and land acquisition. By following this implementation arrangement, the CAISAR project can proceed smoothly and achieve its goals of improving water resource management and enhancing agricultural productivity in Cambodia.

6.2 Project Implementation Organizations (Component 2)

195 The expansion of irrigated areas and the modernization of irrigation systems are high in the order of priorities of the Royal Government of Cambodia as well as the Ministry of Water Resources and Meteorology (MOWRAM), which is responsible for sustainable water resources management, including irrigation in Cambodia. Proper irrigation O&M can only be successfully implemented when the five basic pillars of irrigation are properly addressed. These five pillars are: (i) security of water

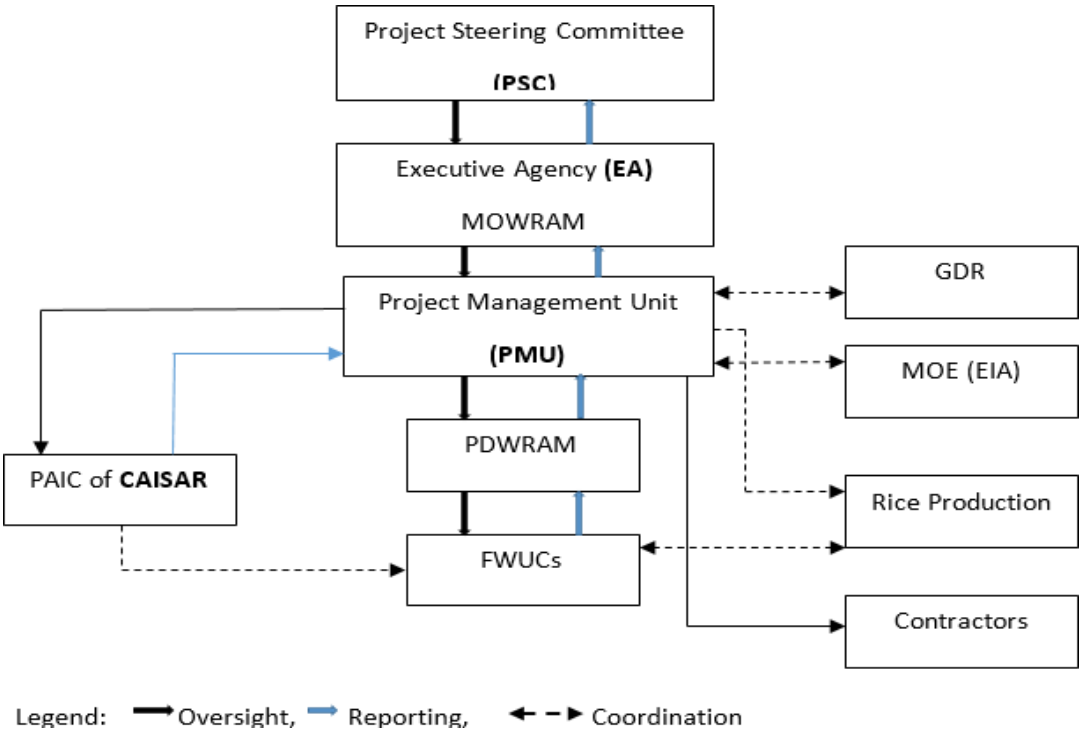
availability; (ii) sustainable infrastructure; (iii) water management, (IV) Irrigation institution and (v) human capital.

196 The FWUC Department has personnel at the Central level but no Office and personnel at the Province and District level so for the effective operation of FWUC the DFWUC should recruit and or appoint additional personnel and train them to meet the right qualification and experience for the FWUC office at the provincial and district levels.

197 A CAISAR project implementation organization chart is defined in Source: Feasibility Study
198 Figure 6-1. MOWRAM is the Executing Agency for implementation of the Project. However, successful implementation of the Project requires the cooperation of several ministries. The project steering committee (PSC) was established to achieve the inter-ministerial coordination and chaired by the Minister of MOWRAM and comprising of senior officials from MOWRAM, MOI (NCDD), MAFF, Ministry of Environment (MOE), Ministry of Economy and Finance (MEF), and the Provincial Governor's Offices of Pursat, Kampong Chhnang, Kandal, and Kampong Speu provinces will oversee project implementation and provide support to the project. The Table 6-1 below show the Management, Executive and Implementation body and Figure 6-1 show the Project organization Structure.

Table 6-1: PSC Management Arrangement.

Descriptions	**Arrangements**
Management	
(i) Oversight Body	**Project Steering Committee (PSC)** Chair: H.E. Lim Kean Hor, Minister, MOWRAM Secretary: H.E. Chann Sinath, Deputy Director General, DFWUC/Project Director Members: H.E. Secretary of State, MOI (NCDD) H.E. Secretary of State, MEF H.E. Secretary of State, MOWRAM H.E. Under Secretary of State, MEF H.E. Under Secretary State, MAFF H.E. Director General, MEF H.E. 4 Provincial Governors Director of Department of Cooperation and Debt Management, MEF Office of Multilateral Cooperation 1, MEF
(ii) Executing Agency	MOWRAM
(iii) Implementation Unit	Establish PMU at MOWRAM Level and possibly PIU at PDWRAM Level



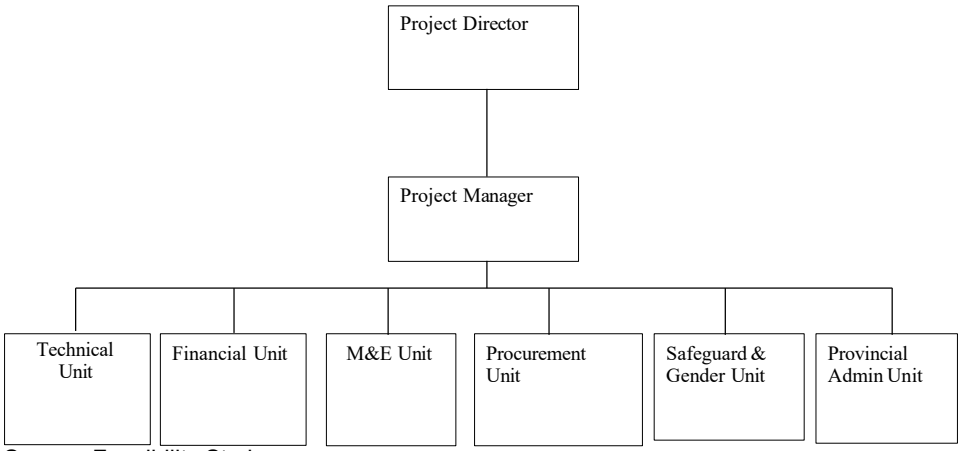
Source: Feasibility Study

Figure 6-1: CAISAR Project (Component 1) Structure Chart

199 A project management unit (PMU) has been established for the CAISAR project. The PMU will be headed by the Secretary of State of MOWRAM as Project Director, with assistance from the DFWUC Director as Project Manager. The PMU will be fully involved in the preparation and implementation of the project. The PMU is composed of designated personnel from MOWRAM, the Department of Hydrology and River Works (DHRW) of MOWRAM, and the PDWRAMs of Pursat, Kampong Chhnang, Kampong Speu, and Kandal provinces.

200 The PDWRAMs are responsible for coordinating all field activities with FWUCs and DFWUC and implementing O&M activities.

201 The PMU is supported by the Project Management Implementation Consulting (PMIC) and consists of Project Director, Project Manager, Technical Unit, M&E Unit, Financial Unit, Procurement Unit, Safeguard & Gender Unit and Provincial Administration Unit as show in Figure 6-2 below.



Source: Feasibility Study

Figure 6-2 PMU Structure Chart.

6.3 Project Implementation Organizations at Sub-National Level

202 Note that the following text applies to Component 2 only. It is envisaged that IFAD will detail further the role of the NCDD and the coordination with the provincial and district agencies for agriculture, rural development etc.

6.4 Provincial Department of Water Resources and Meteorology (PDWRAM)

203 The Provincial Department of Water Resources and Meteorology of MOWRAM is the mandated body tasked to undertake full responsibilities for the O&M of the Main system/scheme. Specifically, PDWRAM is expected to perform the following responsibilities:

a) Ensures that the main canal infrastructure is properly maintained and repaired.
b) Ensures that the seasonal water management plan is endorsed and approved.
c) Ensure that in the dry season the main canal system provides sufficient water.
d) Provide technical assistance to FWUC and its members in the operation and maintenance of the irrigation systems/scheme.
e) Assume leadership in the resolution of conflicts on water disputes.
f) Operation and maintenance of main canal systems with appropriate funding provided by the Royal Government of Cambodia.
g) Implement routine maintenance of the Main Canal system including the structures.
h) Update report to MOWRAM on the deferred maintenance needs of the system including an estimate cost and time repair work.
i) Monitor the volume of water in the main canal and the level of water released to the water users in order for it to function normally.

6.5 Project Implementation Organizations at Scheme Level

204 According to the FWUC Sub-decree of March 2015, a FWUC shall be established and registered with MOWRAM for each irrigation system/scheme in Cambodia. Establishing the FWUC is important in helping sustain the irrigation schemes to be constructed under the Project. Therefore, the Project will establishment an efficient and effective FWUC and will provide adequate inputs and supports to ensure that the FWUC will be able to function effectively.

205 The FWUC will be established as early as possible after a subproject has been proved feasible and endorsed for the construction to enable the local farmers to participate in all stages of the project formulation and implementation.

206 The establishment of a FWUC requires considerable efforts in community organization and training of the established FWUC. The general strategy in mobilizing and organizing the farmers is described below:

(i) One FWUC is organized in each irrigation system/scheme, hence, there will be 4 FWUCs established in the CAISAR, 1 FWUC will need to be restructured or have the committee members re-elected, and 1 FWUC needs more capacity building as mention in Table 6-2 below.
(ii) One FWUG is delineated and organized within the command area of one secondary canal (SC). When the SC area is small, a FWUG could also cover more than one SC.
(iii) One FWUSG is delineated and organized within the command area of one or more tertiary canal (TC)

Table 6-2: Distribution Network & Name of FWUC to be established in the CAISAR Scheme.

No	Scheme Name	Command Area (ha)	Number			Number		
			District	Commune	Village	FWUC	FWUG	FWUSG
1	Ou Tapoang Tanai	13, 270	1	2	31	1	2	31
2	Lum Hach	16,664	3	10	55	1	10	55
3	Chhean Laeung	5,307	1	3	15	1	3	15
4	Stueng Krang Bat	1,500	2	3	13	1	3	13

No	Scheme Name	Command Area (ha)	Number			Number		
			District	Commune	Village	FWUC	FWUG	FWUSG
5	Brambei Mom	16,556	3	12	56	The current FWUC is weak and incapable of collecting ISF. It needs to be restructured and or re-elected as the current FWUC is governed by only 4 communes out of 12 communes in the CAISAR Project scheme.		
6	Krapeu Troum	903	1	1	14	This FWUC is active and they need more capacity building, support and documentation.		

207 After the FWUC's are recognized and officially registered, the Farmer Water User Committee (FWUC) will have full responsibility for the operation and maintenance of the irrigation system as follows:

a) Has the obligation to collect the irrigation service fee (ISF) from all its members for repair and maintenance of the secondary and tertiary irrigation system.
b) Resolve all internal conflicts involving water distribution between and among other FWUC leaders.
c) Convene the General Meeting once a year and other meetings with group and subgroup member as required.
d) Take action to replace vacant position of the structure as required and in accordance with its Statute.
e) Ensure that ISF are collected and kept properly and evaluate expenditures, manage and monitor the level of ISF in each phase and adjust as needed after approval from the members.
f) Assist in facilitating the support of the MOWRAM, PDWRAM and Development Partners on repairs, maintenance, and development of irrigated infrastructure as well as on agricultural development.
g) Mobilize local labor and financial resources to support regularly and seasonally operations and maintenance of irrigation system such as secondary and or tertiary canals and other parts.
h) Review on all kinds of secondary and tertiary canals and structures and Submit report to the PDWRAM.
i) Conduct seasonal maintenance before season of planting.
j) Prepare seasonal water distribution schedule for each growing season and provide a copy to PDWRAM for the preparation of the seasonal water management plan.
k) Manage the distribution of water under the guidance of PDWRAM because these structures are usually under the responsibility of PDWRAM but the operation of these gates will be transferred to the FWUC.

6.6 Procurement

208 The procurement principles to be followed by the CAISAR project were set out in the Aide Memorandum between MOWRAM, AIIB and IFAD following missions in December 2020 and January 2021. Project procurement using AIIB/GCF/IFAD financings will follow the Standard Operating Procedures on Procurement for All Externally Financed Projects/Programs in Cambodia (the SOP 2019/ Procurement Manual) to the extent such are consistent with the IFAD and AIIB Project Procurement Guidelines. NCDD PIU will be directly responsible for project procurement activities of Component 1. MOWRAM PMU will be directly responsible for project procurement activities of Component 2. Procurement review committees for both components will have representatives from both MOWRAM PMU and NCDD PIU.

209 Procurement method thresholds and prior review thresholds for GCF/IFAD financed activities will be determined and specified in the Project Procurement Arrangements Letter (PPA). Requests for IFAD prior review and no objection (for 18-month/annual procurement plans, procurement documents subjected to IFAD prior review) shall be routed through IFAD's web-based procurement management and tracking system (the current NOTUS system to be upgraded in 2023).

210 For the procurement of AIIB/GCF/IFAD financed activities, the standard bidding documents under the MEF's Standard Operational Procedures will be adopted and used with integration of additional provisions in compliance with the AIIB/IFAD Policy on Preventing Fraud and Corruption in its Activities and Operations, and IFAD's Social, Environmental and Climate Assessment Procedures (SECAP).

211 For Component 2 activities, three areas will be identified, (a) Project Management by PMU (b) Preparation of TOR's for DED and Pilots, surveys, detailed engineering design (DED) and contract preparation and tendering towards implementation (c) Packages of work and purchase/Installation of M&E goods such as solar pump stations.

212 For (a) and (b) the PMU already have a procurement plan detailing when the work is expected, how and when it will be procured and budgets. These do not need to be repeated here as they are continually updated by the PMU.

213 For the implementation phase a series of packages for civil works of around $10m-$20m can readily be defined and contracts requiring specific expertise such as the nature-based works on the river restoration work at Ou Ta Poung River, or the heavier engineering work for the upgrading of the offtake structure on the Damnak Ampil and widening/lining of the feeder canal linking to the Ou Ta Paoung River. Lining of secondary offtake canals to increase capacity whilst limiting additional land take may be similarly packaged. For tertiary and quaternary canals significant work with the local communities is needed to finalise design and layout acceptable to the farmers and landowners. To avoid double pumping raised canals and solar pump installations are needed. Land requirements may be reduced through buried pipe or channel systems with access roads above. Continuity for drainage and fish may require small siphons. On the Krang Ponley particularly, expertise in storages and pond restoration is needed as well as more significant drainage works and embankment raising. Creating farm ponds in Cambodia is significantly more expensive than in Thailand where conditions are similar and there is potential for improving efficiencies.

6.7 Monitoring and Reporting Arrangements

214 The E&S performance will be included in the subproject and overall project progress reports. The two safeguards specialists in each of the PPMUs, with assistance from the CSC/field engineers (where relevant), will monitor and report on the E&S performance of the project. The safeguards specialists in the PPMUs will submit E&S performance reports at the subproject level to the CPMU on a monthly basis. At the central level, the CPMU will prepare E&S monitoring report twice per year for submission to IFAD and the GCF, describing the project's progress and compliance with the SECAP/GCF safeguards standards and other requirements.

215 The progress report submitted to the CPMU must include sufficient information on subproject implementation progress and E&S issues related to ESCMF implementation. The overall progress report from CPMU to be submitted to IFAD and the GCF must include adequate information regarding: (i) preparation and disclosure of the E&S instruments for subprojects; (ii) implementation progress of the ESCMP, including incorporation of the ECOP/COC on SEA/other ESCMP requirements pertaining to the contractor in the bidding and contractual documents; (iii) monitoring and supervision on implementation perforamnce of contractors, CSCs, and PPMUs according to the ESCMP, ECOP, and COC on SEA; and (iv) any challenges, solutions, and lessons learned during E&S/ESCMF implementation. Table 6-3 provides a summary of reporting procedures.

Table 6-3: Reporting Procedures

	Report Prepared by	Submitted to	Frequency of Reporting
1	Contractor to the Employer	PPMUs	Once before construction commences and monthly thereafter
2	Construction Supervision Consultant (CSC)	PPMUs	Weekly and monthly

3	Community Monitoring	PPMUs	When the community has any complaint about the subproject E&S/ESCMF implementation
4	PPMUs	CPMU	Monthly
5	CPMU	IFAD and GCF	Once every six-months, in accordance with any signed legal agreements.

6.8 Incorporation of ESCMF into Project Operational Manual

216 The ESCMF process and requirements will be incorporated into the Project Implementation Manual (PIM) and the CPMU will provide training to ensure that the subproject owners (PPMUs) understand them and will supervise and monitor the ESCMF implementation periodically. The E&S section in the POM will also refer to the ESCMF and related safeguards documents, as needed.

7. CAPACITY BUILDING, TRAINING, AND TECHNICAL ASSISTANCE

7.1 Capacity Building for Efficient Project Management

217 Capacity building is a component that will provide supports to MOWRAM/ PMU and PDWRAM to strengthen their capacity with the objective to expedite Project implementation and ensure effective Project management. The capacity building will cover (i) overall Project management, (ii) establishment of FWUCs and capacity building of FWUCs and iii) international and national consultants to fill capacity gaps of MOWRAM/ PMU and PDWRAM.

7.2 MOWRAM/ PMU and PDWRAM

218 The institutional assessment report prepared by PPIC and WAPCOS, December 2022 noted that the weak and insufficient capacity of human resource in all levels of the irrigation management is the primary cause of the slow rural development in Cambodia. The need for adequately trained professionals in water resources and irrigation management in Cambodia is an issue. The capacity building can be performed through education, training, workshop, etc.

219 Based on the institutional assessments report of the Water Resources Management Sector Development Program (WRMSDP), the training for MOWRAM and PDWRAM will include all personnel at the central and provincial levels that are involved in the CAISAR project scheme. This means that the officers who will be involved in the CAISAR project will also be trained. However, the training for FWUCs TOT must be included. For the CAISAR project it is advised that the training plan covers all 6 Irrigation Schemes with both for CAISAR PMU and PDWRAM with topics including 1) Project Orientation and Presentation of Project Plans; 2) FWUC Formation and Strengthening; 3) Gender Awareness and Gender Action Plan; 4) Data Management for Hydro and Meteorological Data and O&M for Meteorological Equipment; 5) Environmental Awareness; 6) Construction Management and Supervision and 7) On-Farm Water Management and Operation and Maintenance.

7.3 FWUC/FWUG/FWUSG

220 To help the trainees clearly understand and be able to apply them to their work, it was noted that each training program needs to dedicate sufficient time for each topic.

221 For FWUC management training programs are needed to strengthen the capacity of existing or new FWUCs that includes: a. Basic administrative management, b. Accounting and finance, c. Conflict resolution, d. Operation and maintenance of irrigation facilities and e. Collection of irrigation service fees.

222 It is suggested that FWUC need to have the opportunity to meet regularly and exchange their personal experiences and to learn from each other regarding FWUC management. Interaction between FWUCs can help to reduce conflicts between FWUCs in the same irrigation scheme/ reservoir.

223 As each FWUC have different geographical characteristics, socio-economic condition and different issues, training materials should be simplified by using the simple words and expressions commonly used by the local people

224 A well-defined FWUC Organizing Framework within MOWRAM/PDWRAM needs to be synchronized with the Water Distribution Schedule and agreed upon within the FWUC and disseminated to all farmer-water users within the Irrigation scheme.

225 The Project should construct the secondary and tertiary canals until the tertiary gates and will assist FWUC in collection of ISF.

226 The institutional assessment report has suggested that Technical and financial support will be provided to the FWUC that will manage the operation of Ou Tapoang, Lum Hach and Kraing Pomley Scheme to ensure that system O&M is conducted in an effective and sustainable manner.

227 To ensure effective and consistent training on E&S, particularly under the new IFAD SECAP (2021) and GCF ESS (2022), training should be provided by qualified national consultants. In addition to refresher training on safeguards pertaining to waste management, use and disposal of pesticides/fertilizers, etc., there must be additional training focused on ensuring the effective performance of contractors – including provision of adequate services related to health, safety of workers and local communities.

7.4 Training and Technical Assistance

228 Training and capacity building on the IFAD SECAP/GCF ESS has been recommended to address the concepts of proportionality and adaptive management as well as cover the implementation of the safeguards documents as they relate to: (i) contractor management and monitoring of E&S issues concerning labour; (ii) community health and safety; (iii) environmental health and safety; and (iv) requirements for systematic stakeholder engagement. The targeted training programs focused on E&S risk management could also help strengthening inter-agency coordination and cooperation which is critical for ensuring effective management of all aspects of climate change adaptation. Given the project structure and the plan to implement a number of subprojects in each province involved, significant inputs from qualified national consultants will be required, along with on-the-job training on assessing risks and impacts management during preparation and implementation.

229 During implementation of Project, E&S training and technical assistance will be provided to the implementing agencies both at the Project and subproject level. During the first three years, the CPMU will conduct at least two safeguard training workshops per year (one on environment and one on social) to the subproject owners regarding the ESCMF process and needs for preparation of safeguard documents (ESCMPs, SEP, IP Plans, and ECOP etc.). When possible, an IFAD SECAP Specialist will participate in these training workshops. Safeguards technical training for any other specific issues and related aspects should occur at least once per year for three years. This could be combined with the annual IEC.

230 Priority for training should include, but is not limited to, the following:

(i) The ESCMF process and guidelines for preparation, implementation, and supervision of E&S instruments designed for CAISAR and its subprojects;
(ii) Specific training on the IP Plans, SEP, and labour management with regard to planning and implementation, including the application of differentiated GRM pathways to more effectively respond to local complaints;
(iii) Specific training on supervision and monitoring of contractor performance, including forms and reporting processes; basic knowledge on health and safety; good construction practices for reducing potential impacts on local environment and local peoples; Codes of Conduct on SEA; and communication and GRM procedures and other social issues related to communicable diseases (including covid-19), etc.;
(iv) Specific training on IPM; safe use and disposal of pesticides/herbicides/chemical fertilizers being used in primary production;
(v) Specific training on waste management, including hazardous and bio-hazardous waste;
(vi) Specific training on the use of PPE and best practices (during construction, pesticide application, etc.).

7.5 Technical Assistance on E&S Capacity Building

231 Given the specific needs related to E&S training and limited capacity of some agencies with respect to the newest IFAD SECAP and GCF ESS, a qualified national firm could be mobilized by the CPMU to provide E&S training, supervision, monitoring, and reporting of the ESCMF implementation and SECAP/ESS compliance to IFAD and the GCF. If required by IFAD and/or the GCF, the CPMU will also mobilize an independent monitoring agency (IMA) for monitoring of IP Plan implementation, voluntary land donation (if applicable), and other E&S consultants to assist in the preparation and/or monitoring of various E&S activities during implementation. PPMUs may mobilize E&S consultants

(either individual or hired through a firm) to assist in the implementation of ESCMF, preparation of E&S documents, and mitigation measures of the subprojects under their responsibility.

232 MoWRAM have significant experience in application of the World Bank ESF and the Asian Development Bank safeguards policy through a number of similar projects over the past several years. Through this project, MoWRAM have maintained a proven track record for safeguards compliance. MoWRAM keep improving their capacities, through continued capacity development of staff of the Environmental and Social Office (ESO). Some of the staff within the ESO have solid working experience in engineering, community development, environment, social and public administration, engaging with indigenous people, and most have been trained by the World Bank on various topics related to environment and social management in rural development projects. The ESO with MoWRAM have a total of 7 staff (4 are female) who are assigned to different projects. The ESO will need additional technical support during the WASAC project implementation from E&S specialized staffs. MoWRAM will engage additional national consultants to work alongside staff of ESO to support the PMUs of MoWRAM in day-to-day E&S implementation and management.

Review of MoWRAM/PMUs capacity in prevention of SEA/SH risks

233 The MoWRAM PMUs have experience in identifying SEA/SH risks and prevention of SEA/SH based on lessons learned from several previous projects. Under this project, based on identified risks of SEA/SH, an approach and framework for management of SEA/SH risks has been proposed, and further addressed in the Labor Management Procedures. PMUs will appoint one social officer and one GRM officer to ensure the SEA/SH risks are monitored and reported. In addition, the MoWRAM PMUs have assigned a gender focal point to provide on-the-job training to the Contractors.

234 At an early stage of project implementation, MoWRAM PMUs will recruit E&S consultants, and engage a consultant specialized in SEA/SH to carry out SEA/SH trainings for PMU members and relevant members of MoWRAM, ESOs. MoWRAM also ensure that SEA/SH risks will be updated based on local experience and site conduct at respective subprojects. Accordingly, actions to be taken to prevent SEA/SH will be updated and included as part of the ESCMPs, and which will be subsequently applied as part of construction Contractor responsibilities (as prescribed in the Contractors' Work Contract). Budget will also be allocated (in Contractor's bill-of-quantity) to ensure the Contractor has budget in place to recruit a SEA/SH consultant to conduct public awareness raising on SEA/SH at subprojects, and to undertake SEA/SH management measures on the part of Contractors' workers and staff to minimize the risks of SEA/SH. In case where SEA/SH incidence is frequent or a significant episode has occurred.

235 Land acquisition and voluntary donations training will be conducted by the E&S Consultant. It is expected this training could be started as soon as E&S specialized staff are engaged by MoWRAM. Additional support from E&S staffs will be needed monthly or bimonthly during the construction phase, and quarterly or biannually during maintenance phase based on the need for support for the select subprojects. These training initiatives will be carried out face-to-faced. In case COVID-19 restrictions return, virtual training will be conducted. Zoom or Webex will be used for online training, The training will have knowledge session combined with discussion/exercises/role plays/quiz with Questions & Answers session at the end of each day. The training will be delivered in different time format, depending on the topics, number of participants, time availability, and may typically range from one day to three days. MoWRAM and PMUs will engage qualified trainers for the above training topics. For new topics, MoWRAM can ask support from the AIIB and IFAD to support in terms of sharing training material, references, and assist in training facilitation, if possible, to provided MoWRAM PMUs with practical, hands-on experience at the first stage of project implementation, particularly soon after project effectiveness.

8. ESCMF IMPLEMENTATION BUDGET

236 The roles and responsibilities of each organization have been clearly outlined, with MOWRAM responsible for overall supervision and guidance, and the DFWUC responsible for preparing the annual work plan and budgets, initiating, and coordinating communication, coordinating with the Ministry of Agriculture, Forestry and Fisheries (MAFF) on agriculture support activities, and implementing social and environmental safeguards, among other tasks. The PDWRAM will assist the PMU in disseminating information and coordinating with the Ministry of Economy and Finance-General Department of Resettlement (MEF-GDR) to implement the resettlement plan, among other tasks.

237 The E&S performance will be included in the subproject and overall project progress reports. The two safeguards specialists with assistance from the CSC/field engineers (where relevant), will monitor and report on the E&S performance of the project. The safeguards specialists in the PPMUs will submit E&S performance reports at the subproject level to the CPMU on a monthly basis.

238 The ESCMF process and requirements will be incorporated into the Project Implementation Manual (PIM) and the PMU will provide training to ensure that the subproject owners (PMUs) understand them and will supervise and monitor the ESCMF implementation periodically. The E&S section in the POM will also refer to the ESCMF and related safeguards documents, as needed.

239 Monitoring and evaluation will be a crucial aspect of the project's success, with engagement at the FWUC level monitoring and reporting to ensure capacity is being increased in time to realize the significant benefits expected upon completion of construction. Material effectiveness and quality of design will also be monitored and evaluated to ensure the scheme is delivered to a standard consistent with at least a 25-year asset life.

240 The following ESCMF implementation costs include two safeguards' specialists in the PMU, Their responsible include: (a) preparation of E&S documents of subprojects, including consultation with local authorities and communities; (b) supervision, monitoring, and training workshops on E&S issues; (c) implementation and monitoring of the ESCMPs, SEP, IP Plan, and Gender Action Plan. (with the support of the project's Monitoring & Evaluation Specialist); and (d) ensuring contractors implement their respective Environmental Code of Practice and Codes of Conduct for Gender Based Violence (GBV) and Violence Against Children (VAC) and any site-specific measures. The budget also includes the social economic survey including the census for the resettlement plan. A budget for an Independent E&S Monitoring Consultant for an estimated 6 year construction period for the 6 schemes.

241 MoWRAM will appoint at least one Environmental Specialist, one Social Specialist, and one GRM Focal Point (hereinafter ESOs) for full time support for the project. The ESOs of MoWRAM will be instrumental in ensuring the environmental and social performance of the project. The ESOs, who are supported by Design and Supervision consultants and E&S consultants, will be responsible for ensuring effective environmental and social management for all project activities. The ESOs, Design and Supervision consultants and E&S consultants will work together as a team in which ESOs play the lead role in E&S monitoring for the whole project. In particular, ESOs will review all related project and E&S documents which are prepared by E&S consultants. Where necessary, ESO will conduct site visits, interview contractor, construction supervisors, workers, provincial-level government staff of MoWRAM, local authorities and local communities to collect necessary E&S information for the purpose of internal monitoring. The ESO will monitor Contractors' compliance with Construction-ESCMP and visit each subproject location at least once a month during construction. Upon completion of each site visit, the MoWRAM'S ESOs should prepare a Monitoring Report reflecting main issues found, resolution arrangements and timing for the resolution.

The **ESOs** will be responsible for:

- Implementing and monitoring performance of environment and social mitigation measures, including health and safety;

- Conducting screening and scoping on environment and social impacts, including screening for land acquisition impacts based on the guidance in the RPF and presence of Indigenous Peoples based on the guidance in the IPPF;
- Conducting trainings on health, safety, gender, SEA/SH, VAC, labor rights, HIV/AIDS, STDs, Covid-19 and the grievance redress mechanism to project communities, and monitoring contractor's training for their workers on Workers' Code of Conduct which covers SEA/SH/VAC, HIV/AIDS, STDs, and COVID-19 and the workers' grievance redress mechanism;
- Monitoring environmental and social activities of the project, in particular the implementation of the ESCMPs for subprojects, and any other relevant project documents such as RP and IPP;
- Monitor, including ensuring effective functioning of project's Grievance Redress Mechanism and solve grievances submitted to the PMUs level;
- Leading all stakeholder engagement activities, including information disclosure, consultations, reporting back to stakeholders, according to the provisions in the SEP;
- Working closely with Provincial Department of Water Resource and Meteorology, General Department of Resettlement, and other line ministries and/or relevant departments as necessary;
- Prepare monthly reports on E&S implementation and submit to the PM and PD.

E&S Consultants

242 The E&S consultants are responsible for assisting the ESO in monitoring and reporting on the safeguard implementation performed by the contractors.

- Develop screening checklist to assess risks and potential environmental and social impacts for each subproject;
- Take lead in building capacity for the project (based on list of potential training topics, including periodic provision of on-the-job training to contractors, ESO and PMUs on the implementation and management of E&S risks and impact at subproject level;
- Review C-ESCMP and ensure C-ESCMP is consistent and cover all risks and potential impacts identified in site-specific ESCMP, particularly risks related to OHS, CHS, SEA/SH/VAC taking into account local knowledge and experience in prevention and management of these risks.
- Ensure C-ESCMP have actionable plan to addressed identified risks and potential impacts, including allocation of resources to implement fully such actions.
- Make recommendation for improvement before PMU's and PMU's DISS Consultant's approval of C-ESCMP;
- Conduct site visit to construction sites and worker camp and make above assessment as part of monitoring and reporting responsibility;
- Develop E&S monitoring checklist and reporting template;
- Participate and support ESO in monthly safeguard monitoring and reporting;

243 The Government of Cambodia and AIIB, IFAD and GCF will co-finance the ESCMF implementation budget, except for costs related to all aspects of land acquisition, resettlement, and livelihood restoration. When needed, qualified national (individual or firm) consultants for capacity building and training on ESCMF implementation and the concepts of the AIIB's ESF, IFAD's SECAP and GCF's ES Policy will be provided. Budget for trainings and capacity building are mainstreamed into the project budget across project outputs/components, so are not listed explicitly in the ESCMF implementation budget. Likewise, the budget for preparation of the Biodiversity Impact Assessment and related Biodiversity Management Plan, if any, are not listed in the ESCMF implementation budget, as they have already been contracted by MOWRAM as part of the ESCIA.

244 Costs related to staffing, implementation, and monitoring of the ESCMF, as well as costs more broadly focused on safeguards are built into existing project activities/components, can be found in Table 8-1.

Table 8-1: Estimated ESCMF Implementation Cost

Line Item	Estimated cost (USD)	Remarks
Environment & Climate Safeguards Specialist	USD 240,000 (60 months at USD 4000 per month) per PMU	The PMU will be responsible for management of this budget.
Gender & Social Safeguards Specialist	USD 240,000 (60 months at USD 4000 per month) per PMU	
GRM Focal Point	USD 240,000 (60 months at USD 4000 per month) per PMU	
Socioeconomic and census survey for Resettlement Plan 840 ha impacted (private & public) with estimate of 10 households per ha	USD 250,000	
Independent E&S Monitoring Consultant (Estimated 6 year project implementation period)	USD 500,00	
TOTAL	**USD 1,470,000**	

9. GRIEVANCE REDRESS MECHANISM (GRM)

245 As part of environmental and social policies of the AIIB, IFAD, and GCF, the Lead Agency is required to establish and implement a GRM to respond to concerns and grievances of project-affected parties related to the E&S performance of the project/subprojects in a timely manner. The GRM may include: (a) different ways in which users can submit their grievances, including submission in person, by phone, text messages, mail, email or via a web site; (b) a log where grievances are registered in writing and maintained in a database; (c) publicly advertised procedures, setting out the length of time users can expected to wait for acknowledgement, response, and resolution of their grievances; (d) transparency about the grievance procedures, governing structure, and decision makers; and (e) an appeals process (including the natural judiciary) to which unsatisfied grievances may be referred when resolution of grievance has not been achieved. The project/subject owner may provide mediation as an option where users are not satisfied with the project's resolution. Project/subproject owners must establish and implement the project GRM to receive and facilitate resolution of such concerns and grievances. As best practice, this ESCMF stipulates that contracted workers will have access to the project GRM to also raise workplace-related concerns. Those workers will be informed of the GRM upon their recruitment, as well as the measures put in place to protect them against any reprisal for its use.

246 As part of overall implementation of the subproject, the GRM will be established by the implementing agencies. The GRM identifies procedures, responsible persons, and contact information; will be readily accessible for the public; and will handle grievances and resolve them at the lowest level required and as quickly as possible. The GRM provides the framework within which complaints about environmental and safety issues can be handled, grievances can be addressed, and disputes can be settled quickly. The GRM will be in place before the subproject activities commence.

247 General Process: Complaints and claims through the project GRM can be lodged verbally, in writing, or by telephone/email. On receipt of a complaint, or project representative will register the complaint in the Complaints File and maintain a Log of Events pertaining to the complaint, until its resolution. Information to be recorded in the Complaints Log will include:

- The date and time of the complaint;
- The name, address and contact details of the complainant;
- A short description of the issue of complaint;
- Actions taken to address the complaint, including persons contacted and findings of each step in the complaint redress process;
- The dates and times when the complainant is contacted during the redress process;
- The final resolution of the complaint;
- The date, time and manner in which the complainant was informed thereof; and
- The complainant's signature when resolution has been obtained.

9.1 Objectives of the Project GRMs

248 The objective of the GRM is to provide affected persons with redress procedures that can be conveniently used to raise a project related concern or grievance. The GRM guides how a complaint can be lodged, including forms and channels through which a complaint can be submitted. To facilitate the grievance resolution process, grievances received will be acknowledged in writing and solved within a specified timeframe. During the resolution process, where necessary, dialogue will be held with aggrieved person for mutual understanding and effective resolution. Once a complaint is resolved, the aggrieved person will be notified of the resolution results.

249 The GRM has sequential steps that aggrieved person can use. If the aggrieved person is not satisfactory with the grievance resolution result, or if their complaint is not resolved within the timeframe specified for a particular step, aggrieved person can move on to the next step which is higher in resolution hierarchy. The project has an appeal process where complainant can resort if they

are not satisfied with a resolution decision at a particular step, or their complaints are not resolved within a specified timeframe.

9.2 Summary of national legislation related to grievance and complaint

250 The RGC has various laws and sub-decrees that have been in place to guide the implementation of the complaint resolution process. These documents specify the right of the complainants as well as the responsibilities of concerned governmental agencies as to complaint resolution. Relevant legal documents include:

- Law on Expropriation (dated 26 February 2010);
- Labor Law (dated 13 March 1997, amended on 20 July 2007 and 26 June 2018);
- Law on Prevention of Domestic Violence and Protection of Victims (dated 24 October 2005);
- Sub-decree No. 22 ANK/BK (2018) on Standard Operating Procedures for Land Acquisition and Involuntary Resettlement for Externally Financed Projects in Cambodia. Guidelines for Grievance Redress Mechanism (Appendix 8);
- Law on Administrative Management of Capital, Provinces, Municipalities, Districts and Khans (dated 22 May 2008) – Section 6 on Solution of Local Conflicts;
- Sub-decree No. 22 (25 March 2002) on Decentralization of Roles, Functions, and Power to Commune Councils (Article 61: duty to promote the role of conciliating disputes between citizens);
- Sub decree No 47 ANK.BK (31 May 2002) on Organization and Functioning of the Cadastral Commission (Chapter 4 – District/Khan Level Conciliation).

9.3 Principles of the Project GRMs

251 Under CAISAR, the following principles will be applied:

- **Channels.** Different channels are established to enable affected person to submit their grievances, including submission to village committee, as well as district and provincial levels.
- **Forms.** Grievances can be submitted in writing and verbally, and either directly by the affected households, or by a person delegated by the complainant.
- **Complainant can delegate a representative who acts on their behalf.** A person lodging a grievance can ask assistance from their family or from individual to act as their representative.
- **Disclosure.** GRM procedures are disclosed in public domain (e.g., websites of PMU, public notice board at village hall, and in front of substation).
- **Documentation.** A grievance logbook will be maintained at substation (subproject level) and at PMU level (through PMU GRM focal point).
- **Transparency.** Grievance procedures include steps, time frame for grievance resolution for each step, notification to affected person, how decision is made.
- **Acknowledgement.** The unit in charge of complaint resolution will notify complainant upon complaint receipt and will initiate the complaint resolution process.
- **Appeal.** If the agency in charge does not resolve a grievance in a manner that is satisfactory to the affected person, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court.
- **Monitoring.** All grievances received are recorded by PMU and relevant substations, and are processed/resolved in a given timeframe, and are monitored by PMU GRM focal point.
- **Time-limit.** Time-limit is specified for each step in the grievance resolution process.
- **Complainants bear no costs.** Complaint resolution is free of charge to aggrieved person. However, if the complaints bring their case to court, they will bear the costs associated with their lawsuit.
- **Any grievance concerning urgent health and safety issues** shall be resolved immediately.

252 The project has in place complaint handling procedures for three types of potential grievances, including grievances related to 1) land acquisition, 2) labor and working conditions, and 3) sexual exploitation and abuse and sexual harassment (SEA/SH/GBV/GBV), and 3) general complaints. These procedures are established based on the above GRM principles and are in accordance with pertinent national legislation. The GRM for complaints related to land acquisition is provided in the project's Resettlement and Policy Framework (RPF) and that for IPs is provided in the project's IPPF. Summary for the above four procedures is provided below:

9.4.1 Redress Procedure for Complaints related to Land Acquisition

9.4 Project's Redress Procedures

253 Under this project, to facilitate the grievance redress, the informal and formal steps are combined for convenient use of affected people, as follows:

- **Step 1 − Commune/Sangkat level.** APs will seek assistance from commune/Sangkat chief or community elderlies who will discuss with the leader of the PRSC-WG to find a solution. Verbal grievance can be provided to the commune/Sangkat chief or community elderlies. So, no written complaint is required. It is noted that even if the complaint is made verbally, the complaint will be registered in project's logbook, including resolution process and result for such verbal grievance for monitoring purpose. Upon receipt of the verbal complaint, the PRSC-WG will consult with the IRC-WG to ensure the complaint is addressed timely. If the grievance is not resolved to the satisfaction of the AP, or if the AP prefers, s/he may lodge their complaint through the formal route which includes the steps below.
- **Step 2 − District level**. AH can lodge a written complaint to the Head of the District Office (where the subproject is located). The AH can bring a community elderly or their representative to discuss their grievance at the District Office. A conciliation meeting shall be held and a decision be made within 15 working days from the date of complaint is received by the District Office. If the complaint is resolved to the satisfaction of the AH, the IRC-WG will inform GDR's Department of Internal Monitoring and Data Management (DIMDM) who will review and seek the approval of the Director General of GDR for appropriate remedial action. GDR will inform the AF of the decision/ remedial action within 15 working days from the receipt of the grievance by the District Office. If the complaint is rejected at this step, District Office will inform the AH of the rejection in writing. If the complainant is not satisfied with the decision/resolution result, s/he can proceed to step 3 (below).
- **Step 3 − GDR level.** The complainant who is not satisfied with proposed resolution from Step 2 shall lodge a written complaint to the GDR for resolution.The GDR, through its DIMDM, will carry out a holistic review of the complaint and submit a report on its findings with the relevant recommendations, if any, to the Director General of GDR for review and decision. GDR may conduct a field visit to meet the complaint and the IRC-WG to gather relevant information. The final report must be completed within 30 working days from the date of receipt of the complaint by GDR for submission to the Director General of GDR who will make a final decision within 5 working days of receipt of the final report. In the event that the subject matter requires a policy level intervention, it will be referred to the IRC for a decision which may require that an additional 10 working days be extended from the original deadline for final decision.
- **Step 4 − Provincial level.** AH will submit a written complaint to the PGRC through the Provincial Governor's Office. The complainant or a representative will be given an opportunity to present its case during a meeting and the PGRC may consider any compelling and special circumstances of the AH to inform their decision. The GDR will send a representative, as a non-voting member, to provide an explanation to the rejection of the complaint at Step 3 with the GDR. The decision of the PGRC must be made on a consensus basis and will be final and binding except when the matter relates to government's policy. Decisions related to government's policy matters on land acquisition and resettlement are decided by the IRC. The PGRC will have 40 working days from the date of receipt of the complaint to reach a final decision. The decision of the PGRC will be sent to the IRC (through the GDR) for endorsement before any remedial action is taken.

  There are no fees or charges levied on the AH for their lodgment of complaint and for complaint resolution for the above 4 steps.
- **Step 5 − Court of Law**. If the aggrieved person prefers filing a lawsuit at the Provincial/Municipal Courts, as applicable, to seek a resolution, AP can do so but will bear cost related to the lawsuit as per the Expropriation Law. When the case is brought to a Court

of Law, there is no involvement of the GDR, PRSC or IRC-WG unless there is a judicial order from the competent courts.

9.4.2 Redress Procedure for Complaints related to Labor and Working Conditions

254 Project workers can lodge their grievance/complaint as follows:

- **Step 1 – Employer Level (Contractor and Subcontractor).** Aggrieved person (AP) can submit their grievance to their Employer who serves as the first focal point for receiving and resolving grievance. Grievance can be lodged verbally or in writing, in person or by phone, text message, mail or email (anonymous complaint is accepted). The Employer involved will resolve the case no later than 15 working days. Once resolved and the AP is satisfactory, the Employer will report the case, including resolution process and results, to the SEO of the MOWRAM for information and record. If the AP is not satisfied with the resolution of their Employer, the Employer will refer the AP to the SEO of MOWRAM, if needed and inform the AP of this referral. It is noted that if a complaint concerns the safety and health of one or several individuals, such complaint shall be resolved as soon as possible – depending on the nature and urgency of the grievance.
- **Step 2 – PMU level.** MOWRAM SEO will resolve the complaint referred to by the Employer (Step 1) and acknowledge receipt of the AP's complaints within two weeks from the date of complaint receipt. If the SEO of MOWRAM cannot resolve the complaint, the SEO Team will consult with the Project Manager/Director for resolution. The SEO of the MOWRAM will inform the AP (in writing) of the PMU's resolution result within 30 days from the date of complaint receipt. If the AP is not satisfied with the resolution result proposed by PMU, PMU will refer the case to the Project Steering Committee of the project and shall inform the AP (in writing) of this referral.
- **Step 3 – Project Steering Committee level.** At this level, the case will be resolved no later than 21 days. The AP will be informed of the resolution decision in writing. In case the grievance has not been solved within the specified timeframe, or the AP does not agree with the proposed resolution, the AP can approach the Labor Inspector of his/her province or municipality.
- **Step 4 – Court of Law.** If the AP is not satisfied with the resolution proposed above, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court. If the grievance could not be resolved satisfactorily by the multistakeholder committee, the affected person may resort to the court of law. The cost associated with the lawsuit shall be borne by the AP. The decision of the Court will be final.

9.4.3 Redress Procedure for Complaints related to SEA/SH/GBV

255 Under the project, the GRM for SEA/SH/GBV mainly serves to: (i) refer complainants to a local GBV service provider; and (ii) record resolution of the complaint. In line with the above, the following principles apply so as to recognize SEA/SH/GBV victim as principal decision makers in their own care, and treat them with agency, dignity and respect for their needs and wishes:

- **Multiple channels** are in place for easy access and lodge complaints.
- **SEA/SH/GBV survivors will be referred to a local GBV service provider** for immediate support if they make a complaint directly to PMU.
- **Confidentiality of survivors is protected.** GM operator (at PMU and local GBV service providers) will keep confidential for SEA/SH/GBV allegation report.
- **No identifiable information on the survivor shall be collected and stored** in Project Grievance Logbook.
- **Costs of operating the SEA/SH/GBV GRM will be covered by the project**.

256 **It is noted that under this project, GBV service provider will be engaged** for subprojects that are rated "High" or "Substantial" for SEA/SH/GBV risks − based on SEA/SH/GBV risk assessment as part of site-specific ESMP.

The following channels can be used to submit a grievance related to SEA/SH/GBV:

+ Channel 1 – AP who believe the SEA/SH/GBV incidence is related to project workers can follow steps outlined in Section 6.4.2 (above) to lodge a SEA/SH/GBV complaint.

+ Channel 2 – Alternatively, AP can lodge their complaint, verbally or in writing, to the GRM's Focal Point within the SEO of MOWRAM for advice and resolution (contact of GRM Focal Point is provided in Section 5.1 (Resources).

+ Channel 3 – If AP wants to bring the case to the Court of Law, AP can follow steps below for prosecution. Prosecution related to SEA/SH/GBV is administered under the Criminal Code and the Code of Criminal Procedure and is as follows:

- **Step 1 – Judicial Police.** SEA/SH/GBV victim or a representative can submit their grievance to a local Judicial Police (JP) Officer. JPs include a) Commune/ Sangkat Chief, b) Commune/ Sangkat/ District/ Provincial/ National Police, and c) District/ Provincial/ National Military Police. The JP is responsible for receiving, recording complaints, and may conduct preliminary investigations to identify and arrest the perpetrator. The JP will also collect evidence to support the prosecutors. If the SEA/SH/GBV happens at home and/or falls under the domain of domestic violence (as per Law on the Prevention of Domestic Violence and Protection of Victims), the SEA/SH/GBV survivor may seek support from a local qualified Judiciary Police Officer (appointed by the Ministry of Women's Affairs) who can act as a complaining party on behalf of the SEA/SH/GBV survivor15.
- **Step 2 – Prosecutor.** Upon receiving the completed written record from the JP, the prosecutor can decide on if the prosecutor will hold a file without processing it further or conduct proceedings against the perpetrator. The prosecutor may bring the case to the Court of Law and present the evidence in Court hearings.
- **Step 3 – Investigation by Judge.** During this step, the investigating Judge will conduct interrogation of the charged person and perform other required investigation procedure.
- **Step 4 – Hearing.** After issuing an order of indictment, the investigating Judge will submit the case to the trial court president who shall arrange a date for the trial. The decision of the Court on SEA/SH/GBV resolution is final.

9.4.4 Redress Procedure for General Complaints

257 In case individuals, households, or communities are affected by any other aspects, for instance, environmental impacts such as increased dust, noise, or lack of safety measures that increase risks of traffic accident to road users or to local EM, various channels will be established for convinient use by affected parties, including IPs. These include:

- **PMU GRM focal point's telephone** (See Section 5.1 – Resources).
- **Local EM leaders** (in case affected individual/households are EM)
- **Contractor's hotline:** to report cases that they think contractors can solve timely (contact detail of Contractos will be posted at construction sites, and distributed to IPs (through Subproject Information Booklet) during consultation, and post at public billboard of Commune/Sangkat offices, pagodas, etc.
- **Commune/Sangkat offices**

9.5 Registration of Project Grievance

258 The SEO, Project 6.Managers within MOWRAM is responsible to establishing and maintaining the project grievance logbook (PGL). The PGL will be established by the SEO to record all concerns/ grievance that are submitted by project stakeholders during project implementation. In case there is serious complaint, the World Bank should be notified of these complaints within 24 hours of complaint receipt (See Annex 3 for Guidance for establishing and maintaining Project Grievance Logbook).

[15] In 2007, Inter-Ministerial Prakas No. 64 was issued by the Ministry of Women's Affairs (MoWA) and the Ministry of Justice (MoJ) appointing MoWA officials who have legal qualifications to be officials of the MoWA Judicial Police. The roles and authority of the JPO under MoWA is defined in the MoWA's Prakas No. 072 KKN/BS (2007) and is as follows: (1) act as a plaintiff representing the victim (2) prepare reports and records (3) monitor and follow up on relevant investigations (4) follow up on Court's procedures (decisions and convictions). In addition, Prakas of the Ministry of the Interior (No. 3840, 2020) on Establishment and Functioning of the Commune/ Sangkat Committee for Women and Children, has defined the roles and responsibilities of these Committees in prevention, mitigation and collaboration with juridical agencies to prevent, resolve cases related to domestic violence, sexual abuses, sexual harassment, human trafficking (such as exportations of women and children in commune/ sangkat for sexual exploitation).

259 **The GRM is an integral project management element** that intends to seek feedback from beneficiaries and resolve of complaints on project activities and performance. The GRMs for the project are based on IAAB, IFAD, UN, and GCF requirements and, most importantly, national requirements for solving potential problems between project owners and local residents/persons affected by the subproject(s).

10. ESCMF STAKEHOLDER CONSULTATION AND DISCLOSURE

10.1 Consultation Requirements

260 AIIB, IFAD and GCF require that consultations be held with the project affected peoples, local communities, vulnerable persons/ethnic minorities, and other relevant stakeholders. The consultations should provide information on the following aspects: a) purpose of the project; b) results of the environmental and social assessment; and c) presentation of the complementary studies required, in any instances where they apply. This ESCMF has been prepared through a detailed consultative process at both the field and central level, and consultations findings may also be used for subsequent safeguards documents.

261 Consultation through community outreach during project implementation is good practice to ensure that the potential adverse impacts and concerns are properly addressed during project construction and operation. Consultation with affected populations and ethnic minorities is required when the activities involve physical relocation, land acquisition, and ethnic minorities.

10.2 Consultation Process Summary

262 Public consultation is a key component of CAISAR and it was pivotal in preparation of the following documents:

- Environmental and Social Management Framework (ESCMF)
- Resettlement Planning Framework (RPF)
- Indigenous Peoples Planning Framework (IPPF)
- Gender Assessment & Social Inclusion Plan
- Stakeholder Engagement Plan (SEP), and
- Environmental, Social, Climate Assessment report (ESCA)

10.3 Initial Stakeholder Consultation Results

263 A number of missions and stakeholder engagement meetings have been held which are all part of the process of informing stakeholders about the proposed project, getting understanding and acceptance of the project, and getting input to further optimize the design and implementation of the project.

10.3.1 *Missions 1 and 2*

264 A two-stage joint mission was conducted by the Asian Infrastructure Investment Bank (AIIB), the International Fund for Agricultural Development (IFAD) and Ministry of Water Resources and Metrology (MoWRAM) for design and review of progress on the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project (the Project) from 11 to 24 December 2022[1] and 9 to 19 January 2023.[2]

265 During the mission, discussions were held with key stakeholders in Phnom Penh and field visits to four provinces (Pursat, Kampong Chnang, Kampong Speu, and Kandal province) were conducted. Mission members visited all the key points of the irrigation areas guided by the Secretary of State His Excellency Chan Sinath and the directors of the Provincial Water Resource Management (PDWRAM). Districts and commune administrations, farmers and agribusiness entrepreneurs were met to determine and reach agreement on the directions and focus of the Project design and to review progress to date.

266 The objectives of the mission were (a) to check the requirements at the Project sites and review preparation progress, (b) to prepare all necessary information, studies and relevant documentation necessary for completing the Feasibility Study (FS), Green Climate Fund (GCF) Project Concept Note (CN) and GCF's Full Funding Proposal package, and (c) to define and

check the key studies required for the feasibility study and carry out the relevant consultations for the design mission.

10.3.2 *Mission 3*

267 A third field mission was conducted during the period of 18-26 May 2023 to Ou Tapoung (Pursat Province), Lum Hach (Kampong Chhnang Province) and Krang Ponley (Kampong Pseu, Kandal Province). The objectives of this mission were to: 1. Conduct discussions with provincial agencies with respect to planned projects and possible issues, and 2. Better understand the irrigation and flood control schemes as well as the smart irrigation needs; 3. Investigate the potential environmental and social issues related to the planned project schemes; and 4. To discuss appropriate environmental, social and climate safeguard measures suitable for the project (Annex 12).

10.3.3 *Ou Tapoung Feasibility Study Consultations*

During the preparation of the Ou Tapoung Feasibility Study, several meetings were held with FWUC commune representatives. These included:

- Meeting with Village Leaders from the Ou Ta Paong tail-end area, which included the following Villages of Ou Ta Paong Commune:
    1) Prey Yeang
    2) Robors Reang
    3) Chamkar Muol
    4) Chamkar Khluy
    5) Ou Tapoang
    6) Anglong Kray
    7) Srash Mkak
    8) Bot Kokichas
    9) Sdok Khlork
    10) Chhouk Krobao
    11) Somroung Pok
    12) Psar Angdoeurk
    13) Ornga Mean,
    14) Srash Ron
    15) Bot Kokithmey
    16) Ta nai
    17) Ou Bot
    18) Tuol Rokeang
- Meeting with FWUC of Kampang Irrigation Scheme on Svay Doun Kaev River
- Meeting with Bakan District Chairman
- Meeting with FWUC Damnak Ampil
- Meeting with FWUC Krouch Saeuch

PDWRAM explained that most of the systems in the DAC command area have at one or another time in the past 15 years undergone a rehabilitation. OTP is sort of a 'left-over'. PDWRAM explained that the rehabilitation of the OTP system is included in the current Five-Year Plan (PDWRAM). PDWRAM envisages that the OTP command area will receive its irrigation water via a gate on Damnak Ampil Canal (DAC).[16] An existing branch of Damnak Ampil Canal (DAC) is destined as the most logic route for delivering water to OTP River.

The feasibility study is to recommend options for improvement of the irrigation services in the area between the rivers Kambot and Svay Doun Khay. The work to be undertaken includes rehabilitation, upgrading, and extension of existing infrastructure systems for irrigation, drainage, flood protection, water storage, and transport.

[16] The ToR for the CAISAR Consultancy Services states:

10.3.4 *First Round of Stakeholder Engagement Meetings*

268 The first round of stakeholder meetings were held during the 26th to 30th June 2023 at commune and provincial levels in all three subprojects and six irrigation schemes. There were potential affected people and local authorities in the subproject areas and command areas that attended the consultation meetings at commune level, while representatives from provincial administration and provincial departments attended the public consultation meeting at provincial level.

269 The SECAP team provided a presentation at each meeting that included the following topics:

- Background of the CAISAR project
- Purpose of the Public Consultation
- Technical scope of each scheme
- Anticipated environmental and social risks and impacts
- Environmental and social safeguards documents to be prepared
- Grievance redress mechanism

270 Key comments and concerns raised by meeting participants included:

- Is there a **compensation** program for affected people?
- How can **complaints** be lodged if there is an issue?
- Participants generally expressed support for the project to be implemented soon

271 The key recommendations from the first round of stakeholder meetings include:

- Brambei Mom (Kampong Speu): there is a community forestry of 800ha. Wild animals such as wild boar, peafowl, tiger cat, banteng, gaur and so on.
- UXO: still found in some areas.
- Kampong Chhnang Department of Agriculture: suggested further assessment for the reservoir of Lum Hach.
- Reservoir of Lum Hach was reserved for irrigation purpose and it is state land. However, local people encroach and occupy the land inside the Lum Hach reservoir over the past years.
- Provincial Department of Health: recommended to ensure the health and safety of workers in the project (e.g., disease transmission and medical staff should standby at each construction site.
- Provincial Department of Education: should avoid adverse impacts on schools and students.

10.4 Information Disclosure

272 AIIB, IFAD and GCF funded projects are required to disclose all safeguards related documents locally in an accessible place and in a form and language understandable to key stakeholders (in this instance, Khmer and English) and on the external website of MOWRAM and of IFAD and the GCF prior to appraisal.

REFERENCES

1. United Nations. (2018). The least developed country category: 2018 country snapshots. Available- https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/Snapshots2018.pdf.
2. World Food Programme. (2023). Saving Lives Changing lives. Available- https://docs.wfp.org/api/documents/WFP-0000147767/download/?_ga=2.188002408.1116277075.1681899242-636470978.1669479646
3. World Bank Group. (2016). *Cambodia Economic Update, April 2016: Improving Macroeconomic and Financial Resilience*. World Bank. Available at- https://openknowledge.worldbank.org/entities/publication/78d3d276-3a5f-5bf2-915d-2d0381a13930
4. Kono, A. and Chey, T. 2019. Rapid assessment of upland cashew, mango, organic rice, and vegetable production. Actions for Climate-resilient and Sustainable Agricultural Production in the Northern Tonle Sap Basin. FAO.
5. RGC, 2020. Cambodia's Updated NDC. Retrieve from: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Cambodia%20First/20201231_NDC_Update_Cambodia.pdf
6. The Asia Foundation (2018). cambodia-atlas-on-gender-and-environment.pdf.pdf (opendevelopmentmekong.net)
7. Kampong Spoeu, one of the four target provinces, reported the highest number of droughts (one of the eight main natural hazards in Cambodia) between 1996 and 2013. (https://www.unccd.int/sites/default/files/country_profile_documents/1%2520FINAL_NDP_Cambodia%255B1157%255D.pdf).
8. Thoeun, H. C. (2015) Observed and projected changes in temperature and rainfall in Cambodia. Weather and Climate Extremes. 7:61. [old reference]
9. MAFF (2017) MAFF Annual Report 2016-17
10. Climate risk country profile, Cambodia. 2021. https://climateknowledgeportal.worldbank.org/sites/default/files/2021-08/15849-WB_Cambodia%20Country%20Profil
11. Data for 2020, World Bank, World Development Indicators
12. The ESCMF examines the risks and impacts when a project consists of a program and/or a series of subprojects, and the risks and impacts cannot be determined until the program or subproject details have been identified.
13. The 1989 Pelosi Amendment requires disclosure of environmental impacts at least 120 days prior to board approval for high- and sometimes substantial-risk projects (URL: https://www.gao.gov/archive/2000/ns00192.pdf)
14. Data for 2020, World Bank, World Development Indicators
15. The ToR for the CAISAR Consultancy Services states:
16. Ministry of Environment. (2002). Report on the Impact of Drought in Cambodia. Available online
17. The World Bank Group & Asian Development Bank. (2021). Climate Risk Profile: Cambodia. Available online https://www.adb.org/sites/default/files/publication/722236/climate-risk-country-profile-cambodia.pdf
18. ActionAid Cambodia. (2022). Cambodia Women's Resilience Index. Available online https://cambodia.actionaid.org/publications/2022/cambodia-womens-resilience-index-2022#downloads
19. Royal Government of Cambodia (2014-2023). Cambodia Climate Change Strategic Plan. Available online https://www4.unfccc.int/sites/NAPC/Documents/Parties/Cambodia_CCCSP.pdf
20. Alvar-Beltrán, J., Soldan, R., Ly, P., Seng, V., Srun, K., Manzanas, R., ... & Heureux, A. (2022). Modelling climate change impacts on wet and dry season rice in Cambodia. Journal of Agronomy and Crop Science, 208(5), 746-761.
21. The Ministry of Water Resources and Meteorology (MOWRAM) (July 2023). The 'Climate Adaptive Irrigation and Sustainable Agriculture for Resilience' project (CAISAR), Feasibility Study and Project Preparation AIIB PPSF, Grant S0452A, Code 00-452-PPSF-DTA
22. Ministry of Environment (2022), Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR)

ANNEX 1: EXCLUSION LIST

Any sub-project that meets one or more of the following screening criteria will not be approved for financing under the project:

- Rural roads with total length of more than 10 kilometres per scheme;
- Irrigation canals with base width more than 10m; sluices with total drainage width more than 10m; irrigation embankments to protect cultivation areas of more than 500 hectares; large dams (higher than 15m) or any dams resulting in a high-risk rating (in terms of environment, social, and/or dam safety).
- Reservoirs with capacity of more than 3 million cubic meters;
- Infrastructure schemes that require physical resettlement of more than 20 people per subproject area or affect more than 10 percent (in value term) of assets of an individual household, or adversely impacts security of tenure of EM households.
- Any sub-project that physically displaces EM or dilutes/changes their security of tenure.
- Relocation and/or demolition of any permanent houses or business.
- Use of the project as an incentive and/or a tool to support and/or implement involuntary resettlement of local people and village consolidation.
- Land appropriation
- New settlements or expansion of existing settlements.
- Activities that would likely create adverse impacts on ethnic groups/indigenous peoples within the village and/or in neighboring villages, or activities unacceptable to ethnic groups living in an ethnic homogenous village or a village of mixed ethnic composition.
- Damage or loss to cultural property, including sites having archeological (prehistoric), paleontological, historical, religious, cultural and unique natural values.
- Resources access restriction (e.g. restricted access to farming land) that could not be mitigated and will result in adverse impacts on the livelihoods of ethnic groups and disadvantage peoples.
- Purchase of banned pesticides, insecticides, herbicides and other unbanned pesticides, unbanned insecticides and unbanned herbicides and dangerous chemicals exceeding the amount required to treat efficiently the infected area. However, if pest invasion occurs, the use of small amounts of eligible and registered pesticides in Cambodia will be allowed if supplemented by additional training of farmers to ensure pesticide safe uses in line with IFAD/GCF ESS policies and procedures. Highly Hazardous Pesticides (HHP) will not be used by the project.
- Purchase of destructive farming gear and other investments detrimental to the environment.
- Unsustainable exploitation of natural resources.
- Introduction of non-native species, unless these are already present in the vicinity or known from similar settings to be non-invasive.
- Significant conversion or degradation of natural habitat or where the conservation and/or environmental gains do not clearly outweigh any potential losses.
- Production or trade in any product or activity deemed illegal under Cambodia's laws or regulations or international conventions and agreements, or subject to international bans.
- Labor and working conditions involving harmful, exploitative, involuntary or compulsory forms of labor, forced labor[17], child labor[18] or significant occupational health and safety issues.
- Trade in any products with businesses engaged in exploitative environmental or social behavior. Sub-activities that require full EIA will not be funded including any projects that will use or induce the use of hazardous materials (including asbestos) or any banned chemicals.

[17] Forced labor means all work or service, not voluntarily performed, that is extracted from an individual under threat of force or penalty.

[18] Harmful child labor means the employment of children that is economically exploitive, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health, or physical, mental, spiritual, moral, or social development.

ANNEX 2: IUCN RED LIST OF THREATENED SPECIES

KPL

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Crocodylus siamensis	Siamese Crocodile	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys grandis	Giant Asian Pond Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys annandalii	Yellow-headed Temple Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Pangasianodon gigas	Mekong Giant Catfish	ACTINOPTERYGII	CR	Decreasing	Freshwater
Pangasius sanitwongsei	Giant Pangasius	ACTINOPTERYGII	CR	Decreasing	Freshwater
Probarbus jullieni	Jullien's Golden Carp	ACTINOPTERYGII	CR	Decreasing	Freshwater
Batagur a nis	Southern River Terrapin	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
Catlocarpio siamensis	Giant Carp	ACTINOPTERYGII	CR	Decreasing	Freshwater
Datnioides pulcher	Siamese Tiger Perch	ACTINOPTERYGII	CR	Decreasing	Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Heliopais personatus	Masked Finfoot	AVES	CR	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Emberiza aureola	Yellow-breasted Bunting	AVES	CR	Decreasing	Terrestrial, Freshwater
Pelochelys cantorii	Asian Giant Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
Indotestudo elongata	Elongated Tortoise	REPTILIA	CR	Decreasing	Terrestrial
Manis javanica	Sunda Pangolin	MAMMALIA	CR	Decreasing	Terrestrial
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
Gyps tenuirostris	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial
Panthera pardus ssp. delacouri	Indochinese Leopard	MAMMALIA	CR	Decreasing	Terrestrial
Rucervus eldii	Eld's Deer	MAMMALIA	EN	Decreasing	Terrestrial, Freshwater
Laubuka caeruleostigmata	Flying Minnow	ACTINOPTERYGII	EN	Decreasing	Freshwater
Cuora amboinensis	Southeast Asian Box Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Lutra sumatrana	Hairy-nosed Otter	MAMMALIA	EN	Decreasing	Terrestrial, Marine, Freshwater
Siebenrockiella crassicollis	Black Marsh Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Fluvitrygon oxyrhynchus	Marbled Whipray	CHONDRICHTHYES	EN	Decreasing	Freshwater
Pangasianodon hypophthalmus	Striped Catfish	ACTINOPTERYGII	EN	Decreasing	Freshwater
Urogymnus polylepis	Giant Freshwater Whipray	CHONDRICHTHYES	EN	Decreasing	Marine, Freshwater
Asarcornis scutulata	White-winged Duck	AVES	EN	Decreasing	Terrestrial, Freshwater
Rynchops albicollis	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
Mycteria cinerea	Milky Stork	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
Leptoptilos dubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Scleropages formosus		ACTINOPTERYGII	EN	Decreasing	Freshwater
Bos javanicus	Banteng	MAMMALIA	EN	Decreasing	Terrestrial

Cuon alpinus	Dhole	MAMMALIA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Elephas maximus	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
Hylobates pileatus	Pileated Gibbon	MAMMALIA	EN	Decreasing	Terrestrial
Macaca fascicularis	Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
Pteropus vampyrus	Large Flying-fox	MAMMALIA	EN	Decreasing	Terrestrial
Pterocarpus macrocarpus	Burma Padauk	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Hopea helferi		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Shorea hypochra	White Meranti	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Hopea ferrea		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Anisoptera costata		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Dipterocarpus intricatus		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Vatica philastreana		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Nycticebus bengalensis	Bengal Slow Loris	MAMMALIA	EN	Decreasing	Terrestrial

Trachypithecus germaini	Indochinese Silvered Langur	MAMMALIA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Viverra megaspila	Large-spotted Civet	MAMMALIA	EN	Decreasing	Terrestrial
Pavo muticus	Green Peafowl	AVES	EN	Decreasing	Terrestrial
Tectona grandis	Teak	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Calostoma insigne		AGARICOMYCETES	EN	Decreasing	Terrestrial
Macaca fascicularis ssp. fascicularis	Common Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial

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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Crocodylus siamensis	Siamese Crocodile	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys grandis	Giant Asian Pond Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys annandalii	Yellow-headed Temple Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater

| Species Name | Common Name | Taxonomic Group | IUCN Category | Population Trend | Biome |

Crocodylus siamensis	Siamese Crocodile	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys grandis	Giant Asian Pond Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys annandalii	Yellow-headed Temple Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
Gyps tenuirostris	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial
Panthera pardus ssp. delacouri	Indochinese Leopard	MAMMALIA	CR	Decreasing	Terrestrial
Rucervus eldii	Eld's Deer	MAMMALIA	EN	Decreasing	Terrestrial, Freshwater
Laubuka caeruleostigmata	Flying Minnow	ACTINOPTERYGII	EN	Decreasing	Freshwater
Cuora amboinensis	Southeast Asian Box Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Lutra sumatrana	Hairy-nosed Otter	MAMMALIA	EN	Decreasing	Terrestrial, Marine, Freshwater

Siebenrockiella crassicollis	Black Marsh Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Fluvitrygon oxyrhynchus	Marbled Whipray	CHONDRICHTHYES	EN	Decreasing	Freshwater
Pangasianodon hypophthalmus	Striped Catfish	ACTINOPTERYGII	EN	Decreasing	Freshwater
Urogymnus polylepis	Giant Freshwater Whipray	CHONDRICHTHYES	EN	Decreasing	Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Asarcornis scutulata	White-winged Duck	AVES	EN	Decreasing	Terrestrial, Freshwater
Rynchops albicollis	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
Mycteria cinerea	Milky Stork	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
Leptoptilos dubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Scleropages formosus		ACTINOPTERYGII	EN	Decreasing	Freshwater
Bos javanicus	Banteng	MAMMALIA	EN	Decreasing	Terrestrial
Cuon alpinus	Dhole	MAMMALIA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Elephas maximus	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
Hylobates pileatus	Pileated Gibbon	MAMMALIA	EN	Decreasing	Terrestrial
Macaca fascicularis	Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial
Manouria impressa	Impressed Tortoise	REPTILIA	EN	Decreasing	Terrestrial
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
Pteropus vampyrus	Large Flying-fox	MAMMALIA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Pterocarpus macrocarpus	Burma Padauk	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Anisoptera costata		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Dipterocarpus intricatus		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Nycticebus bengalensis	Bengal Slow Loris	MAMMALIA	EN	Decreasing	Terrestrial
Trachypithecus germaini	Indochinese Silvered Langur	MAMMALIA	EN	Decreasing	Terrestrial

Viverra megaspila	Large-spotted Civet	MAMMALIA	EN	Decreasing	Terrestrial
Pavo muticus	Green Peafowl	AVES	EN	Decreasing	Terrestrial
Calostoma insigne		AGARICOMYCETES	EN	Decreasing	Terrestrial
Macaca fascicularis ssp. fascicularis	Common Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial

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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Crocodylus siamensis	Siamese Crocodile	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys grandis	Giant Asian Pond Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Heosemys annandalii	Yellow-headed Temple Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Pangasianodon gigas	Mekong Giant Catfish	ACTINOPTERYGII	CR	Decreasing	Freshwater
Pangasius sanitwongsei	Giant Pangasius	ACTINOPTERYGII	CR	Decreasing	Freshwater
Batagur a nis	Southern River Terrapin	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Catlocarpio siamensis	Giant Carp	ACTINOPTERYGII	CR	Decreasing	Freshwater
Datnioides pulcher	Siamese Tiger Perch	ACTINOPTERYGII	CR	Decreasing	Freshwater
Terniopsis ubonensis		MAGNOLIOPSIDA	CR	Unknown	Freshwater
Heliopais personatus	Masked Finfoot	AVES	CR	Decreasing	Terrestrial, Freshwater
Emberiza aureola	Yellow-breasted Bunting	AVES	CR	Decreasing	Terrestrial, Freshwater
Indotestudo elongata	Elongated Tortoise	REPTILIA	CR	Decreasing	Terrestrial
Manis javanica	Sunda Pangolin	MAMMALIA	CR	Decreasing	Terrestrial
Aquilaria crassna	Agarwood	MAGNOLIOPSIDA	CR	Decreasing	Terrestrial
Houbaropsis bengalensis	Bengal Florican	AVES	CR	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Gyps tenuirostris	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial
Panthera pardus ssp. delacouri	Indochinese Leopard	MAMMALIA	CR	Decreasing	Terrestrial
Laubuka caeruleostigmata	Flying Minnow	ACTINOPTERYGII	EN	Decreasing	Freshwater
Cuora amboinensis	Southeast Asian Box Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Lutra sumatrana	Hairy-nosed Otter	MAMMALIA	EN	Decreasing	Terrestrial, Marine, Freshwater
Siebenrockiella crassicollis	Black Marsh Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Fluvitrygon oxyrhynchus	Marbled Whipray	CHONDRICHTHYES	EN	Decreasing	Freshwater
Cyclemys atripons	Western Black-bridged Leaf Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Pangasianodon hypophthalmus	Striped Catfish	ACTINOPTERYGII	EN	Decreasing	Freshwater
Terniopsis chanthaburiensis		MAGNOLIOPSIDA	EN	Decreasing	Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Asarcornis scutulata	White-winged Duck	AVES	EN	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
Mycteria cinerea	Milky Stork	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
Leptoptilos dubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Scleropages formosus		ACTINOPTERYGII	EN	Decreasing	Freshwater
Bos javanicus	Banteng	MAMMALIA	EN	Decreasing	Terrestrial
Cuon alpinus	Dhole	MAMMALIA	EN	Decreasing	Terrestrial
Elephas maximus	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
Hylobates pileatus	Pileated Gibbon	MAMMALIA	EN	Decreasing	Terrestrial
Macaca fascicularis	Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial
Manouria impressa	Impressed Tortoise	REPTILIA	EN	Decreasing	Terrestrial
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
Pteropus vampyrus	Large Flying-fox	MAMMALIA	EN	Decreasing	Terrestrial
Dipterocarpus intricatus		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Nycticebus bengalensis	Bengal Slow Loris	MAMMALIA	EN	Decreasing	Terrestrial
Trachypithecus germaini	Indochinese Silvered Langur	MAMMALIA	EN	Decreasing	Terrestrial
Viverra megaspila	Large-spotted Civet	MAMMALIA	EN	Decreasing	Terrestrial
Philautus cardamonus		AMPHIBIA	EN	Unknown	Terrestrial
Pavo muticus	Green Peafowl	AVES	EN	Decreasing	Terrestrial
Cnemaspis neangthyi	Neang Thy's Rock Gecko	REPTILIA	EN	Unknown	Terrestrial
Calostoma insigne		AGARICOMYCETES	EN	Decreasing	Terrestrial
Macaca fascicularis ssp. fascicularis	Common Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial

ANNEX 3: TERMS OF REFERENCE FOR E&S SAFEGUARDS MONITORING CONSULTANT

The following is meant to serve as a sample Terms of Reference and should, therefore, be amended accordingly to fit the context of the CAISAR project once final decisions have been made about budget and division of tasks (e.g. whether the project's Monitoring & Evaluation (M&E) specialist will be separate from the Safeguards M&E consultant).

BACKGROUND

[Hiring unit should insert background information on the CAISAR project within the given Provincial PMU and project area here]

OBJECTIVES OF THE ASSIGNMENT

MOWRAM seeks the Consultancy Services of an experienced Individual Consultant "Environmental & Social Safeguards and Project Monitoring & Evaluation Consultant" as part of the Provincial Project Management Unit (full-time engagement). The objective of this assignment is monitoring compliance of the project activities with Environmental & Social Safeguards instruments. In addition, the Consultant will support the Project's overall M&E.

SCOPE OF WORK

Duties and Responsibilities:
The specific tasks stipulated in this ToR to be undertaken by the Environmental & Social Safeguards and Project M&E Consultant include, but are not limited to the following:

With regard to Environmental and Social Safeguards:
The Consultant will assist the Project Coordinator/Project Manager and will work closely with the Environmental & Social Safeguards staff within the Provincial PMU to handle Environmental and Social Safeguards related responsibilities. Specifically:

- Undertake site visits and on-ground review, check and document compliance with site-specific measures as presented in site-specific ESCMPs.
- Provide guidance to contactors, site supervisors, and other stakeholders on manners of implementation and documentation of compliance related to environmental mitigation and monitoring measures, as presented in site-specific ESCMPs.
- Check that all documents necessary to ensure full compliance with Environmental & Social Safeguard instruments, in particular, Environmental and Social Management Plans (ESCMPs) and Indigenous Peoples' Plans (IPPs) are prepared, regularly updated, and available to relevant stakeholders;
- Ensure that project activities, being developed as a part of the Project, are designed to include avoidance of potential social and environmental risks, as recommended in the ESCMPs and annual IP Plans already prepared;
- Provide overall Environmental and Social Management oversight during the implementation of CAISAR's activities and advise the implementation agencies in addressing the environmental issues;
- Ensure that each subproject and related activities under the project are subject to the Project's ESCMP procedures;
- Review subproject and activity plans, design, costs, and bidding documents and be involved in procurement of Civil Works and Supervision to ensure that Civil Works and Supervision contracts include provisions concerning the Environmental and Social Safeguard issues;
- Coordinate with relevant agencies for obtaining environmentally related permits, as necessary;
- Communicate with local governments, contractors, and with any Environmental, Social, Health and Safety (ESHS) Experts that may be part of the subproject supervision team in all matters related to design, implementation, documenting and reporting on environmental compliance, as indicated in site-specific ESCMPs;

- Monitor implementation of site-specific ESCMPs by the Contractors to ensure that appropriate management process and procedures are in place, that Environmental and Social Safeguards related measures are adequately addressed and to ensure that in the event of a noncompliance agreed remedial actions are applied and documented;
- Check and ensure that the regular reports are prepared and timely submitted by the Contractor as per content agreed and provide comments, as appropriate;
- Contribute to, along with the E&S Provincial PMU Specialists, preparation of semi-annual ESCMP Compliance Reports for IFAD and the GCF
- Participate in missions and technical visits by IFAD, and work closely with the IFAD SECAP Specialists and Provincial PMU E&S Specialists to ensure the Project's compliance with relevant environmental and social policies.
- Undertake other actions related to environmental and social aspects of the Project, as may be instructed by the Project Manager/Coordinator from time to time and/or the E&S Specialists in the Provincial PMU, in order to ensure full compliance of the Project with national and international environmental and social standards and legislation.

With regard to Project Monitoring & Evaluation:

The Consultant will be in charge of the Project's Monitoring & Evaluation (M&E), design the strategic and technical approach to implementing project goals within the technical framework outlined for the Results Monitoring. The Consultant will coordinate and work with other members of the Provincial PMU, particularly any staff which DARD has assigned to operate the REDD+ MIS SIS and/or Project MIS, to ensure adequate monitoring of progress against the project indicators. In addition, the Consultant will also work closely with any specialists hired to carry out Mid-Term and/or Terminal Project Monitoring & Evaluation and facilitate the gathering of information.

- Review and familiarize themselves with the Project's documents, in particular with Project Operational Manual (POM) and Monitoring Information System (MIS) already established;
- Carry out the preparation and implementation of the M&E program and keep records on achievements, breakdowns of indicators;
- Continuously monitor progress towards the project's objectives and according to agreed Performance Monitoring Indicators;
- Report in semi-annual reports on the project objectives and Results Framework updates;
- Monitor the project's implementation and evaluate outcomes and results for each Component and Subcomponent, using the MIS;
- Determine whether the inputs in the project are well utilized;
- Monitor the project's implementation against the planned activities (physical and financial), analyze reasons for delays (if any), and propose measures and solutions to overcome delays;
- Ensure that the project's activities are properly implemented as per the agreed program, and take corrective actions when necessary;
- Identify good practices and advantages within the project, recording lessons-learned for future consideration;
- Carry out the roles and responsibilities given by the Project Coordinator/Manager;
- Support the beneficiary survey and other end-of-project evaluations
- Take all necessary measures for the maintenance of the MIS to keep it operational.

QUALIFICATIONS REQUIREMENTS

The person suitable for the position of the Environmental & Social Safeguard and Project Monitoring & Evaluation Consultant should have the following qualifications:

- Master's degree, preferable in the Environmental Sciences, Environmental Engineering or equivalent professional qualifications appropriate to the Consultancy Services requested;
- A minimum of 5 (five) years of relevant experience in Environmental & Social Safeguard Monitoring;
- Knowledge of Cambodia's regulations and laws (particularly in the EIA processes) is required;
- Familiarity with the IFAD, GCF, and REDD+ Safeguard policies will be an advantage;
- Knowledge and experience in Project Monitoring & Evaluation is desirable;

- Proficiency in using computer and office software packages (word processing, spreadsheet etc.). Experience in the handling of web-based data and Management Information Systems will be an added advantage;
- Fluent written and spoken Khmer and English.

REPORTING OBLIGATIONS

The Consultant will work under the direction of and report to the CAISAR Project Manager/Coordinator within the PMU, and in close consultation with the E&S Specialists of the PMU. The Consultant will deliver monthly progress reports concerning the accomplishment of their assignments.

In addition, concerning the overall Project M&E, the Consultant shall prepare semi-annual and annual surveys on project outcomes indicators and prepare semi-annual and annual project progress reports, updating relevant parts of the Result Framework, as appropriate. This work shall be conducted in close consultation with any relevant specialists with the PMU.

CLIENT'S INPUTS

The Consultant will be based and work in the Provincial PMU office. MOWRAM, as host of the Provincial PMU, will provide the office space and equipment required to perform the tasks assigned.

TERMS OF THE ASSIGNMENT AND DURATION

- The Consultant will work on full-time basis.
- Remuneration will be paid on a monthly basis.
- The Consultant will be offered the opportunities to grow up professionally by attending relevant training events and courses during the term of the contract.
- The initial contract with the Consultant will cover one year, with a 3 month probation period, at which time the performance of Consultant shall be evaluated and extension may be made annually pending continued performance.
- Evaluation of the 3 (three) month probation period and any contract extension would be fully based on the consultant's performance certified by the Project Coordinator/Manager and as agreed with IFAD.

ANNEX 4: CHANCE FINDS PROCEDURE

The following *"chance find"* procedures must be included in all third-party contracts (e.g. Letters of Agreement) in instances where the contracted party is assisting with project implementation and/or construction activities.

Provincial PMUs will ensure that the bidding documents and work contract for civil works contractors include clauses on chance find procedures. Specifically, the clause will stipulate that if the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during project implementation, the Contractor shall:

- Stop the activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local or provincial authorities take over;
- Notify the supervisory Safeguards Specialist within the PMU who, in turn, will notify the responsible local and provincial authorities immediately (within 24 hours or less);
- Responsible local and/or provincial authorities would oversee protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by government approved archeologists. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values;
- Decisions on how to handle the finding shall be taken by the responsible local and provincial authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage;
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities; and
- Project activities could resume only after permission is given from the responsible local or provincial authorities concerning safeguard of the heritage.

Note that the reporting of chance finds only occurs when an item/area/etc. of cultural significance is found, and is only carried out insofar as what is detailed above (i.e. reporting the find, reporting how the item/area will be treated moving forward). Reporting begins with the local level implementer (e.g. staff tasked to the implement the project within a village) notifying the Safeguards Specialist, after which, the Safeguards Specialist guides the process according to the instructions above (e.g. notifying the relevant government authorities).

ANNEX 5: E & S CODES OF PRACTICE FOR CONSTRUCTION

Generic contract clauses are provided to assist with environmental and social management works. These clauses are general and should be modified as needed. These clauses are intended to be included as requirements in the works contract and shall remain in force throughout the contract period.

Clause on ESCMP

The Contractor is required to implement this ESCMP. The Contractor is responsible for the implementation of construction and rehabilitation activities for the sites and for implementing the impact mitigation measures in the construction phase. The Contractor's approach shall be detailed in the Contractor's Management Plan.

The Contractor shall include a suitably qualified and experienced Environmental, Occupational Health and Safety Officer (and other staff or consultants as necessary) to be specifically responsible for preparation and regular update and supervision of the ESCMP. The Environmental, Occupational Health and Safety Officer is responsible for the daily supervision and monitoring of the Contractors implementation of the Plan and compliance with the Project ESCMP for the duration of the contract. The Contractor's approach to comply with the ESCMP shall be approved by PMU prior to the Contractor's mobilization to the site.

The Contractor will be required to report on the implementation status of the ESCMP to PMU. The damages due to the violation of the stipulations by the Contractor shall be compensated and/or restored by the Contractor at his or her own expense. Performance will be monitored by PMU and will be enforced by withholding of payments (refer to relevant clause in the bid documents).

Other Standard Clauses

Permits and Approvals

The contractor shall be responsible for ensuring that he or she has all relevant legal approvals and permits required to commence works.

Site Security

The contractor shall be responsible for maintaining security over the construction site including the protection of stored materials and equipment. In the event of severe weather, the contractor shall secure the construction site and associated equipment in such a manner as to protect the site and adjacent areas from consequential damages. This includes the management of onsite, construction materials, construction and sanitary wastes, additional strengthening of erosion control and soil stabilization systems and other conditions resulting from contractor activities which may increase the potential for damages.

Discovery of Antiquities and Cultural Heritage

If, during the execution of the activities contained in this contract, any material is discovered onsite which may be considered of historical or cultural interest, such as evidence of prior settlements, native or historical activities, evidence of any existence on a site which may be of cultural significance, all work shall stop and the supervising contracting officer shall be notified immediately and the Chance Find Procedures followed (Appendix 5). The area in which the material was discovered shall be secured, cordoned off, marked, and the evidence preserved for examination by the local archaeological or cultural authority. No item believed to be an artefact must be removed or disturbed by any of the workers. Work may resume, without penalty of prejudice to the contractor upon permission from the contracting officer with any restrictions offered to protect the site.

Worker Occupational Health and Safety

The contractor shall ensure that all workers operate within a safe environment. Sanitation facilities shall be provided for all site workers. All sanitary wastes generated as a result of project activities shall be managed in a manner approved by the contracting officer and the local authority responsible for public health. The contractor shall ensure that there are basic medical facilities on site and that there are staff trained in basic first aid. Workers must be provided with the necessary protective gear as per their specific tasks such as hard hats, overalls, gloves, goggles, boots, etc. The contractor shall

provide the contracting officer with an occupational health and safety plan for approval prior to the commencement of site activities.

The contractor must ensure that all workers operate within a safe environment. All relevant Labor and Occupational Health and Safety regulations must be adhered to ensure worker safety. Sanitary facilities must be provided for all workers on site. Appropriate posting of information within the site must be done to inform workers of key rules and regulations to follow.

Noise Control

The contractor shall control noise emissions generated as a result of contracting activities to the extent possible. In the case of site locations where noise disturbance will be a concern, the contractor shall ensure that the equipment is in good working order with manufacturer supplied noise suppression (mufflers etc.) systems functioning and in good repair.

Where noise management is a concern, the contractor shall make reasonable efforts to schedule activities during normal working hours (between 7 am and 5 pm). Where noise is likely to pose a risk to the surrounding community either by normal works or working outside of normal working hours or on weekends, the contractor shall inform the contracting officer and shall develop a public notification and noise management plan for approval by the contracting officer.

Use and Management of Hazardous Materials, fuels, solvents and petroleum products

The use of any hazardous materials including pesticides, oils, fuels and petroleum products shall conform to the proper use recommendations of the product. Waste hazardous materials and their containers shall be disposed of in a manner approved by the contracting officer in accordance with State and/or national laws and the Project ESCMP. A site management plan will be developed by the contractor if the operation involves the use of these materials to include estimated quantities to be consumed in the process, storage plans, spill control plans, and waste disposal practices to be followed. Any plans required shall be approved by the contracting officer.

Elements of the hazardous materials management shall include:

- Contractor must provide temporary storage on site of all hazardous or toxic substances in safe containers labeled with details of composition, properties and handling information;
- Hazardous substances shall be placed in a leak-proof container to prevent spillage and leaching; and
- Wastes shall be transported and disposed of in a manner outlined in the ESCMP, and cleared by the PMU Safeguards Team compliant with national laws and policies and the ESCMP.

12.

Use and Management of Pesticides

Any use of pesticides shall be approved by the contracting officer and shall conform to the manufacturers' recommendations for use and application. Any person using pesticides shall demonstrate that they have read and understood these requirements and are capable of complying with the usage recommendations to the satisfaction of the contracting officer. All pesticides to be used shall conform to the list of acceptable pesticides that are not banned by the relevant local authority.

If termite treatment is to be utilized, ensure appropriate chemical management measures are implemented to prevent contamination of surrounding areas, and use only licensed and registered pest control professionals with training and knowledge of proper application methods and techniques.

Use of Explosives

No explosives shall be used on the Project.

Site Stabilization and Erosion Control

The Contractor shall implement measures at the site of operations to manage soil erosion through minimization of excavated area and time of exposure of excavated areas, preservation of existing ground cover to the extent possible, provision of approved ground cover and the use of traps and filtration systems. Where excavations are made, contractor shall implement appropriate stabilizing techniques to prevent cave-in or landslide. Measures shall be approved by the contracting officer.

The contractor must ensure that appropriate erosion control measures such as silt fences are installed. Proper site drainage must be implemented. Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. The use of retaining

structures and planting with deep rooted grasses to retain soil during and after works must be considered. The use of bio-engineering methods must be considered as a measure to reduce erosion and land slippage. All slopes and excavated areas must be monitored for movement.

The contractor will establish appropriate erosion and sediment control measures such as hay bales, sedimentation basins, and / or silt fences and traps to prevent sediment from moving off site and causing excessive turbidity in nearby streams, rivers and wetlands. Construction vehicles and machinery will be washed only in designated areas where runoff will not pollute natural surface water bodies.

Air Quality

The Contractor shall comply with the Project ESCMP requirements for dust management.

Traffic Management

In the event that construction activities should result in the disruption of area transportation services, including temporary loss of roadways, blockages due to deliveries and site related activities, the contractor shall provide the contracting officer with a traffic management plan including a description of the anticipated service disruptions, community information plan, and traffic control strategy to be implemented so as to minimize the impact to the surrounding community. This plan shall consider time of day for planned disruptions, and shall include consideration for alternative access routes, access to essential services such as medical, disaster evacuation, and other critical services. The plan shall be approved by the contracting officer.

Elements of the traffic management plan to be developed and implemented by contractor shall include:

- Alternative routes will be identified in the instance of extended road works or road blockages;
- Public notification of all disturbance to their normal routes;
- Signage, barriers and traffic diversions must be clearly visible, and the public warned of all potential hazards;
- Provision for safe passages and crossings for all pedestrians where construction traffic interferes with their normal route;
- Active traffic management by trained and visible staff at the site or along roadways as required to ensure safe and convenient passage for the vehicular and pedestrian public; and
- Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours or times of livestock movement.

13.

Water Quality

The Contractor shall comply with the Project ESCMP requirements for water quality. Under no circumstances shall the contractor permit the collection of standing water as a consequence of contractor activities to ensure that it does not create breeding grounds for any pests such as mosquitoes.

Management of Solid Wastes and Construction Debris

The contractor shall provide a solid waste management plan that conforms to the national solid waste management policies and regulations and the site-specific ESCMP for approval by the PMU and IFAD (see Appendix 3 for an outline of a site-specific ESCMP). The site's waste management plan shall include a description of waste handling procedures including collection, storage and disposal through the national waste management system. There will be no open burning of waste material and the contractor shall endeavor to recycle wastes as appropriate. Under no circumstances shall the contractor allow construction wastes to accumulate so as to cause a nuisance or health risk due to the propagation of pests and disease vectors.

Management of Workers

The Contractor will prepare a specific Code of Conduct (see Appendix 9) to describe the expected behaviors of their project worker in relation to the local communities and their social sensitivities. This is to avoid creating demand for illegal sex work, avoid SEA/SH and Violence against Children, manage alcohol consumption and avoid the use of illegal substances, and abide by cultural and social norms of the host community. The Contractor is to ensure no children (persons under the age of 18) are hired to work in the project.

The Contractor is to ensure that all overseas project staff undergo a training on the Staff Code of Conduct. Gender based violence and HIV/AIDS and communicable disease awareness raising and resources shall also be provided to all workers. MARD shall provide to the Contractor a list of approved service providers, which shall include recognized NGOs and others for conducting this training.

The Contractor is to stipulate the conditions under which visitors may attend the workers' accommodation, including curfews. The Contractor shall ensure that basic social/collective rest and recreation spaces and activities within the workers accommodation to help minimize the impact that the workers would have on the leisure and recreational facilities of the nearby communities. The Contractor must comply with the Guidelines for Worker's Camps (Appendix 7).

As per guidelines in the ESCMP, the Contractor must ensure that Worker's Camps are located at least 500m from nearby communities and schools (see Appendix 7).

ANNEX 6: GUIDELINES FOR WORKERS' CAMPS

To ensure the compliance to the OHS and ESF requirement, these guidelines will help the contractor when setting up worker's camps.

GENERAL

The Workers Camp Management Plan will be compliant with the specific prescriptions of the site-specific ESCMP. Contractors must ensure that Worker's Camps are located at least 500m from nearby communities and schools.

WORKER RECRUITMENT

The Contractor is required to minimise the number of skilled workers that are recruited from overseas. No unskilled labour will be sourced from overseas. Local communities should be prioritized for unskilled labour, including a target of 15% female unskilled workers when/where applicable. The Contractor will maximize the number of skilled and unskilled workers that are recruited from the communities along the project site.

The Contractor will be required to provide justification for any skilled workers recruited from overseas and explain why this position cannot be filled locally.

WORKERS CAMP FACILITIES

All facilities in the Workers Camp must be complaint with the stipulations of the ESCMP. The camp shall be provided with the following minimum facilities:

- Eating space and dormitories as required shall be constructed of suitable materials to provide a safe healthy environment for the workforce and which facilitate regular cleaning and the provision of ventilation and illumination.
- At least one water closet toilet, one urinal and one shower per 10 personnel engaged either permanently or temporarily on the project. Separate toilet and wash facilities shall be provided for male and female employees, including ensuring that toilets are available close to working sites/road sections where women are working.
- A sick bay and first aid station.
- Sewage collection facilities to allow for the treatment of black and grey wastewater discharge from toilets, washrooms, showers, kitchens, laundry and the like. The management of all camp wastewater water shall be as prescribed in the ESCMP.
- All camp facilities shall be maintained in a safe clean and or appropriate condition throughout the construction period.
- Throughout the period of the contract the employer, the engineer, or their representatives shall have uninterrupted access to and from the camp for the purpose of carrying out routine inspections of all buildings, facilities or installations of whatever nature to ensure compliance with this specification.

WORKERS CAMP OPERATIONS

- The Contractor will be required to provide adequate provisions for the workers for the duration of the project so as not to be a burden on the food or water security of the surrounding communities. The Contractor will strive to hire local labour to provide cleaning and food services.
- All wastewater, solid waste, freshwater usage, noise levels, handling and storage of hazardous materials shall be as prescribed in the ESCMP.

MANAGEMENT OF OFF DUTY WORKERS

- The Contractor will prepare ensure all staff sign and adhere to the Workers' Code of Conduct to describe the expected behaviours of their project worker in relation to the local communities and their social sensitivities.

- The Contractor is to ensure that all overseas project staff, not already living in Cambodia undergo a cultural familiarisation session as part of their induction training. The purpose of this induction will be to introduce the project staff to the cultural sensitivities of the local communities and the expected behaviours of the staff in their interactions with these communities.
- The Contractor is to stipulate the conditions under which visitors may attend the workers camp. Strict visiting hours should be enforced, and all visitors will be required to sign in and out of the worker's camp. No overnight visitors will be allowed.
- The Contractor shall ensure that basic social/collective rest spaces are provided equipped with seating within the Workers Camp to help minimise the impact that the workers would have on the leisure and recreational facilities of the nearby communities. Provisions should also be made to provide the workers with an active recreation space within the camp.

WORKERS CAMP MANAGEMENT PLAN

A Worker Camp Management Plan shall be submitted by the Contractor to the Provincial PMU. The Workers' Camp Management Plan shall describe how this document and the ESCMP shall be implemented in the following:

- Recruitment strategy
- Accommodation
- Canteen and dining areas
- Ablutions
- Water supply
- Wastewater management system
- Proposed power supply
- Code of Conduct for Workers
- Recreational/leisure facilities for workers
- Visitors to the Workers Camp
- Interactions with the local communities

ANNEX 7: CONTRACTORS' COVID-19 GUIDELINE

The objective of the Contractors' General Guideline on COVID-19 Considerations in Construction Works is to provide guidance on Prevention Measures and Response to possible cases of COVID-19 following the update-to-day guidance of the Ministry of Health.

Prevention Measures:

- Dissemination of COVID-19 prevention measures to staff and workers through orientation or distributing leaflet/poster at information/safety board at each construction and camp site
- Daily checking temperature of staff and workers prior to start working
- Staff and workers are wearing masks all the time
- Do not share personal items or supplies such as phones, pens, notebooks, tools, etc
- Avoid common physical greetings, such as handshakes
- Maintain a minimum physical distance of one metre from others if possible
- Wash hands often with soap and water for at least 20 seconds after using the washroom, before handling food, after blowing nose, coughing, or sneezing, and before smoking. If hands are not visibly soiled, and soap and water are unavailable, alcohol-based hand sanitizer can be used
- All offices and jobsites implement additional cleaning measures of common areas. All door handles, railings, ladders, switches, controls, eating surfaces, shared tools and equipment, taps, toilets, and personal workstation areas are wiped down at least twice a day with a disinfectant, such as disinfectant wipes. Individuals are responsible for cleaning and disinfecting their workstations
- Commonly touched surfaces on vehicles and equipment are thoroughly cleaned and disinfected at the end of shifts and between users
- Coughing or sneezing into a tissue or the bend of your arm, not your hand; dispose of used tissues you have as soon as possible in a lined waste basket and wash your hands afterwards
- Complying with any instructions announced by the Ministry of Health

Response to Possible Cases of COVID-19

- Individuals who have been potentially exposed to the virus, or who are exhibiting flu-like symptoms such as fever, tiredness, coughing, or congestion are instructed to:
  - Not come to work;
  - Contact their supervisor and/or human resources department;
  - Stay at home and self-isolate; and
  - Contact local health authorities for further direction.

- Such individuals are required to follow the directions of the local health authority and may not return to work until given approval by the proper health authorities;
- Individuals who begin to display flu-like symptoms on site are instructed to avoid touching anything, take extra care to contain coughs and sneezes, and return home immediately to undergo self-isolation as directed by the local health authority;
- All areas on site potentially infected by a confirmed or probable case are barricaded to keep individuals two meters away until the area is properly cleaned and disinfected.

ANNEX 8: WORKERS' CODE OF CONDUCT

Instructions: This Code of Conduct should be included in bidding documents for the civil works contractor(s) and in their contracts once hired. This Code of Conduct should also be included in bidding documents, and the contracts, of construction contractor. This Code of Conduct is to be signed by all contractor, including subcontractors, if any, including contractors and subcontractors' managers who work under the CAISAR project.

I, _____, acknowledge that adhering to environmental, social, health and safety (ESHS) standards, following the project's occupational health and safety (OHS) requirements, and preventing Sexual Exploitation Abuse (SEA)/Sexual Harassment (SH) is important.

The Contractor/DDIS considers that failure to follow ESHS and OHS standards, or to partake in activities constituting SEA and SH be it on the work site, the work site surroundings, at workers' camps, or the surrounding communities—constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. Prosecution by the Police of those who commit VAC, SEA/SH may be pursued if appropriate.

I agree that while working on the project I will:

- Carry out his/her duties competently and diligently;
- Comply with this Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person;
- Maintain a safe working environment including by:
- Ensure that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health;
- Use appropriate measures relating to chemical, physical and biological substances and agents; and
- Follow applicable emergency operating procedures.
- Report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and danger to his/her life or health;
- Consent to a background check in any place I have worked for more than six months.
- Attend and actively partake in training courses related to ESHS, OHS, VAC, SEA/SH as requested by my employer.
- Will wear my personal protective equipment (PPE) at all times when at the work site or engaged in project related activities.
- Take all practical steps to implement the environmental and social management plan (ESCMP).
- Implement the OHS Management Plan.
- Adhere to a zero-alcohol policy during work activities, and refrain from the use of narcotics or other substances which can impair faculties at all times.
- Treat women, children (persons under the age of 18), and men with respect regardless of race, color, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
- Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- Not sexually exploit or abuse project beneficiaries and members of the surrounding communities.

- Not engage in sexual harassment of work personnel and staff —for instance, making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature is prohibited: i.e. looking somebody up and down; kissing, howling or smacking sounds; hanging around somebody; whistling and catcalls; in some instances, giving personal gifts.
- Not engage in sexual favors —for instance, making promises of favorable treatment (i.e. promotion), threats of unfavorable treatment (i.e. loss of job) or payments in kind or in cash, dependent on sexual acts—or other forms of humiliating, degrading or exploitative behavior.
- Not use prostitution in any form at any time.
- Not participate in sexual contact or activity with children under the age of 18—including grooming or contact through digital media. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense or excuse.
- Unless there is the full consent[19] by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex (including prostitution). Such sexual activity is considered "non-consensual" within the scope of this Code.
- Consider reporting through the GRM or to my manager any suspected or actual SEA/SH by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.
- Complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation, and Sexual Assault (SEA);
- Report violations of this Code of Conduct; and

With respect to children under the age of 18:

- Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
- Wherever possible, ensure that another adult is present when working in the proximity of children.
- Not invite unaccompanied children unrelated to my family into my home unless they are at immediate risk of injury or in physical danger.
- Not use any computers, mobile phones, video and digital cameras or any other medium to exploit or harass children or to access child pornography (see also "Use of children's images for work related purposes" below).
- Refrain from physical punishment or discipline of children.
- No hiring of children for any CAISAR project activity (no persons under the age of 18).
- Comply with all relevant local legislation, including labor laws in relation to child labor and World Bank's safeguard policies on child labor and minimum age.
- Take appropriate caution when photographing or filming children (see x-bb below). Photos or films of children should generally not be taken in the CAISAR, except in instances showing the benefits or impacts of road works, such as impacts to schools or school safety trainings.

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

- Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this I must explain how the photograph or film will be used.

[19] **Consent** is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained using threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even if national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

- Ensure photographs, films, videos and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Raising Concerns

If any person observes behavior that he/she believes may represent a violation of this Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done in either of the following ways:

- Contact [enter name of the Contractor's Social Expert with relevant experience in handling gender-based violence, or if such person is not required under the Contract, another individual designated by the Contractor to handle these matters] in writing at this address [ ] or by telephone at [ ] or in person at [ ]; or
- Call [ ] to reach the Contractor's hotline (if any) and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

Sanctions

I understand that if I breach this Workers' Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning;
- Formal warning;
- Additional Training;
- Loss of up to one week's salary;
- Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months;
- Termination of employment;
- Report to the Police if warranted.

I understand that it is my responsibility to ensure that the environmental, social, health and safety standards are met. That I will adhere to the occupational health and safety management plan. That I will avoid actions or behaviors that could be construed as VAC or SEA/SH. Any such actions will be a breach this Workers' Code of Conduct. I do hereby acknowledge that I have read the foregoing Workers' Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, VAC and SEA/SH issues. I understand that any action inconsistent with this Workers' Code of Conduct or failure to act mandated by this Workers' Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____
Printed Name: _____
Title: _____
Date: _____

ANNEX 9: SAMPLE TORS FOR AN ENVIRONMENT & CLIMATE SAFEGUARDS SPECIALIST

BACKGROUND: [This section must include the project background, ideally tailored to the specific PPMU]

OBJECTIVE:

The Environment & Climate Safeguards Specialist will be responsible for the implementation, monitoring, and reporting of all environment and climate-related safeguards for the project. This will include, when relevant, implementation of the project's Grievance Redress Mechanism (GRM), and any items listed in the Environmental, Social, and Climate Management Framework (ESCMF). You will work in close collaboration with the Gender & Social Safeguards Specialist, as well as the project's Monitoring & Reporting specialist. You will report to the lead of the Provincial Project Management Unit.

RESPONSIBILITIES:

- Prepare, implement, and monitor environmental safeguards instruments, including the environmental & climate-risk aspects of ESCMPs and any Biodiversity Management Plans.
- Compile the environmental baseline data for ESCMPs and Biodiversity Management Plans (when applicable) at sub-project sites based on requirements of the Government of Cambodia, IFAD, and GCF
- Identify key issues & ways to manage issues pertaining to the environment and climate.
- Conduct consultations, in collaboration with the Gender & Social Safeguards Specialist, with target communities in the project area to assess the (i) current environmental situation (at local level, this includes peoples' perception of the situation); (ii) environmental & climate-related impacts of sub-projects; and (iii) mitigation measures (including the communities' recommendations/solutions) that can be taken pertaining to any negative environmental/climate impacts
- Obtain data from, sensitize, and clearly explain to relevant government staff (or civil society organizations/partners, etc.) the data, M&E, and compliance requirements for environmental safeguards & climate risk considerations during project implementation.
- Manage, along with the Gender & Social Safeguards Specialist, the project's Grievance Redress Mechanism.

MINIMUM REQUIREMENTS:

- Manage, along with the Gender & Social Safeguards Specialist, the project's Grievance Redress Mechanism.
- Advanced University degree in Environmental Science, Biology, Environmental/Civil Engineering, or any related field.
- Minimum of 5 years of relevant operational experience and proven track record in working agricultural, forest management, and construction activities, including compliance with Environmental and Social standards
- Familiarity with climate science and management of climate risks
- Working knowledge of English and Khmer proficiency.
- National of Viet Nam.

CORE COMPETENCIES:

- Results Focus
- Teamwork
- Communication
- Building Effective Relationships
- Knowledge Sharing and Continuous Improvement

TECHNICAL/FUNCTIONAL SKILLS:

- Work experience in implementation and management of international safeguards standards pertaining to environment, climate, and agroforestry activities.
- Knowledge of issues pertaining to environment, climate, and biodiversity.

- Knowledge of computer-aided design programs, AutoCAD required and Structural Analysis programs.
- Knowledge and understanding of international environmental and social safeguards standards and practices

SELECTION CRITERIA:

- Demonstrated capacity supervise agricultural, forest management, and construction activities, including compliance with Environmental and Social standards
- Demonstrated ability to liaise with multiple agencies and contractors, effectively building an understanding and partnership with other UN bodies, NGOs, government agencies, and contractors
- Ability to plan, organize, implement, and report
- Excellent communication, writing, and presentation skills in English and Khmer
- Teamwork spirit, ability to work under minimum supervision
- Ability to build effective working relationships with national and international colleagues, with different cultural and technical backgrounds
- Proven strong communication, interpersonal and negotiation skills
- Analytical skills and experience.
- Ability to keep sensitive information as confidential.

ANNEX 10: SAMPLE TORS FOR A GENDER & SOCIAL SAFEGUARDS SPECIALIST

BACKGROUND: [This section must include the project background, ideally tailored to the specific PPMU]

OBJECTIVE:

The Gender & Social Safeguards Specialist will be responsible for the implementation, monitoring, and reporting of all environment and climate-related safeguards for the project. This will include, when relevant, implementation of the project's Grievance Redress Mechanism (GRM), and any items listed in the Environmental, Social, and Climate Management Framework (ESCMF). You will work in close collaboration with the Gender & Social Safeguards Specialist, as well as the project's Monitoring & Reporting specialist. You will report to the lead of the Provincial Project Management Unit.

RESPONSIBILITIES:

- Prepare, implement, and monitor social safeguards instruments, including the social aspects of ESCMPs, the Labour Management Plan, and IP Plan.
- Compile the social baseline data for ESCMPs, LMPs, and IP Plans at sub-project sites with information on demographics, ethnic/religious minorities and indigenous populations, overall population, education, health, social protection, language(s), religion, and any other areas required based on IFAD and GCF guidelines
- Identify key issues & ways to manage issues pertaining to gender, IP, and social inclusion.
- Conduct consultations, in collaboration with the Environment & Climate Specialist, with target communities in the project area to assess the (i) current social situation (at local level, this includes peoples' perception of the situation); (ii) social impacts of sub-projects; and (iii) mitigation measures (including the communities' recommendations/solutions) that can be taken pertaining to any negative social impacts
- Obtain data from, sensitize, and clearly explain to relevant government staff (or civil society organizations/partners, etc.) the data, M&E, and compliance requirements for social safeguards & gender/IP/social inclusion during project implementation.
- Manage, along with the Environment & Climate Safeguards Specialist, the project's Grievance Redress Mechanism.

MINIMUM REQUIREMENTS:

- Advanced University degree in Social Sciences, Gender Studies, International Development, or any related field to social inclusion/gender and social safeguards.
- Minimum of 5 years of relevant operational experience and proven track record in working on development projects in the agriculture/forest sector.
- Working knowledge of English and Khmer proficiency.
- National of Viet Nam.

14.

CORE COMPETENCIES:

- Results Focus
- Teamwork
- Communication
- Building Effective Relationships
- Knowledge Sharing and Continuous Improvement

TECHNICAL/FUNCTIONAL SKILLS:

- Work experience in implementation and management of gender and social inclusion activities, and social safeguards to international standards.
- Knowledge of issues pertaining to ethnic minorities, Indigenous Persons, gender, youth, and other vulnerable populations.
- Knowledge and understanding of international environmental and social safeguards standards and practices

SELECTION CRITERIA:

- Demonstrated capacity supervise agricultural, forest management, and construction activities, including attention to issues of gender and social inclusion and compliance with Environmental and Social standards
- Demonstrated ability to liaise with multiple agencies and contractors, effectively building an understanding and partnership with other UN bodies, NGOs, government agencies, and contractors
- Ability to plan, organize, implement, and report
- Excellent communication, writing, and presentation skills in English and Khmer
- Teamwork spirit, ability to work under minimum supervision
- Ability to build effective working relationships with national and international colleagues, with different cultural and technical backgrounds
- Proven strong communication, interpersonal and negotiation skills
- Analytical skills and experience.
- Ability to keep sensitive information as confidential.

ANNEX 11: MISSION 3 LIST OF PARTICIPANTS

MINISTRY OF ECONOMY AND FINANCE(MEF)

1.	1.	Heng Hanglim, Deputy Director, GDR
2.	2.	Khem Sopheamony, Officer, GDR
3.	3.	Huy Cahnnan, Officer, GDR

PMU ADB & WB MOWRAM

1.	4.	H.E Chann Sinath, Secretary of State and Director of PMU-ADB&WB MOWRAM
2.	5.	Im Soursdey, Deputy Director of DFWUC and IAIP Project Manager
3.	6.	Chhim Sophea, Irrigation Engineer
4.	7.	Ngorn Ly Leakina, Officer Administration Office of DoFWUC
5.	8.	Chev Dalis, Procurement Assistant and Officer of DoFWUC
6.	9.	Kim Vann, Finance Officer, DoFWUC
7.	10.	Thou Vannak, Consultant
8.	11.	Lang Sokkim, Vice Chief Officer
9.	12.	Pol Saren, Deputy Director of Department
10.	13.	Tan Naren, Chief of Office
11.	14.	Hem Visal, Vice Chief Officer
12.	15.	Prum Vanndy, Officer
13.	16.	Vann Vathanak, Officer
14.	17.	Eam Sophorn, Officer
15.	18.	Vann Munirath, Officer
16.	19.	Heng Sovannara, Director, TSA
17.	20.	Khvan Pheaktra, Officer, TSA
18.	21.	Tong Seng, Chief of Office, DHRW
19.	22.	Chhun Thai Sreng,PMU
20.	23.	Penh Socheat, National Environment, Consultant Team
21.	24.	Le Anh Tuan, International Social Specialist
22.	25.	Sreng Vanmly, Deputy of Office
23.	26.	Sok KHOM, Deputy Secretary General, CNMC
24.	27.	Roeun Sophanna, Procurement Team

MINISTRY OF ENVIRONMENT (MOE)

1.	28.	Thiv Sophearith, DDG/GDEP
2.	29.	Pech Moran, Deputy Director
3.	30.	Chea Puthea, Official

MINISTRY OF AGRICULTURE,FORESTRY AND FISHERIES (MAFF)

1.	31.	Koeut Kitlineath, Deputy Secretary General
2.	32.	Seng Tuy, Acting Director, DAEng

MINISTRY OF INDUSTRY, SCIENCE, TECHNOLOGY & INNOVATION (MISTI)

1.	33.	Kim Thunsamnang, Deputy Director General
2.	34.	Chhoeun Raksmey, Deputy Diector
3.	35.	Vong Sanin, Technical Officer & Project Management

MINISTRY OF RURAL DEVELOPMENT (MRD)

1. 36. Ong Ponnaka, Deputy Director General
2. 37. Soem Sopheara, Chief Office
3. 38. Se Vophorn, Chief Office

MINISTRY OF WOMEN AFFAIR (MOWA)

1. 39. Sav Kimsoeurn, Deputy Director General
2. 40. Meas ChinVut, Chief Office
3. 41. Phay Chan Makara, Vice Chief Office

MINISTRY OF LAND MANAGEMENT, URBAN PLANNING AND CONSTRUCTION (MLMUPC)

1. 42. CHHIM Sokun, Deputy Director General
2. 43. Meng Sotha, Director

MINISTRY OF PLANNING (MOP)

1. 44. Laing Bolin, Deputy Director

PDWRAM_Kandal

1. 45. Prak LAK, Director of PDoWRAM
2. 46. Hor Sophal, Deputy of PDoWRAM
3. 47. Heng Kearithy, Officer

PDWRAM_Kampong Chhnang

1. 48. H.E PECH KEYMONY, Deputy Governor
2. 49. Dauk BunThon, Director of PDoWRAM
3. 50. Gnin Hun, Director of PDAFF
4. 51. Seing Sokhan, Deputy Governor of Teuk Phos District
5. 52. Lun Pisey, Officer of of PDAFF
6. 53. Pen Sophea, Chief Commune of Svay Chuk
7. 54. Phan Sophalla, Commune Council of Krang Skea
8. 55. Keo Yan, Chief Commune of Krang Skea
9. 56. Sam San, Chief Commune of Tbeng Khpos
10. 57. Ouk Proeung, Chief Commune of Svay
11. 58. Meas Sokea, Commune Clerk
12. 59. Mak Sothearith, Commune Clerk
13. 60. Mong Vath, Chief Commune of Anchanh Rong
14. 61. Seam Senghour, Chief Commune of Prey Moul
15. 62. Khuy Khy, Chief Commune of Prasnoeb
16. 63. Prum Thorn, Chief Commune of Banteay Preal
17. 64. Moeng Visalsok, Chief Commune of Kdol Senchey
18. 65. Mey Sophally, Deputy Governor of Rolea Bier District
19. 66. Phal Sopheap, Deputy Governor of Baribour District
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3. 71. Tep Chamroeun, Director of Administration
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5. 73. Hai Thoura, Chief of PDoAFF
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8. 76. Nin Sinath, Deputy Director of PDoRD
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10. 78. Kit Phal, Deputy of PDoWRAM
11. 79. Dos Dara, Commune Council of Rom Lech
12. 80. Lav Sokha, Chief Office of PDoWRAM
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ANNEX 12: TOR BIODIVERSITY MANAGEMENT SPECIALIST

TERMS OF REFERENCE

International Biodiversity Specialist

Background

The Government of Cambodia (GoC) has applied for financing from the Asian Infrastructure Investment Bank (AIIB or the Bank) toward the cost of the Climate Adaptive Irrigation Supporting Agricultural Resilience (CAISAR) which will support the GoC's efforts to sustain food security and improve climate resilience during and after the COVID-19 crisis through restoration and enhancement of smart and climate-resilient irrigation systems and associated ecosystems, flood control management and disaster resilience measures in 3 irrigation schemes situated in four provinces, namely: Kampong Speu, Kampong Chhnang, Kandal, and Pursat. The development objective of the CAISAR project is to restore and enhance the adaptive capacity and resilience of rural populations and agronomic systems to cope with climate change, including and disaster risk brought on by extreme events (flooding and drought), to achieve increased food security, agro-economics, and the maintenance of the companion biodiversity and ecosystem services that support it.

The estimated budget of the CAISAR project will exceed US 240 Million with AIIB being the major lender but with substantial grant co-financing for Green Climate Fund (GCF) and IFAD. MOWRAM has received a project preparation grant from AIIB (PPSF) for project preparation. The project will be implemented through the following 3 components: 1) Improving farm-level climate resilience and water use efficiency, 2) Climate-proofing water infrastructure for increased resilience and 3) Institutional Strengthening. In 2022/23, under this PPSF grant, MOWRAM implemented a first project formulation and feasibility study (FIRM) to provide the basis for the GCF funding proposal. MOWRAM is now seeking additional TA to complement this FIRM reporting and support the formulation of the Full-Funding Proposal.

General

Based on an assessment of climate change risk analyses, the Biodiversity Consultant will identify and assess the manner in which climate change is likely to impact biodiversity in the project area; with particular attention to species that either support agriculture (e.g. wild fish, birds, pollinators, soil micro-biome,) or conflict with agriculture (e.g. crop pests, displaced wildlife, alien invasive species). The climate and project risks to Threatened species existing in the project area would also be assessed and potential mitigation responses identified. This analysis will be used to generate a number of practical and cost effective recommendations to be included in a Biodiversity Management Plan.

The Consultant will also work in collaboration with the multidisciplinary CAISAR team to help identify biodiversity risk to and opportunities associated with proposed project agricultural interventions/adaptive solutions and to provide timely recommendations for their more sustainable design, selection, implementation, monitoring and associated local, inclusive, capacity building.

The Consultant will also provide guidance related to consideration, selection and development of biodiversity offsets where unavoidable residual impacts associate with proposed project interventions, can be offset and in some cases applied to Kunming declaration objectives.

The analysis will prioritize biodiversity mitigation and management programs based on their relevance and cost-effectiveness, to address the risks and opportunities associated with climate change and project initiatives. The prioritization exercise would include consideration of opportunities to adaptively enhance and benefit from the cultivation of local heirloom genetic varieties, wild cultivars and potential enhanced propagation of more resilient native fish and potential other faunal species. To the extent possible, solutions that are adapted to the needs of the poor, women, youth, and indigenous groups should be highlighted.

To achieve the above objective with high quality deliverables, the international climate change biodiversity specialist is required to fulfil the following tasks and responsibilities:

1. *Describe the methodology, location time and costs for a series of strategic biodiversity surveys within the CAISAR project study area to validate and expand on the existing IBAT data set. The data collected will provide baseline data against which project intervention, project impact and climate driven change can be monitored. These data will provide essential information that can be used to apply adaptive management practices to ensure project initiatives optimize positive biodiversity and ecosystem service outcomes.*

   ***Deliverable**: Guidance document detailing methodology to be used for biodiversity surveys.*

2. *Identify species of flora and fauna, including threatened and invasive species in the project area, most likely to be impacted by Climate change, climate extremes and expansion of agriculture, including CAISAR projects, as well as species used by local communities and or, on which there are dependencies.*

   ***Deliverable**: **prioritized flora and fauna species list** with summary data on species habitat associations, conservation status, record of occurrence in the project area, probable key habitats, population trends, population drivers, and assessment of climate risk to species*)

3. *Prepare a high-level/landscape-level? Biodiversity Management Plan (BMP) addressing each of the 6 CAISAR sub-project areas. The BMP will highlight species and habitats of concern, and Identify potential approaches to deliver positive environmental externalities (e.g. air quality, soil, water quality and availability, ecosystem services, biodiversity) that can be incorporated into CAISAR initiatives. CAISAR BMP will include guidance for the assessment of residual biodiversity impacts, provision for adaptive management, monitoring requirements, and development of site-specific Biodiversity Action Plans.*

   Deliverable: CAISAR Landscape Level BMP

4. *Refine biodiversity sensitivity mapping based on available data and make this available to the CAISAR planning and design process.*

   ***Deliverable: refined biodiversity sensitivity map** for the CAISAR project area and each of the 6 sub-project areas)*

5. *Prepare a community biodiversity survey questionnaire to better understand biodiversity trends, perceived drivers, local use and community perspectives on biodiversity conservation and local importance in the CAISAR study area/area of influence. A detailed methodology, including questions, target communities, time and costs estimate would be prepared.*

   ***Deliverable: Local Biodiversity Knowledge Questionnaire and Survey Guidance document**.*

6. *Identify key biodiversity stakeholders to be engaged while identifying biodiversity conservation priorities and concerns, development of biodiversity management/action plans, and residual impact biodiversity offsets,*

   ***Deliverable: Biodiversity Stakeholders List and contact information**)*

7. *Identify potential priority biodiversity offset locations and site management requirements based on site analysis and consultation with government and community authorities.*

   ***Deliverable: List of priority biodiversity offset sites** proximate to each of the 6 CAISAR project areas that would be more suitable and relevant for the development of biodiversity offsets.*

8. *Integrate biodiversity initiatives into the overall CAISAR stakeholder engagement plan identifying the relevant stakeholder groups and the engagement process to be followed.*

   ***Deliverable: Specific reference to biodiversity in the CAISAR stakeholder Engagement Plan**.*

9. *Work collaboratively and cooperatively with the CAISAR multi-disciplinary team to ensure biodiversity conservation and enhancement is practically integrated into project planning, design elements and companion documentation.*

Deliverable: Reference to biodiversity considerations where appropriate in CAISAR assessments, design, execution, and reporting*.*

10. *Ensure the biodiversity component of the CAISAR project provides for local, inclusive, capacity building where practical and appropriate.*

    Deliverable: specific reference to opportunities for engagement of a broad cross section or local society in biodiversity-related initiatives *and documentation of participants in same.*

Key Deliverables

The main task of the International Climate Change Adaptation Biodiversity Specialist (CCABS) will be to provide discipline input to the Full Funding Proposal and the associated Annexes based on the guidance given in GCF's programming manual. With regard to biodiversity, the GEF programming manual highlights the following considerations:

1. "*The project/programme is expected to promote positive* ***environmental externalities*** *(e.g. air quality, soil*)". The CAISAR biodiversity specialist is expected to help ensure the project delivers enhanced ecosystems services to the intervention area.
2. "*Since project activities often target multiple areas and provide multiple benefits (e.g. co-benefits from improved agricultural productivity,* ***biodiversity conservation benefiting from improved ecosystems management****), additional financial contributions from other donors should be sought, where possible."*
3. "*The excessive development of land for agriculture worldwide has impacted the Earth's climate by reducing the carbon stored in intact forests, and has caused* ***biodiversity and ecosystem service losses***." The CAISAR biodiversity specialist is expected to strive to ensure the project results in a net improvement in local ecosystems services as a result of the project.
4. "*As may be required by specific environmental and social safeguards, the Environmental and Social Policy and the Indigenous Peoples Policy, additional stand-alone assessment and management plans may need to be prepared and disclosed. Examples of additional instruments include: a resettlement policy framework, resettlement action plan, Indigenous peoples planning framework, Indigenous peoples plan, and* ***biodiversity action plan*****"**

Consultant qualifications

Environmental specialist with a minimum Masters level degree in applied environmental science with expertise in biodiversity, biodiversity management and action plans, conservation biology and environmental planning. The consultant should have at least 10 years related experience, be comfortable working in a multi-disciplinary and cultural environment as well have working experience in South Asia. The consultant should have completed at least 5 previous biodiversity management plans and have recent experience with critical habitat assessment.

Duration: 60 working days from mid-June to mid-September 2023.

Location: Phnom Penh, Cambodia with field visits in lower Tonle Sap basin.

ANNEX 13: CAISAR CLIMATE CHANGE IMPACT RATIONAL

Project activity	Description and promotion strategy in the project	specific practice	adaptation or mitigation	Primary climate benefits	Climate rational (primary impact)	Climate rationale (secondary impact	Climate co primary is a prim
Component 2. Upgrading and climate-proofing water infrastructure for increased resilience							
Outcome 2.1. Modernization of irrigation scheme and ponds							
2.1.1.Technical analysis, field survey and preparing plan for system upgrading	This activity involves conducting a technical analysis and field survey of the existing irrigation system. The purpose is to identify areas that require upgrading or rehabilitation and to assess the feasibility of constructing new irrigation schemes and storage ponds. The promotion strategy will likely involve engaging farmers and stakeholders in the survey process to ensure a participatory approach. The findings from the analysis will be used to prepare a comprehensive plan for upgrading the irrigation system.	The specific practices under this sub-component include: o Rehabilitating and upgrading existing irrigation schemes. o Constructing new irrigation schemes and storage ponds where feasible and appropriate. o Deploying ecosystem-based solutions that better serve the environment. o Implementing energy-efficient measures to reduce greenhouse gas (GHG) emissions. o Utilizing high-efficiency irrigation systems like drip and sprinkler irrigation to minimize water losses. o Replacing current diesel pumps with single-point solar pumping systems. o Integrating nature-based solutions and Indigenous materials for constructing flood protection embankments.	The specific practices listed above include both adaptation and mitigation measures: o Adaptation: Upgrading and modernizing irrigation systems, establishing early warning systems, and flood-proofing infrastructure to cope with increasing flood and drought conditions. o Mitigation: Deploying energy-efficient irrigation technologies, replacing diesel pumps with solar pumps, and utilizing nature-based solutions to reduce GHG emissions.	The primary climate benefits of these practices are: o Improved resilience of the water delivery system, reducing damage to crops and infrastructure during extreme wet days and upstream flooding. o Enhanced climate adaptation through climate-proofing measures, allowing the irrigation system to cope with changing climate conditions.	The climate rationale or primary impact is to ensure a climate-resilient water supply for farmers. The project aims to reduce the negative climate impacts of droughts, dry spells, and flood during the monsoon season by upgrading the irrigation system and implementing climate-adaptive measures.	The secondary impact is the creation of green opportunities and additional benefits, such as: oIncreased water availability and storage capacity for irrigation. o Implementation of crop diversification and new income-generating activities like fish farming or duck breeding. oCreation of employment opportunities, especially for young people. o Time and labor savings, particularly for women, through the use of efficient irrigation technologies.	The Climate co-b o Mitigation: Red the use of en solar pumping, an o Adaptation: Im infrastructure, le coping with extrem
2.1.2.Implementation of infrastructure upgrading	Sub-Component 2.1.2 involves the actual implementation of infrastructure upgrading activities identified in the technical analysis and plan prepared in Sub-Component 2.1.1. The upgrading process may include rehabilitating existing irrigation systems, modernizing infrastructure, and constructing new irrigation schemes and storage ponds as required. The promotion strategy is likely to focus on engaging stakeholders, including farmers, in the implementation process to ensure their active participation and buy-in.	Specific practices under this sub-component include: o Executing the rehabilitation and modernization plans for irrigation systems and infrastructure. o Constructing new irrigation schemes and storage ponds according to the prepared plans. o Utilizing climate-proofing measures to enhance the resilience of the irrigation system against extreme weather events. o Implementing engineering techniques and nature-based solutions to ensure the long-term sustainability of the upgraded infrastructure.	The specific practices listed above are primarily adaptation measures aimed at: o Enhancing the resilience of the irrigation system to cope with increasing flood and drought conditions. o Reducing the damage and destruction of irrigation infrastructure during extreme weather events.	The primary climate benefits of Sub-Component 2.1.2 are: oImproved climate resilience of the irrigation system, ensuring consistent water delivery to farmers. oMinimized damage to crops and infrastructure during flood and drought events.	The climate rationale or primary impact is to ensure a climate-resilient water supply for farmers by implementing infrastructure upgrades and modernization to withstand the impacts of changing climatic conditions.	The secondary impact is the creation of green opportunities and additional benefits, including: oIncreased water availability and storage capacity for irrigation purposes. o Potential for crop diversification and income generation through alternative farming activities. o Employment opportunities, especially for young people involved in the implementation and maintenance of the upgraded infrastructure.	The Climate co-b oMitigation: Poten through the use o systems and ec techniques. oAdaptation: Impr water infrastructur events.
2.1.3.Preparing canal O&M plans including application of ICT and SCADA for operation. The implementation will follow a participatory approach involving farmers right from survey, design, prioritization, and construction implementation. This subcomponent will be financed by GCF, IFAD and Government. Moreover, these technologies will allow to save time and labour, especially for women, and offer opportunities to engage rural youth.	Sub-Component 2.1.3 involves the preparation of Operation and Maintenance (O&M) plans for the upgraded irrigation canals and systems. This includes integrating Information and Communication Technology (ICT) and Supervisory Control and Data Acquisition (SCADA) systems for efficient operation. The promotion strategy may involve raising awareness among stakeholders about the benefits of adopting ICT and SCADA technologies to optimize water management and ensure effective maintenance.	Specific practices under this sub-component include: oDeveloping comprehensive O&M plans for the upgraded irrigation canals. oIncorporating ICT and SCADA systems for real-time monitoring and control of water flow and distribution. oUtilizing modern technology to optimize water allocation and minimize water losses. oTraining personnel in the operation and maintenance of the new systems.	The specific practices listed above are primarily adaptation measures aimed at: oEnhancing the resilience of the irrigation system through efficient water management. oCoping with changing climate conditions and reducing vulnerability to extreme weather events.	The primary climate benefits of Sub-Component 2.1.3 are: oImproved water efficiency and reduced water losses through advanced monitoring and control systems. oIncreased climate resilience of the irrigation infrastructure through effective O&M practices.	The climate rationale or primary impact is to ensure the sustainable and climate-resilient operation of the irrigation system through the adoption of modern technologies and efficient water management practices.	The secondary impact includes: oEnhanced water resource management and allocation. oImproved agricultural productivity through optimized water distribution. oReduction of maintenance costs and increased system longevity.	The Climate co-b oMitigation: Redu energy consumpti management and technologies. oAdaptation: Impr irrigation infrastru coping with chang
Outcome 2.2: Flood-proofing and Drainage improvements							
2.2.1.Establish flood monitoring, information, and early warning systems.	Sub-Component 2.2.1 involves the establishment of flood monitoring, information, and early warning systems. This includes setting up mechanisms to monitor weather conditions, water levels, and other relevant data to detect potential floods. The promotion strategy may involve raising awareness among stakeholders about the importance of early warning systems, training local communities to respond to flood warnings, and ensuring effective dissemination of flood-related information.	Specific practices under this sub-component include: oInstalling flood monitoring equipment and sensors in vulnerable areas. oSetting up a system to collect and analyze meteorological and hydrological data. oDeveloping protocols for issuing flood warnings and disseminating information to affected communities.	The specific practices listed above are primarily adaptation measures aimed at: oEnhancing disaster prevention and protection of farmlands and assets by providing early warnings to vulnerable communities.	The primary climate benefits of Sub-Component 2.2.1 are: oImproved disaster preparedness and reduced vulnerability to flood events through early warning systems. oEnhanced ability to respond proactively to potential flood situations.	The climate rationale or primary impact is to strengthen flood preparedness and response capacities to cope with the increasing threat of floods under changing climate conditions.	The secondary impact includes: oReduction of damages to farmlands and assets due to improved flood protection measures. oEnhanced safety and well-being of vulnerable communities through timely flood warnings.	The Climate co-b oMitigation: Poten property damage which enable pro management. oAdaptation: Impr climate-related flo vulnerable comm
2.2.2.Strengthening and construction of flood control and drainage infrastructures. It will be implemented in an integrated manner with component 2.1 activities as required. The climate information and early warning activities will be strengthened as part of component 3 and are detailed in that section	Sub-Component 2.2.2 focuses on strengthening and constructing flood control and drainage infrastructures. The project will prioritize areas identified as flood-prone based on hydrological modeling and stakeholder consultation. The promotion strategy may involve community engagement and participation in the planning and implementation of flood control measures.	Specific practices under this sub-component include: oStrengthening existing drainage networks through excavation and widening. oConstructing new flood protection embankments using resilient indigenous materials and nature-based solutions. oInstalling sub-surface drainages in needy areas to improve water drainage.	The specific practices listed above are primarily adaptation measures aimed at: oEnhancing the resilience of the drainage networks and flood embankments to protect farmlands and assets from flood events.	The primary climate benefits of Sub-Component 2.2.2 are: oImproved flood protection and drainage infrastructure to minimize damages during flood events. oIncreased resilience of the irrigation system against intensifying flood threats under changing climate conditions.	The climate rationale or primary impact is to strengthen flood protection measures and improve drainage systems to cope with the increasing frequency and intensity of floods resulting from climate change.	The secondary impact includes: oEnhanced protection of agricultural lands and infrastructure from flood damages. oImproved water management and reduced flood-induced risks for farmers.	The Climate co-b oMitigation: Utiliz and resilient mate measures can co and reduce emiss methods. oAdaptation: Incr system and farml flood events.
Outcome 2.3.: Establishments and training of Farmers Water User Communities (FWUC)							
2.3.1.Formation of institutional strengthening of the FWUC	Sub-Component 2.3.1 focuses on forming and strengthening Farmers Water User Communities (FWUCs). FWUCs play a crucial role in the sustainable operation and maintenance of irrigation schemes. The promotion strategy may involve encouraging community participation, providing training in FWUC management, and promoting inclusivity in decision-making processes.	Specific practices under this sub-component include: oEstablishing new FWUCs and strengthening existing ones. oImproving capacities in O&M activities, water use efficiency, and green technology adoption. oEnhancing the arrangement of water rights and water allocation to promote equitable and efficient water use.	The specific practices listed above are primarily adaptation measures aimed at: oStrengthening institutional capacity to effectively manage and operate the irrigation system. oPromoting sustainable water use practices and climate adaptation strategies among farmers.	The primary climate benefits of Sub-Component 2.3.1 are: oEnhanced sustainability and long-term operation of the climate-smart and climate-proof irrigation systems. oImproved capacity of FWUCs to cope with climate-related challenges and implement climate adaptation strategies.	The climate rationale or primary impact is to ensure the sustainable operation and maintenance of the irrigation system under changing climate conditions through the establishment and strengthening of FWUCs.	The secondary impact includes: oImproved water use efficiency and equitable water allocation. oIncreased capacity of farmers to adopt climate-smart practices and technologies.	The Climate co-b oMitigation: Adop sustainable practi reduced emission oAdaptation: Incr system through ef adaptation strateg
2.3.2 Build technical capacities of FWCU for canal O&M	Sub-Component 2.3.2 focuses on building the technical capacities of Farmers Water User Communities (FWUCs) in canal operation and maintenance (O&M). The project will provide training and support to FWUC members to effectively manage and operate the irrigation canals. The promotion strategy may involve conducting training sessions, workshops, and capacity-building programs for FWUC members to enhance their technical skills.	Specific practices under this sub-component include: oConducting technical training for FWUC members on canal O&M. oEquipping FWUCs with the necessary knowledge and skills for efficient water distribution and maintenance. oImplementing best practices in water resource management.	The specific practices listed above are primarily adaptation measures aimed at: oStrengthening the capacity of FWUCs to cope with changing climate conditions and efficiently manage water resources.	The primary climate benefits of Sub-Component 2.3.2 are: oEnhanced climate resilience of the irrigation system through improved canal operation and maintenance. oIncreased efficiency in water distribution, reducing water losses during irrigation.	The climate rationale or primary impact is to empower FWUCs with the technical skills needed to effectively manage the irrigation system under changing climate conditions.	The secondary impact includes: oImproved water use efficiency and reduced water wastage. oEnhanced agricultural productivity through efficient water distribution.	The Climate co-b oMitigation: Effici reduced water los contributing to low oAdaptation: Incr irrigation system practices.
2.3.3prepare long term financing plan for WUAS: This will require an identification of the capacity needs, membership, functionality of the FWUCs in the area . This will be followed by assisting them in developing a business model for the operation and maintenance of each irrigation scheme on a self-sustaining basis in partnership with the private sector. This will entail the development of an O&M plan for the infrastructure investments, assessment of the willingness and ability of the users to pay for the services and a regulatory framework that gives the WUAs the authority to collect the fee and assess the basis on which water fee will be paid as irrigation fees can be based on the size of the land being irrigated or the volume of water used. These elements will be further reviewed during the preparation of the FFP.	Sub-Component 2.3.3 involves preparing a long-term financing plan for Water User Associations (WUAs). This plan will outline the financial resources required for the sustainable operation and maintenance of the irrigation system. The promotion strategy may involve working with relevant stakeholders, including private sector partners, to develop a financially viable plan.	Specific practices under this sub-component include: oIdentifying the financial needs of WUAs for irrigation system operation and maintenance. oAssessing the willingness and ability of users to pay for irrigation service. oDeveloping a regulatory framework for water fee collection.	The specific practices listed above are primarily adaptation measures aimed at: oEnsuring the long-term sustainability of the irrigation system by securing adequate financial resources.	The primary climate benefits of Sub-Component 2.3.3 are: oIncreased financial resilience of WUAs to cope with climate-related challenges in the operation and maintenance of the irrigation system. oEnhanced capacity to sustainably manage the irrigation infrastructure under changing climate conditions.	The climate rationale or primary impact is to develop a long-term financing plan that enables WUAs to effectively manage and maintain the irrigation system in the face of climate-related risks.	The secondary impact includes: oImproved financial sustainability of the irrigation system. oEnhanced capacity of WUAs to invest in climate-resilient infrastructure and technologies.	The Climate co-b oMitigation: Finan more likely to in friendly irrigation t emissions. oAdaptation: Incr climate impacts th financing.

ANNEX 14 – INDIGENOUS PEOPLES PLANNING FRAMEWORK

Table of Contents

LIST OF TABLES 132
LIST OF FIGURES 132
ABBREVIATIONS 133
DEFINITIONS 134
1. INTRODUCTION 143
1.1 PROJECT BACKGROUND 143
1.1.1 Project Context 143
1.1.2 Project Development Objective and Project Components 143
1.2 OBJECTIVES AND PRINCIPLES OF THE INDIGENOUS PEOPLES PLANNING FRAMEWORK 144
1.2.1 Objectives 144
1.2.2 Principles 145
2. LEGAL FRAMEWORK 146
2.1 OVERVIEW 146
2.2 NATIONAL LAWS AND REGULATIONS RELATED TO INDIGENOUS PEOPLES 146
2.3 AIIB'S ESS3 ON INDIGENOUS PEOPLES 150
2.4 GAPS BETWEEN NATIONAL POLICIES & DONOR'S ENVIRONMENTAL AND SOCIAL POLICIES 152
3. RISKS, IMPACTS AND MITIGATION MEASURES 155
3.1 OVERVIEW OF INDIGENOUS PEOPLES 155
3.1.1 Overview of IPs in Cambodia 155
3.1.2 Overview of IPs in the Project Area 156
3.2 PROJECT'S ENVIRONMENTAL AND SOCIAL RISK AND IMPACTS 156
3.3 MITIGATION MEASURES 157
4. PREPARATION OF INDIGENOUS PEOPLES PLAN 158
4.1 SCREENING FOR ETHNIC GROUPS/ INDIGENOUS PEOPLES (EG/IP) 158
4.2 PREPARING AN IPP 158
4.3 UPDATING AN IPP ..... ERROR! BOOKMARK NOT DEFINED.
4.4 APPROVING AN IPP 159
4.5 DISCLOSING AN IPP 160
4.6 IMPLEMENTING AN IPP 160
5. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE 160
5.1 PURPOSE OF ENGAGING IP DURING PROJECT PREPARATION AND IMPLEMENTATION 160
5.2 CONSULTATION RESULTS DURING PROJECT PREPARATION 160
5.3 CONSULTATION WITH IPS DURING PROJECT IMPLEMENTATION 160
5.3.1 Overview of consultation process 160
5.3.2 Free, Prior and Informed Consultation/Consent 161
5.4 INFORMATION DISCLOSURE 163

6. GRIEVANCE REDRESS MECHANISM 163
6.1 PURPOSE OF PROJECT'S GRM 164
6.2 GRIEVANCE REDRESS PROCEDURES 164
6.2.1 Grievances related to Land Acquisition 164
6.2.2 Grievances related to Gender Based Violence/SEA/SH 164
6.2.3 Grievances related to any other aspects not covered in the above GRM 164
7. IMPLEMENTATION ARRANGEMENTS 166
7.1 IMPLEMENTATION ARRANGEMENTS 166
7.2 CAPACITY BUILDING 166
7.3 MONITORING & EVALUATION 166
7.4 REPORTING 167
8. COSTS AND BUDGET 167
8.1 COSTS 167
8.2 BUDGET 168
ANNEXES 170
ANNEX 1 – SUMMARY OF CONSULTATION DURING PROJECT PREPARATION ..... ERROR! BOOKMARK NOT DEFINED.
ANNEX 2 – IP SCREENING FORM 170
ANNEX 3 – OUTLINE OF AN IPP 174
ANNEX 4 –INDICATORS FOR IPP IMPLEMENTATION MONITORING 177

List of Tables

Table 1 – Distribution of Indigenous People Groups in Project Provinces 156
Table 2 – Key activities and costs for supporting IPP implementation (in US Dollars) 169

List of Figures

Figure 2 – Map showing seven irrigation schemes located in four provinces 144

Abbreviations

CAISAR	Climate Adaptive Irrigation and Sustainable Agriculture for Resilience
COI	Corridor of Impact
DDIS	Detailed Design Implementation and Supervision
EA/IA	Executing Agency/Implementing Agency
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESO	Environmental and Social Officers
ESS	Environmental and Social Standards
FPICon	Free Prior and Informed Consultation
IDA	International Development Association
ILO	International Labour Organization
IP	Indigenous People
IPP	Indigenous Peoples' Plan
IPPF	Indigenous Peoples Planning Framework
MoWRAM	Ministry of Water Resources and Meteorology
MoSALVY	Ministry of Social Affairs, Labor, Vocational Training and Youth Rehabilitation
NCDD	National Committee for Sub-National Democratic Development
NGO	Non-Government Organization
PDWRAM	Provincial Department of Water Resources and Meteorology
PMU	Project Management Unit
PIU	Project Implementation Unit
PPC	Project Preparation Consultants
RGC	Royal Government of Cambodia
RP	Resettlement Plan
RPF	Resettlement Planning Framework
SA/SIA	Social Assessment/ Social Impact Assessment
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SIB	Subproject Information Booklet
VAC	Violence Against Children

Definitions

Disadvantaged individuals/groups

Refers to individuals or groups who, due to certain own circumstances such as their age, gender, disabilities, health, economic and ethnic status, and so forth, are more likely affected adversely by the project impacts and/or more limited in their ability to take advantage of project benefits. Disadvantaged individuals/groups are more likely excluded from, or unable to participate fully in the mainstream consultation process. Thus, they may require specific assistance to stay engaged during project planning and implementation. In this project, disadvantaged individuals/ groups are defined as those who have the following characteristics: i) from an ethnic group, (ii) landless/ limited productive land, (iii) female headed household with dependents, (iv) frequent lack of male labor at home (e.g. migrant workers); (v) jobless, or limited economic opportunities; (vi) family member(s) with chronic illness, or disabilities; (vii) elderlies who live on their own; (viii) youth, particularly very young couple with children (early marriage), (ix) live in an especially difficult circumstance, and (x) don't meet above criteria but are concurred by local community as vulnerable to poverty and need project's support to reduce their vulnerability. Disadvantaged individuals are usually from a poor, or a near poor household.

Environmental and social risk

Environmental (including climate change and natural disasters) and social risks are determined by a combination of project design and operational characteristics, together with exogenous factors, which: (i) may adversely affect the ability of a project to achieve and sustain its development objective(s); and (ii) define the nature, scale and significance of direct and indirect environmental and social impacts.

Free, Prior, and Informed Consultation (FPICon)

According to ESS 3 of AIIB's ESF, FPICon is established as follows:

- The scope of FPICon applies to project design, implementation arrangements and expected outcomes related to risks to, and impacts on, the affected Indigenous Peoples;
- FPICon builds on the process of meaningful consultation and requires good faith negotiation between the Client and the affected Indigenous Peoples;
- The Client documents: (a) the details of the process by which the support of the affected local indigenous communities will be determined, in a written consultation process agreement with these communities; and (b) the details of the Project-related matters on which their broad community support has been obtained, in a consultation statement, which includes all agreements reached as well as dissenting views; and
- FPICon does not require unanimity and may be achieved even when individuals or groups within or among these affected Indigenous Peoples explicitly disagree with support for the Project.

Inclusion

Inclusion means empowering all people to participate in, and benefit from, the development process. Inclusion encompasses policies to promote equality and nondiscrimination by improving the access of all people, including the poor and disadvantaged, to services and benefits such as education, health, social protection, infrastructure, affordable energy, employment, financial services and productive assets. It also embraces action to remove barriers against those who are often excluded from the development process, such as women, children, persons with disabilities, youth and minorities, and to ensure that the voice of all can be heard.

Indigenous Peoples

According to the AIIB's Environment and Social Framework, the term "Indigenous Peoples" is used in a generic sense to refer exclusively to a distinct social and cultural group possessing all the following characteristics – in varying degrees:

- Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others; and
- Collective attachment[1] to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas; and
- Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture, and
- A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.

According to IFAD's SECAP, IPs are defined as follows:

- Priority in time, with respect to occupation and use of a specific territory;
- The voluntary perpetuation of cultural distinctiveness, which may include aspects of language, social organization, religion and spiritual values, modes of production, laws and institutions;
- Self-identification, as well as recognition by other groups, or by state authorities, as a distinct collectivity; and
- An experience of subjugation, marginalization, dispossession, exclusion or discrimination.

According to GCF's Indigenous People Policy, IPs are defined as follows:

- Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others;
- Collective attachment to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation as well as to the natural resources in these areas;
- Customary cultural, economic, social, or political systems that are distinct or separate from those of the mainstream society or culture; and
- A distinct language or dialect, often different from the official language or languages of the country or region in which they reside. This includes a language or dialect that has existed but does not exist now due to impacts that have made it difficult for a community or group to maintain a distinct language or dialect.

Information disclosure

[1] Collective attachment means that for generations there has been a physical presence in and economic ties to land and territories traditionally owned, or customarily used or occupied, by the group concerned, including areas that hold special significance for it, such as sacred sites.

The process of disseminating project information to stakeholders to allow them to understand the risks and impacts of the project, and potential opportunities. Information disclosure should be in line with the project's Stakeholder Engagement Plan which is in line with the requirements of the ESF of AIIB, SECAP of IFAD, and Information Disclosure Policy of GEF. It is required that the disclosure of project information include: (a) purpose, nature and scale of the project; (b) duration of proposed project activities; (c) environmental and social risks and potential impacts of the project on local communities, particularly the vulnerable/disadvantaged groups and proposed mitigation measures; (d) proposed stakeholder engagement process highlighting approach that will be taken to promote meaningful participation of project affected persons; (e) time and venue of proposed public consultation meetings, and the process by which meetings will be notified, meeting results summarized, and reported back to project stakeholders; and (f) process and means by which grievances can be received and addressed timely.

Meaningful consultation

Two-way process that (a) begins early in project planning process to gather initial views on project proposal and inform project design; (b) encourages stakeholder feedback, particularly as a way of informing project design and engagement by stakeholders in the identification and mitigation of environmental and social risks and impacts; (c) continues on an ongoing basis, as risks and impacts arise; (d) is based on prior disclosure and dissemination of relevant, transparent, objective, meaningful and easily accessible information in a timeframe that enables meaningful consultation with project stakeholders in a format culturally appropriate, and in relevant local language(s) and is understandable to stakeholders; (e) considers and responds to feedback; (f) supports active and inclusive engagement with project-affected parties; (g) is free of external manipulation, interference, coercion, discrimination, and intimidation; and (h) is documented and disclosed by the Government.

Vulnerable individuals /groups

Refers to individuals/groups who, by virtue of factors beyond their control, are: (a) more likely to be adversely affected by the Project's environmental and social impacts; (b) more likely than others to be limited in their ability to claim or take advantage of Project benefits. Such individuals or groups are also more likely to be excluded from or unable to participate fully in the mainstream consultation process and may require specific measures or assistance (or both) to do so.

Based on the results of the vulnerability assessment conducted for the project, vulnerable individuals/groups need differentiated mitigation measures to cope with project's adverse impacts (e.g. loss of productive land/ income source), take advantage of project's intended benefits, and fully participate in meaningful consultation process during project design, implementation, and operations. Therefore, under this project, the following groups are considered vulnerable under this project: (i) poor[2] and near-poor[3], (ii) female headed households with dependents; (iii) households from Indigenous Peoples or Ethnic Minority group that meet the definitions of Indigenous Peoples of AIIB, IFAD, and GCF, (iv) households headed by an elderly, or a disabled person with no regular income, (v) household having at least a family member with chronic illness that needs regular medical treatment.

[2] The poor are those who a) live below the poverty line (which is KHR 10,951 per person per day as defined by the World Bank for Cambodia), or b) have IDPoor 1 (very poor) or IDPoor 2 (poor).

[3] The near-poor are those whose daily per capita consumption lies between poverty line and 1.25 times the poverty line – as proposed by the World Bank. Near-poor households also have not only lower income per capita but also less diversified incomes than non-poor households (cf. WB 2022, Cambodia Poverty Assessment – Toward A More Inclusive and Resilient Cambodia).

Executive Summary

This Executive Summary summarizes the main points in the project's Indigenous Peoples Planning Framework (IPPF) which was prepared by the Ministry of Water Resources and Meteorology. This IPPF will be applied to all activities that will be carried out under the CAISAR. This IPPF is a living document which may be updated as required during project implementation. If updated, the latest IPPF version will be disclosed through the same channels.

Project Development Objective and Project Components

The project objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces: Pursat , Kampong Chhnang, Kampong Speu, and Kandal.

The project will be implemented through various activities organized through the following three components:

- Component 1. Improving farm-level climate adaptation, resilience, and water use efficiency
- Component 2. Upgrading and climate-proofing water infrastructure for increased resilience
- Component 3. Institutional strengthening

Purpose of the Indigenous Peoples Planning Framework

This framework is a guide to screening, assessment, and planning, including an arrangement of the outline of culturally appropriate and meaningful consultations with Indigenous peoples, conducting social impact assessments (SIA) and preparation of the IPP that pertains to any specific subproject. The purpose of this Indigenous Peoples Planning Framework (IPPF) is to set out the requirements of the AIIB's ESS3 on Indigenous Peoples and the IFAD's SECAP Standard 4, and the RGC's policy on development of Indigenous Peoples. Based on the gaps between the AIIB's ESS3, IFAD's SECAP Standard 4, and RGC's policies, measures are proposed to close the gaps through implementation arrangements, procedures, design criteria, etc. to be applied to all subprojects and project components that were confirmed during project preparation and will be identified during project implementation.

Gaps between National Policies & Donor's Environmental and Social Policies

Despite the fact that Cambodia has a policy that recognizes the rights of IPs to culture, education, justice, health, environment, land, agriculture, water resources and infrastructure among others, there are no decrees, sub-decrees or procedures for specific safeguards to protect the interest of IPs, other than those related to land or forestry. The Cambodia Land Law does recognize the right of indigenous communities in Cambodia to own immovable property - their land - with collective title. However, in practice, the procedure to register collective title can be very time consuming and only a few indigenous communities have received collective title since the Land Law was enacted in 2001. Similarly, the Forest Law also guarantees and recognizes the right of IPs to continue the use and access to certain forest areas that they traditionally use and practice.

Overall, there is an acceptable level of consistency between the government system, the AIIB'ESS and the IFAD standards on IPs. The self-identification process of indigenous communities defined in the national

policy is broadly consistent with international good practice. The national framework does not exclude communities who have become more mainstream, and indigenous communities may apply for legal status regardless of whether or not they still use their own language or practice traditional agriculture.

However, while there are some complementary links between Cambodian laws and regulations related to IPs and the ESS 3, there are no sufficiently detailed regulations or operating procedures to facilitate full implementation of the IPPs. Therefore, this IPPF has been prepared on the basis of the ESS 3 by considering relevant Cambodian policies and regulations. The IPPF also outlines the Grievance Redress Mechanism (GRM), based on the GRM that is used for the Project, which will need to be further refined in consultation with IPs, if any are found to be residing at any subproject sites.

Project's Environmental and Social Risk and Impacts

The project will bring about an overall positive impact to local farmers. In subproject where IP peoples have farmland in the command area, these IPs will benefit from improved irrigation, water supply, government's agricultural extension services, and services from local farmers' cooperatives. As IPs participate in project activities, particularly agricultural extension services, they can grow more crops, participate in value chain, increase income, and eventually improve their livelihoods. Reliable water access and promising farming opportunities thanks to improved irrigation and extension services also keep the poor, including the poor IPs, from migrating to other areas in search for income generation opportunities. Adverse impacts on IPs are foreseen. However, these impacts are mostly local, small-scaled, such as minor land acquisition in some subproject to allow construction of irrigation canal. Land impacts would be very small at household level (e.g. loss of strip of land) which would not affect the livelihoods of the IP remarkably.

During subproject construction and operation, there are a number of environmental and social risks that may apply to local people, including IP peoples who may happen to be present in a subproject area. Environmental and social risks and impacts that have been identified during project preparation have been discussed in consultation meetings with a) IP peoples who are present in subproject area, and b) other project stakeholders at commune, district, provincial and central level. These consultations aim to ensure potentially affected people, and relevant project stakeholders, are aware of such risks and stay engaged during subproject preparation and implementation for risk prevention and mitigation (Please see full list of social and environmental risks in the project's ESCMF (Section E&S Risks and Impacts) that may apply to any ethnic minorities who are present in subproject area. See also SEP, particularly section (Proposed Strategy for Consultation with Vulnerable/Disadvantaged Groups) for guidance on conducting consultation with IPs when IPs are present in the subproject area.

Mitigation Measures

Although above risks and impacts will be validated, and assessed at further length when subproject locations become known, IP(s) in a subproject's area may be affected disproportionately compared to the mainstream group. The distinctive cultural and socioeconomic characteristics of the IPs, including their existing livelihoods, etc. may expose IPs to further risks and impacts, increase their vulnerability and compromise their ability to respond to such risks and impacts – if a holistic approach is not in place. Effective communication, such as IEC, and active participation of involved IPs, are among important factors that contribute to effective engagement of IPs for meaningful consultation during subproject preparation and participatory monitoring during subproject implementation. The coordination of project stakeholders, including PMU, Contractors, local authorities, local agencies, local service providers, and

most notably the active and full participation of IPs, collectively contribute to minimizing identified risks and potential impacts at identified subprojects.

Detailed mitigation measures for the above risks and potential impacts are proposed in the project's ESCMF. These mitigation measures are specific for design stage, pre-construction stage, construction stage, and operation stage,

Purpose of Engaging IP during project preparation and implementation

The AIIB's ESF defines stakeholder engagement as a process of identifying relevant stakeholders, conducting stakeholder analysis, and organizing a series of consultations to meet with project stakeholders for collecting stakeholders' feedback and concerns on project's risks and impacts, as well as stakeholders' development needs in relation to project purposes and activities. This aims to ensure the project's adverse impacts on IPs can be avoided, or minimized and mitigated if avoidance is not possible. For this project, it is important that IPs need to be consulted on their development needs (in relation to project purposes) to ensure they can receive socioeconomic benefits that are appropriate to them culturally.

Information Disclosure

Prior to conducting consultations, MoWRAM will notify the concerned IPs of the consultation plan during preparation. MoWRAM will provide affected IPs with initial subproject information in the form of booklet in both Khmer and local language (if applicable). This initial information should be provided to IP at least two weeks prior to consultation. If the concerned IPs do not have a written language, the IP will be provided the information in Khmer and are explained verbally in the local language of the concerned IP to ensure the IP are fully informed of the consultation purpose and initial subproject information.

> For public consultation, the draft IPPF (in English) and its Executive Summary (in Khmer) was (should be?) disclosed on MoWRAM's website on XXX (https://www.). The Executive Summary (in Khmer) was also disclosed in hard copy at MoWRAM's public library in Phnom Penh, and in the offices of Provincial Departments of Water Resources and Meteorology in all four project provinces. Once finalized, the IPPF will be re-disclosed again through the above channels prior to AIIB's and IFAD's project appraisal. The draft and final IPPF will be disclosed in English on the AIIB's and IFAD's website.

During project implementation, all draft IPPs, once completed by MoWRAM and submitted to the Bank for review, shall be disclosed to affected IP communities in Khmer language. The summary of the IPP (in the form of an Information Booklet) will be translated into IP's language if the consulted IPs have their own written language. Public meetings will be hold with the affected IP(s) to explain the contents of the relevant IPP in their mother language to ensure affected IPs understand what and how the activities under the IPP will be carried out, including E&S risks and impacts of subproject activities, and how the IPs will be engaged by MoWRAM in consultation meetings during subproject preparation, and in monitoring during subproject implementation to minimize identified E&S risks and impacts. IPPs – prepared for relevant subprojects, will be disclosed locally in Khmer and local IP language (if applicable), as well as in Khmer and English language on MoWRAM's website. The English version of the IPPs will be disclosed on the AIIB's and IFAD's website.

Grievance Redress Procedures

The following section outlines complaint handling procedures that are designed to assist affected Indigenous Peoples (IPs) in making complaints regarding the project. These procedures are designed to address potential impacts and risks during project preparation and cover the following key areas: a) land

acquisition, where individual IP land is acquired either permanently or temporarily during construction, b) Gender based violence, where IPs are victims, survivors, witnesses, or otherwise affected by SEA/SH actions related to the project, and c) general complaints and concerns related to project design, adverse impacts on IPs such as dust, noise, vibration, and any other aspects that IPs attribute to project activities.

Implementation Arrangements

The MoWRAM will be responsible for implementing this IPPF. The Project Director (PD) at MoWRAM will be responsible for providing overall guidance, policy advice, conducting internal coordination, discussing and resolving issues at project level − in association with relevant government agencies where needed. The Project Manager (PM) at MoWRAM will provide day-to-day support to the PD and will be responsible for ensuring that the IPPF will be followed. The PM will oversee the work of the ESOs and ensure proper screening of IP groups will be carried out for each subproject, and steps for IP screening and social assessment described in this IPPF are followed. Within MoWRAM, the ESOs will be responsible for carrying out day-to-day activities set forth in this IPPF. An IP specialist will be appointed within MoWRAM's PMU (in addition to a Resettlement and Environmental Specialist) to provide guidance to Provincial PDWRAM in conducting consultation with affected IP in respective subprojects.

The MoWRAM needs to inform the AIIB and IFAD of the IP screening results and steps that MoWRAM will take in case IPs are present in the subproject area. When IPs are found in the subproject, MoWRAM will engage IP consultants to work closely with PMU's IP Specialist and PDWRAM to conduct Social Assessment and prepare IPPs. PMU's IP specialist and IP consultants will visit the subproject sites and work closely with PDWRAM, local authorities, relevant agencies, NGOs, particularly local IP leaders and IP members, including vulnerable groups of affected IP communities, to conduct Social Assessment.

Capacity Building

Since the MOWRAM is new to AIIB's ESF and IFAD's SECAP, and have not been familiar with requirements of AIIB's ESS3 and IFAD's SECAP Standard 4, they may not be able to conduct meaningful consultation from initial years of project implementation. In the first year, these specialists will be trained by the AIIB task team on ESF with a particular focus ESSs and IFAD's SECAP with a particular focus Standard that apply to this project to enable newly appointed ES specialists at the MOWRAM to provide appropriate support. Where needed, IP consultant will be engaged to provide additional support to PMUs' specialist, particularly in the initial years of project implementation. Since independent ES monitoring consultant will be engaged by PMU at MoWRAM, feedback from this consultant, alongside internal monitoring results, will provide regular feedback to PMU on how IPPF/IPP is carried out so that adjustment/improvement could be made appropriately and timely.

Monitoring & Evaluation

The application of this IPPF and preparation and implementation of subproject IPPs will be monitored internally by the MoWRAM. Adverse impact on IPs (if any) due to land acquisition will be monitored by GDR and MoWRAM as part of implementation arrangement set forth in Section 9.1.2 of project's Resettlement Planning Framework (RPF).

Within MoWRAM, the ESOs or the Detailed Design Implementation and Supervision (DDIS) will be responsible for conducting quarterly monitoring activities of the activities set for under all subproject IPPs. Monitoring of IPPF/IPP implementation will focus on assessing the compliance of IPP implementation against the followings:

- IP screening process and results;

- Quality of Social Assessment and adequacy of IPPs prepared based on SAs;
- Information disclosure;
- Functioning of project's GRM (as customized to the respective IP groups present in each subproject area to ensure the GRM is culturally appropriate to the local IPs);
- Development activities carried under IPPs (based on development needs of IPs);
- Results and impacts of IPPs (in ensuring the affected IP receive socioeconomic benefits of the project that is culturally appropriate, gender and intergenerational inclusive, and contributing to achieving the objective of the AIIB's ESS3 and IFAD's SECAP Standard 4).

In addition to internal monitoring, the project will encourage IPs in subproject areas to participate in monitoring and evaluation of IPP implementation process and implementation outcome which affects them. During SA exercise, feedback and suggestions from IPs will be solicited as to how they wish to participate in monitoring and evaluation of IPP activities.

MOWRAM will provide a quarterly IPP implementation report to the AIIB and IFAD. These results will be incorporated into MoWRAM's consolidated Environmental and Social Compliance Report (ESCR) (See Annex 5 for Indicative Indicators for Internal Monitoring of IPP implementation).

Reporting

MoWRAM's ESOs will ensure feedback from affected and interested IP, as well as grievances submitted by affected IPs, are resolved timely and effectively, and that resolution results are reported timely back to the aggrieved IPs. The method of reporting back depends on the stakeholders, and as follows:

- For stakeholders at national level, email and/or official letter will be used to report back to stakeholders following consultations and/or workshops. The content of the report will summarize what comments, suggestions, concerns that have been received, by whom and when, and how such comments, suggestions, concerns were considered.
- For stakeholders at local level, follow-up meetings/consultations will be conducted to informed stakeholders know on how comments, suggestions, concerned were considered.
- For Indigenous Peoples, project's responses to their comments, suggestions, concerns are reported back to them in subsequent face-to-face consultations – in line with the project's SEP and the IPPF, including how the project had considered and addressed their concerns through concrete actions to be carried out during subproject implementation process and through IPP implementation.

Grievances of all project IP will be reported back to them through project's GRM channels within the timeframes specified for each step of the above GRM procedure.

Costs

Indicative costs for IPPF implementation are estimated during project preparation for the purpose of budget planning. The actual costs of IPPF implementation depend on the number of IPPs, including scope and activities to be carried out under each IPP, during project implementation. The estimated cost below may be updated once the list of subprojects is finalized. Costs incurred as compensation payment for land acquisition and associated impacts are covered by counterpart funds and are estimated in the project' Resettlement Planning Framework (RPF).

Budget

The budget for implementing IPPF/IPPs will be allocated from counterpart funding. implementation, based on infrastructure construction subprojects that will be identified/confirmed during project implementation, this budget plan will be updated to ensure funding is sufficiently planned annually to ensure timely and effective activities in Figure below.

1. INTRODUCTION

1.1 Project Background

1.1.1 Project Context

Cambodia's irrigated agriculture faces increasing challenges from adverse impacts of climate change, especially the changes in rainfall patterns, duration and timing of the rainy season, and climate induced water disasters such as floods and droughts. Climate Resilient (CR) and low emission practices and investments in agriculture and water management are therefore crucial to protect and enhance Cambodia's agricultural production and productivity which will in turn contribute to poverty reduction and increased food security.

Addressing the complex impacts of climate change on rain fed and irrigated agriculture requires action at both farm and irrigation scheme, including enabling environment at regional and national level. Farm level actions will help communities adapt to climate change while also saving water and decreasing GHG emissions from BAU of agriculture, water use and management. This will help farmers to diversify their farming while also addressing changing rainfall patterns and increasing drought conditions throughout the growing season. Actions at system level will help achieve a modernized and climate proofed irrigation infrastructure delivering irrigation services to farmers in line with the requirements at the farm level. It will also protect the natural capital stocks, especially the land and water against the increasing threats of flood. In addition, replacement of diesel pumps with solar pumps and combination of both grey and green solutions for irrigation modernization and flood proofing works will help reduce GHG emissions.

The integrated actions combining both farm and system levels has a transformative potential to reduce vulnerability of water and agriculture systems to climate change impacts while also reducing GHG emissions and enhancing the livelihood of rural populations who primarily depend on agriculture.

The theory of change demonstrates how the project shifts the BAU from poorly constructed and maintained irrigation systems to a smart, climate resilient water management system with climate proofed irrigation and flood control infrastructures for smallholder farmers. The project's outcomes and outputs are in-line with GCF's adaptation and mitigation goals, objectives, and long-term sustainability principles.

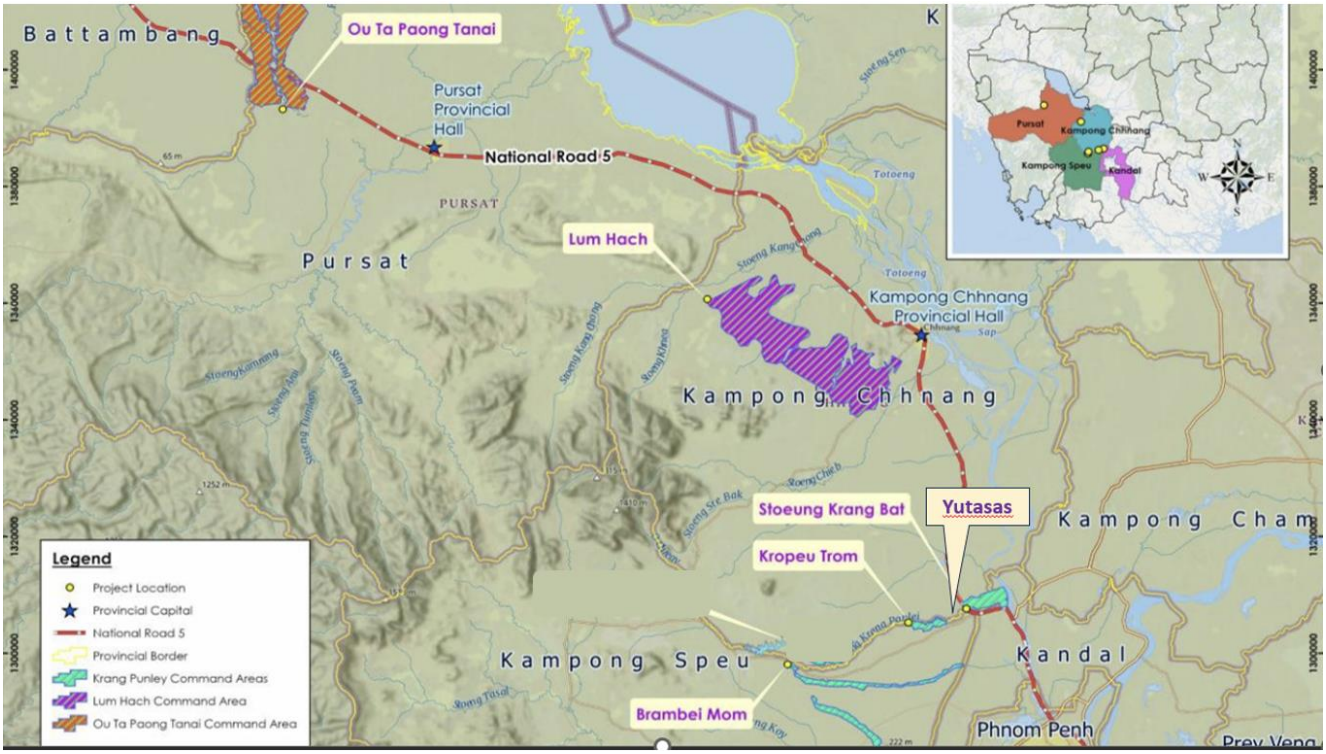
The paradigm shifting aspects of the project will include the data driven climate-proofing of irrigation infrastructure and focus on last-mile engagement of vulnerable communities. The TOC shows that IF climate resiliency of irrigated agriculture is enhanced then the agricultural outputs and income of small-scale farmers will increase, as well as the climate resilience of vulnerable households and in particular to women will increase because water and food systems are less vulnerable to increasing temperatures, changing rainfall patterns and the extreme water events, AND low-emission irrigation and sustainable agriculture adaptation practices will contribute to NDC mitigation targets.

The project's goal stated above shall be achieved through the generation of the following three outcomes: (1) Improved resiliency of small holder farmers (2) Resilient water control infrastructure and water service delivery with less crop and asset damage and (3) Reduced GHG emission. These three outcomes are derived from interventions at farm and irrigation system level together with institutional strengthening of relevant stakeholders (MoWRAM, NCDD, MoF, and MAAF) and will contribute towards an irrigated agricultural system that is climate resilient and productive ultimately reducing the climatic vulnerability of poor farmers in the project areas.

1.1.2 Project Development Objective and Project Components

The project objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia in Kampong Speu, Kampong Chhnang, Kandal, and Pursat province (see map below).

Figure 1 – Map showing six irrigation schemes located in four provinces



The project will be implemented through various activities organized through the following three components:

- Component 1. Improving farm-level climate adaptation, resilience, and water use efficiency
- Component 2. Upgrading and climate-proofing water infrastructure for increased resilience
- Component 3. Institutional strengthening

1.2 Objectives and Principles of the Indigenous Peoples Planning Framework

1.2.1 Objectives

This Indigenous Peoples Planning Framework (IPPF) is prepared in case the project is affect any Indigenous Peoples. This framework guides screening, assessment, and planning, including an arrangement of the outline of culturally appropriate and meaningful consultations with Indigenous peoples, conducting social impact assessments (SIA), and preparing the IPP for any specific subproject. This IPPF is prepared in accordance with the requirements of the AIIB's ESS3 on Indigenous Peoples and the IFAD's SECAP Standard 4, and the RGC's policy on development of Indigenous Peoples. Based on the gaps between the AIIB's ESS3, IFAD's SECAP Standard 4, and RGC's policies, measures are proposed to close the gaps through implementation arrangements, procedures, design criteria, etc. to be applied to all subprojects and project components that were confirmed during project preparation and will be identified during project implementation.

The objectives of this IPPF are:

- Ensure the Project is designed and implemented in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, economies and cultures, as defined by the Indigenous Peoples

themselves, so that they a) Receive culturally appropriate social and economic benefits; b) Do not suffer adverse impacts as a result of Projects; and c) Can participate actively in Projects that affect them.

In particular, IPPF aims to subproject's activities:

- Avoid adverse impacts of the project on IP communities. When avoidance is not possible, minimize, mitigate and/or compensate for such impacts.
- Promote sustainable development benefits and opportunities for IP communities in a manner that is accessible, culturally appropriate and inclusive.
- Improve subproject design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the IP communities affected by CAISAR throughout project cycle.
- Recognize, respect and preserve the culture, knowledge, and practices of IP communities, and provide IPs with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.

1.2.2 Principles

To achieve the above mentioned objectives, the following principles will be observed – at subproject level:

a) Early screening to determine IP presence and/or collective attachment to the Project area as well as potential impacts on IPs.

b) Conduct of culturally appropriate, gender-sensitive and technically backed-up social impact assessment where full consideration to IP−generated options as regards benefits and mitigation measures are considered and translated into the IP plans.

c) Undertake meaningful consultations with affected IP communities and concerned organizations to solicit their participation across the subproject cycle to avoid adverse impacts or in cases when avoidance is not possible, to minimize, mitigate, or compensate for such effects by establishing culturally appropriate and gender inclusivecapacity development modalities and grievance mechanisms.

d) Ensure free, prior and informed consent of affected IP communities to project activities that may introduce commercial development of cultural resources and indigenous knowledge, physical displacement from traditional or customary land, and commercialdevelopment of natural resources within customary lands that impact on livelihoods or cultural uses that define the identity and community of IPs. Consent refers to a collective expression by affected IP communities, through individuals and/or their recognized representatives, of broad community support for Project/project activities even if some individuals or groups object.

e) Avoid restricted access to and physical displacement from protected areas and naturalresources but when not possible, ensure that affected IP communities participate in allaspects of the subproject cycle and that their benefits are equitably shared.

f) An IPP will be prepared that is based on the social impact assessment with the assistance of qualified and experienced experts that draw on indigenous knowledge through consultation with affected IP communities. The IPP will include a framework for continued consultation with the affected IP communities during project implementation; specifies measures to ensure that IPs receive culturally

appropriate benefits; identification of measures to avoid, minimize, mitigate, or compensate for any adverse project impacts; culturally appropriate grievance procedures; M&E arrangements, and a budget and time-bound actions for implementing the planned measures.

g) The draft IPP after approval by the AIIB is disclosed including documentation of the consultation process and the results of the social impact assessment in a timely manner and made available in an accessible place and in a form and local languages understandable to affected IPs communities and other stakeholders. The final IPP andits updates will also be disclosed to the affected IP communities and other stakeholders.

h) Prepare an action plan for legal recognition of customary rights to lands and territories or ancestral domains when the project involves (i) activities that are contingent on establishing legally recognized rights to lands and territories that IPs have traditionallyowned or customarily used or occupied, or (ii) involuntary acquisition of such lands.

i) Monitor implementation of the IPP using qualified and experienced experts; adopt a participatory monitoring approach, wherever possible; and assess whether the IPP's objective and desired outcome have been achieved, considering the baseline conditions and the results of IPP monitoring and disclose the monitoring report.

2. LEGAL FRAMEWORK

2.1 Overview

Over 97 percent of Cambodia's population belongs to the Khmer ethnic group, while the remainder comprise a range of ethnic groups, including Chams (predominantly Muslim), ethnic Vietnamese, ethnic Chinese, and indigenous Khmer Loeu (hill-tribes). Amongst the non-ethnic groups, only the hill-tribes are categorized as IPs by the government. There are also isolated villages Cham (Muslim) communities that are non-Khmer ethnic groups, but they are generally well assimilated in Khmer society and not recognized as IPs.

2.2 National Laws and Regulations Related to Indigenous Peoples

Cambodia has a number of laws and policies that protect the rights of local communities, including IPs. Since the IPs have strong ties to the land and natural resources, the Land Law (2001) is the most significant for them because it sets out the basis for their rights to land. Article 25 provides for the collective ownership of land, while Article 26 recognizes the role of traditional authorities, mechanisms and customs in decision-making and exercising ownership rights. The subsequent Policy and Sub-decree for Indigenous Peoples Registration of Collective Land Rights sets the incorporation of the community as a legal entity as a condition for receiving a collective title. National policies applicable to the indigenous peoples include:

Cambodia Constitution (1993). Article 31 stipulates that Khmer citizens are entitled to the same rights, freedom and duties and are equal before the law, regardless of their race, color, sex, language, beliefs, religions, political tendencies, birth of origin, social status, resources, and any position. Article 44 guarantees all persons, individually or collectively, shall have the right to own property. Only natural persons or legal entities of Khmer nationality shall have the right to own land. Legal private ownership shall be protected by law. Expropriation of ownership from any person shall be exercised only in the public interest as provided for by law and shall require fair and just compensation in advance.

Land Law (2001) recognizes the collective land rights of indigenous communities by the State that offer a unique chance for indigenous peoples in Cambodia to exercise their right to self-determined development that include Article 26: Ownership of the lands is granted by the State to indigenous communities as collective ownership, including all the rights and protections enjoyed by private owners. The exercise of collective ownership rights are the responsibility of the traditional authorities and decision-making mechanisms of the indigenous community, according to their customs and subject to laws such as the law on environment protection; Article 28: No authority outside the community may acquire any rights to immovable properties belonging to an indigenous community. Indigenous communities have the right to collective ownership of their lands, which gives them all the rights and protection of ownership as enjoyed by private landowners. The lands of indigenous communities include residential and agricultural land and encompass land actually cultivated and the lands reserved/fallow land for shifting cultivation. Indigenous communities shall continue to manage their community land according to their traditional customs, pending the determination of their legal status. Once they are registered as legal entities, communities can apply for the registration of their collective title (Land Law 2001, Article 23 to 25). Article 43 stipulates the Commune Council's role in protecting and preserving the environment and natural resources. They also have a role in the classifying and setting of boundaries for all forests in their area of jurisdiction, in coordination with the Ministry of Agriculture, Fisheries and Forestry (Forestry Law 2002, Article 10).

Land Concessions 2003 and 2005. A sub-decree on Social Land Concessions (SLC)was established in 2003 to accompany the implementation of the Land Allocation for Social and Economic Development Project (LASED). The SLC aims at providing state private land for purposes of settlement and family farming to private families particularly the poor, disabledsoldiers, and families of deceased soldiers who have no or not enough land.

In late December 2005, the ELC sub-decree was established, defining a mechanism to grant state private land through a specific ELC contract to a concessionaire to use the land for agricultural and agro-industrial production. This refers to the cultivation of food or industrial crops, animal raising and aquaculture and the construction of facilities for the processing of domestic agricultural raw materials (Sub-Decree No.146 on ELC, article 2). For an ELC, which can be granted to private or investment companies, it must have been classified and registered in the Land Register as state private land, complying with the necessary legal procedures (Land Law 2001 Article 17, Sub-Decree No.118 on State Land Management article. 3 & 21, Sub- Decree No. 146 on ELC article. 2).

All responsibilities and authorities in granting ELCs lie with the MAFF. The concession land cannot exceed 10,000 ha and may only be granted when some additional requirements are fulfilled as follows (sub decree No.146 on ELC, article 4 & 5):

a) A land use plan for the land has been adopted by the Provincial or Municipal State Land Management Committee, and the land use is consistent with the plan.

b) Environmental and social impact assessments have been completed with respect to the land use and development plan.

c) There are solutions for resettlement issues in accordance with the existing legal framework and procedures. There shall be no involuntary resettlement and access to private land shall be respected.

d) Public consultations have been conducted with territorial authorities and local residents, relating to economic land concession projects or proposals.

Moreover, the proposal for ELC has to be evaluated against criteria that include the promotion of people's living standards, perpetual environmental protection and natural resource management, avoidance or minimization

of adverse social impacts, creation of increased employment and with linkages and mutual support between SLC and ELC.

Organic Law (2008) recognizes the vulnerability of the indigenous peoples in Cambodia. It mandates that provincial and district councils in rural areas, capital, municipal and khan levels in urban areas formulate development plans that identify the needs of vulnerable groups, including those from the IP communities.

Protected Area Law (2008) defines the framework of management, conservation and development of protected areas. The law aims to ensure effective management and conservation of biodiversity, and sustainable use of natural resources in protected areas. The law recognizes the right of forest-dependent indigenous peoples to live within the protected areas and to use sustainably the natural resources. Under this law, protected areas are divided into four zones, including core zone, conservation zone, sustainable use zone, and community zone. The law has provisions that define how land can be used and managed in each zone.

Forestry Law 2003 authorizes the granting of forest concessions. The sub-decree on the Management of Forest Concessions states that cancelled or revoked forest concessions shall revert to natural forest protected areas and cannot be converted into an Economic Land Concession (ELC) or awarded to other companies.

Law on Education (2007) aims to promote development of human resources of the nation by providing lifetime education to all people to enable their improvements in terms of knowledge, skills, capacities, dignity, good moral behaviors and characteristics. It also encourages people to learn to better understand, love and protect the national identity, cultures and language. Article 11, 15, 16, and 40 of the Forest Law (2002) recognizes and protects the rights of indigenous peoples to access and use certain forest areas, which they traditionally rely on to sustain their way of life and enjoy the benefits of the forest

Sub-Decree No. 83 ANK, BK (2009) on Procedures of Registration of Land of Indigenous Communities. The objective of this Sub-Decree is to provide indigenous communities with legal rights to land tenure, ensure land tenure security, and protect collective ownership by preserving the identity, culture, good custom and tradition of each indigenous community.

Policy on Environmental and Social Safeguards for Sub-National Democratic Development (RGC-NCDD, 2019) states in the strategy No.7 that Indigenous Peoples also are known in Cambodia as 'Khmer Leou' who have their own cultures and customs and make their own living in a way that is significantly different from those of 'Khmer Kroam' who live in small groups. The "Khmer Leou" is considered vulnerable IP groups and receive special care and attention by the government. It is required that development projects implemented at sub-national administration should not negatively impact their lives, and traditions and customs of the "Khmer Leou", particularly with regards to resettlement and land. In terms of application, specifically in land acquisition and resettlement, this policy is applied through the RGC's SOP-LAR (2018) – Land Acquisition and Involuntary Resettlement, which requires the avoidance of land acquisition or minimization of its use where avoidance is not possible.

Manual for Indigenous Communities Identification; Legal Entity Registration; and Communal Land Registration Process *(*OHCHR, MoI, MRD, MLMUPC (2018) *provide detailed guidance on steps and measures that need to be taken for identification of indigenous communities, registration of legal entities, and community land registration process.*

RGC (2018) Land Acquisition and Involuntary Resettlement, Standard Operating Procedures for Externally Financed Projects in Cambodia. In Section E (Impact on Indigenous Peoples), it is stipulated that land acquisition and resettlement that potentially affects indigenous people should be avoided – to the maximum extent possible, through selection of site, alignment, and land demarcation. However, when land acquisition is not avoidable, a separate social impacts assessment will need to be carried out to understand clearly how the indigenous peoples use their land; how they conduct their economic activities; how they organize their social

activities; and how the project would potentially affect the IP's identity, culture, and customary livelihoods. As per the decree, a separate Indigenous Peoples Plan (IPP) must be developed to address social impacts, compensation and resettlement packages, and implementation arrangements. The consultation process should consider customary practices, and in most cases, tribal or customary leaders will be consulted as they make decisions for their people. The Project Preparation Consultants (PPC), along with the Executing Agency/Implementing Agency (EA/IA) and local commune authorities, typically prepare the IPP. This is separate from the preparation of the BRP and DRP, although the latter will include a compensation package for the displaced indigenous peoples.

Registration of Lands of Indigenous Communities 2009. Sub-decrees on tenurial security have been issued by the GKC to put in place procedures whereby IPs can process claims to their rightful lands (provided they are the majority population at commune level). Recognition and certification of lands among IPs are ongoing with the issuance of the 2009 Sub-Decree on Procedures of Registration of Lands of Indigenous Communities.

National Policy on the Development of Indigenous Peoples (NPDIP). The Council of Ministers approved the NPDIP on 24 April 2009, serving as a guiding document for the implementation of government policies related to Indigenous Peoples across various sectors such as culture, education, health, land, agriculture, infrastructure, justice, tourism, industry, and energy. The NPDIP recognizes the necessity of specific policies for indigenous communities and establishes principles for their formal registration as legal entities with their own bylaws. Additionally, the NPDIP supports the participation of indigenous communities in economic development that affects their lives and cultures, ensuring their full entitlement to express their opinions and make decisions on the development of the economy, society and their cultures towards societal growth. The NPDIP promotes the use of local languages in multilingual primary education, media, and public consultation. It also lists ten brief sector strategies dedicated to culture, education and vocational training, health, environment, land, agriculture, water resources, infrastructure, justice, industry and mines and energy. The NPDIP calls for conducting impact assessments for all infrastructure projects: "Development projects in the living areas of indigenous peoples can function only if there has been an environmental and social impact assessment and publicity to relevant indigenous peoples' communities in advance in order for those people to have an opportunity to provide input about their need." The NPDIP recognizes the rights of indigenous peoples in traditional lands, culture and traditions. This is consistent with the national Land Law (2001).

Policy on Registration and Right to Use of Land of Indigenous Communities: The Council of Ministers approved on April 24, 2009. The Prime Minister signed a Sub-Decree on procedures of registration of Land of indigenous communities on June 9, 2009. This policy was developed on basis of the Land Law (2001), which recognizes the right of the indigenous communities to possess and use land under their collective ownership. The policy states that the registration of indigenous communities' land, as collective ownership, is different from the registration of individually owned land parcel. This is because land registration of the indigenous communities entails the registration of all land parcels that the communities own and use. The policy consists of both State Public Land and State Private Land in accordance with articles 25, 26, and 229 of the Land Law (2001) and related Sub-decrees. These land parcels vary in size and can be located within the same or different communes/ sangkat. Therefore, the registration of land parcels of indigenous communities requires a separate Sub-decree that supplements the existing procedures for sporadic and systematic land registration.

Other Policy Considerations. Apart from its Constitution and other national laws, Cambodia has adopted and supports the UN Declaration of Rights of Indigenous Peoples (IP)by way of ending discrimination and promoting the rights of Cambodia's recognized IPs.

2.3 AIIB's ESS3 on Indigenous Peoples

The AIIB Environmental and Social Framework (ESF) sets out the requirements for all Bank supported operations to comply with the Bank policies addressing environmental and social impacts, among other policies[4]. The ESF includes three mandatory Environmental and Social Standards (ESSs) that detail the requirements applicable to Bank clients on, respectively: Environment and Social Assessment and Management (ESS 1), Land Acquisition and Involuntary Resettlement (ESS 2) and Indigenous Peoples (ESS 3).

Objective. The objective of the ESS 3 is to enable the design and implementation of Projects in a way that fosters full respect for IPs identity, dignity, human rights, economies and cultures, as defined by the IPs themselves, so that: (a) they receive culturally appropriate social and economic benefits; (b) they do not suffer adverse impacts as a result of Projects; and (c) can participate actively in Projects that affect them.

[4] https://www.aiib.org/en/policies-strategies/_download/environment-framework/AIIB-Revised-Environmental-and-Social-Framework-ESF-May-2021-final.pdf

Scope and application.

The ESS 3 applies if IPs are present in, or have a collective attachment to, the proposed area of a subproject, and are likely to be affected by the subproject. The term IP is used in a generic sense to refer to a distinct social and cultural group possessing the following characteristics in varying degrees: (a) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; (b) collective attachment to geographically distinct habitats, ancestral territories or areas of seasonal use or occupation in the subproject area and to the natural resources in this area; (c) customary cultural, economic, social or political institutions that are distinct or separate from those of the dominant society or culture; and (d) a distinct language or dialect, often different from the official language or languages of the country in which they reside. 4 In considering these characteristics, national legislation, customary law and any international conventions to which the member in whose territory the subproject is located is a party may be considered. A group that has lost collective attachment to geographically distinct habitats or ancestral territories in the Project area because of forced severance remains eligible for coverage as an IP under ESS 3.

Indigenous Peoples Planning Framework: An Indigenous Peoples Planning Framework (IPPF) is prepared when a Project is likely to involve IPs and consist of a program or series of activities whose details had not yet been identified at the time the Project was approved by the Bank. In the case of this Project, and under exceptional circumstances, the AIIB determined that the environmental and social assessment of the identified Project activities could be conducted using a phased approach as defined under Section E, Special Circumstances of the IPP of the ESS 3, during the development of the activities in conformity with the IPPF that is approved by the Bank.

Indigenous Peoples Plan. Generally, if the subproject process determines that IPs are present in, or have collective attachment to, a subproject area, and furthermore are likely to be affected by the subproject, the Project is required to prepare an Indigenous Peoples Plan (IPP). The IPP should draw on indigenous knowledge and participation by any affected IP communities and take into consideration differentiated impacts of the Project with respect to gender and different generations. The IPP includes (a) a framework for continued consultation with those affected IPs during the subproject implementation; (b) measures to provide these IPs with gender sensitive and culturally appropriate benefits; (c) measures to avoid, minimize. Mitigate, offset or compensate for any adverse subproject impacts, and actions to address these impacts on the different groups in the community; (d) culturally appropriate grievance procedures, monitoring and evaluation arrangements; and (e) a budget and time-bound actions for implementing the planned measures.

In the event where project activities: (a) have impacts on land and natural resources subject to traditional ownership or under customary occupation or use; (b) cause relocation of IP and/or EM from land and/or limitations on access to natural resources subject to traditional ownership or under customary occupation or use; or (c) have significant impacts on Indigenous Peoples' cultural resources, the project needs to engaged the affected IP communities in a Free, Prior and Informed Consultation (FPICon) and thereafter obtain the broad support of the affected IP/EM communities for project activities that affect them.

For CAISAR, based on the current assessment, it is anticipated that the project would not affect any land and/or natural resources that are traditionally owned or under customary occupation or use by IP and/or EM, nor their cultural resources. Therefore, FPICon is not likely triggered under the Project albeit the applicability of FPICon will be determined based on the SIA to be carried for relevant subprojects.

2.4 Gaps between National Policies & Donor's Environmental and Social Policies

Despite the fact that Cambodia has a policy that recognizes the rights of IPs to culture, education, justice, health, environment, land, agriculture, water resources and infrastructure among others, there are no decrees, sub-decrees or procedures for specific safeguards to protect the interest of IPs, other than those related to land or forestry. The Cambodia Land Law does recognize the right of indigenous communities in Cambodia to own immovable property - their land - with collective title. However, in practice, the procedure to register collective title can be very time consuming and only a few indigenous communities have received collective title since the Land Law was enacted in 2001. Similarly, the Forest Law also guarantees and recognizes the right of IPs to continue the use and access to certain forest areas that they traditionally use and practice.

Overall, there is an acceptable level of consistency between the government system, the AIIB'ESS and the IFAD standards on IPs. The self-identification process of indigenous communities defined in the national policy is broadly consistent with international good practice. The national framework does not exclude communities who have become more mainstream, and indigenous communities may apply for legal status regardless of whether or not they still use their own language or practice traditional agriculture.

However, while there are some complementary links between Cambodian laws and regulations related to IPs and the ESS 3, there are no sufficiently detailed regulations or operating procedures to facilitate full implementation of the IPPs. Therefore, this IPPF has been prepared on the basis of the ESS 3 of AIIB and Standard 4 of IFAD (Indigenous Peoples), considering relevant Cambodian policies and regulations. The IPPF also outlines the Grievance Redress Mechanism (GRM), based on the GRM that is used for the Project, which will need to be further refined in consultation with IPs, if any are found to be residing at any subproject sites.

Items for Clarification	RGC's Policies	AIIB's ESS3	IFAD's SECAP Standard 7	Clarifications
Definition of IPs	Have list of IPs that are officially recognized as IPs	• Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others; and • Collective attachment[5] to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas; and • Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture, and • A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.	• Priority in time, with respect to occupation and use of a specific territory; • The voluntary perpetuation of cultural distinctiveness, which may include aspects of language, social organization, religion and spiritual values, modes of production, laws and institutions; • Self-identification, as well as recognition by other groups, or by state authorities, as a distinct collectivity; and • An experience of subjugation, marginalization, dispossession, exclusion or discrimination.	Screening of IP will be conducted based on all ethnic groups to identified in the subproject's area of influence. Screening of IP will be based on the definitions of IP in AIIB's ESS 3 and IFAD's ESS4.
FPIC	No requirements about FPIC	***Environmental and Social Standard 3*** Conduct meaningful consultation (based on **Free, Prior, Informed Consultation** – FPICon) to obtain broad support from affected IP community when project activities: • Have impacts on land and natural resources subject to traditional ownership or under customary occupation or use; • Cause relocation of Indigenous Peoples from land and natural resources subject to traditional ownership or under customary occupation or use;	***SECAP standard 4*** Conduct meaningful consultations to obtain **Free, Prior, Informed Consent** from affected IPs when project activities: • Have an impact on the land access and use rights of rural communities; and • Target indigenous peoples or rural areas that are home to indigenous peoples. Engagement with indigenous peoples will be undertaken in good faith, in a culturally appropriate manner and with full regard to these peoples'	

[5] Collective attachment means that for generations there has been a physical presence in and economic ties to land and territories traditionally owned, or customarily used or occupied, by the group concerned, including areas that hold special significance for it, such as sacred sites.

Items for Clarification	RGC's Policies	AIIB's ESS3	IFAD's SECAP Standard 7	Clarifications
		• have significant impacts on Indigenous Peoples' cultural resources. Apply Free, Prior and Informed Consent if the laws of the Member in whose territory the Project is located mandate free, prior and informed consent (FPIC) if AIIB has determined that the requirements of such FPIC are consistent with those of FPICon.	institutions, governance systems, customs and methods of decision-making.	

3. RISKS, IMPACTS AND MITIGATION MEASURES

3.1 Overview of Indigenous Peoples

3.1.1 Overview of IPs in Cambodia

There are 22 indigenous groups that are recognized by the RGC in Cambodia. The total population of these 22 indigenous groups is 171,193 people. Most of the indigenous people (92.4%, 2013) live in the northern and eastern parts of country, particularly in provinces of Ratanakiri, Mondulkiri, Kratie, Stung Treng, Kampong Thom, and Preah Vihear provinces. Of 22 indigenous groups, 6 groups are considered major groups as they have more than 10,000 people each. These 6 groups account for 88% of the total ethnic population of the country, including Tampuan, Pnong, Kreung, Kuy, Jarai, and Prev[6].

The indigenous families are larger than the average family size of the Cambodian population, with an average of 5.3 members per family in 2008 and 4.9 in 2013. Female-headed household accounted for 14% in 2008 and 22% in 2013.

Education. Among the indigenous population aged 15 and over, almost 66% did not attend a school or complete any educational degrees. In comparison, 24.1% attended only primary school (in total, 90% had little or no education). About 10% have at least completed lower secondary education, of which 4% have joined upper secondary education, and less than 1% have received a high school diploma. However, the data show that younger indigenous peoples have a better education rate than the older indigenous peoples, and men are more educated than women.

Employment and Economic Situation. The employment rate is 87.7% among men and 85.5% among women. According to different indigenous groups, the larger indigenous groups tend to have higher labor force participation rates, such as Tampuan, Pnong, Kreung, Preu, Kuy, Kraol, and Kavet. However, the majority of indigenous peoples work without pay (57.3%) and are self-employed (38%), with more men being self-employed (58.9%) and the majority of women working without pay (78.4%). In terms of the economic sectors, the vast majority of indigenous peoples aged 15 and over are employed in agriculture (93.3% of the population, 90.6% of men, and 95.9% of women), a few in the industry sector (total 1.6%, men 1.8%, and women 1.4%), and in the services sector (total 5.1%, men 7.6%, and women 2.8%).

Health and Hygiene. There is no data on indigenous peoples' health problems other than the data on disability from the censuses and intercensal population surveys, and the data on disability, maternal health, access to health and childcare services from Cambodian Socio-Economic Surveys containing only the information about local ethnic minority groups in Cambodia. According to the 2015 Cambodia Socio-Economic Survey, 14% of local ethnic minorities were sick in 30 days before the survey, with children and the elderly being sick the most and the working-age population being sick the least. In addition, boys and older men were twice as likely to be ill as girls and older women, and adult women were 2.7 times as likely to be sick as adult men. The fact that boys were more likely to be sick than girls can be explained by the fact that boys tend to accompany their parents to work in agriculture or collect nontimber forest products. The most common diseases are malaria, respiratory diseases, typhoid fever, and tuberculosis. The health services visited include pharmacies, public hospitals, and private clinics.

Housing and ownership. In 2013, more than 95% of indigenous families had their own houses (96.3% in 2013). The majority of indigenous households used kerosene lamps and batteries as the main source of light. In contrast, 20.6% of households used electricity or their own generators as the main light source in 2013. For the primary fuel type for cooking, most indigenous households used firewood (95% in 2013). For household items

[6] Report on the Demographic and Socio-economic Situation of Indigenous Peoples in Cambodia (2021).

for information and communication, almost a third of indigenous households have television, 110% have mobile phones, and less than 1% have internet. For traveling, 76.1% of indigenous households had motorbikes, 2.2% had cars, 9.1% had tractors, 7.8% had boats, and 37.4% had bicycles (2013).

3.1.2 Overview of IPs in the Project Area

IPs were found in the four project provinces including Pursat, Kampong Chhnang, Kampong Speu, and Kandal. (See Table 2 below).

Table 1 – Distribution of Indigenous People Groups in Project Provinces

No.	Province	Indigenous Groups (>= 1000 people)	Indigenous Groups (>= 100 people)	Indigenous Groups (<100 people)
1	Pursat		Jarai, Poar	Kavet, Kleung, Kuoy, Kreung, Stieng, Ja'ong, Kroul, S'och, Kajrouk
2	Kampong Chhnang		Jarai	Kavet, Kleung, Kuoy, Kreung, Lun, Tampuon, Stieng, Ja'ong, Kroul, Rodae, S'och, Kajrouk
3	Kampong Speu		Jarai, Souy	Kavet, Kleung, Kuoy, Kreung, Lun, Stieng, Ja'ong, Kroul, Mel, Kajrouk
4	Kandal		Jarai, Kleung, Stieng, Ja'ong	Kavet, Kuoy, Lun, Bunong, Praov, Tampoun, Kroul, Rodae, L'moon, Souy, Kajrouk, Mon

Source. *Ministry of Planning and Ministry of Rural Development (2021) Report on Demographic and Socio-economic Situation of Indigenous Peoples in Cambodia.*

3.2 Project's Environmental and Social Risk and Impacts

The project will bring about an overall positive impact to local farmers. In subproject where IP peoples have farmland in the command area, these IPs will benefit from improved irrigation, water supply, government's agricultural extension services, and services from local farmers' cooperatives. As IPs participate in project activities, particularly agricultural extension services, they can grow more crops, participate in value chain, increase income, and eventually improve their livelihoods. Reliable water access and promising farming opportunities thanks to improved irrigation and extension services also keep the poor, including the poor IPs, from migrating to other areas in search for income generation opportunities. Adverse impacts on IPs are foreseen. However, these impacts are mostly local, small-scaled, such as minor land acquisition in some subproject to allow construction of irrigation canal. Land impacts would be very small at household level (e.g. loss of strip of land) which would not affect the livelihoods of the IP remarkably.

During subproject construction and operation, there are a number of environmental and social risks that may apply to local people, including IP peoples who may happen to be present in a subproject area. Environmental and social risks and impacts that have been identified during project preparation have been discussed in consultation meetings with a) IP peoples who are present in subproject area, and b) other project stakeholders at commune, district, provincial and central level. These consultations aim to ensure potentially affected people, and relevant project stakeholders, are aware of such risks and stay engaged during subproject preparation and implementation for risk prevention and mitigation (Please see full list of social and environmental risks in the project's ESCMF (Section E&S Risks and Impacts) that may apply to any ethnic minorities who are present in subproject area. See also SEP, particularly section (Proposed Strategy for Consultation with Vulnerable/Disadvantaged Groups) for guidance on conducting consultation with IPs when IPs are present in the subproject area.

3.3 Mitigation Measures

Although above risks and impacts will be validated, and assessed at further length when subproject locations become known, IP(s) in a subproject's area may be affected disproportionately compared to the mainstream group. The distinctive cultural and socioeconomic characteristics of the IPs, including their existing livelihoods, etc. may expose IPs to further risks and impacts, increase their vulnerability and compromise their ability to respond to such risks and impacts – if a holistic approach is not in place. Effective communication, such as IEC, and active participation of involved IPs, are among important factors that contribute to effective engagement of IPs for meaningful consultation during subproject preparation and participatory monitoring during subproject implementation. The coordination of project stakeholders, including PMU, Contractors, local authorities, local agencies, local service providers, and most notably the active and full participation of IPs, collectively contribute to minimizing identified risks and potential impacts at identified subprojects.

Detailed mitigation measures for the above risks and potential impacts are proposed in the project's ESCMF. These mitigation measures are specific for design stage, pre-construction stage, construction stage, and operation stage,

During subproject design and pre-construction stage:

To avoid, minimize potential impacts related to land acquisition:

- Effort will be made by PMU to ensure irrigation and road design avoid acquisition of land from IPs;
- In case where avoidance is not feasible (because of technical requirements), minimize the need for land acquisition through alternative designs;
- Compensate affected IP in accordance with RPF, if avoidance is not possible.
- Provide additional financial and developmental support, as needed, based on meaningful consultation, to support affected IPs to fully and timely restore their livelihoods and income to the pre-project level, as a minimum.

During pre-construction stage:

To address identified risks for affected IPs at subproject level, PMU will implement the following:

- Prepare site-specific ESCMP
- Screen for presence of IP(s) in subproject area, based on detailed design
- Conduct Social Assessment (based on site-specific ESCMP)
- Develop IPPs, incorporating results from SA, including mitigation measures, etc. based on meaningful consultations
- Implement IPP (as part of site-specific ESCMP)
- As part of IPP, conduct Behavior Change Communication using audio-visual and local IP language to provide knowledge, raise awareness, change attitude, and promote behavior change among IP and local stakeholders to respond effectively to identified risks, particularly risks related to SEA/SH/VAC, communicable disease, traffic safety, culture related conflicts, etc.
- Where necessary, engage service provider (e.g. SEA/SH service providers) (for subproject being risk "high" or "substantial" on SEA/SH risk (risk is assessed as part of preparation of site specific ESCMP).

During construction stage:

- Implement the following as an integrated approach:
  i. PMU to implement site-specific ESCMP
  ii. PMU to continue implementing IPP – as part of site specific ESCMP (in close collaboration with IPs and local partners)
  iii. Contractor to implement C-ESCMP (including IEC campaign)
  iv. PMU to allow budget fully and timely (based on budget plan in IPP, Contractors' bill-of-quantity)
  v. PMU will enhance monitoring process to ensure risks are minimized. This can be achieved through coordinated works of SEO-PMU, DDIS consultant, E&S consultant, and independent E&S monitoring consultant, and participatory consultation of local IPs.

During operation stage:

- Ensure safety measures are in place (e.g. signpost, warnings, safe crossing, etc.)
- Continue IEC campaign, where need, to raise awareness of IPs on safe driving before new road is open to traffic
- PMU to maintain GRM's focal point (particularly during liability stage of contractors following construction completion)
- Ensure routine maintenance is carried out to ensure the road functions as designed

4. PREPARATION OF INDIGENOUS PEOPLES PLAN

When Indigenous Peoples and/or Ethnic Minority groups are present in a subproject area, PMU needs to prepare an IPP for the respective subproject. It is noted the IPP shall be prepared whether the identified IPs/EMs are affected positively (as subproject beneficiaries), or adversely, or both. To prepare an IPP for a subproject, a social assessment will be conducted for that subproject to inform the content development for the IPP and guide the IPP implementation. To ensure the social assessment focuses, social assessment shall be conducted vis-à-vis investment activities that are proposed under the mentioned subproject.

The following three steps shall be followed to prepare an IPP: 1) Screen for Indigenous Peoples/ Ethnic Minorities, 2) Conduct social assessment to develop IPP, and 3) Write-up the IPP:

4.1 Screening for Indigenous Peoples/ Ethnic Minorities (IP/EM)

Once the six subprojects (Ou Ta Pong, Lum Hach, Brambei Mom, Krapeau Trom, Yotassas, and Steung Krang Bat are approved, PMU's Consultant will conduct IP screening for these seven subprojects. The IP Screening involves two key tasks: 1) Define subproject area (based on subproject's area of influence), and 2) Screen for IP/EMs in the subproject area (See Annex 2 for more guidance). If the IP screening indicates that IP and/or EMs are present in the subproject area, an IPP has to be prepared.

4.2 Preparing an IPP

Preparation of an IPP involve two key steps: 1) conducting a Social Assessment and 2) writing up the IPP.

Step 1. Conduct a Social Assessment (SA)

The purpose of the social assessment is to identify and examine the potential impacts of the approved subproject on the livelihoods of the IP/EMs. In particular, the SA explores how the environmental and social risks and impacts associated with the proposed subproject activities affect the IP/EM. Based on this understanding, measures will be proposed to avoid, or mitigate the adverse impacts and risks and meanwhile enhancing the intended positive impacts of the subproject. The social assessment shall be conducted in a manner that is inclusive, culturally appropriate and gender sensitive. The depth and breadth of the SA should be based on the scope, scale and nature of the subproject impacts and risks. These are determined based on:

a) The magnitude of subproject's impacts on the affected IP/EM, including: (i) customary rights of use and access to land and natural resources; (ii) socioeconomic status; (iii) cultural and communal integrity and heritage; (iv) health, education, livelihood systems and social security status; and (v) indigenous knowledge; and
b) The vulnerability of the affected IP/EM.

The social assessment needs to have the following key elements:

a) Description of the subproject, including a map of the subproject area;
b) Policy, legal and administrative framework, including the international and national legal framework applicable to the subproject;
c) Scoping, including stakeholder identification and consultation plan;
d) Baseline environmental and social data;
e) Evaluation of environmental and social risks and impacts;
f) Development of mitigation, monitoring and management measures and actions.

Step 2. Write-up an IPP

Based on the information generated from the above social assessment, PMU's consultant will write up the IPP. An IPP shall include the key following elements, as a minimum.

a) A framework for continued consultation with these affected Indigenous Peoples during Project implementation;
b) Measures to provide these Indigenous Peoples with gender sensitive and culturally appropriate benefits;
c) Measures to avoid, minimize, mitigate, offset or compensate for any adverse Project impacts, and actions to address these impacts on the different groups in the community;
d) Culturally appropriate grievance procedures, monitoring and evaluation arrangements; and
e) A budget and time-bound actions for implementing the planned measures.

It is recommended that the IPP should be developed as an overall community development plan to address specific issues associated with the needs of the affected IP/EM. The IPP needs to address not only any adverse impacts and risks, but also enhance the intended positive impact of the subprojects through a continuous IP/EM engagement process during sub-sheme design, implementation, monitoring. This aims to promote the ownership of affected IP/EM and enhance subproject's development effectiveness.

4.3 Approving an IPP

PMU will submit all IPPs to the AIIB for review and clearance prior to IPP implementation.

4.4 Disclosing an IPP

All IPPs, once cleared by AIIB, will be disclosed locally in both English and Khmer at subproject area and will be posted on the websites of MoWRAM and MAFF. The same version will also be disclosed on AIIB's and IFAD's website.

4.5 Implementing an IPP

The IPP should be implemented in coordination with the local authorities and affected IP. The activities and the outcomes of the IPPs implementation should be monitored and evaluated (See also Section 7.3). MoWRAM and MAFF will ensure sufficient financial and human resources available timely prior to embarking IPP implementation.

5. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

5.1 Purpose of Engaging IP during project preparation and implementation

The AIIB's ESF defines stakeholder engagement as a process of identifying relevant stakeholders, conducting stakeholder analysis, and organizing a series of consultations to meet with project stakeholders for collecting stakeholders' feedback and concerns on project's risks and impacts, as well as stakeholders' development needs in relation to project purposes and activities. This aims to ensure the project's adverse impacts on IPs can be avoided, or minimized and mitigated if avoidance is not possible. For this project, it is important that IPs need to be consulted on their development needs (in relation to project purposes) to ensure they can receive socioeconomic benefits that are appropriate to them culturally.

5.2 Consultation results during Project Preparation

Consultation on project design and related IP issues was conducted in XXX 2023 at national level (as listed below), and with IPs potentially affected at subprojects during 25-30 June 2023 (on proposed project), and XXX September 2023 (based on initial design). (See summary of consultation results at Annex 1).

5.3 Consultation with IPs during Project Implementation

5.3.1 Overview of consultation process

During project implementation, consultations with IPs will be carried out for subprojects where IP screening has confirmed that IPs, as per AIIB ESS3 and IFAD's SECAP Standard 4, are present in the subproject areas. The consultations with identified IPs will be carried out on an iterative basis throughout subproject cycle, to ensure affected IP are informed of the risks and impacts identified for the subproject, and provide meaningful feedback. To ensure relevant IP stakeholders are engaged in project consultations, MoWRAM will identify IP group(s) present in subprojects, then conduct consultations with them – as per Section 4.2. The consultations with identified IP groups will be conducted in a culturally appropriate manner that takes into consideration gender sensitivity and intergenerational perspectives.

The consultations will seek also feedback from IPs on subproject's risks and impacts, suggestions to avoid or mitigate such risks and impacts, and developmental needs of the IP in relation to the project goal and subproject activities. To promote effective project design and build project support and ownership of local IPs, while reducing risk of potential delays during subproject implementation, MoWRAM will apply the engagement strategy. The engagement process will include analysis of IPs as project stakeholders, engagement planning, disclosure of information, and conducting meaningful consultations with the affected IP(s). The consultations will be based on the existing customary institutions and decision-making processes of the consulted IPs to

promote IP's participation and support for the subprojects. In particular, the consultations to be conducted by MoWRAM at subproject level will:

a) Involve the participation of IPs' representative bodies and organizations, such as councils of elders or village councils, or chieftains. Where appropriate, consultations shall be carried out with other members of the IP communities;

b) Allow for IPs to participate effectively in the design of project activities or mitigation measures that could potentially affect them – either positively or negatively;

c) Provide IPs sufficient time to confirm the broad support from the affected IP for proposed project activities, and associated risks and impacts.

Stage	Stakeholders	Activities	Outcomes
1. Subproject identification	▪ MoWRAM and MAFF ▪ Implementing agency at provincial and district level (e.g. PDWRAM, PDAFF) ▪ Commune and village authorities ▪ Target beneficiary households, including poor, vulnerable, and disadvantaged groups	▪ Government and agency meetings to explain need for safeguards, agree on selection criteria. ▪ Scoping – visiting potential sites, physical inspection. ▪ Meetings and briefings with provincial and district agencies. ▪ Meetings with commune and village authorities. ▪ Meetings with target beneficiaries.	▪ Agreement on objectives, priorities. ▪ Indicative development priorities for community. ▪ Identification of problems and issues. ▪ Basic design needs. ▪ Records of community participation disaggregated by sex and ethnicity.
2. Subproject preparation	▪ MoWRAM and MAFF ▪ Implementing agency at provincial and district level (e.g. PDWRAM, PDAFF) ▪ Commune and village authorities ▪ Target beneficiary households, including poor, vulnerable, and disadvantaged groups	▪ data requirements, participatory methods, consultation process and need for indigenous people /ethnic minority	▪ Data for preparation of socioeconomic profiles. ▪ Needs and constraints identified. ▪ Special considerations identified.

	▪ Commune and village authorities ▪ Target beneficiary households ▪ Members of vulnerable or minority groups ▪ Project technical assistance	▪ Open village meeting to explain purpose and process of consultations. ▪ Field level data collection – socio- economic data and surveys.	▪ Identification of gender issues, women's needs, and priorities. ▪ Identification of specific needs for tailoring innovative behavior change campaign
		▪ Household level and focus group discussions for identifying needs ▪ IP/ Ethnic minority households and separate focal discussion groups by gender. ▪ Discuss proposed project design. ▪ Obtain feedback, determine level and scope of support. ▪ Update briefings for provincial and district agencies.	▪ Identification of indigenous peoples/ethnic minority households that will be qualified/covered under the IP/EM ▪ Identification of needs for Information, Education and Communication material to be prepared in IP/EM language. ▪ Records of community participation and consultation results.
3. Subproject completion and evaluation	▪ MoWRAM and MAFF ▪ Implementing agency at provincial and district level (e.g. PDWRAM, PDAFF) ▪ Commune and village authorities ▪ Target beneficiary households, including poor, vulnerable, and disadvantaged groups	▪ Meetings with commune and village officials to discuss benefits and issues. ▪ Focus group discussions to review/evaluate benefits received, implementation issues, and improvements needed. ▪ Separate focal group discussion (by gender) where needed.	▪ Feedback on implementation progress, issues, and constraints. ▪ Suggestions for future improvements ▪ Records of community participation and consultation results

5.3.2 Free, Prior and Informed Consultation/Consent

The project will be designed to avoid any project activities that may

(a) have impacts on land and natural resources subject to traditional ownership or under customary occupation or use;
(b) cause relocation of Indigenous Peoples from land and/or limitations on access to natural resources subject to traditional ownership or under customary occupation or use; or
(c) have significant impacts on Indigenous Peoples' cultural resources.

The SIA process will determine the applicability of FPIC but on top of it, the project will ensure engaged the affected IP/EM in a meaningful consultation process by adopting the Informed Consultation and Participation (ICP) approach to ensure affected IP/EM are engaged in the informed consultation process and participating in project's consultation sessions. The consultation process adopted will be inclusive and iterative and promote in-depth exchange of views and information. PMU will ensure the views of the affected IP/EM concerning matters that affect IP/EM directly are considered and incorporated into subproject's design and implementation, particularly into proposed mitigation measures, sharing of development benefits and opportunities, and implementation issues.

The consultation process will also aim to capture both men's and women's views that are obtained from separate engagements/meetings, and will reflect men's and women's different concerns and priorities about subproject's risks and impacts, mitigation mechanisms, and benefits, in subproject implementation process. PMU will document the consultation process, particularly measures that PMU will take to avoid or minimize risks to and adverse impacts on affected IP/EM, and inform affected people of how their concerns have been considered and taken into action.

5.4 Information Disclosure

Prior to conducting consultations, MoWRAM will notify the concerned IPs of the consultation plan during preparation. MoWRAM will provide affected IPs with initial subproject information in the form of booklet in both Khmer and local language (if applicable). This initial information should be provided to IP at least two weeks prior to consultation. If the concerned IPs do not have a written language, the IP will be provided the information in Khmer and are explained verbally in the local language of the concerned IP to ensure the IP are fully informed of the consultation purpose and initial subproject information.

For public consultation, the draft IPPF (in English) and its Executive Summary (in Khmer) will be disclosed on MoWRAM's website on XXX (https://www.). The Executive Summary (in Khmer) will also be disclosed in hard copy at MoWRAM's public library in Phnom Penh, and in the offices of Provincial Departments of Water Resources and Meteorology in all four project provinces. Once finalized, the IPPF will be re-disclosed again through the above channels prior to AIIB's and IFAD's project appraisal. The draft and final IPPF will be disclosed in English on the AIIB's and IFAD's website.

During project implementation, all draft IPPs, once completed by MoWRAM and submitted to the Bank for review, shall be disclosed to affected IP communities in Khmer language. The summary of the IPP (in the form of an Information Booklet) will be translated into IP's language if the consulted IPs have their own written language. Public meetings will be hold with the affected IP(s) to explain the contents of the relevant IPP in their mother language to ensure affected IPs understand what and how the activities under the IPP will be carried out, including E&S risks and impacts of subproject activities, and how the IPs will be engaged by MoWRAM in consultation meetings during subproject preparation, and in monitoring during subproject implementation to minimize identified E&S risks and impacts. IPPs – prepared for relevant subprojects, will be disclosed locally in Khmer and local IP language (if applicable), as well as in Khmer and English language on MoWRAM's website. The English version of the IPPs will be disclosed on the AIIB's and IFAD's website.

6. GRIEVANCE REDRESS MECHANISM

6.1 Purpose of Project's GRM

The purpose of the GRM in this IPPF is to provide aggrieved IP with grievance redress procedures that are accessible, easily used, and free of charge to ensure that the grievances submitted by the affected IPs are solved timely. The GRM in this IPPF guides how a complaint of affected IP can be lodged, including forms of grievance lodging, channels, and steps that can be taken.

The GRM also describes the time-limits, where possible, for each step, such as time-limit for acknowledging receipt of complaints, notification of resolution decision. During the grievance resolution progress, where necessary, dialogues will be held between the aggrieved IP and project's GRM focal point that are designated for each step. Dialogues with affected IP during complaint resolution process aims to promote mutual understanding and collaboration among concerned parties.

The project also includes an appeal process that a complainant can use when they are dissatisfied with the resolution results/decision, or their complaints are not resolved within a specified timeframe. During subproject implementation, IPs in the subproject area will be reminded of the availability of this GRM and will be explained during consultations about how to use it.

6.2 Grievance Redress Procedures

The following section outlines complaint handling procedures that are designed to assist affected Indigenous Peoples (IPs) in making complaints regarding the project. These procedures are designed to address potential impacts and risks during project preparation and cover three key areas: a) land acquisition, where individual IP land is acquired either permanently or temporarily during construction, b) gender based violence, where IPs are victims, survivors, witnesses, or otherwise affected by SEA/SH actions related to the project, and c) general complaints and concerns related to project design, adverse impacts on IPs such as dust, noise, vibration, and any other aspects that IPs attribute to project activities.

6.2.1 Grievances related to Land Acquisition

The project has prepared a standardized GRM for stakeholders affected by land acquisition, including IPs. However, given the presence of various IP groups in project provinces, the IP groups in each subproject area will be consulted for feedback on the project's standardized GRM, as presented below. The purpose of consultation on the GRM in this IPPF is to ensure that the standardized steps and process below are culturally appropriate to the affected IP group. If required by the consulted IPs, the GRM below will be updated to reflect the customary complaint handling procedures currently practiced by the consulted IP and/or may be preferred by the affected IPs, based on the Social Assessment of IPs once site-specific subprojects are identified or confirmed during project implementation (See detailed Procedures at Section 6.2.2 of project's Resettlement Policy Framework).

6.2.2 Grievances related to Gender Based Violence/SEA/SH

In case the IP wishes to submit a grievance related to gender based violence, they can lodge their grievance using the Redress Procedure for Complaints related to gender (See Section 6.4.3 in the Stakeholder Engagement Plan for details).

6.2.3 Grievances related to any other aspects not covered in the above GRM

If environmental factors, such as elevated levels of dust or increased noise during evening hours, negatively impact the living or business activities of IPs, several channels will be established for their convenience. These channels may include:

- **PMU GRM focal point's telephone;**

- **Local IP leaders;**
- **Contractor's hotline:** to report cases that they think contractors can timely address them (contact detail of Contractors will be posted at construction sites, and distributed to IPs (through Subproject Information Booklet) during consultations, and posted at public billboards of Commune/Sangkat offices, pagodas; and
- **Commune/Sangkat offices**

7. IMPLEMENTATION ARRANGEMENTS

7.1 Implementation Arrangements

The MoWRAM will be responsible for implementing this IPPF. The Project Director (PD) at MoWRAM will be responsible for providing overall guidance, policy advice, conducting internal coordination, discussing and resolving issues at project level – in association with relevant government agencies where needed. The Project Manager (PM) at MoWRAM will provide day-to-day support to the PD and will be responsible for ensuring that the IPPF will be followed. The PM will oversee the work of the ESOs and ensure proper screening of IP groups will be carried out for each subproject, and steps for IP screening and social assessment described in this IPPF are followed. Within MoWRAM, the ESOs will be responsible for carrying out day-to-day activities set forth in this IPPF. An IP specialist will be appointed within MoWRAM's PMU (in addition to a Resettlement and Environmental Specialist) to provide guidance to Provincial PDWRAM in conducting consultation with affected IP in respective subprojects.

The MoWRAM needs to inform the AIIB and IFAD of the IP screening results and steps that MoWRAM will take in case IPs are present in the subproject area. When IPs are found in the subproject, MoWRAM will engage IP consultants to work closely with PMU's IP Specialist and PDWRAM to conduct Social Assessment and prepare IPPs. PMU's IP specialist and IP consultants will visit the subproject sites and work closely with PDWRAM, local authorities, relevant agencies, NGOs, particularly local IP leaders and IP members, including vulnerable groups of affected IP communities, to conduct Social Assessment.

7.2 Capacity Building

Since the MOWRAM is new to AIIB's ESF and IFAD's SECAP, and have not been familiar with requirements of AIIB's ESS3 and IFAD's SECAP Standard 4, they may not be able to conduct meaningful consultation from initial years of project implementation. In the first year, these specialists will be trained by the AIIB task team on ESF with a particular focus ESSs and IFAD's SECAP with a particular focus Standard that apply to this project to enable newly appointed ES specialists at the MOWRAM to provide appropriate support. Where needed, IP consultant will be engaged to provide additional support to PMUs' specialist, particularly in the initial years of project implementation. Since independent ES monitoring consultant will be engaged by PMU at MoWRAM, feedback from this consultant, alongside internal monitoring results, will provide regular feedback to PMU on how IPPF/IPP is carried out so that adjustment/improvement could be made appropriately and timely.

7.3 Monitoring & Evaluation

The application of the IPPF, including implementation of subproject IPPs, will be monitored internally by the MoWRAM. Adverse impact on IPs (if any) due to land acquisition will be monitored by GDR and MoWRAM as part of implementation arrangement set forth in Section 9.1.2 of project's Resettlement Planning Framework (RPF).

Within MoWRAM, the ESO will be responsible for conducting quarterly monitoring activities of the activities set for under all subproject IPPs. Monitoring of IPPF/IPP implementation will focus on assessing the compliance of IPP implementation vis-à-vis the followings:

- IP screening process and results;
- Information disclosure;
- Quality of Social Assessment and of IPP preparation;
- IPP implementation process, the level of achievement at output, outcome, and purpose levels;

- Functioning of project's GRM (as customized to respective EG/IP groups present in each subproject area to ensure the GRM is culturally appropriate to the local EG/IPs);
- Development activities carried under IPPs (based on development needs of IPs);
- Results and impacts of IPPs (in ensuring the affected IP receive socioeconomic benefits of the project that is culturally appropriate, gender and intergenerational inclusive, and contributing to achieving the objective of the AIIB's ESS3 and IFAD's SECAP Standard 4).

In addition to internal monitoring, the project will encourage IPs in subproject areas to participate in monitoring and evaluation of IPP implementation process and implementation outcome which affects them. During SA exercise, feedback and suggestions from IPs will be solicited as to how they wish to participate in monitoring and evaluation of IPP activities.

MOWRAM will provide a quarterly IPP implementation report to the AIIB and IFAD. These results will be incorporated into MoWRAM's consolidated Environmental and Social Compliance Report (ESCR) (See Annex 4 for Indicative Indicators for Internal Monitoring of IPP implementation).

7.4 Reporting

MoWRAM's ESOs will ensure feedback from affected and interested IP, as well as grievances submitted by affected IPs, are resolved timely and effectively, and that resolution results are reported timely back to the aggrieved IPs. The method of reporting back depends on the stakeholders, and as follows:

- For stakeholders at national level, email and/or official letter will be used to report back to stakeholders following consultations and/or workshops. The content of the report will summarize what comments, suggestions, concerns that have been received, by whom and when, and how such comments, suggestions, concerns were considered.
- For stakeholders at local level, follow-up meetings/consultations will be conducted to informed stakeholders know on how comments, suggestions, concerned were considered.
- For Indigenous Peoples, project's responses to their comments, suggestions, concerns are reported back to them in subsequent face-to-face consultations – in line with the project's SEP and the IPPF, including how the project had considered and addressed their concerns through concrete actions to be carried out during subproject implementation process and through IPP implementation.

Grievances of all project IP will be reported back to them through project's GRM channels within the timeframes specified for each step of the above GRM procedure.

8. COSTS AND BUDGET

8.1 Costs

Indicative costs for IPPF implementation are estimated during project preparation (See Figure below) for the purpose of budget planning. The actual costs of IPP implementation depend on the number of IPPs, including scope and activities to be carried out under each IPP, during project implementation. The estimated cost below may be updated once the list of subprojects is finalized.

8.2 Budget

The budget for implementing IPPs will be allocated from project's financing (See Figure below). Implementation, based on subprojects that will be identified/confirmed during project implementation. This budget plan will be updated to ensure funding is planned annually to ensure timely and effective implementation of proposed activities.

Table 2 – Key activities and costs for supporting IPP implementation (in US Dollars)

No.	Key activities	Stakeholders involved	Estimated costs (per province x 4)	Sub-Total (Counterpart Budget)	Sub-Total (AIIB finance)	Sub-Total (IFAD finance)	Total
1	Recruitments of IP consultants to conduct screening and SA	• MoWRAM (oversight) • ESO (implement)	3,000 x 4	12,000	-		12,000
2	Recruitment of bilingual facilitators to support consultations as part of SA	• MoWRAM • ESO (implement)	1,000 x 4	4,000	-		4,000
3	Conduct Social Assessment and Prepare subproject IPPs	• MoWRAM (oversight) • ESO (lead) • IP Consultant (implement)	5,000 x 4	20,000	-		20,000
4	Conduct mitigation measures, development activities, and relevant activities, as part of IPP (based on the needs of consulted IPs, e.g. trainings for IP on good agriculture practices such as Integrated Pest Management, water saving technology (e.g. alternative wet dry, fertilizer needs assessment/ application, alternative job that is not land based for income generation activities which are culturally appropriate, etc.)	• MoWRAM (lead) • Consultant (implement)	5,000 x 4	20,000	-		20,000
5	Monitoring and Evaluation, Reporting	• MoWRAM (oversight) • ESO (implement)	2,000x4	8,000	-		8,000
6	Staff allowance	• MoWRAM (oversight) • ESO (implement)	$34 x 7 staffs x 10 days x 4 provinces	9,520	-		9,520
7	Transport		1,000 x 4	4,000	-		4,000
8	Data collection		1,000x 4	4,000	-		4,000
9	Others		500 x 60	30,000	-		30,000
10	Contingency (10% of above 9 items)						11,152
					Grand-Total		**122,672**

ANNEXES

Annex 1 – Guidance for Screening for Indigenous Peoples/Ethnic Minorities

Once a subproject is approved, PMU's Consultant will conduct initial screening for the presence of IP/EM in the subproject area. The following steps could be followed:

1) **Define area of influence** (subproject area): subproject area needs to be defined, spatially, based on the subproject area described in the most updated Environmental and Social Impact Assessment/ Environmental and Social Management Plan prepared for the subproject.

2) **Screening.** Screening of IP/EM consist of two key tasks: desktop review and field works.

Desktop screening. Conduct IP/EM screening vis-à-vis above defined subproject. Identification of potential presence of IP/EM could be carried out initially based on the IP database managed by the Ministry of Rural Development and the Ministry of Planning. In addition, commune authorities within the subproject area could be asked to provide the most updated information about IP/EM groups living in their respective communes to facilitate consultant's initial desktop screening. It is noted that Ethnic Minorities refer to all groups by their own ethnicity and IP in the context of Cambodia refers to IP groups that are officially recognized. Screening results need to be updated if there is change to subproject area.

Consultant's screening needs to cover IP groups (that are recognized by the Government), and other ethnic groups based on the definition of IP of AIIB and IFAD (See also Definitions section of this document).

Field visit. After completing desktop review, PMU's consultant will visit the subproject's area of influence to validate their above initial screening results In addition to face-to-face validation with local commune authorities (and district authorities if needed) on initial screening result, the consultant need to conduct field observation in area where identified IP/EM are living, and their production area. Consultant may need to interview IP/EM and their respective leaders living in subproject area, and local people who are knowledgeable about IP/EM such as the village chiefs, opinion leaders, mass organizations such as commune women's union, farmers' association, to understand more about the socioeconomic and cultural life, livelihood activities, cultural heritages of the identified IP/EM in the subproject area. Consultant needs to visit the field again if there is change to subproject area.

While doing desktop screening and making field visit for validation of desktop review, the following guiding questions and IP screening form can be used:

- Are there socio-cultural groups in or use the subproject area who may be considered as hill tribes, ethnic minorities or indigenous communities within the subproject area?
- Are there national or local laws or policies as well as anthropological research or studies that consider these groups residing in or using the subproject area as belonging to ethnic minorities, IPs or cultural communities?
- Do such groups identify themselves as being part of a distinct social or cultural group?
- Do such groups maintain collective attachments to distinct habitats or ancestral territories and/or to the dominant society in these habitats and territories?
- Do such groups maintain cultural, economic, social and political institutions distinct from the dominant society and culture?
- Do such groups speak a distinct language or dialect?
- Have such groups been historically, socially and ecologically marginalized, disempowered, excluded and/or discriminated against?
- Are such groups represented as IPs in any formal decision-making bodies a the National of local levels?

- Do such groups experience subjugation, marginalization, dispossession, exclusion or discrimination?
- How vulnerable the groups are under the subproject's impacts and risks?

If screening result indicates that the ethnic groups being considered matches the definition of IPs as per AIIB's ESS 3 and IFAD's Standard 4 (See definition of IPs at section "Definitions" of this document), the IP screening results should be documented fully in the form of IP Screening Report and recommend that an IPP will be prepared for the relevant subproject.

Province-Capital:	**Municipality-District-Khan:**	**Location map attached**	
		Yes	No
Commune-Sangkat:	**Village:**	**Street-road No.:**	
Type of civil work/activity:			
Brief description of work/activity and location of civil work*: [Roads, community pond. required/purpose of civil work, (table/explain each activity) number of village (number of population) affected with explanation aboutthe affected community]*			

Screening checklist				
Questions	**Yes**	**No**	**Not known**	**Remarks**
A. Indigenous Peoples Identification				
1. Are there socio-cultural groups present in or usethe Project/Subproject area who may be considered as "tribes" (hill tribes, schedules tribes,tribal peoples), "minorities" (ethnic or national minorities), or "indigenous communities" in the Subproject area?				
2. Are there national or local laws or policies as wellas anthropological research/studies that consider these groups present in or using the subproject areas belonging to "ethnic minorities", scheduled tribes, tribal peoples, national minorities, or cultural communities?				
3. Do such groups self-identify as being part of a distinct social and cultural group?				
4. Do such groups maintain collective attachmentsto distinct habitats or ancestral territories and/or tothe natural resources in these habitats and territories?				

5. Do such groups maintain cultural, economic, social, and political institutions distinct from the dominant society and culture?				
6. Do such groups speak a distinct language or dialect?				
7. Has such groups been historically, socially and economically marginalized, disempowered, excluded, and/or discriminated against?				
8. Are such groups represented as "Indigenous Peoples" or as "ethnic minorities" or "scheduled tribes" or "tribal populations" in any formal decision-making bodies at the national or local levels?				

Questions	**Yes**	**No**	**Not known**	**Remarks**
B. Identification of potential impacts *(provide elaboration in Remarks column)*				
9. Will the subproject directly or indirectly benefit or target IPs?				
10. Will the subproject directly or indirectly affect Indigenous Peoples' traditional sociocultural and belief practices? (e.g. childrearing, health, education, arts, and governance)				
11. Will the subproject affect the livelihood systemsof Indigenous Peoples? (e.g., food production system, natural resource management, crafts and trade, employment status)				
12. Will the subproject be in an area (land or territory) occupied, owned, or used by Indigenous Peoples, and/or claimed as ancestral domain?				
C. Identification of Specialist Requirements				
13. Commercial development of the cultural resources and knowledge of IPs?				
14. Physical displacement from traditional or customary lands?				
15. Commercial development of natural resources (such as minerals, hydrocarbons, forests, water, hunting or fishing grounds) within customary lands under use that would impact the livelihoods or the cultural, ceremonial, spiritual uses that define the identity and community of Indigenous Peoples?				
16. Establishing legal recognition of rights to landsand territories that are traditionally owned or customarily used, occupied or claimed by IPs?				
17. Acquisition of lands that are traditionally ownedor customarily used, occupied or claimed by IPs?				

Anticipated impact on IPs

Subproject activities		**Expected positive impact**	**Expected negative impact**

Subproject Category	Subproject eligibility	Next steps
A. Subproject has impacts (negative or positive) on IP communities residing withinthe subproject area.	A/B	Prepare IPP describing the completion of meaningful consultations with the IPs and the identification of appropriate mitigation measures to obviate or mitigate any identified negative impacts.
B. Subproject has no impacts sine there are no IP communities residing in thesubproject area.	C	No IPP required and no further action is needed.

IP Screening checklist by:

	Name	Position:
	Signature	Date:

Annex 2 – Guidance for Preparing an Indigenous People Plan (IPP)

As mentioned in Section 4.2, preparation of an IPP involves two key steps: conducting a Social Assessment (SA) and writing up the IPP.

1. Conducting a Social Assessment for the purpose of IPP

The SA aims to understand how the IP is affected by the subproject's activities, which informs how mitigation and development measures shall be proposed. The SA aims to explore measures to ensure a) affected IPs shall receive socioeconomic benefits culturally appropriate to them; b) if there are any potential adverse impacts and risks for IPs, such risks and impacts will be avoided to extent possible; c) where avoidance is not possible, measures are proposed to minimize, mitigate, and compensate for unavoidable adverse impacts. Mitigation and development measures will be proposed based on meaningful consultations with the IP households affected by subproject's investment activities.

The scope of SA will be proportionate to: (a) the magnitude of subproject's risks and impacts on the IP; socioeconomic status; cultural and communal integrity and heritage; health, education, livelihood systems and social security status; and indigenous knowledge; and (b) the vulnerability of the affected Indigenous Peoples. The IPP will also need to complement the broader coverage of environmental and social risks and impacts identified in subproject's Environmental and Social Impact Assessment that is conducted to develop subproject Environmental and Social Management Plan. The IPP need to provide specialized guidance on how specific issues associated with the needs of affected IP shall be addressed.

The level of detail and comprehensiveness of the IPP should be proportionate to subproject's risks and impacts. Mitigation and development measures that are proposed for the affected IPs should be culturally appropriate to the IPs.

2. Writing up the IPP

An Indigenous Peoples Plan (IPP) is required for subprojects that have impacts on IPs (positive, adverse, or both). The level of detail and comprehensiveness of IPP is commensurate with the significance of potential impacts on indigenous peoples. The substantive aspects of this outline will guide the preparation of IPPs,although not necessarily in the order shown.

1. **Executive Summary of the Indigenous Peoples Plan**
   This section concisely describes the critical facts, significant findings, and recommended actions.

2. **Description of the Project**
   This section provides a general description of the subproject, discusses the subproject interventions and activities that may bring impacts on indigenous peoples; and identifies the subproject area.

3. **Social Impact Assessment**
   This section:
   a) Reviews the legal and institutional framework applicable to IPs in the subproject context.
   b) Provides baseline information on the demographic, social, cultural, and political characteristics of the affected indigenous peoples communities; the land and territoriesthat they have traditionally owned or customarily used or occupied; and the natural resources on which they depend.

c) Identifies key Project stakeholders and elaborate a culturally appropriate and gender- sensitive process for meaningful consultation with indigenous peoples at each stage of subproject preparation and implementation, taking the review and baseline informationinto account.
d) Assesses, based on meaningful consultation with the affected indigenous peoples, thepotential adverse and positive effects of the Project. Critical to the determination of potential adverse impacts is a gender-sensitive analysis of the relative vulnerability of,and risks to, the affected indigenous peoples given their particular circumstances andclose ties to land and natural resources, as well as their lack of access to opportunitiesrelative to those available to other social groups in the communities, regions, or national societies in which they live.
e) Includes a gender-sensitive assessment of the affected IPs perceptions about the project and its impact on their social, economic, and cultural status.
f) Identifies and recommends, based on meaningful consultation with the affected IPs, the measures necessary to avoid adverse effects or, if such measures are not possible,identifies measures to minimize, mitigate, and/or compensate for such effects and to ensure that the indigenous peoples receive culturally appropriate benefits under the Project.

4. Information Disclosure, Consultation, and Participation

This section: (i) describes the information disclosure, consultation, and participation process with the affected indigenous peoples that was carried out during subproject preparation; (ii) summarizes their comments on the results of the ESIA and identifies concerns raised during consultation and how these have been addressed in the Project design; (iii) in the case of Project activities requiring broad community support, documents the process and outcome ofconsultations with affected IPs and any agreement resulting from such consultations for the Project activities and safeguard measures addressing the impacts of such activities; (iv) describes consultation and participation mechanisms to be used during implementation to ensure ethnic minority participation during implementation; and (v) confirms disclosure of thedraft and final IPP to the affected IPs.

5. Beneficial Measures

This section specifies the measures to ensure that the IPs receive social and economic benefits that are culturally appropriate, and gender responsive.

6. Mitigation Measures

This section specifies the measures to avoid adverse impacts on IPs; and where the avoidance is impossible, specifies the measures to minimize, mitigate and compensate for identified unavoidable adverse impacts for each affected indigenous peoples.

7. Capacity Building

This section provides measures to strengthen the social, legal, and technical capabilities of (i)government institutions to address IPs issues in the Project area; and (ii) IPs organizations inthe Project area to enable them to represent the affected IPs more effectively.

8. Grievance Redress Mechanism

This section describes the procedures to redress grievances by affected IPs. It also explains how the procedures are accessible to indigenous peoples and culturally appropriate and gender sensitive.

9. Implementation Arrangement

This section describes institutional arrangement responsibilities and mechanisms for carryingout the various measures of the IPP. It also describes the process of including relevant local organizations and nongovernment

organizations in carrying out the measures of the IPP.

10.Monitoring, Reporting and Evaluation

This section describes the mechanisms and benchmarks appropriate to the Project for monitoring and evaluating the implementation of the IPP. It also specifies arrangements for participation of affected indigenous peoples in the preparation and validation of monitoring, and evaluation reports.

11.Cost Estimate and Financing

This section provides an itemized budget for all activities described in the IPP.

Annex 3 – Indicators for IPP Implementation Monitoring

Monitoring indicators should assist the project to assess progress of the Indigenous Peoples Plan (IPP) and whether mitigation measures are effective, resulting in desired outcomes. This enables the project to respond to any issues and manage change accordingly.

Indicators that show implementation progress are called process indicators and give some certainty that the project is proceeding according to plan.

Indicators that measure whether the IPP mitigation measures are successful are called outcome indicators and reflect the results of the process.

It is important that an appropriate number of indicators be included in the monitoring plan. Too few may leave gaps in critical areas. Too many may overburden the collection process, and diminish quality. Use the minimum but necessary number of monitoring indicators to ensure adequate IPP implementation and expected outcomes.

Some examples of process and outcome indicators are shown below. They are not an exhaustive list, and should be selected as required.

Example of Process Indictors	
Demographic baseline	• The numbers of affected Indigenous Peoples (IP) by category of impact, gender, age, habitat (village etc.), income, status and position • Number of households with handicapped, elderly or invalid members • Number of female headed households • Number of vulnerable households (poor, elderly) • Number of households by ethnic group • Number of births and deaths
Consultation and participation	• Number of consultation and participation activities that occur—meetings, information dissemination, brochures; flyers, training • Percentage of IP women as participants; number of meetings exclusively with IP women • Percentage of vulnerable IP groups represented / attending meetings; number of meetings exclusively with vulnerable IP groups. • Languages used at meetings • Good faith negotiations—recording of process, participants, locations, correspondence • Broad community support—record of processes, participants, locations and agreement obtained • Consultation and participation progress against plan and budget
Mitigation measures	• Progress of implementation of mitigation / beneficial measures against plan • Number of activities that occur/completed—such as construction, livelihood restoration, disbursements, training • Percentage progress against timelines and budget
Grievance redress	• Total number of people/groups using the grievance redress procedure. • Number of distinct people/groups. Any IP group with significantly more grievances? • How many times has a household submitted the same grievance? • Number of grievances resolved? • Length of time taken to be resolved? • Types of grievance categories and prevalence

Implementation problems	• Identified delays — (days, cost) due to personnel, capacity, insufficient funds, etc. • Number of times implementation schedule revised
Example of Outcome Indicators	
Consultation and participation program	• Awareness of IP issues among implementing stakeholders in each sector • Awareness of IPP mitigation and beneficial measures amongst recipients • Awareness of project details amongst stakeholders • IP perception of effectiveness, cultural appropriateness and inclusiveness of consultation measures • Attendance at consultation and participation activities Level of involvement by IP and representatives in the design and implementation of consultation and participation
Enhanced dignity of IP groups, integrity of traditional kinship networks and livelihood patterns	• Changes in religious/cultural practices • Changes in cultural governance • Participation in cultural governance (by gender, status) • Number of people (age and sex) who can speak national language and/or local dialect • Changes in condition of schools, community buildings, temples structures • Numbers of religious/cultural events and persons (monk shamans, priests etc.) • Participation in cultural/religious events (by gender, time/resources allocated)
Livelihoods and living standards	• Major asset inventory—e.g. vehicle, phone, tools, kitchen equipment • Changes in patterns of IP occupation, production, and resource use • Changes in income and expenditure patterns among IP households • Savings • Change in food used by IP—amount, nutrition source • Cost of living changes—market prices etc. • Changes in key social parameters—gender roles of production • Vulnerable groups—status, relative income, livelihood · Education—literacy and numeracy level in national/ethnic language • School attendance of IP children (by sex and age) • Key health indicators of IP (by gender, age)

IFAD
Investing in rural people

Cambodia

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: Annex 6 Caisar Escmf

Document Date:	28/07/2025
Project No.	2000003926
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Asia and the Pacific Division
Programme Management Department

KING DOM OF CAMBODIA

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MINISTRY OF WATER RESOURCES AND METEOROLOGY

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience Project

Annex 6

ENVIRONMENTAL, SOCIAL AND CLIMATE MANAGEMENT FRAMEWORK

Version 2

30 September 2023

ACKNOWLEDGEMENTS

The CAISAR project is composed of three sub-project command areas – Ou Ta Paong, in Pursat Province, Lum Hach, in Kampong Chhnang Province and Krang Ponley in Kampong Chhnang, Kapong Speu and Kandal This ESCMF report was submitted by the Cambodia Ministry of Water Resources and Meteorology (MOWRAM) (Accredited Entity) for GCF financing under the CAISAR project. The report was prepared by Ron Livingston (CAISAR SECAP Team Leader) with key inputs from Tuan Anh Le (CAISAR SECAP Gender and Social Safeguards Expert); Sopheak Kong (CAISAR SECAP National Deputy Team Leader) and Socheat Penh (CAISAR SECAP National Environmental Expert under the overall guidance of his H.E. Chann Sinath, MOWRAM AIIB Project Director; Ms. Bo Zhang, CAISAR Project Team Leader, Investment Operations Officer, AIIB; and Mr. Frew Behabtu, Country Director for Cambodia, IFAD.

The ESCMF report should be read in conjunction with the other safeguards documents (Stakeholder Engagement Plan, Resettlement Planning Framework, Indigenous Peoples Planning Framework, Gender Assessment & Social Action Plan, and Environmental and Social Impact Assessment).

Assessment of environmental and social risks and impacts, both inherent and project-related, was based on supporting background reports, desk reviews of literature and similar projects, and extensive consultation during the project design. Many consultations with National, Provincial and District agencies and community members in project communes have been undertaken on the various aspects of the CAISAR project. The first round of consultations specific to the ESCMF were conducted during June 2023. We are grateful to the focal points of four project provinces who worked hard to support the introduction of the planned projects and discussions on the planned objectives, outcomes and benefits. Without their commitment and active support in leading the extensive consultation effort, the consultations would not have been possible.

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ABBREVIATIONS

4P	Public–Private–Producer Partnership
AIIB	Asian Infrastructure Investment Bank
AVC	Agricultural Value Chain
BAU	Business-as-usual
CFM	Community Forest Management
CIG	Community Interest Group
COVID-19	Severe Acute Respiratory Syndrome Coronavirus 2
EM	Ethnic Minority
ESMP	Environmental & Social Management Plan
ESS	Environmental & Social Standards
FA	Farmers Association
FC	Farmers' Cooperative
FAO	Food and Agriculture Organization of the United Nations
FLA	Forest Land Allocation
FGD	Focus Group Discussion
FHH	Female-Headed Household
FPIC	Free, Prior, Informed Consent
FWUC	Farmer Water Users Community
GASIP	Gender Action and Social Inclusion Plan
GCF	Green Climate Fund
GBV	Gender Based Violence
GRM	Grievance Redress Mechanism
HHS	Household Survey
IEC	Information, Education and Communication
IFAD	International Fund for Agricultural Development
IPP	Indigenous Peoples' Plan
KII	Key Informant Interview
MOWRAM	Ministry of Water Resources and Meteorology
NDC	Nationally Determined Contribution

NTFP	Non-Timber Forest Products
OCOP	One Commune, One Product
OHS	Occupation Health and Safety
PFES	Payment for Forest Environmental Services
PMU	Project Management Unit
SDP	socio-economic development planning
SEA/SH	Sexual Exploitation and Abuse/Sexual Harassment
SECAP	Social, Environmental, and Climate Assessment Procedures
SEP	Stakeholder Engagement Plan
PMU	Project Management Board
VAC	Violence Against Children

Table of Contents

Acknowledgements ii

Abbreviations iii

List of Figures ix

Executive Summary x

1. Introduction 1

1.1 Project Rationale 1

1.2 Country & Project Context 1

1.2.1 Climate Change Impacts and Vulnerability of the Agriculture Sector 4

1.3 Purpose and Application of the ESCMF 7

1.4 Scope of the ESCMF 8

2. Project description 10

2.1 Project Objective, Components, Area and Beneficiaries 10

2.2 Component 1: Improving farm-level climate adaptation, resilience, and water use efficiency 10

2.3 Component 2. Upgrading and climate-proofing water infrastructure for increased resilience 12

2.4 Component 3. Institutional Strengthening 14

3. Policy, Legal and Administrative Framework 15

3.1 Applicable National Laws and Regulations 15

3.1.1 Laws/Sub-Decrees relevant to Environment and Natural Resources Management 15

3.1.2 EIA Classification 22

3.1.3 Occupational and Community Safety and Health 23

3.1.4 Applicable Evaluation Ambient Quality Standards 24

3.1.5 International Conventions 26

3.2 Application of AIIB, IFAD and GCF Environmental, Social, and Climate Risks Standards/Procedures 26

3.2.1 AIIB's Environmental and Social Framework 26

3.2.2 AIIB's Environmental and Social Standards 27

3.2.3 Environmental and Social Standard 1: Environmental and Social Assessment and Management Scope and Application 27

3.2.4 Environmental and Social Standard 2: Land acquisition and involuntary resettlement 27

3.2.5 Environmental and Social Standard 3: Indigenous Peoples 27

3.2.6 Application of IFAD and GCF Environmental, Social, and Climate Risks Standards/Procedures 28

3.2.7 SECAP's Environment and Social Standards (ESSs) are described as below: 28

3.3 Gap Analysis and Gap Filling Measures 31

3.3.1 Environmental, Social and Climate Assessment in Cambodia 33

3.3.2 Labor and Working Conditions in Cambodia 33

4. ENVIRONMENT, SOCIAL & CLIMATE ASSESSMENT **35**

4.1 Project Objective, Components, Areas and Beneficiaries *35*

4.2 Project Area *35*

4.3 Project target areas and beneficiaries *41*
4.3.1 Krang Ponley 41
4.3.2 Lum Hach 41
4.3.3 Ou Ta Paong 41

4.4 Socio-economic context and vulnerability *43*

4.5 Agriculture *44*

4.6 Water Resources *45*

4.7 Irrigation *46*

4.8 Biodiversity *47*
4.8.1 Designated areas and species of interest 47
4.8.2 IBAT Initial Biodiversity Assessment 51
4.8.3 Protected Areas, Key Biodiversity Areas and IUCN Threatened Species 52

4.9 Assessment of Environmental, Social and Climate Risks, Impacts and Mitigation Measures *56*
4.9.1 Pre-Construction Phase 56
4.9.1.1 Environmental Risks and Impacts (Pre-construction Phase) 56
4.9.1.2 Social Risks and Impacts (Pre-construction Phase) 56
4.9.1.3 Climate Risks and Impacts (Pre-construction Phase) 57
4.9.1.4 Environmental Mitigation Measures (Pre-construction Phase) 57
4.9.1.5 Social Mitigation Measures (Pre-construction Phase) 58
4.9.1.6 Climate Mitigation and Adaptation Measures (Pre-construction Phase) 58
4.9.2 Construction Phase 59
4.9.2.1 Environmental Risks and Impacts (Construction Phase) 59
4.9.2.2 Social Risks and Impacts (Construction Phase) 59
4.9.2.3 Climate Risks and Impacts (Construction Phase) 59
4.9.2.4 Environmental Mitigation Measures (Construction Phase) 60
4.9.2.5 Social Mitigation Measures (Construction Phase) 60
4.9.2.6 Climate Mitigation and Adaptation Measures (Construction Phase) 61
4.9.3 Operations Phase 61
4.9.3.1 Environmental Risks and Impacts (Operations Phase) 61
4.9.3.2 Social Risks and Impacts (Operations Phase) 62
4.9.3.3 Climate Risks and Impacts (Operations Phase) 62
4.9.3.4 Environmental Mitigation Measures (Operations Phase) 63
4.9.3.5 Social Mitigation Measures (Operations Phase) 63
4.9.3.6 Climate Mitigation and Adaptation Measures (Operations Phase) 63
4.9.4 Positive Environmental, Social and Climate Impacts 64
4.9.4.1 Positive Environmental Impacts 64
4.9.4.2 Positive Social Impacts 64
4.9.4.3 Positive Climate Impacts 65

5. PROCEDURES FOR REVIEW, CLEARANCE, AND IMPLEMENTATION OF SUBPROJECT E&S INSTRUMENTS **66**

5.1 Objective and Approach *66*

5.2 Key Steps *66*

5.3 E&S Risk and Impact Assessment *68*

5.4 Development of E&S Documents *68*
5.5 Review, Approval, and Disclosure of E&S Documents *68*
5.6 Implementation, Supervision, Monitoring, and Reporting *69*

6. IMPLEMENTATION ARRANGEMENTS **70**
6.1 Responsibility for ESCMF Implementation *70*
6.2 Project Implementation Organizations (Component 2) *70*
6.3 Project Implementation Organizations at Sub-National Level *73*
6.4 Provincial Department of Water Resources and Meteorology (PDWRAM) *73*
6.5 Project Implementation Organizations at Scheme Level *73*
6.6 Procurement *74*
6.7 Monitoring and Reporting Arrangements *75*
6.8 Incorporation of ESCMF into Project Operational Manual *76*

7. CAPACITY BUILDING, TRAINING, AND TECHNICAL ASSISTANCE **77**
7.1 Capacity Building for Efficient Project Management *77*
7.2 MOWRAM/ PMU and PDWRAM *77*
7.3 FWUC/FWUG/FWUSG *77*
7.4 Training and Technical Assistance *78*
7.5 Technical Assistance on E&S Capacity Building *78*

8. ESCMF IMPLEMENTATION BUDGET **80**

9. GRIEVANCE REDRESS MECHANISM (GRM) **83**
9.1 Objectives of the Project GRMs *83*
9.2 Summary of national legislation related to grievance and complaint *85*
9.3 Principles of the Project GRMs *85*
9.4.1 Redress Procedure for Complaints related to Land Acquisition 86
9.4 Project's Redress Procedures *86*
9.4.2 Redress Procedure for Complaints related to Labor and Working Conditions 87
9.4.3 Redress Procedure for Complaints related to SEA/SH/GBV 87
9.4.4 Redress Procedure for General Complaints 88
9.5 Registration of Project Grievance *88*

10. ESCMF STAKEHOLDER CONSULTATION AND DISCLOSURE **90**
10.1 Consultation Requirements *90*
10.2 Consultation Process Summary *90*
10.3 Initial Stakeholder Consultation Results *90*
10.3.1 Missions 1 and 2 90
10.3.2 Mission 3 91
10.3.3 Ou Tapoung Feasibility Study Consultations 91

10.3.4 First Round of Stakeholder Engagement Meetings 92
10.4 Information Disclosure *92*
ANNEX 1: EXCLUSION LIST **94**
ANNEX 2: IUCN RED LIST OF THREATENED SPECIES **95**
ANNEX 3: TERMS OF REFERENCE FOR E&S SAFEGUARDS MONITORING CONSULTANT **108**
ANNEX 4: CHANCE FINDS PROCEDURE **111**
ANNEX 5: E & S CODES OF PRACTICE FOR CONSTRUCTION **112**
ANNEX 6: GUIDELINES FOR WORKERS' CAMPS **116**
ANNEX 7: CONTRACTORS' COVID-19 GUIDELINE **118**
ANNEX 8: WORKERS' CODE OF CONDUCT **119**
ANNEX 9: SAMPLE TORS FOR AN ENVIRONMENT & CLIMATE SAFEGUARDS SPECIALIST **122**
ANNEX 10: SAMPLE TORS FOR A GENDER & SOCIAL SAFEGUARDS SPECIALIST **124**
ANNEX 11: MISSION 3 LIST OF PARTICIPANTS **126**
ANNEX 12: TOR BIODIVERSITY MANAGEMENT SPECIALIST **129**
ANNEX 13: CAISAR CLIMATE CHANGE IMPACT RATIONAL **132**
ANNEX 14: INDIGENOUS PEOPLES PLANNING FRAMEWORK **132**

List of Figures

Figure 1-1 Map of the project area and total percentage of poor households by 2016 (AF, 2018) 3
Figure 1-2: SPEI in the high warning scenario (RCP4.5) 6
Figure 4-1: Map showing the location of the CAISAR project areas and& Provincial Boundaries 37
Figure 4-2: Ou Ta Paoung Project Layout 37
Figure 4-3 Lum Hach Feasibility Level Canal Layouts and Storage (excluding JICA System) 38
Figure 4-4: Krang Ponley overview schematic 39
Figure 4-5: Location of Krang Ponley Irrigation Schemes 39
Figure 4-6 Krang Ponley Subproject - Chhean Loeung area canals do not exist, ... 40
Figure 4-7 The Outlet of the Krang Ponley to the Tonle Sap is through Krang Bat area 40
Figure 4-8 Tonle Sap Agricultural Protection Zones 48
Figure 4-9 Community Fish Refuges in the CAISAR Command Areas 50
Figure 4-10 Key Biodiversity Areas 51
Figure 4-11 IBAT Biodiversity Features around Lum Hach Scheme 52
Figure 4-12 IBAT Biodiversity Features around Krang Ponley Scheme 54
Figure 4-13 IBAT Biodiversity Features around Ou Ta Paong Scheme 55
Figure 5-1: Flowchart for Safeguard Actions for Subprojects 67
Figure 6-1: CAISAR Project (Component 1) Structure Chart 72
Figure 6-2 PMU Structure Chart 72

List of Tables

Table 3-1: Environmental and Natural Resource Management Policies, Laws & Guidelines 15
Table 3-2: ESIA Classification for Development ProjectsClassification for Development Projects 23
Table-3-3: Key National and International Environmental Standards and Guidelines 24
Table-3-4: Water quality standard in public water areas for public health protection 24
Table-3-5: Water quality standard in public water areas for bio-diversity conservation 25
Table-3-6: Ambient Air Quality Standard 25
Table-3-7: Maximum permitted noise level in public and residential area (dB (A)) 25
Table-3-8: Scope of Safeguards Standards 28
Table-4-1: Summary of the Sub Project Elements 42
Table 6-1: PSC Management Arrangement 71
Table 6-2: Distribution Network & Name of FWUC to be established in the CAISAR Scheme. 73
Table 6-3: Reporting Procedures 75
Table 8-1: Estimated ESCMF Implementation Cost 82

EXECUTIVE SUMMARY

1. **Project Rationale**: The CAISAR project covers a total command area of 45,000ha and is composed of three sub-project command areas – Ou Ta Paong, in Pursat Province, Lum Hach, in Kampong Chhnang Province and Krang Ponley in Kampong Chhnang, Kapong Speu and Kandal. The project objective is to improve agriculture productivity by providing irrigation and flood protection in the project areas. The project design is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia (Pursat, Kampong Chhnang, Kampong Speu, and Kendal). Mitigation is a co-benefit of this adaptation project, as it will also contribute to reduce GHG emissions, including methane emissions from rice fields. These objectives will be achieved by implementing three components that aim at addressing climate change vulnerabilities, increasing agriculture productivity, and developing institutional capacities. The investments to be implemented will (i) combine robust climate-resilient water management and agricultural practices at the farm level, (ii) establish climate-proofed irrigation and flood control infrastructure and (iii) develop institutional capacity to plan, maintain and operate irrigation and flood control infrastructure in a changing climate context. The CAISAR project has a broad positive impact benefitting 120,000 households (500,000 rural people) directly while its effect will propagate to over 3 million people in the region. The project will be executed through the Ministry of Water Resources and Meteorology (MOWRAM) and the National Committee for Sub-National Democratic Development Secretariat (NCDD-S), a Direct Access Accredited Entity to the GCF. The expected timelines for the approval of the co-financing by IFAD and AIIB Executive Boards are respectively September 2024 and January 2024, with the inception of the project is expected to take place in December 2024.

2. **Methodology for Risk Categorization:** Project-related and inherent environmental, social, and climate risks were determined by: (i) screening the project activities against the International Fund for Agricultural Development's (IFAD's) Social, Environmental, and Climate Assessment Procedures (SECAP) requirements, the AIIB's Environmental & Social Framework (ESF), and the Green Climate Fund's (GCF's) Environmental & Social Policy; (ii) considering the findings of desk research on risks associated with similar projects and relevant background papers; and (iii) incorporating findings from the first round of ESCMF stakeholder consultations and previous stakeholder engagement efforts in the form of household surveys (630 households in total), 100 focus group discussions, and 100 key informant interviews. Numerous missions to the project areas and discussions with provincial and district agencies and communes enhanced understanding of project objectives.

3. The initial SECAP review identified patterns of existing issues inherent to the project area which could increase risk to the project, its personnel, and/or beneficiaries. Additional desk research highlighted further areas of potential inherent risk and lessons-learned from other projects. The screening of CAISAR project activities, together with the ESCMF stakeholder meetings, household survey responses, focus group discussions, key informant interviews, and field visits with consultations provided insight on the latest conditions which could affect the success of the project and the potential project-specific impacts (both positive and negative).

4. **Framework Approach:** Given that site locations for project implementation have not been finalized, the design team agreed to use a framework approach consistent with IFAD's SECAP and GCF's ESS. Documentation is based on the format typically provided for a GCF project, rather than the typical IFAD SECAP note format, to simplify the approval process. This was agreed upon with AIIB and IFAD headquarters prior to development of this ESCMF.

5. **Project Impacts & Inherent Risks:** The safeguards categorization for CAISAR is high for both social and environmental impacts and risks. To address issues of climate-induced risks and impacts, the CAISAR project will apply several climate resilience measures and adaptation strategies including climate-informed planning, integrated water resources management, efficient irrigation practices, water storage and reservoir management, ecosystem-based approaches, early warning systems, climate-resilient

infrastructure, capacity building and awareness, stakeholder engagement and participatory approaches, and monitoring and evaluation. These measures will be financed under the project, as the project explicitly targets climate mitigation and adaptation by design.

6. **Key social impacts to be considered as part of the ESCIA** include: (i) potential contraction of diseases (e.g. sexually transmitted diseases such as HIV/AIDS, and/or other communicable diseases) due to labor influx; (ii) potential conflict with local communities due to construction workers who work and stay near the community; (iii) potential labour-related accidents for persons hired by the project construction companies to support seasonal construction work; (iv) gender based violence and/or sexual harrassment and abuse (e.g. verbal and physical abuse, sexual harrassment, violence against children) due to the influx of labour; (v) child labour/age inappropriate work, (vi) forced labour (e.g. coerced to work through the use of violence/intimidation, or by more subtle means such as debt manipulation, retention of identity papers, or similar threats); (vii) possible social exclusion (due to vulnerability, land tenure issues, disability, etc.); and (viii) lack of contract for EM workers, particularly for seasonal works of less than one month's duration.

7. The above risks to be evaluated as part of the ESCIA are not considered to be serious in nature and mitigation measures will be included in the ESCMP. General mitigation measures are provided within Chapter IV of this Environmental, Social and Climate Management Framework (ESCMF).

8. **Key environmental impacts to be considered as part of the ESCIA include:** The project is expected to have largely positive environmental impacts, including improved ecosystem services, soil fertility/soil health, forest health, and natural resources management. Potential negative environmental impacts to be mitigated include are related to small-scale infrastructure (e.g. construction/repair of small-scale rural roads, irrigation channels, small-scale reservoirs, etc.). These impacts may include: (i) erosion and run-off to water bodies during earthworks/construction; (ii) temporary traffic blocks and related safety issues during construction and operation; (iii) temporary pollution from construction (e.g. dust, noise, vibration, waste & wastewater generation from workers' campsites); (iv) potential water pollution from sourcing aggregates/construction materials (soil, gravels); and (v) increased water consumption. Additional environmental risks (not explicitly linked to construction activities) include: (i) presence of unexploded ordinances (UXOs) at project sites (an inherent risk listed below); and (ii) increased use of pesticides due to crop intensification/improved crop yields. As with the social risks and impacts, mitigation measures for the environmental risks and impacts are provided in Chapter IV of this ESCMF.

9. To mitigate issues pertaining to social exclusion and conflict over land use/land tenure/land management, related safeguards documents, like the Stakeholder Engagement Plan (SEP), Indigenous Peoples' Plan (IP Plan), and Gender Assessment and Action Plan (GAP), have been developed to supplement this ESCMF and improve overall project design. The Grievance Redress Mechanism (GRM) is also available for any project affected persons who feel they have been negatively impacted or excluded and is detailed in Chapter IX of this ESCMF.

10. **Inherent Risks:** There are inherent risks pertaining to presence of landmines and unexploded ordinances (UXOs) if construction occurs in new areas (i.e., areas without existing construction/infrastructure/activities). Inherent risks are addressed with project-related impacts under Chapter IV of the ESCMF.

11. **Implementation:** The ESCMF will be implemented with the support of two safeguards specialists with MOWRAM Project Management Unit. Further support at the commune level will be determined by inclusion of safeguards-related obligations within the Terms of Reference of the project staff/implementing agencies. For construction financed under the project, contractors will be obliged to abide by the GCF and AIIB and IFAD safeguards requirements, in addition to national legislation/regulations, and commit to Environmental and Social Management Plans (ESCMPs) and Environmental Codes of Practices (ECOPs) as part of their contract. Independent ESC monitoring will be conducted over the life of the project construction and implementation phase. A socio-economic and census survey will be conducted to support the development of the Resettlement Plan.

1. INTRODUCTION

1.1 Project Rationale

1 The CAISAR project covers a total command area of 45,000ha and is composed of three sub-project command areas – Ou Ta Paong, in Pursat Province, Lum Hach, in Kampong Chhnang Province and Krang Ponley in Kampong Chhnang, Kapong Speu and Kandal. The project objective is to improve agriculture productivity by providing irrigation and flood protection in the project areas. The project design is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia, including Pursat, Kampong Chhnang, Kampong Speu, and Kendal provinces. Mitigation is a co-benefit of this adaptation project, as it will also contribute to reduce GHG emissions, including methane emissions from rice fields. These objectives will be achieved by implementing three components that aim at addressing vulnerabilities of farming communities to climate change, increasing agriculture productivity, and developing institutional capacities. The investments to be implemented will (i) combine robust climate- resilient water management and agricultural practices at the farm level, (ii) establish climate-proofed irrigation and flood control infrastructure and (iii) develop institutional capacity to plan, maintain and operate irrigation and flood control infrastructure in a changing climate context. The CAISAR project has a broad positive impact 'enefitting 120,000 household (500,000 people) directly while its effect will propagate to over 3 million people in the region. The project will be executed through the Ministry of Water Resources and Meteorology (MOWRAM) and the National Committee for Sub-National Democratic Development Secretariat (NCDD-S), a Direct Access Accredited Entity to the GCF. The expected timelines for the approval of the co-financing by IFAD and AIIB Executive Boards are respectively September 2024 and January 2024, with the inception of the project is expected to take place in December 2024.

1.2 Country & Project Context

2 The CAISAR Feasibility Study noted that Cambodia is highly vulnerable to climate change and natural disaster risks. It is ranked 151 out of 181 countries in the 2020 ND-GAIN Index, was the 12th most disaster-prone country among 172 countries for 1999–2018 and remains one of the few Least Developed Countries (LDCs) in Asia. Annual economic losses resulting from natural disasters in the country were estimated at 0.7% of GDP in 2011. The World Risk Index of 15.8% indicates a very high risk of disaster because of extreme natural events, with an exposure index of 27% and a vulnerability index of 59%. Approximately 80% of the country is within the Mekong River and Tonle Sap basins, increasing exposure to floods, storms, and droughts. Identified hazards are assessed as high across the whole country for river floods and coastal floods, cyclones, extreme heat, and wildfires. By mid-century, climate change will result in more frequent heavy precipitation days, from 2.4 days to 4.9 days in the rainy season, and an increase in the number of consecutive dry days in the same season from 0.8 days to 4.4 days. The median temperature is projected to increase by 1.6°C by 2060.

3 Cambodia has approximately 4.5 million ha of cultivated land, 70% of which is rice production, as well as industrial crops (20%), rubber plantations (7%), and permanent crops (4%). Cambodia maintains a high reliance on the agriculture sector, which accounts for nearly 22% of the country's GDP while the rural population represents 75.8% of the national population[1]. In Cambodia, relatively low yields, coupled with frequent natural disasters, contribute to temporary food shortages for vulnerable communities. Based on food availability and food access, a mapping of food security has been conducted for the country. Seven of Cambodia's 25 provinces (including Phnom Penh) are classified as acutely food insecure, and an additional seven are moderately insecure. Livelihoods rely heavily on rain-fed agriculture and non-poor households are vulnerable to falling back into poverty in the event of extreme or frequent climate shocks[2].

[1] UNDESA (2018) The Least Developed Country Category: 2018 Country Snapshots. Available at: https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/Snapshots2018.pdf.

[2] https://docs.wfp.org/api/documents/WFP-0000147767/download/?_ga=2.188002408.1116277075.1681899242-636470978.1669479646

4 Women and children are among the most vulnerable groups to climate change. Climate adaptation among rural populations and national institutions remains low as many households face rising debt caused by coping with natural disasters and the COVID-19 pandemic. Since 2020, the negative impacts of climate change and the pandemic led to a 10% loss in Gross Domestic Product (GDP). In addition to negative climate impacts, the stagnating global agricultural commodity prices, rising labor costs and the limited scope for cropland expansion in the country will challenge the agriculture sector (WB, 2015)[3].

5 Farming remains mostly subsistence-based and rain-fed, with low productivity. Only 7 – 8% of the total potential agricultural land area is under full irrigation in Cambodia. Further, only 15% of the cultivated rice area is irrigated (compared to 28% in Thailand and 46% in Viet Nam), and 85% of the rice cropping area is vulnerable to changing rainfall patterns[4]. Therefore, while rice accounts for 50% of agricultural GDP, yields are lower than neighboring countries. The lack of water for irrigation is a crucial barrier for farmers to deal with climate change-induced water shortages, and to cultivate more than a single crop per year – limiting their resilience and adaptive capacity. Studies suggest that shifting to irrigated cultivation could result in annual overall production increases of up to 40%. The lack of timely information on droughts and floods (seasonal forecasts, the changing length) is another barrier. Furthermore, farmers lack the knowledge and tools to adapt their farming practices / production techniques to climate change; they are largely unaware of climate resilient practices (e.g., alternatives to flooded rice cultivation or application of AWD methods in rice), stress-tolerant seed varieties and improved planting materials, efficient input management, and the benefits of applying such practices. The labor shortage in rural areas has increased due to migration to urban areas, which in turn has led to a rise in agricultural wages. Other significant barriers for small-scale farmers include access to credit on attractive and appropriate terms, and market intelligence. Cambodia is unlikely to achieve 5% of their annual agricultural growth target by 2030, without more investment in climate adaptation, sustainable irrigation, and flood control and drainage schemes. Persistent poverty, limited access to finance, and insufficient institutional capacities have left the rural agrarian population vulnerable to the negative impacts of climate change, economic slowdown, and environmental degradation.

6 The local private sector also fails to offer technologies that farmers need (e.g., stress tolerant seeds, bio-inputs) and engage in value addition (e.g., rice milling prior to exports) adequately and sufficiently. Production and distribution costs of agricultural products are high compared to the neighboring countries, largely due to high energy and transport costs. Private sector investment in water saving micro technologies in irrigation and extension services remains low due to an unfavorable agri-business environment, such as access to appropriate finance, poor communication and cooperation between government and private sector, and the absence of a clear regulatory framework for the establishment, operation and pricing for the private management of water. Large agri-businesses face high costs and shortages of working capital. Many agri-business firms operate below capacity and potential new investors are reluctant to invest due to low profitability and high risk of failure.

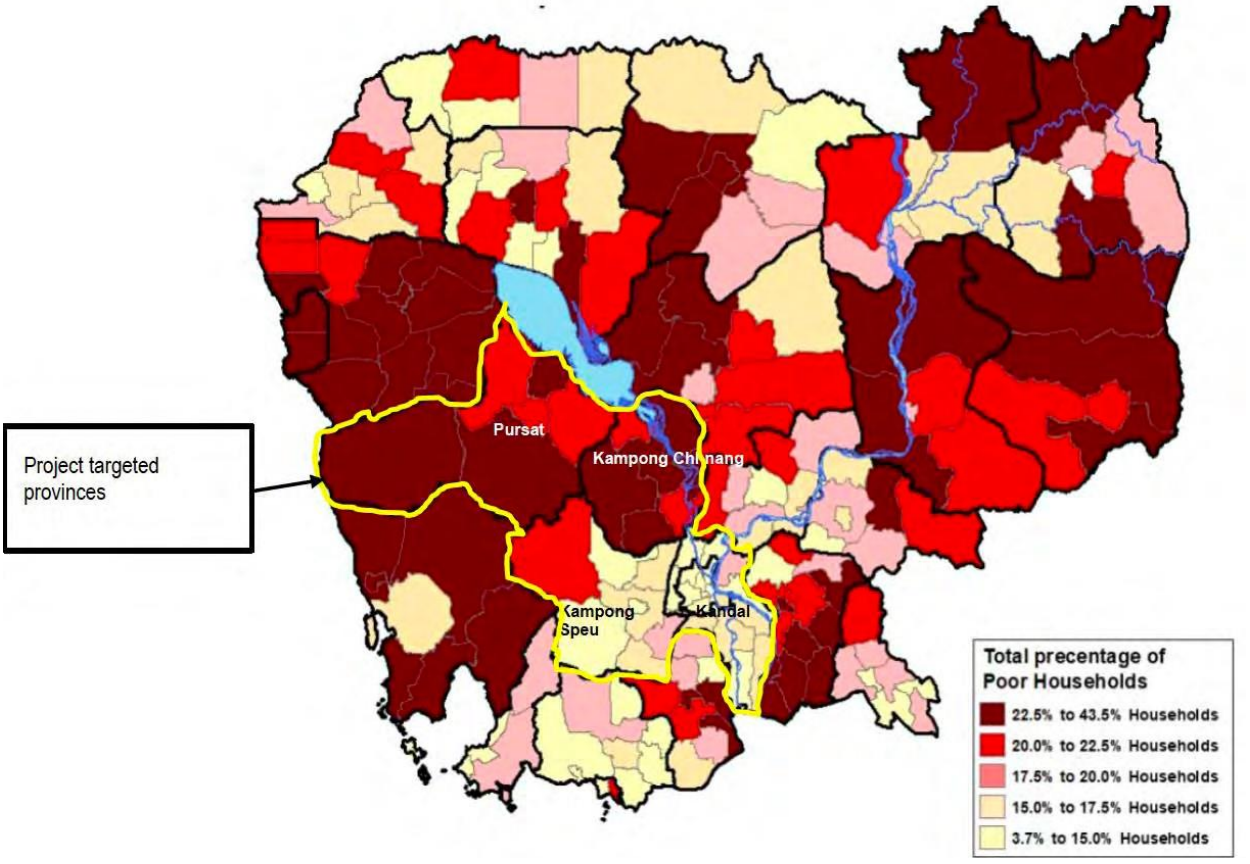
7 There are several obstacles to women's economic empowerment in Cambodia, including (i) the amount of time and responsibility for unpaid domestic and care work, (ii) low levels of literacy and education, and (iii) a lack of access to resources necessary for economic empowerment, and (iv) resilience to climate risks. Women have higher participation in agriculture than men but receive lower benefits and have lower access to land, extension services, financial services, markets, and technologies. Rural youth face difficulties in accessing land, which also limits access to credit, as financial institutions generally require land as collateral and a high proportion migrate to urban areas in search of work. Poverty incidence among ethnic minorities is not significantly higher than among the majority, but they suffer disadvantages in access to health, education and other services.

[3] https://openknowledge.worldbank.org/entities/publication/78d3d276-3a5f-5bf2-915d-2d0381a13930

[4] Kono, A. and Chey, T. 2019. Rapid assessment of upland cashew, mango, organic rice, and vegetable production. Actions for Climate-resilient and Sustainable Agricultural Production in the Northern Tonle Sap Basin. FAO.

8 In Cambodia, GHG emissions are dominated by the Forestry and Other Land Uses (FOLU) sector (60.90%) and agriculture (16.9%), followed by energy (12.10%), IPPU (7.90%) and waste (2.20%) sectors. Under a business-as-usual (BAU) scenario, Cambodia forecasts an increase in emissions from 125.2 MtCO2eq in 2016 to 155.0 MtCO2eq in 2030. While the emissions reduction scenarios (by 2030) in the NDCs largely target AFOLU and energy sectors, owing to the links between FOLU (land-use and forest conversion) and agriculture, actions to increase productivity of agricultural lands and interventions such as home gardens are likely to have indirect effect on AFOLU targets[5].

9 The CAISAR target provinces include: Kampong Speu, Kampong Chhnang, Kandal, and Pursat. These provinces[6] have the highest population density, high total percentage of poor households, and a high percentage of women-headed households (Figure 1). The livelihoods of the poorest and most vulnerable people in the region depend mainly on agricultural production and water availability through precipitation, river flow, and irrigation schemes. This area and its population is particularly vulnerable to climate risks due to changing weather patterns and flooding.



Source: CAISAR Feasibility Study

Figure 1-1 Map of the project area and total percentage of poor households by 2016 (AF, 2018)

[5] RGC, 2020. Cambodia's Updated NDC. Retrieve from: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Cambodia%20First/20201231_NDC_Update_Cambodia.pdf

[6] The Asia Foundation (2018). cambodia-atlas-on-gender-and-environment.pdf.pdf (opendevelopmentmekong.net)

10 The project area was already under stress prior to the COVID-19 pandemic with small-scale farmers and larger food producers struggling to produce food and access markets. Food shortages face, additional pressure from climate change with serious droughts[7] during the dry months and heavy monsoon during the rainfall season. Rural communities highlight major water problems with competition in irrigation due to aging/lack of infrastructure and reduced water availability in rivers and ponds, which poor communities and households depend on. The proposed underlying investment project will support the government's efforts to sustain food security and rural livelihood after the COVID-19 crisis through the restoration and enhancement of climate-smart and climate-resilient irrigation systems under the "Build Back Better" approach in the target provinces.

1.2.1 *Climate Change Impacts and Vulnerability of the Agriculture Sector*

11 The concept note stated that similar to other monsoon-dependent countries, climate change is altering Cambodia's and project areas' monsoon calendar, increasing total drought days and shifting the start of the rainy season. While annual rainfall is expected to increase, the number of days with rain is decreasing and daily rain intensity is increasing, resulting in extreme rainfall events and flooding risks. The World Resource Institute (WRI) rates the upper and lower Tonle Sap watershed as extremely high for water risk (WRI, Aqueduct). Inter-annual variability in rainfall significantly influences river discharges and between one and four million hectares of Cambodia's floodplain, of which about 25% falls in the project areas, may be submerged during the wet season, reaching critical thresholds for irrigation and ecosystem stability.

12 Flooding in the project areas generally occurs between July and October, driven by rainfall as well as high water levels in the Mekong River and Tonle Sap Lake. With the increased intensity of wet-season rainfall, the duration and extent of flooding have increased in some areas. While local rainfall patterns are important for both irrigated and rainfed agricultural systems, the Mekong-Tonle Sap flood impulse dominates the flooding pattern and hence plays an important role in the overall water management.

13 Observed impacts of climate change trends in recent years have manifested by longer dry seasons and more intense "El Niño" related droughts, delayed onset of the monsoon season, increased rain intensity and frequency, leading to floods, and unexpected dry periods during the rainy season. Annual mean temperature anomaly has increased at a rate of 0.23 °C per decade since 19508, with a stronger signal of increase during the dry season. The rate of temperature change is notable in the dry season (December, January and February) followed by pre-monsoon (March, April and May) and, to a minor extent, by wet season months (June, July and August). The increase in mean annual temperature and decrease in dry season rainfall has manifested in droughts and water shortages significantly impacting rainfed agriculture due to a late start and early ending of the wet season.9

14 On average, annual damages and loss of wet season rice caused by floods and droughts is approximately 120,501 hectares, of which 70 percent of the damage and loss is due to floods and 30 percent is the result of droughts. Flooding occurs frequently and extensively in Cambodia. The source of these floods can be the Mekong River including the Tonle Sap Great Lake, tributary flash floods, urban flooding, and failure of structures such as protection levee and storages. In terms of the population affected, Cambodia is one of the world's most flood-exposed countries in the world. By 2050, population exposed to flood is expected to reach 19% of the population. Projected climate change trend indicates more severe floods and droughts, which is expected to affect Cambodia's GDP by nearly 10% by 2050[10]

[7] Kampong Spoeu, one of the four target provinces, reported the highest number of droughts (one of the eight main natural hazards in Cambodia) between 1996 and 2013. (https://www.unccd.int/sites/default/files/country_profile_documents/1%2520FINAL_NDP_Cambodia%255B1157%255D.pdf).

[8] Thoeun, H. C. (2015) Observed and projected changes in temperature and rainfall in Cambodia. Weather and Climate Extremes. 7:61. [old reference]

[9] MAFF (2017) MAFF Annual Report 2016-17

[10] Climate risk country profile, Cambodia. 2021. https://climateknowledgeportal.worldbank.org/sites/default/files/2021-08/15849-WB_Cambodia%20Country%20Profil

15 Drought has significant social and economic impacts in Cambodia, in particular in the project areas. According to the Ministry of Environment. (2002). Report on the Impact of Drought in Cambodia, the drought in 2002 affected 43 districts in eight provinces. Some 442,419 families (2,017,340 individuals) were affected. The total estimated damage was US$ 9 million. Rice and crop production was affected in all provinces and about half a million rural people faced food insecurity. Droughts events have become more frequent as further explained in annex 1, and are expected to intensify in future. According to the International Rice Research Institute, rice grain yield will decline by 10% for each 1°C increase in growing-season minimum (night) temperature in the dry season. In Cambodia, drought has been negatively impacting rice production, and is widely recognized as one of the most serious climate risks for the agriculture sector.

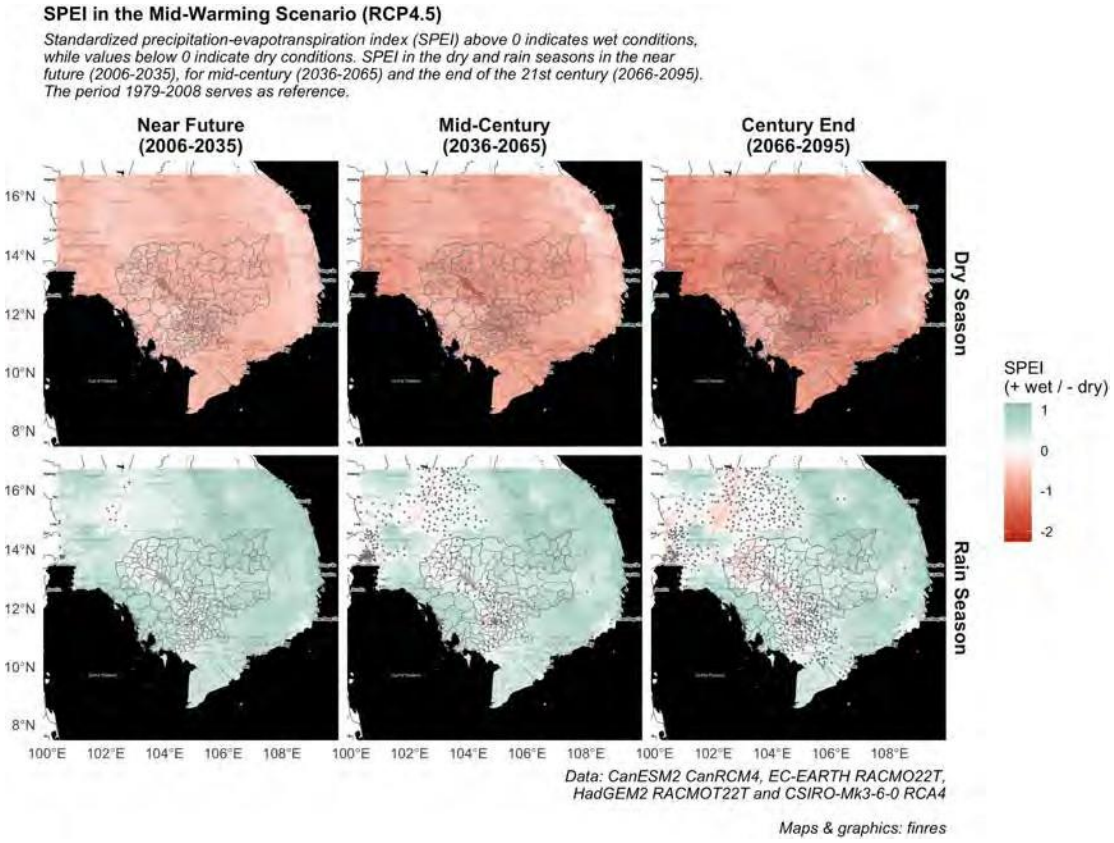
16 The Climate Risk Country Profile, Cambodia 2021 noted that future projections of climate change in the project area under the RCP4.5 scenario (Figure 1-1) indicate a temperature increase of 1.6°C by mid-century (2036-2065) and up to 2.2°C by the end of the 21st century (2066-2095)[11]. Nights exposed to high temperatures are projected to become more frequent during the 21st century (+114 nights by mid- century and +151 nights by the 2080s). Population, crop and livestock systems will also experience heat extremes more frequently in comparison to the reference period (42 days by mid-century and reaching 62 days by the 2080s) and IFAD is expecting a drastic reduction in the productivity of crops and livestock (IFAD's preliminary climate analysis). Out of all the rivers within the Mekong River Basin, the water levels of the Tonle Sap Lake tributaries are anticipated to experience the greatest water decline. These changes in water levels are attributed to shifts in seasonal rainfall distribution and prolonged dry periods (IPCC, 2021).

17 The changes in precipitation and temperature patterns induced by climate change in the project area could affect the climatic suitability of cereals, vegetables and starchy crops produced. On average, for most crops analysed for this project, the temperature suitability could progressively decrease with some crops falling outside their optimal temperature levels. Overall, this change in patterns could contribute to a reduction in crop yield for both irrigated and non-irrigated crops. For example, in the Kampong Chhang region, rice yield could decrease from 9 to 12%, with and without irrigation, respectively, by 2050 (a period of 20 years centred around 2050) compared to 2020 (Climate Risk Country Profile, Cambodia, 2021). These projections are for the RCP8.5 scenario and without CO2 fertilization. As smallholder farmers' incomes are largely dependent on their yield, it is anticipated that farmers' income could become more volatile with a decreasing trend over time. It is projected that vegetables will be increasingly exposed to heat-stress conditions during the pre-monsoon and early wet-season months (March-June). Over these months, heat-stress conditions (>36ºC) will be exceeded more than 50 days during the growing season, lasting approximately 90 days.

18 Climate change affects women, men, and vulnerable people differently, and their responses to its impacts also differ, including in relation to safeguarding food security and livelihoods and coping with hazards and risks. In the project area, women have significantly less access than men to financial instruments, land, natural resources, climate change resources and technologies, education, and other development services for successful adaptation to climate change. Cambodia's Women's Resilience Index, ActionAid, 2022 found women less resilient in times of disaster than men due to women's unstable and insecure sources of income, limited access to shelters or safe places, inadequate early warning information, poor housing, weak social safety nets and absence of emergency networks. Furthermore, women's responsibilities in household resources position them well to contribute to livelihood strategies adapted to

[11] Climate risk country profile, Cambodia. 2021. https://climateknowledgeportal.worldbank.org/sites/default/files/2021-08/15849-WB_Cambodia%20Country%20Profil

changing environmental realities. However, lack of information, access to planning processes, and care obligations, limit their ability to contribute.



Source: GCF Concept Note

Legend: Above 0 indicates wet conditions, while values below 0 indicate dry conditions.

Figure 1-2: SPEI in the high warning scenario (RCP4.5)

19 Agriculture is central to the economic and social life of Cambodia. With 76% of the population currently living in rural areas, Cambodia's populace and economy rely heavily on agriculture and fisheries, contributing 22% of GDP and employing 34% of the country's labour force[12]. As a result, Cambodia has a high dependency on natural resources and climate-sensitive sectors of the economy, which makes it particularly vulnerable to inter-annual and intra-annual changes in climatic conditions. Natural hazards have significant effects on Cambodia's population and pose a serious challenge for water resource management and poverty alleviation in the country. This vulnerability to hazards combined with high exposure to climatic extremes, means that Cambodia is faced with a heightened disaster risk from both floods and droughts.

20 Current climate models project that these climatic extremes will worsen over the coming century, meaning that they must be considered when addressing poverty reduction and economic development. The Royal Government of Cambodia is making efforts to devise strategies that decrease this vulnerability through improved flood and drought proofing, natural disaster preparedness and climate adaptation strategies to reduce risks from floods and droughts. Reducing the impacts of floods and droughts are key priorities for sustainable development (IPCC, **2021**).

[12] Data for 2020, World Bank, World Development Indicators

21 The Royal Government of Cambodia is committed to meetings its greenhouse gas emission targets and ensuring that appropriate mitigation and adaptation efforts are adopted across key sectors of the economy. The Climate Change Strategic Plan 2014 – 2023 sets out the main strategic objectives and directions for climate-smart development in Cambodia over the coming decade and the agriculture sector will be a key player to ensure that the objectives of the plan are met (National Climate Change Strategic Plan 2014-2023, Royal Government of Cambodia, 2013). The agricultural sector therefore has significant potential to reduce poverty, food insecurity and ensure rural populations are resilient and adapted to climate change.

22 The CAISAR project will support the RGC's effort to improve and strengthen the disaster resilience of the populations of four provinces in Cambodia. Through combining irrigation rehabilitation with climate smart and resilient design, the project will build a low carbon and climate resilient future, enabling rural populations to adequately adapt to current and future climate impacts and increase their food security and livelihoods whilst also enabling the RGC to meet its climate targets.

23 **Stakeholder Engagement:** To support development and design of this project, extensive stakeholder engagement was conducted to discern potential positive and negative project impacts, as well as key design opportunities to improve accessibility and participation. In July and September of 2023 stakeholder meetings were conducted with potential communities affected in each project area as well as with key NGOs. Continued stakeholder engagement must involve iterative consultations throughout the project's life cycle with particular attention to vulnerable populations and groups prone to exclusion, be that for reasons of gender, orientation, age, ability, religious beliefs, and/or ethnicity. The guidelines for stakeholder engagement are available in the Stakeholder Engagement Plan (SEP).

24 **Indigenous Peoples/Ethnic Minorites, Women, and Vulnerable, Disadvantaged Persons:** to ensure adequate inclusion of ethnic minorities, women, and other vulnerable persons, an Indigenous Peoples' Plan (IP Plan) and Gender Assessment & Action Plan (GAP) have been prepared to guide project implementers and ensure that considerations for the differentiated needs of ethnic minority (EM) communities, women, and vulnerable persons are built into the project design and monitoring indicators.

25 **Environmental, Social and Climate Management Framework (ESCMF)** serves as the primary guidance document for management and mitigation of environmental, social, and climate risks and impacts throughout the project cycle.

1.3 Purpose and Application of the ESCMF

26 The project objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia (Pursat, Kampong Chhnang, Kampong Speu, and Kendal). Mitigation is a co-benefit of this adaptation project, as it will also contribute to reduce GHG emissions, including methane emissions from rice fields. These objectives will be achieved by implementing three components that aim at addressing climate change vulnerabilities, increasing agriculture productivity, and developing institutional capacities. The investments to be implemented will (i) combine robust climate-resilient water management and agricultural practices at the farm level, (ii) establish climate-proofed irrigation and flood control infrastructure and (iii) develop institutional capacity to plan, maintain and operate irrigation and flood control infrastructure in a changing climate context.

27 The CAISAR project involves numerous subprojects and activities where specific locations are still to be identified during further design and implementation. Based on the inability to confirm specific sub-projects prior to project appraisal, this Environmental and Social Management Framework (ESCMF) has been prepared. Given small discrepancies in the format of the environmental, social, and climate risks/impacts documentation required for IAAB, FAO, IFAD and GCF funded projects, the Government of Cambodia agreed with IFAD's SECAP specialists based in headquarters to follow the standard GCF documentation, rather than developing two separate sets of documents. According to IFAD's Social, Environmental and Climate Assessment Procedures (SECAP) and the Green Climate Fund's (GCF's)

Environmental and Social Standards, the Lead Agency of the proposed project must prepare and disclose this ESCMF[13] before appraisal.

28 The purpose of the ESCMF is to ensure that the project has concrete plans and processes in place to avoid, minimize, and/or mitigate the risks and potentially adverse project-related environmental and social (E&S) impacts, including climate risks, once the CAISAR activities and/or subprojects are identified, planned, and implemented. This living document: (i) assesses and summarizes project-related risks and impacts; and (ii) sets out the principles, rules, guidelines, and procedures to assess any potential risks and impacts of future subproject and activities identified at a later time. It provides measures to reduce, mitigate, and/or offset those adverse risks and impacts from the project and highlights information about areas where subprojects are expected to be located (including any specific E&S-related vulnerabilities of those areas; potential impacts that may occur; and mitigation measures that might be used). Specific objectives of this ESCMF are to:

- Assess the potential environmental, social, and climate-related risks and impacts of the project, both positive and negative, and propose mitigation measures which will effectively address these risks and impacts;
- Establish clear procedures for the E&S planning, review, approval, and implementation of subprojects and other activities to be financed under the project;
- Specify appropriate roles and responsibilities and outline the necessary reporting procedures for managing and monitoring E&S issues/concerns related to subprojects, TA, and activities;
- Determine the training, capacity building, and technical assistance needed to successfully implement the provisions of this ESCMF;
- Outline and address mechanisms for public consultation and disclosure of project documents, as well as redress of possible grievances; and
- Establish the budget requirements for implementation of this ESCMF.

29 This ESCMF provides information on (i) items ineligible for Project funding; (ii) how to conduct the E&S screening; (iii) risks and impacts classifications; (iv) identification of various E&S documents to be prepared (both prior to and after project approval) and the process to be followed for their preparation (including the clearance process); (v) implementation arrangements; (vi) training and capacity building; (v) grievance redress mechanism; (vi) estimated costs and budget requirements; and (vii) guidelines and specific forms for preparation of the identified E&S documents required. This ESCMF will be applied to all subprojects and activities to be financed by CAISAR.

1.4 Scope of the ESCMF

30 This ESCMF was developed based on a review of project-relevant government laws, regulations, ordinances, and other legal documents; various background papers and reports pertaining to environmental and social conditions of the proposed project areas and potential subproject sites, including feasibility studies; as well as numerous field visits, 630 interviews through Livelihood Household Surveys, 100 focus group discussions, 100 key informant interviews, and other consultations (community meetings) in those areas. Safeguards documents prepared for similar projects and/or projects in related areas (e.g. others financed by AIIB, IFAD, World Bank, FAO, etc.) were also taken into consideration.

31 This ESCMF follows the requirements of AIIB, IFAD's SECAP and the GCF's Environmental & Social Policy, taking into consideration the related guidance notes and documents. Information is presented in ten sections, as follows:

1. Introduction
2. Project Description
3. Policy, Legal, and Administrative Framework
4. Environmental and Social Assessment and Proposed Mitigation Measures

[13] The ESCMF examines the risks and impacts when a project consists of a program and/or a series of subprojects, and the risks and impacts cannot be determined until the program or subproject details have been identified.

5. Procedures for Review, Clearance, and Implementation of Subproject E&S Instruments
6. Implementation Arrangements
7. Capacity Building, Training, and Technical Assistance
8. ESCMF Implementation Budget
9. Grievance Redress Mechanism (GRM)
10. ESCMF Consultation and Disclosure

Other information to be considered includes: (i) ineligible activities; (ii) list of banned and restricted pesticide in Cambodia; (iii) Pesticide Management plan; (iv) Chance Find Procedures; (v) List of Consultations & Attendance; (vi) ESCIA Timeline; (vii) ESCIA Budget; (viii) Environmental and Social Screening Checklist; (ix) Indigenous Peoples Planning Framework; (x) Biodiversity Management Planning Framework; (xi) Resettlement Planning Framework; (xii) Gender Assessment & Social Inclusion Plan; (xiii) Climate Management Framework; (xiv) Stakeholder Engagement Plan

32 **Associated facilities.** This ESCMF is also applied to activities or facilities that are, in the judgement of the AIIB, associated activities and/or facilities as defined in the AIIB's ESF. When this is the case, this ESCMF will be applied to such associated activities and/or facilities – to the extent that MoWRAM has influence over such activities and facilities.

2. PROJECT DESCRIPTION

2.1 Project Objective, Components, Area and Beneficiaries

33 The project's focus is on low-carbon and climate resilient at the farm-level, combined with efficient irrigation and flood control infrastructure and their climate proofing, and institutional development of the FWUCs and the government agencies to strengthen water rights, irrigation fees, and enhance sustainability. Thus, disaster resilience compensation is expected to significantly contribute towards achieving climate change adaptation policy objectives outlined in the NDC, and the individual climate change action plans of the Ministry of Water Resources and Meteorology (MOWRAM). The Project originated from the RGC's National Water Resources Management and Sustainable Irrigation Road Map and Investment Program (2019 -2023), which provides a Strategic Framework for the Irrigation Sector.

The CAISAR project is focusing on climate change adaptation with cross-cutting benefits through the reduction of GHG emissions linked to the use of high-efficiency smart irrigation systems, the use of renewable energy for pumping, and cover techniques to reduce evaporanspiration and enhance GHG reduction. While rice production is a major source of GHG emissions in the AFOLU sector in Cambodia, and the project aims to support production to achieve food security and sector growth, target GHG reduction actions in the project aim to support intensification and diversification without compromising GHG emission reduction targets. This is achieve through adoption of water saving technologies such as alternative wet dry, drip irrigation). A full greenhouse gas accounting will be prepared during the project formulation phase. However, a preliminary analysis of GHG in the target provinces has estimated a reduction of GHG of 90,000 Mt CO2-eq annually and 1,800,000 Mt CO2-eq over the life span of 20 years. The investment in agricultural practices and a whole-of-system irrigation approach will irrigate approximately 40,000 hectares (ha) in the rainy monsoon season and about 20,000 ha in the dry season and, as a result, improve energy efficiency by reducing the water and the carbon footprints.

34 The planned CAISAR project has the following planned components

2.2 Component 1: Improving Farm-level climate adaptation, resilience, and water use efficiency

35 The objective of this component is to build climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. This component is designed to address the lack of knowledge and skills to deploy technologies and practices at farm level by farmers and the lack of appropriate extension services to propagate them. It will introduce farmers with various climate resilient technologies and practices for both rice and non-rice activities such as vegetable production, poultry and aquaculture.

Sub-component 1.1 Deployment of farm-level climate adaptation and water use efficiency measures

Output 1.1: Increased capacity of farmers to deploy climate resilient (CR) practices at farm level

This output will focus on developing farmer's capacity in deploying CR technologies and practices to transform the agricultural production system to adapt to the changing climate context. Farmer's will be trained to first develop Action Plans (AP) to re-orient farmer behaviour and assist them in transforming the agriculture production system in a manner that is better adapted to factoring in the agro-ecological context and expected climate change impacts.

- Activity 1.1.1 Preparation of community-based action plans (AP) to transform agriculture with CR practices.
- Activity 1.1.2 Preparation of training materials to support implementation of the AP.
- Activity 1.1.3 Conduct trainings to create a pool of expertise to demonstrate and propagate the CR technologies and practices.
- Activity 1.1.4 Train farmers on applying CR technologies using the FFS approach.
- Activity 1.1.5 Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery.
- Activity 1.1.6 community-based monitoring and evaluation (CBME) of implementation

Sub-Component 1.2 Climate adapted, value added, and market led agricultural investments

Output 1.2 CR value added, and market led agriculture investments secured.

This output involves improving and enhancing some value chains that are key for the project area and include rice, vegetable, chicken and aquaculture value chains, through the use of Public Private Producer Partnerships (4Ps) and increased access to finance, which will improve market access, climate adaptability, and ensure increased income for smallholders in the value chains.

- Activity 1.2.1 Value chain study and planning
- Activity 1.2.2 Establish District Multi-Stakeholder Platforms (MSPs)
- Activity 1.2.3 Public Private Producer Partnership Facility (4PF)

Sub-component 1.3 Improve enabling conditions, capacities and disaster risk management strategies

Output 1.3. Increased access to and use of climate information and advisory services for climate responsive agriculture planning

This sub-component will strengthen the production and dissemination of tailored agro-meteorological information to inform climate responsive management and planning of agriculture in the project target areas through ICT technologies. The aim is to ensure that agro-meteorological services are accessible and useful to farmers to manage climate risks, access to and use of water and efficient cropping systems.

- Activity 1.3.1 Establish ICT based multi-disciplinary platform at provincial level.
- Activity 1.3.2 Building the capacities of the platform to deliver services.
- Activity 1.3.3. Establish the agromet information systems and the outreach mechanisms.
- Activity 1.3.4 Awareness raising and capacity building of farmers and stakeholders in applying the services.

Sub-component 1.4 Rural roads

Output 1.4: Increased resilience of farm road infrastructure to climate change

- Activity 1.4.1 Initial planning and identification
- Activity 1.4.2 Technical survey and design considerations, preparation of cost estimation
- Activity 1.4.3 Improve 50 Kilometers of farm roads.
- Activity 1.4.4 Handing over of the completed works.

2.3 Component 2. Irrigation Infrastructure for increased resilience

Component 2 is linked with Component 1 such that it facilitates the implementation of CR on farm crop and water management practices through improved field level water supply delivery and drainage. It will focus on rehabilitating and modernizing of irrigation and flood protection/drainage infrastructure in the six sub-projects, including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions.

Sub-Component 2.1: Modernization of irrigation scheme and ponds

Sub-Component 2.2: Flood-proofing and Drainage improvements

Sub-Component 2.3: Establishments and training of Farmers Water User Communities (FWUC)

- Activity 2.3.1 Formation of institutional strengthening of the FWUC
- Activity 2.3.2 Build technical capacities of FWCU for canal structure O&M
- Activity 2.3.3 prepare long term financing plan for O&M of the systems including the WUAS.

Sub-Component 2.4: Water information and Management (SCADA)

2.4 Component 3. Institutional Strengthening

36 This component aims to strengthen Government institutions, mainly the MoWRAM, MoE and the NCDD and local institution, the FWUC. While the focus for MoWRAM will be on upgrading technical capacity in various aspects of CR irrigation design and management, key focus area for MoE will be on strengthening climate policies and strategies and in building capacities for monitoring climate actions at national level. It will have three sub-components.

Sub-Component 3.1 MOWRAM capacity Support.

Output 3.1 Strengthened MOWRAM Capacity

Sub-Component 3.2 Strengthening of NDA and NCDD.

Output 3.2 Improved capacities for climate action monitoring

- Activity 3.2.1 Preparation of Loss and Damage Strategy
- Activity 3.2.2 Strengthen national M&E process for climate action
- Activity 3.2.3 Enhancing Capacity of NDA and other stakeholders.

37 **Proposal consistent with Government Framework and priorities and existing investments:** The proposed Project is in line with the national policies of the RGC, especially the "National Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019 - 2033" issued in July 2019 by MOWRAM with the assistance of the development partners. The proposed Project, with its disaster and climate change adaptation design features, will be upscaled to other provinces. RGC and MOWRAM appreciate that water is a limited resource and is taking an integrated water resource management (IWRM) approach to manage water nationwide. MOWRAM is establishing the Water Resources Data Management Center (NWRDMC) and a National Water Resources Information System (WRIS) with ADB assistance. WRIS is an adaptive system housed in the MWRDMC facility that integrates spatial information, CISIS and IAMS, meteorological data, hydrological data, ground measurements, satellite-derived remote sensing data, and Lidar. All data generated on the CAISAR, and all watersheds, are coalesced in WRIS and used to model water availability, use, and floods across entire watersheds.

38 For this project, AIIB requested IFAD to co-finance and assist with the project design, the project implementation, the country's knowledge to maximize people's resilience to climate change impacts and support the reduction of GHG emissions in agriculture.

3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Applicable National Laws and Regulations

39 In 1993, the Royal Government of Cambodia confirmed a new Constitution in which environmental considerations were included for the first time. Specifically, Article 59 requires the State to protect the environment and balance of abundant natural resources and to establish a precise plan for the management of land, water, air, wind, geology, ecological systems, mines, energy, petrol and gas, rock and sand, gems, forests and forestry products, wildlife, and fish and aquatic resources. It was within this constitutional context that the Ministry of Environment (MOE) was established.

40 The hierarchy of legislation in Cambodia is:

- Royal Decree signed by the King;
- Sub-decree signed by the Prime Minister;
- Ministerial Decision signed by a Minister; and
- Regulation issued by Ministry.

41 A Royal Decree ratifies laws passed by parliament. These can be supplemented by "Prakas" or ministerial decisions. These laws allow sub-decrees and regulations to be passed which can stipulate procedures and standards to be met in order to ensure compliance with the law. Many sub-decrees and standards have been drafted but not yet ratified by parliament.

3.1.1 Laws/Sub-Decrees relevant to Environment and Natural Resources Management

42 The Government of Cambodia has established laws and regulations for forests, protected areas, and land management to ensure sustainable development that are relevant to environmental protection and natural resources management. The key elements of the legal and policy framework for the project are summarized in Table 3-1 below.

Table 3-1: Environmental and Natural Resource Management Policies, Laws & Guidelines

Law/Regulation/Guideline	Year	Summary
Royal Decree on the Protection of Natural Areas	1993	Classified 23 protected areas in Cambodia into four categories: (i) natural parks; (ii) wildlife sanctuaries; (iii) protected landscapes; and (iv) multiple-use areas. Designated the Tonle Sap (316,250 ha) as a multiple-use area or area necessary for the stability of the water, forestry, wildlife and fishery resources, for tourism, and for conservation of long-term existing natural resources with a view to assure sustainable economic development.
Royal Decree on the Establishment and Management of Tonle Sap Biosphere Reserve (Royal Decree No. NS/RKT/0401/070)	2001	Establishes the Tonle Sap Biosphere Reserve (TSBR) in accordance with the statutory framework of the World Network of Biosphere Reserves. Divides the TSBR into 3 zones: (i) core areas; (ii) buffer zone and (iii) flexible transition zone. Core area: set aside for long term protection, human activity is limited to monitoring and research. Buffer zone: area surrounding the core areas helping to protect the environment. It may accommodate education and training activities. Transition area: may contain a variety of agricultural activities and human settlements. Here all stakeholders have to cooperate to achieve sustainable development.

Law/Regulation/Guideline	Year	Summary
Royal Decree No. NS/RKM/0208/007 on Protected Areas	2008	Defines the framework of management, conservation & development of protected areas to ensure the conservation of biodiversity, & sustainable use of natural resources in protected areas. The Law gives the Royal Government of Cambodia the authority to establish or modify Protected Areas (Article 9 and 10). A Protected Area shall be established by sub-decree. Article 11 divides the protected area into 4 zones namely, core zone, conservation zone, sustainable use zone & community zone. Article 36 strictly prohibits all types of public infrastructure in the Core Zone & Conservation Zone; & allows development of public infrastructures in the Sustainable Use Zone & Community Zone with approval from the Royal Government at MoE's request. Article 41 provides for the protection of each protected area against destructive/harmful practices, such as destroying water quality in all forms, poisoning, using of chemical substances, disposing of solid and liquid wastes into water or on land. Article 44 requires all proposals & investments within or adjacent to protected area boundary an Environmental and Social Impact Assessment. The law defines Protected Area as **"***An area of the State's public properties in land or water territories, including coasts and sea, located in the area established by a Royal Decree or a new area established in the jurisdiction of the Ministry of Environment. These areas are of physical and biological importance which requires management by law with the purpose of protecting and maintaining biological, natural and cultural resources, and shall be sustainably managed in every generation for environmental, social and economic benefits*". Each protected area shall be divided into four (4) management zoning systems: **1. Core zone:** management area(s) of high conservation value containing threatened and critically endangered species, and fragile ecosystems. Access to the zone is prohibited except for the Nature Conservation and Protection Administration's officials and researchers who, with prior permission from the Ministry of Environment, conduct nature and scientific studies for the purpose of preservation and protection of biological resources and natural environment with the exception of national security and defence sectors. **2. Conservation zone:** management area(s) of high conservation value containing natural resources,

Law/Regulation/Guideline	Year	Summary
		ecosystems, watershed areas, and Natural landscape located adjacent to the core zone. Access to the zone is allowed only with prior consent of the Nature Conservation and Protection Administration at the area with the exception of national security and defence sectors. Small-scale community uses of Non-Timber Forest Products to support local ethnic minorities' livelihood may be allowed under strict control, provided that they do not present serious adverse impacts on biodiversity within the zone. **3. Sustainable use zone:** management area(s) of high economic value for national economic development and management, and conservation of the protected area(s) itself thus contributing to the local community, and indigenous ethnic minorities' livelihood improvement. After consulting with relevant ministries and institutions, local authorities, and local communities in accordance with relevant laws and procedures, the Royal Government of Cambodia may permit development and investment activities in this zone in accordance with the request from the Ministry of Environment. **4. Community zone:** management area(s) for socio-economic development of the local communities and indigenous ethnic minorities and may contain existing residential lands, paddy field and field garden or swidden (Chamkar).
Law on Environmental Protection and Natural Resources Management	1996	The Law was enacted by the National Assembly and launched by the Preah Reach Kram/NS-RKM-1296/36. It was enacted on 24 December 1996. This law has the following objectives: i. To protect and promote environment quality and public health through prevention, reduction and control of pollution; ii. To assess the environmental impacts of all proposed projects prior to the issuance of a decision by the government; iii. To ensure the rational and sustainable conservation, development, management and use of the natural resources of the Kingdom of Cambodia; iv. To encourage and provide possibilities for the public to participate in the protection of environment and the management of the natural resources; and v. To suppress any acts that cause harm to the environment.
Law on the Protection of Cultural Heritage (NS/RKM/0196/26)	1996	Regulates the protection of national cultural heritage and cultural property in general against illegal destruction, modification, alteration, excavation, alienation, exportation or importation. Its Article 37 stipulates that in case of chance find of a cultural property during construction, work should be stopped and the person who found the property should immediately make a declaration to the

Law/Regulation/Guideline	Year	Summary
		local police, who shall, in turn, transmit the property to the Provincial Governor without delay.
Law on Forestry	2002	Article 1: This law defines the framework for management, harvesting, use, development and conservation of the forests in the Kingdom of Cambodia. The objective of this law is to ensure the sustainable management of these forests for their social, economic and environmental benefits, including conservation of biological diversity and cultural heritage.
Law on Water Resources Management (NS/RKM/0607/016)	2007	Requires license/permit/written authorization for the: (i) abstraction & use of water resources other than for domestic purposes, watering for animal husbandry, fishing & irrigation of domestic gardens and orchards; (ii) extraction of sand, soil & gravel from the beds & banks of water courses, lakes, canals & reservoirs; (iii) filling of river, tributary, stream, natural lakes, canal & reservoir; and (iv) discharge, disposal or deposit of polluting substances that are likely to deteriorate water quality and to endanger human, animal and plant health. (Articles 12 & 22) Its Article 24 stipulates that Ministry of Water Resources and Meteorology (MOWRAM), in collaboration with other concerned agencies, may designate a floodplain area as flood retention area.
Law on the Management of Pesticides and Fertilizers	2012	The Law on the Management of Pesticides and Fertilizers was enacted on 14 January 2012. This law has the following objectives: i. To support a policy promoting the effectiveness potentiality of agriculture sector, for the development of social and national economy; ii. To ensure the safe and effective control of pesticides and fertilizers, whether in consistent with the international standards; iii. To enhance public awareness on the implementation of standard requirements of pesticides and fertilizers for all relevant activities related to these products; and iv. To reduce risks caused by the use of pesticides and fertilizers, for beneficiary of farmers and people in the nationwide, by ensuring food security, food safety, public health, and the sustainability of environment. The scope of the law shall apply to the management and the implementation of standard requirements for: i. All type of pesticides and fertilizers, raw materials or active ingredients and other compositions of pesticides and fertilizers which are used as inputs in agricultural production. ii. All activities of natural persons or legal entities who are traders, formulators, pests control services operators, advertisers, donors, and users of all types of pesticides and fertilizers.
Sub-decree on Environmental Impact Assessment Process	1999	The Sub-decree No. 72 ANRK.BK in the Law on Environmental Impact Assessment Process dated 11 August 1999 sets out EIA procedures. The main objectives of this sub-decree are:

Law/Regulation/Guideline	Year	Summary
		i. To determine an EIA for every private and public project or activity, through review by the MOE, prior to the submission for a decision from the government; ii. To determine the type and size of the proposed project(s) and activities, including existing and ongoing activities in both private and public sector prior to undertaking the process of EIA; and iii. To encourage public participation in the implementation of the EIA process and take into account their input and suggestions for reconsideration prior to theimplementation of any project.
Sub-decree No. 36 ANK/BK on Solid Waste Management	1999	Article 1: Regulates solid waste management to ensure the protection of human health and the conservation of biodiversity through using appropriate technical approaches. Article 2: This sub-decree applies to all activities related to disposal, storage, collection, transport, recycling, dumping of garbage and hazardous waste. Article 4: The Ministry of Environment shall establish guidelines on disposal, collection, transport, storage, recycling, minimizing, and dumping of household waste in provinces and cities in order to ensure the safe management of household waste. The authorities of the provinces and cities shall establish the waste management plan in their province and city for short, medium and long-term.
Sub-decree No. 27 ANRK/BK on Water Pollution Control	1999	Regulates activities that cause pollution in public water areas in order to sustain good water quality so that the protection of human health and the conservation of biodiversity are ensured. Annex 2 contains effluent standards. Discharge of landfill leachate shall comply with the effluent standards for discharge of wastewater to public water area and sewer. Annex 13 contains ambient water quality standards for biodiversity conservation, and annex 6 includes ambient water quality standards for public health.
Sub-decree No. 42 ANK/BK on Control of Air Pollution and Noise Disturbance	2000	Regulates air and noise pollution from mobile and fixed sources through monitoring, curb and mitigation activities to protect the environmental quality and public health. It contains the following relevant standards: (i)) ambient air quality standard (Annex 6); and (ii) maximum allowable noise level in public and residential areas (Annex 6). Article 3 A. “Source of pollution” is defined and separates mobile sources (including transport) and fixed sources such as factories and construction sites. Article 3 B. “Pollutant” is defined as smoke, dust, ash particle substance, gas, vapour, fog, odour, radio-active substance.
		-The goal of this sub-decree is to enhance the management of garbage and solid waste of downtowns with effectiveness, transparency and accountability,

Law/Regulation/Guideline	Year	Summary
Sub-decree on Garbage and Urban Solid Waste Management	2015	referring to ensure aesthetics, public health and environmental protection -This sub-decree covers separating, storing, cleaning, collecting, transporting, recycling and management of landfills of garbage and solid waste of downtowns in the Kingdom of Cambodia
Sub-decree N0. 235 on Management of Drainage and Wastewater Treatment System	2017	-Aims to improve the management of drainage and wastewater treatment systems in term of efficiency, transparency, and accountability to ensure safety, public health, and biodiversity conservation. -The scope of this Sub-Decree applies to the management of drainage and wastewater treatment systems in capital, provincial, district, khan and resorts or recreation centers in the Kingdom of Cambodia. Its annexes 1 and 2 provide Effleunt Discharge Standards from Commercial Building, Borey, Satellite City and Resort or Recreation Center Discharges Directly to the Drainage/Sewerage System connected to Centralized Wastewater Treatment Plant, and to the Public Waterbody or Drainage/ Sewerage System
Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed	2015	This Parkas includes the standards of the quantity of toxic chemicals or hazardous substances contained in hazardous waste which is allowed to be disposed in sanitary landfills and standards of the quantity of toxic chemicals or hazardous substances allowed in soils. Any disposal of chemical waste or hazardous substances as stipulated in the Parkas out of sites determined by the ministry and competent institutions shall be absolutely prohibited and deemed as the infringement of law.
Prakas on Environmental Impact Assessment Classification for Development Projects No. 21 PRK.BST	2020	The Prakas determines the types and sizes of projects that are required to prepare environmental impact assessments. Projects having minor environmental impacts are required to prepare an Environmental Protection Agreement together with an Environmental Management Plan. Projects having medium impacts shall prepare an Initial Environmental Impact Assessment report, and projects with significant impacts are required to prepare a full EIA. All sizes of rubbish disposal sites are required to undertake an IESIA and all sizes of industrial waste disposal sites are required to undertake an EIA.
Environmental Guidelines on Solid Waste Management	2006	Contains a Landfill Ordinance that regulates landfill requirements to: (i) reduce as far as possible the adverse effects of waste disposal on the environment; (ii) preserve groundwater, surface water & air quality & to reduce emissions of greenhouse gases (iii) ensure waste is not harmful to human, natural & animal health during operation & decommissioning; and (iv) provide information and technical recommendation on the construction, operation, closure and aftercare management of landfills to ensure public health and safety and environmental protection.

Law/Regulation/Guideline	Year	Summary
Technical Guideline on Garbage and Urban Solid Waste Management	2016	The technical guideline provides standards for all activities related to disposal, storage, collection, transportation, recycling, dumping of municipal and hazardous waste as well as management of final dumpsite (closing Landfill) and continued management. The technical guidelines list the requirements to be implemented within 90 days for landfill closing (e.g. monitoring, gas management).
National Integrated Pest Management Program		The Integrated Pest Management (IPM) Program in Cambodia was established in 1993 after conducting national workshop on "Environment and IPM". The overall goal of National IPM Program is to promote food security in Cambodia by enhancing the sustainability of intensified crop production system through the promotion of integrated crop management (ICM) skills at farm level. The objectives of this program are: i. to reduce dependence on agricultural chemical, especially pesticides, in agricultural production and to minimize hazards to the human health, animals and environment; ii. to develop the capacity of farmers and agricultural technical officers in conducting training and experiments so that they are able to identify problems occurring in agricultural production and find appropriate solution to deal with the problem by themselves; and iii. Educate farmers on agricultural technology by enhancing their knowledge on field ecology and by developing skills among farmers in monitoring and analyzing field situations that enable them to manage crops properly. At the national level the position of the IPM program was strengthened by a Prakas (Ministerial Declaration) in July 2002, recognizing the National IPM Program as coordinating body for all IPM related activities in Cambodia. The Prakas also established a steering committee and a deputy director to act as the national coordinator

Law/Regulation/Guideline	Year	Summary
Labour Law (1997) Decree No. CS/RKM/0397/01 On October 5, 2021, Cambodia enacted the third amendment to the country's main employment legislation, the Labor Law of 1997, revising the rules governing individual labor dispute resolution, work shifts, and public holidays falling on Sundays.	1997	This law governs relations between employers and workers resulting from employment contracts to be performed within Cambodia. The key sections relevant to this project include: **<u>Chapter VIII Health and Safety of Worker</u>** The key provisions relate to the quality of the premises; cleaning and hygiene; lodging of personnel, if applicable (such as workers camps); ventilation and sanitation; individual protective instruments and work clothes; lighting and noise levels in the workplace. Article 230: Workplaces must guarantee the safety of workers. However, the only specific occupational health and safety Prakas relates to the garment industry and brick manufacture. **<u>Chapter IX Work-Related Accidents</u>** Article 248: All occupational illness, as defined by law, shall be considered a work-related accident. The law sets out how accidents should be managed in terms of compensation.

Law on Land (NS/RKM/0801/14)	2001	Provides that: (i) unless it is in the public interest, no person may be deprived of ownership of his immovable property; and (ii) ownership deprivation shall be carried out according to legal forms and procedures and after an advanced payment of fair and just compensation. (Article 5)
Expropriation Law	2010	Defines the principles, mechanisms, and procedures of expropriation, and defining fair and just compensation for any construction, rehabilitation, and public physical infrastructure expansion project for the public and national interests and development of Cambodia.
The Law on Road Traffic	2015	The law is intended to ensure road traffic safety and order, and protection of human and animal health and lives, properties and environment. Its establishment a requirement for all motor vehicles, trailers, and semi-trailers moving on the road to obtain a technical inspection certificate. It also outlines road safety requirements.
National Policy on the Development of Indigenous Peoples		1. The guiding document to address Indigenous Peoples' issues in Cambodia is the National Policy on the Development of Indigenous Peoples. The Policy, prepared starting in 1994, was approved by the Council of Ministers on April 24, 2009 and sets out government policies related to indigenous peoples concerning culture, education, vocational training, health, environment, land, agriculture, water resources, infrastructure, justice, tourism, industry and mines and energy. The Policy provides principles for formal registration of indigenous communities as legal entities with their own bylaws and enables their participation in economic development that affects their lives and cultures. It states: "Indigenous Peoples shall be fully entitled to express their comments and opinions and to make any decisions on the development of the economy, society and their cultures towards growth in the society
Policy on Registration and Right to Use of Indigenous Communities		The policy was approved by the Council of Ministers on April 24, 2009, and a Sub-Decree on procedures of registration of Land of Indigenous communities was signed on June 9, 2009 by the Prime Minister. This policy takes as its basis the recognition in the Land Law of 2001, of the right of indigenous communities to possess and use land as their collective ownership. The policy states that the registration of indigenous communities as collective ownership is different from the registration of individual privately owned land parcels because the land registration of the indigenous communities is the registration of all land parcels belonging to the communities as a whole, consisting of both State Public Land and State Private Land in accordance with the articles 25, 26, and 229 of the Land Law and related Sub-decrees. These land parcels are different in size and can be located within the same or different communes/sangkat

3.1.2 EIA Classification

43 In order to provide guidelines on effective implementation of sub-decree No 72 ANRK.BK on environmental impact assessment Procedures for development projects, MoE promulgated sub- decree No. 21 on Environmental Impact Assessment Classification for Development Projects.

44 According to this sub-decree, environmental impact assessment for projects is classified into three categories.

- Projects requiring full environmental impact assessment (full ESIA), equivalent to AIIB's

environmental category A, and IFAD's high risk
- Projects that require initial environmental impact assessment (IEIA), equivalent to AIIB's environmental category B, and IFAD's substantial risk
- Projects requiring the Contract on Environmental Protection (EPC), equivalent to AIIB's environmental category C plus simple EIA analysis and EMP, equivalent to IFAD's moderate/low risk

45 The sub-decree includes an annex listing projects under various sectors and their categorization on the basis of their nature, type and size. The sector and EIA classification for irrigation project is summarized in Table 3-2 below.

Table 3-2: ESIA Classification for Development ProjectsClassification for Development Projects

No.	Project Type	ESIA (Equiv. to AIIB's A	IESIA (Equiv. to AIIBB's B	Env. Protection Contract
142	Irrigation systems		≥5000ha	1000-5000ha
143	Water diversion systems		≥5000ha	1000-5000ha
176	All building construction	Build area>45000m^2	15000 – 45000m^2	3000-15000m^2
179	Road construction (new)	>100km	≥30 – 100km	10-<30km
180	Railroad and road expansion	>100km	≥50 – 100km	10-<50km
181	Road in protected areas	>30km	≥ 10-30 Km	10km
182	Road widen in protected area	>50km	≥ 10-50 km	10km

Source: Prakas No. 021 PRK.BST dated 03 February 2020.

3.1.3 Occupational and Community Safety and Health

46 Government Occupational and Community Safety and Health (OHS) guidelines follow the OHS Program for Cambodia (2010-2013) that was developed by the International Labor Organization (ILO). The draft guidelines provide the framework for instituting OHS at the workplace and in the community. The OHS guidelines for Cambodia will likely need to be supplemented with the international the IFC EHS/OHS Guidelines for Construction and Decommissioning, Waste Management Facilities, and Toll Roads.

47 Additionally, the National MoH's guideline on Covid-19 and National Guideline for Infection prevention and control for healthcare facilities of Cambodia will be applied due to the current situation in respect of the Covid-19 outbreak to reduce the incidence and risk of preventable Nosocomial Infection (NI). Occupational and community health and safety, as laid out in the EHS guidelines, will be a cross-cutting assessment for the subprojects.

48 The Ministry of Labor and Vocational Training (MLVT) has the following guidelines which will be implemented during the construction phase of the Project:

- MLVT Prakas2 No. 075/11 K.B/BR.K (March 2011) - Sanitation at the Construction Site: The Prakas sets to ensure that the sanitation and safety conditions are fulfilled for workers at construction sites by owners, directors, contractors or sub-contractors of construction establishments or construction companies. Articles 3 and 4 ensure that workers are provided with shelter, sanitation facilities and safe potable water for drinking and washing.

- MLVT Prakas No. 076/11 K.B/BR.K (March 2011) - The Protection of Risk Resulting From Climate Change at Construction Sites. Articles of this Prakas require safety measures and break times for workers at the construction site during extreme weather events.

- MLVT Prakas No. 077/11 K.B/BR.K (March 2011) - Providing of Information at the Construction Site. This Prakas states requirements for owners or responsible persons of a construction site to provide information, i.e. name and address of the owner of enterprise, construction establishment, Construction Company, name and address of architect, nature of construction, date for the start of the construction, estimated time

to finish the construction works, and estimated number of workers to be employed for construction activities.

- MLVT Prakas No. 078/11 K.B/BR.K (March 2011) - Stock of Materials, Waste Disposal and Clearance at Construction Site. This Prakas provides safety guidelines and requirements for the safe storage of construction of materials and hazardous substances/objects that can pose health and safety risks to workers.

49 The key national environmental quality standards applied to the subproject are listed in Table-3-3 below together with relevant international guidelines.

Table-3-3: Key National and International Environmental Standards and Guidelines

Environmental Issue	National Standards	International Guidelines
Ambient air quality	Annex 1, Ambient Air Quality Standard, of Sub-decree on Control of Air Pollution and Noise Disturbance, 2000	WHO Air Quality Guidelines, global update 2005
Noise	Annex 6, Max. Standard of Noise Level Allowable in the Public and Residential Areas, of Sub-decree on Control of Air Pollution and Noise Disturbance, 2000	WHO Guidelines for Community Noise, 1999
Surface water quality	Sub-decree No. 27 ANRK/BK 1999 on Water Pollution Control: Annex 4, Water Quality Standards for Public Waters for the Purpose of Biodiversity Conservation, and Annex 5, Water Quality Standards for Public Waters and Health	US EPA National Recommended Water Quality Criteria Mekong River Commission (MRC)_ Technical Guidelines for the Protection of Aquatic Life MRC Technical Guidelines for the Protection of Human Health

3.1.4 Applicable Evaluation Ambient Quality Standards

50 Water quality standard in public water area for public health protection is shown in Table-3-4 below.

Table-3-4: Water quality standard in public water areas for public health protection

No.	Parameter	Unit	Surface water Standard
1	Carbon tetrachloride	µg/l	< 12
2	Hexachloro-benzene	µg/l	< 0.03
3	DDT	µg/l	< 10
4	Endrin	µg/l	< 0.01
5	Diedrin	µg/l	< 0.01
6	Aldrin	µg/l	< 0.005
7	Isodrin	µg/l	< 0.005
8	Perchloroethylene	µg/l	< 10
9	Hexachlorobutadiene	µg/l	< 0.1
10	Chloroform	µg/l	< 12
11	1,2 Trichloroethylene	µg/l	< 10
12	Trichloroethylene	µg/l	< 10
13	Trichlorobenzene	µg/l	< 0.4
14	Hexachloroethylene	µg/l	< 0.05
15	Benzene	µg/l	< 10
16	Tetrachloroethylene	µg/l	< 10
17	Cadmium	µg/l	< 1

Source*:* Annex 5 of Sub-decree No 27 ANRK.BK on Water Pollution Control, 2009

51 Water quality standards in public water areas for biodiversity conservation is shown in Table-3-5 below.

Table-3-5: Water quality standard in public water areas for bio-diversity conservation

Parameter	Unit	Standard Value		
		River	Lake/Reservoir	Coastal Water
pH		6.5-8.5	6.5-8.5	7.0-8.3
BOD5	mg/l	1-10	NV	NV
Suspended Solid	mg/l	25-100	1-15	n/a
Dissolved Oxygen	mg/l	2.0-7.5	2.0-7.5	2.0-7.5
Coliforms	MPN/100ml	<5000	<1000	<1000
COD	mg/l	NV	1-8	2-8
Total Nitrogen	mg/l		0.1 – 0.6	0.2– 1.0
Total Phosphorus	mg/l		0.005– 0.05	0.02 – 0.09
Oil content	mg/l	NV	NV	0

NV=No value
Source: Annex 4 of Sub-decree on No 27 ANRK.BK Water Pollution Control, 2009.

52 Ambient Air Quality Standards are shown in Table-3-6below.

Table-3-6: Ambient Air Quality Standard

Parameters	Cambodia[a]				IFC-EHS[b] Guidelines WHO
	Period 1h Average mg/m3	Period 8h Average mg/m3	Period 24h Average mg/m3	Period 1year Average mg/m^3	interim target1 ug/m3
Carbon monoxide (CO)	40	20	-	-	
Nitrogen dioxide (NO2)	0.3	-	0.1	-	40（1yr.） 200 (1 hr.)
Sulfur dioxide (SO2)	0.5	-	0.3	0.1	500 (10 min) 125 (24hr.)
Ozone (O3)	0.2	-	-	-	100 (8 hr. daily)
Lead (Pb)	-	-	0.005	-	
Particulates	-	-	0.33	0.1	150 (PM10 24hr) 75 (PM2.5 24hr)

[a] Sub-decree N0 42 ANRK.BK on Air Pollution Control and Noise Disturbance.
[b] Environmental, Health, and Safety Guidelines, IFC.

Maximum permitted noise levels in public and residential areas are shown in Table-3-7 below.

Table-3-7: Maximum permitted noise level in public and residential area (dB (A))

Location	Cambodian Standard			IFC-EHS Guidelines	
	06:00 to 18:00	18:00 to 22:00	22:00 to 6:00	Day 7:00 to 22:00	Night 22:00 to 7:00
Silence Area Hospital; Library, School, Nursery	45	40	35	55	5
Resident Area Hotel; Administration place, House	60	50	45		

Commercial, Services Areas and mix	70	65	50	70	70
Small Industrial factories intermingling in residential areas	75	70	50		

Note: This standard is applied to control of noise level of any source of activity that emitted noise into the public and residential areas.
Source: Annex 6 of Sub-Decree on Air Pollution Control and Noise Disturbance, 2000

3.1.5 International Conventions

53 Cambodia is a signatory to many international environmental treaties and conventions which provide a comprehensive legal framework. These include:

- Biodiversity Convention in 1994;
- Convention on International Trade in Endangered Species of Fauna and Flora (CITES) in 1997;
- Ramsar Convention in 1999;
- United Nations Framework Convention on Climate Change (UNFCC), 1992, entered into force on 21 March 1994 (Cambodia ratified on 18 December 1995);
- Kyoto Protocol 1997, entered into force on 16 February 2005 (Cambodia accessed on 22 August 2002);
- Vienna Convention for the Protection of the Ozone Layer, entered into force on 22 September 1988 (Cambodia accessed on 27 June 2001);
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, entered into force on 1 January 1989 (Cambodia accessed on 27 June 2001);
- The International Convention for the Prevention of Marine Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto “MARPOL 73/78”, fully entered into force on 2 October 1983 (Cambodia ratified on 1994);
- Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, entered into force on 5 May 1992 (Cambodia accessed on 02 March 2001);
- United Nations Convention to Combat Desertification, entered into force on 26 December 1996 (Cambodia ratified on 18 August 1997);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora, entered into force on 01 July 1975 (Cambodia ratified on 04 July 1997);
- Cambodia joined the UNESCO Network of Biosphere Reserves in 1997. It committed to the Millennium Development Goals and subsequently endorsed the Sustainable Development Goals at the UN General Assembly in 2015;
- At the regional level, it ratified the following ASEAN Agreements: (a) on Transboundary Haze Pollution in 2006; and (b) on Disaster Management and Emergency Response, which entered into force in 2009; and
- At the subregional level, Cambodia, along with Lao PDR, Thailand and Viet Nam, signed the “Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin” (or the Mekong Agreement) in April 1995.

3.2 Application of AIIB, IFAD and GCF Environmental, Social, and Climate Risks Standards/Procedures

3.2.1 AIIB’s Environmental and Social Framework

54 The objectives of this ESF are to:

- Reflect institutional aims to address environmental and social risks and impacts in Projects (defined below in *Section II, Definitions,* of the ESP).
- Provide a robust structure for managing operational and reputational risks of the Bank and its shareholders in relation to Projects’ environmental and social risks and impacts.
- Support the environmental and social soundness and sustainability of Projects.

- Facilitate the integration of environmental and social aspects of Projects into the decision-making process by all parties.
- Provide a mechanism for addressing environmental and social risks and impacts in Project identification, preparation and implementation.
- Enable Clients (defined below in *Section II, Definitions,* of the ESP) to identify and manage environmental and social risks and impacts of Projects, including those of climate change.
- Provide a framework for public consultation and disclosure of environmental and social information in relation to Projects.
- Provide a grievance redress mechanism designed to enable Project-affected people to voice their concerns and grievances in connection with the environmental and social aspects of Projects.
- Improve development effectiveness and impact to increase results on the ground, in both the short and long term.
- Support Clients, through Bank financing of Projects, to strengthen their environmental and social management systems.
- Support Clients, through Bank financing of Projects, to implement their obligations under national environmental and social legislation (including under international agreements adopted by the Member) governing these Projects, including commitments relating to climate change.
- Support Clients, where feasible and appropriate, to mobilize resources for technical assistance for the preparation of environmental and social documents and capacity enhancement.
- Facilitate cooperation on environmental and social matters with development partners.

3.2.2 *AIIB's Environmental and Social Standards*

3.2.3 *Environmental and Social Standard 1: Environmental and Social Assessment and Management Scope and Application:*

55 Environmental and Social Standard (**ESS**) 1 applies if the Project is likely to have adverse environmental risks and impacts or social risks and impacts (or both). The scope of the environmental and social assessment and management measures are proportional to the risks and impacts of the Project. ESS 1 provides both for quality environmental and social assessment and for management of risks and impacts through effective mitigation and monitoring measures during the course of Project implementation.

- **Environmental coverage:** Environmental Risks and Impacts, Biodiversity Consideration, protected areas, ecosystem services, sustainability of land and water use, precautionary approach, pollution prevention, resource efficiency, climate change and greenhouse gases.
- **Social coverage:** Social Risks and Impacts, Scope of Social Coverage, Vulnerable/Disadvantaged Groups and Discrimination, Gender, Gender-based violence, Land and Natural Resource Access Loss of access to assets or resources or restriction on land use, Cultural resources
- **Heath and safety:** health and safety of workers and communities, occupational heath and safety, labor influx, building safety, traffic and road safety, security personnel, safety of dam.
- **Labor and Working conditions:** labor management relationships, civil servants, child labor and forced labor,

3.2.4 *Environmental and Social Standard 2: Land acquisition and involuntary resettlement*

56 **Scope and Application.** ESS 2 applies if the Project would or may involve Involuntary Resettlement (including Involuntary Resettlement of the past or foreseeable future that the Bank determines is directly linked to the Project).

3.2.5 *Environmental and Social Standard 3: Indigenous Peoples*

57 **Scope and Application:** ESS 3 applies if Indigenous Peoples are present in, or have a collective attachment to, the proposed area of the Project, and are likely to be affected by the Project.

The term Indigenous Peoples is used in a generic sense to refer to a distinct social and cultural group possessing the following characteristics in varying degrees:2 (a) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; (b) collective attachment to geographically distinct habitats, ancestral territories or areas of seasonal use or occupation in the Project area and to the natural resources in these areas; (c) customary cultural, economic, social or political institutions that are distinct or separate from those of the dominant society or culture; and (d) a distinct language or dialect, often different from the official language or languages of the country or region in which they live. In considering these characteristics, national legislation, customary law and any international conventions to which the Member in whose territory the Project is located is a party may be taken into account. A group that has lost collective attachment to geographically distinct habitats or ancestral territories in the Project area because of forced severance remains eligible for coverage as an Indigenous People, under ESS 3.

3.2.6 *Application of IFAD and GCF Environmental, Social, and Climate Risks Standards/Procedures*

58 Based on the IFAD SECAP and GCF ESS, the following safeguards documents were prepared: (i) Environmental and Social Management Framework (ESCMF) including climate considerations; (ii) Indigenous Peoples' Plan (IP Plan); (iii) Stakeholder Engagement Plan (SEP); and (iv) Gender Assessment & Action Plan (GAP). The documents have been publicly disclosed in advance of implementation and board approval to respect the Pelosi Amendment[14] as a best practice, even though the project is not high or substantial risk (the risk rating is only moderate), and the documents collectively respond to the standards described below.

3.2.7 SECAP's Environment and Social Standards (ESSs) are described as below:

- Standard 1: Biodiversity Conservation;
- Standard 2: Resource Efficiency and Pollution Prevention;
- Standard 3: Cultural Heritage
- Standard 4: Indigenous Peoples
- Standard 5: Labour and Working Conditions
- Standard 6: Community Health and Safety;
- Standard 7: Physical and Economic Resettlement;
- Standard 8: Financial Intermediaries and Direct Investments;
- Standard 9: Climate Change

59 Not explicitly listed as a standard, but considered a vital part of project design, implementation, and safeguarding is stakeholder engagement. Provisions to ensure meaningful engagement are provided within the Stakeholder Engagement Plan and initial feedback and engagement was mainstreamed into the project design.

The scope of the safeguard standards are detailed in Table-3-8.

Table-3-8: Scope of Safeguards Standards

Safeguards Standard	Scope
Standard 1: Biodiversity Conservation	**Scope:** In accordance with the Convention on Biological Diversity (CBD), this standard recognizes that biodiversity is about more than plants, animals and micro-organisms, and includes people and their need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment. Key objectives include: • Maintain and conserve biodiversity

[14] The 1989 Pelosi Amendment requires disclosure of environmental impacts at least 120 days prior to board approval for high- and sometimes substantial-risk projects (URL: https://www.gao.gov/archive/2000/ns00192.pdf)

Safeguards Standard	Scope
	• Ensure the fair and equitable sharing of benefits from the utilization of generic resources; • Respect, preserve, maintain, and encourage knowledge, innovations, and practices of indigenous peoples and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources; and • Adopt a precautionary approach to natural resource conservation and management to ensure opportunities for environmentally sustainable development.
Standard 2: Resource Efficiency and Pollution Prevention	**Scope:** This Standard recognizes that economic activity and development can often pollute the air, water, and land. They may also result in the consumption of finite resources, which may in turn threaten people, ecosystem services and the environment. It advocates for a precautionary approach with the following objectives: • Avoid, minimize and manage the risks and impacts associated with hazardous substances and materials, including pesticides; • Avoid or minimize project-related emissions of short- and long-lived climate pollutants; • Promote more sustainable use of resources, including energy, land and water; and • Identify opportunities for improving resource efficiency.
Standard 3: Cultural Heritage	**Scope:** This Standard recognizes that cultural heritage is central to individual and collective identity and memory, providing continuity between the past, present, and future. Objectives include: • Preserve and safeguard cultural heritage; • Ensure that active efforts are made to prevent IFAD-supported projects from altering, damaging or removing any tangible or intangible cultural heritage; • Promote the equitable sharing of benefits from the use of cultural heritage; and • Promote meaningful consultation on matters related to cultural heritage.
Standard 4: Indigenous Peoples	**Scope:** This standard focuses on the rights of Indigenous Peoples and promotes the following objectives: • Support indigenous peoples to determine priorities and strategies for exercising their right to development; • Ensure that each project is designed in partnership with indigenous peoples and with their full, effective and meaningful consultation, leading to FPIC; • Ensure that indigenous peoples obtain fair and equitable benefits and opportunities from project-supported activities in a culturally appropriate and inclusive manner; and • Recognize and respect the rights of indigenous peoples to the lands, territories, waters and other resources that they have traditionally owned, used or relied upon.
Standard 5: Labour and Working Conditions	**Scope:** This standard is focused on fostering inclusive, diversified, and productive rural economies that create opportunities for decent work and higher incomes. Objectives of this standard are to: • Promote direct action to foster decent rural employment;

Safeguards Standard	Scope

	• Promote, respect and realize fundamental principles and rights by:
	  ○ Preventing discrimination and promoting equal opportunities for workers;
	  ○ Supporting freedom of association and the right to collective bargaining; and
	  ○ Preventing the use of child labour and forced labour;
	• Protect and promote the safety and health of workers;
	• Ensure that projects comply with national employment and labour laws, and international commitments;
	• Leave no one behind by protecting and supporting workers in disadvantaged and vulnerable situations, including women (e.g. maternity protection), young workers, migrant workers, workers in the informal economy and workers with disabilities.

Standard 6: Community Health and Safety	**Scope:** These standard stresses avoiding – and where avoidance is not possible, minimizing and mitigating – health-related and safety-related risks and impacts that may arise from IFAD-supported projects, with special attention to marginalized and disadvantaged groups. Objectives include to: • Ensure quality and safety in the design and construction of programming-related infrastructure, preventing and minimizing potential safety risks and accidents; • Avoid or minimize community exposure to disaster risks, diseases and hazardous materials associated with project activities; • Ensure that the safeguarding of personnel and property minimizes risks to communities and is carried out in accordance with international human rights standards and principles; and • Have in place effective measures to address emergency events, whether human-made or natural hazards.
Standard 7: Physical and Economic Resettlement	**Scope:** This Standard not only considers resettlement as the physical relocation of people but as economic, social and cultural displacement restricting people's access to livelihoods and culturally important sites. Objectives include to: • Avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring alternative project designs and sites; • Avoid forced eviction; • Ensure that resettlement activities are planned and implemented collaboratively with the meaningful participation of affected people; • Enhance and restore the livelihoods of all displaced peoples; and • Provide explicit guidance to borrowers/recipients/partners on the conditions that need to be met regarding involuntary resettlement.
Standard 8: Financial Intermediaries and Direct Investments	**Scope:** This Standard recognizes that investments in FIs (indirect investments) and private-sector companies (direct investments) are critical for promoting sustainable financial markets and providing financial products and services to farming businesses and rural micro, small and medium-sized enterprises. Objectives include to:

Safeguards Standard	Scope
	• Promote sound environmental, social and climate practices, and sound human resource management with FIs and direct investees; • Ensure that FIs and direct investees assess and manage any environmental and social risks and impacts of subprojects; and • Promote good environmental and social management practices by direct investees and in the subprojects financed by FIs.
Standard 9: Climate Change	**Scope:** This standard is focused actively considering, planning for, and responding to projected climate changes. Objectives include to: • Ensure alignment of IFAD-supported projects with the Nationally Determined Contributions of countries and the goals of the Paris Agreement and other international frameworks; • Ensure that proposed activities are screened and assessed for climate change and disaster risks and impacts, including both impacts of projects and on them; • Apply the mitigation hierarchy in project design; • Strengthen the resilience of communities to address the risk of climate change impacts and climate-related disasters; and • Increase the ability of communities to adapt to the adverse impacts of climate change, and foster climate resilience and low GHG-emitting projects that do not threaten food production.

3.3 Gap Analysis and Gap Filling Measures

60 IFAD classifies projects and subprojects into one of four classifications: *high risk*, s*ubstantial risk*, *moderate risk* or *low risk* and discloses a project's risk classification and basis for that classification in project documents and on the IFAD website. GCF classifies projects and subprojects into one of three classifications: high risk, moderate risk, or low risk, however the GCF accepts the standards and risk classifications of Accredited Entities, like IFAD, thus for this project (and to simplify approval for IFAD-funded activities) the ESCMF utilizes the IFAD classifications.

61 The assessment identified key gaps between the county's legal system and international recognized environmental and social standards (e.g. AIIB, IFAD, GCF) and priority needs to ensure full compliance of the ESSs. The conclusion was that Cambodia has a comprehensive regulatory framework that in many cases meets the requirements of the ES standards, and key issues are more associated with implementation and differentiated capacities between the central and provincial PMUs and the provinces. There are opportunities to accelerate implementation of recent improvements in the country system, especially on labour, community safety, and stakeholder engagement.

62 Based on the project's high or category A risk rating for environment, social, and climate considerations, national regulations are adequate for most of the investments, while additional gap-filling measures will be applied for the preparation of an Environmental, Social and Climate Impact Assessment (ESCIA) for the overall project particularly related to the civil works so that contractors and implementation partners can adequately address issues related to contract management, safety of local communities, and workers. Capacity building efforts pertaining to regulation and oversight are also incorporated as part of the safeguards management of the CAISAR project and as part of the project design (e.g. under Component 2 activities).

63 There are key gaps between the environmental, social, and climate assessment requirements of the Asian Infrastructure Investment Bank (AIIB), International Fund for Agricultural Development (IFAD), Green Climate Fund (GCF), and the Cambodian Government.

64 One key difference is the scope of their assessments. The AIIB and GCF focus on infrastructure and climate projects, while IFAD focuses on agricultural development. As a result, the types of environmental and social risks and impacts that are assessed may differ.

65 Another difference is the level of detail required in the assessments. The AIIB requires a comprehensive Environmental and Social Framework (ESF) that covers all projects, while the GCF requires a simplified Environmental and Social Management System (ESMS) that is tailored to each project. IFAD requires an Environmental and Social Assessment (ESA) that is specific to each project.

66 In terms of climate assessments, the GCF requires a detailed assessment of the project's potential greenhouse gas emissions and its contribution to climate change mitigation and adaptation. The AIIB also considers climate risks and opportunities in its project assessments but does not require a specific climate assessment. Cambodia's Environmental Impact Assessment (EIA) requirements do not explicitly specify climate assessment procedures. However, the EIA process does consider the potential impacts of projects on the environment, which includes climate-related factors. The assessment typically covers aspects such as air quality, water resources, biodiversity, and social impacts, which indirectly address climate considerations.

67 Overall, while there are some similarities in the environmental, social, and climate assessment requirements of these institutions, there are also key differences that reflect their different mandates and priorities.

68 A detailed list of the Green Climate Fund's climate assessment requirements for an irrigation and flood protection project in Cambodia require:

1. Project description: The project description should include a detailed description of the irrigation and flood protection project in Cambodia, including the location, size, and scope of the project, as well as the expected benefits and impacts.
2. Climate rationale: The project should have a clear climate rationale that explains how it will contribute to climate change mitigation and adaptation. This should include an analysis of the project's potential greenhouse gas emissions and its contribution to reducing emissions.
3. Baseline emissions: The project should include a baseline emissions assessment that estimates the greenhouse gas emissions that would occur in the absence of the project.
4. Project emissions: The project should estimate the greenhouse gas emissions that will be generated by the project, including direct and indirect emissions.
5. Mitigation potential: The project should assess its potential to reduce greenhouse gas emissions and contribute to climate change mitigation. This should include an analysis of the project's potential to reduce emissions compared to the baseline scenario.
6. Adaptation potential: The project should assess its potential to contribute to climate change adaptation, including an analysis of the project's ability to increase resilience to climate change impacts such as flooding and drought.
7. Co-benefits: The project should identify and assess any co-benefits that may result from the project, such as improved food security, increased access to water, or improved livelihoods.
8. Risks and uncertainties: The project should identify and assess any risks and uncertainties associated with the project, including potential environmental, social, and economic risks.
9. Monitoring and evaluation: The project should include a monitoring and evaluation plan that outlines how the project's greenhouse gas emissions, climate change mitigation and adaptation impacts, and co-benefits will be monitored and evaluated over time.

69 Overall, the Green Climate Fund's climate assessment requirements for an irrigation and flood protection project in Cambodia are designed to ensure that the project is aligned with the Fund's climate change objectives and that its potential greenhouse gas emissions and contributions to climate change mitigation and adaptation are carefully evaluated.

70 It is important to ensure that the environmental, social, and climate assessments of an irrigation and flood control project in Cambodia meet both the requirements of the international organizations as well as the legal requirements of the Cambodia government. This will help to ensure that the project is implemented in a way that is legally compliant and meets international standards for environmental and social sustainability and climate change mitigation and adaptation.

3.3.1 *Environmental, Social and Climate Assessment in Cambodia*

71 The Environmental Impact Assessment (EIA) process in Cambodia faces several issues that hinder its effectiveness and transparency. Some of the key issues include:

1 Limited public participation: The EIA process in Cambodia often lacks meaningful public participation. Communities and affected stakeholders are not adequately informed or involved in decision-making processes, limiting their ability to provide input, voice concerns, and influence project outcomes.
2 Inadequate assessment quality: The quality of environmental impact assessments conducted in Cambodia is often criticized for being insufficient and not meeting international standards. This can result in inaccurate or incomplete assessments, leading to inadequate identification and mitigation of potential environmental and social impacts.
3 Lack of independence: The EIA process in Cambodia suffers from a lack of independence, as project proponents are often responsible for conducting and financing their own environmental impact assessments. This can create conflicts of interest and raise concerns about the credibility and objectivity of the assessment process.
4 Weak enforcement and compliance: Despite having regulations in place, the enforcement of EIA requirements and conditions is often weak in Cambodia. This can lead to non-compliance by project developers, with inadequate monitoring and enforcement mechanisms to ensure adherence to environmental safeguards.
5 Limited capacity and resources: Cambodia faces challenges in terms of limited technical capacity and resources for conducting robust environmental impact assessments. Insufficient expertise and resources can result in inadequate assessments and monitoring, compromising the effectiveness of the EIA process.
6 Lack of transparency and accountability: The EIA process in Cambodia lacks transparency, with limited public access to information and documentation related to environmental impact assessments. This lack of transparency hampers accountability and the ability of affected communities to understand and challenge project decisions.

72 While climate change is not explicitly mentioned in the Cambodian EIA requirements, the government has recognized the importance of climate change mitigation and adaptation. The country has developed policies and strategies to address climate change, such as the National Adaptation Plan and the National Climate Change Strategic Plan. These initiatives aim to integrate climate change considerations into various sectors, including infrastructure development and land use planning.

73 In recent years, there has been recognition globally of the need to include climate change considerations in the EIA process. This includes assessing the potential greenhouse gas emissions, vulnerability to climate impacts, and the resilience of projects to climate change.

74 In conclusion the ESCIA requirements of AIIB, IFAD, GCF and the Cambodian government are similar intent and must include the specific climate assessment requirements as defined by GCF.

3.3.2 *Labor and Working Conditions in Cambodia*

75 Cambodia’s labor law does address various aspects related to child labor, gender equality, forced labor, and occupational health and safety. However, it is important to note that there are still challenges in effectively enforcing these laws and ensuring full compliance across all sectors.

76 Regarding child labor, Cambodia’s labor law prohibits the employment of children under the age of 15 in any economic activity. However, there are exceptions for light work that is not harmful to their health and development, and the law also allows for children aged 12 to 15 to engage in light work with certain restrictions. Despite these regulations, child labor remains a concern in Cambodia, particularly in sectors such as agriculture, construction, and informal work.

77 In terms of gender equality, Cambodia’s labor law prohibits discrimination based on gender in recruitment, remuneration, promotion, and other employment-related matters. It also guarantees equal

pay for equal work. However, gender-based discrimination and disparities in the labor market, including lower wages for women and limited representation in higher-level positions, continue to persist.

78 Regarding forced labor, Cambodia's labor law explicitly prohibits any form of forced or compulsory labor. It also prohibits debt bondage and human trafficking. However, forced labor remains a significant issue, particularly in sectors such as agriculture, construction, and domestic work. The government has taken steps to combat this problem, including establishing mechanisms for reporting and addressing cases of forced labor.

79 Occupational health and safety is another area addressed by Cambodia's labor law. The law requires employers to provide a safe and healthy working environment, including measures to prevent accidents, injuries, and occupational diseases. It also mandates the establishment of workplace safety committees and the provision of training on occupational health and safety. However, the enforcement of these regulations and the implementation of effective safety measures can be challenging, particularly in sectors with informal or hazardous working conditions.

80 In summary, while Cambodia's labor law does address child labor, gender equality, forced labor, and occupational health and safety, there are still gaps in enforcement and compliance. Efforts are needed to strengthen the implementation of these laws and ensure the protection of workers' rights in practice.

81 Systematic labor inspection heavily relies on self-reporting, especially when construction contractors and primary suppliers are involved. For this reason, a template for labor management procedures must be included in bidding documents of contracted workers. For primary suppliers of materials, the practice of conducting due diligence on labour and working conditions among potential sources of aggregate material is uncommon. Therefore, a monitoring procedure must be established prior commencement of related works, and the site-specific ESA must assess potential labor issues, including risks of child and forced labour for suppliers and in the value chains relevant for the CAISAR project, and other health hazards on workers due to waste management and handling of any related hazardous materials during construction to ensure compliance with national laws and Standards. MOWRAM as the Lead Agency of the CAISAR project must ensure that OHS procedures and a working grievance redress mechanism are stipulated within the contract, including the system for monitoring third party contractors' compliance with the agreed OHS procedures and GRM.

4. ENVIRONMENT, SOCIAL & CLIMATE ASSESSMENT

4.1 Project Objective, Components, Areas and Beneficiaries

82 The project rationale is provided in Section 1.1. The Country and project context is provided in Section 1.2, and the CAISAR Project components are outlined in Chapter 2.

83 The CAISAR project has a broad positive impact benefitting approximately 120,000 households (500, 000 rural people) directly while its effect will propagate to over 3 million people in the region (CAISAR Feasibility Study 2023). The project will be executed through the Ministry of Water Resources and Meteorology (MOWRAM) and the National Committee for Sub-National Democratic Development Secretariat (NCDD-S), a Direct Access Accredited Entity to the GCF. The expected timelines for the approval of the co-financing by IFAD and AIIB Executive Boards are respectively September 2024 and January 2024, with the inception of the project is expected to take place in December 2024.

4.2 Project Area

84 The CAISAR project aims to enhance Cambodia's resilience against climate change through investments in innovative practices such as flood protection, drainage, and solar pumping, with a total estimated budget of $280 million. The costs are distributed among different CAISAR objectives, with flood and drainage costing $47.4 million, solar and raised tertiary costing $82.1 million, and irrigation and storage costing $150.6 million. The project is divided into three sub-projects, each with different requirements and costs. The CAISAR scheme is expected to improve yields and provide better drought resilience over the 25-year asset life, with the project expecting significant yield improvements in all three sub-project areas.

85 The core benefits of the project include food security in the face of climate change as well as significant economic contributions to poor rural households by enabling climate change resilient and adaptive agriculture as well as nationally important greenhouse gas emission reductions. The scheme will bring several indirect benefits improving the socio-economic situation for communities living within the command areas such as improved access to transport links, education and community strengthening through the establishment of FWUCs. The project is expected to be economically viable even under pessimistic assumptions, with the baseline internal rate of return for the project at 17%.

86 Through nature-based approaches including river restoration and rehabilitation and creation of natural ponds, the CAISAR project is expected to provide several environmental enhancements whilst ensuring that the environmental impacts of the construction and operational phases of the project are limited and mitigated where possible. In addition to this, the use of innovative climate-smart solutions will reduce the overall climate impact of the scheme and endeavor to reduce the emission of greenhouse gases from the existing and proposed agricultural practices with the introduction of solar pumps and Alternate Wetting and Drying techniques.

87 The character and existing farming systems differ widely in each sub project as will be described below. The CAISAR feasibility study covers a total command area of 45,000ha and is composed of three sub-project command areas – Ou Ta Paong, in Pursat Province, Lum Hach, in Kampong Chhnang Province and Krang Ponley in Kampong Chhnang, Kapong Speu and Kandal Province as shown in
Source: CAISAR Feasibility Study

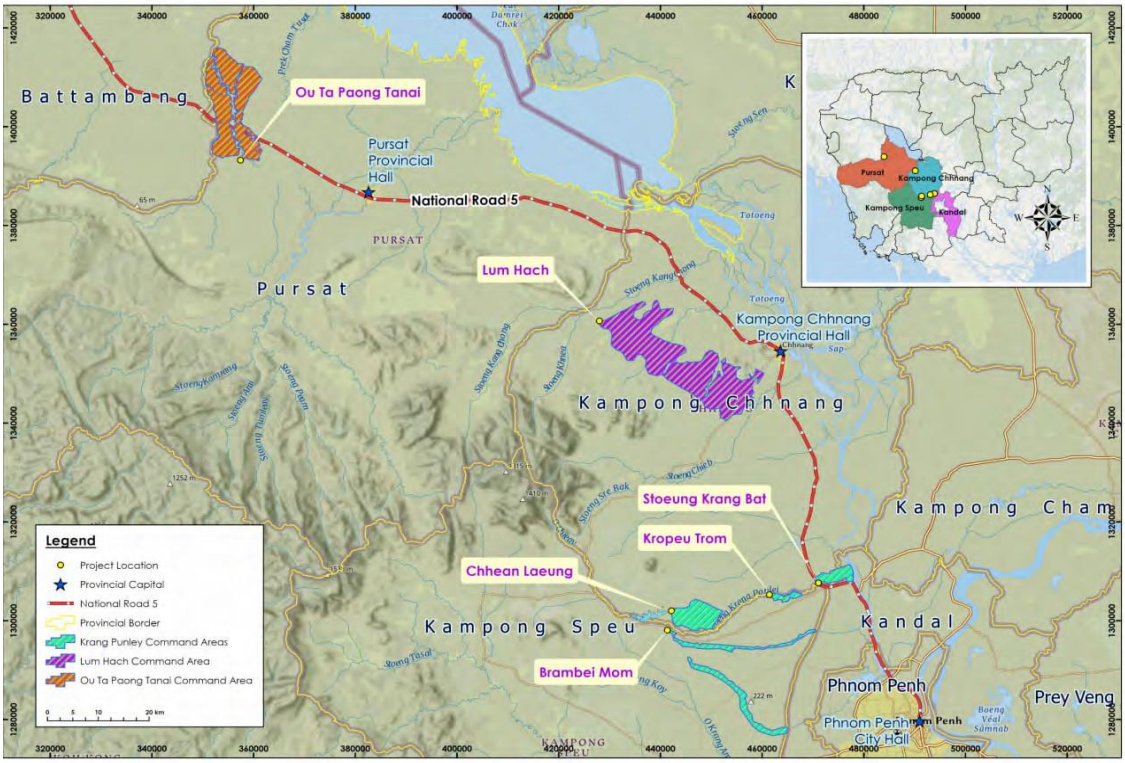
Figure 4-1: Map showing the location of the CAISAR project areas and& Provincial Boundaries

88 .

89 Detailed characteristics of the different sub-project command areas, with respect to historical and present-day conditions, temperature, precipitation, agricultural cover, and current water resources are presented in each Feasibility report for the corresponding projects which will be available to the team.

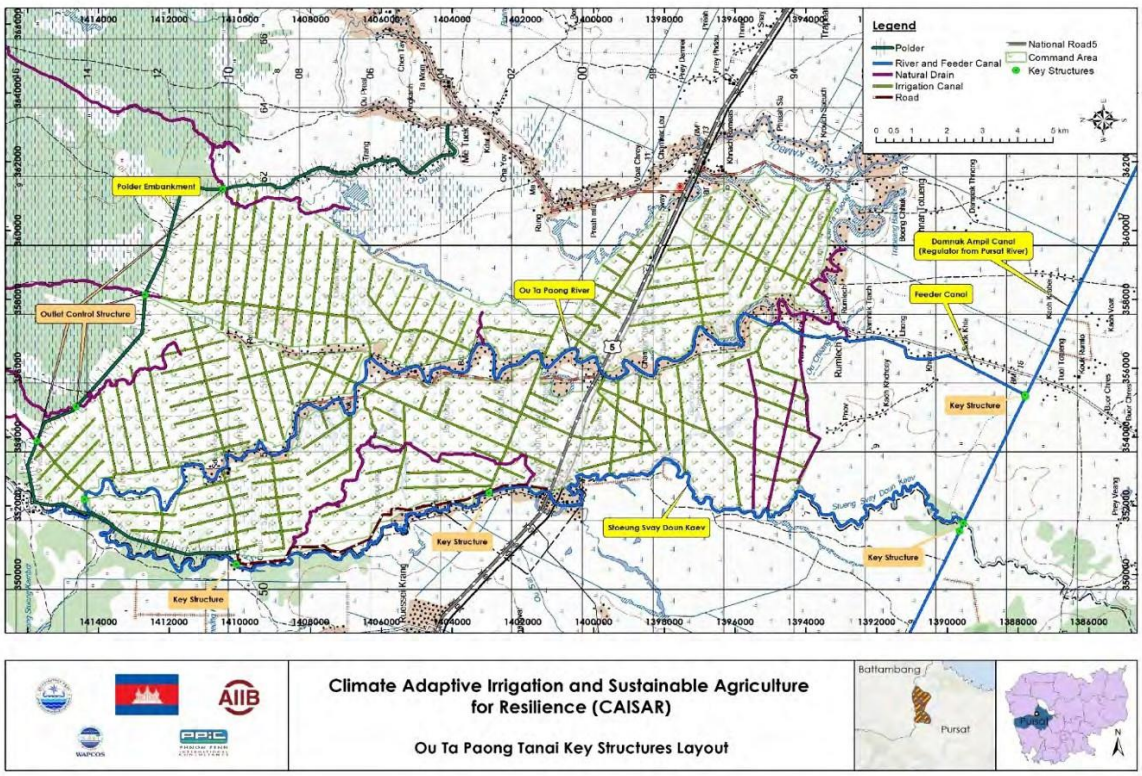
90 The sub-project areas, except for Kampong Chhnang, each have existing irrigation infrastructure which needs rehabilitation and/or has a suitable nearby water source that could enhance the agricultural output from the area and make it more resilient to the effects of climate change. The final command areas were then established based on field surveys and stakeholder consultations and

target areas that require the greatest assistance. Each sub-project area is currently experiencing or projected to experience challenges because of climate change and is therefore in need of climate adaptation and resilience measures. This work has been conducted in consultation with MOWRAM and the PDWRAM to ensure that local information is considered at each project stage.



Source: CAISAR Feasibility Study

Figure 4-1: Map showing the location of the CAISAR project areas and& Provincial Boundaries



Source: CAISAR Feasibility Study 2023

Figure 4-2: Ou Ta Paoung Project Layout - Some irrigation exists, others depend on flood recession or rainfall.

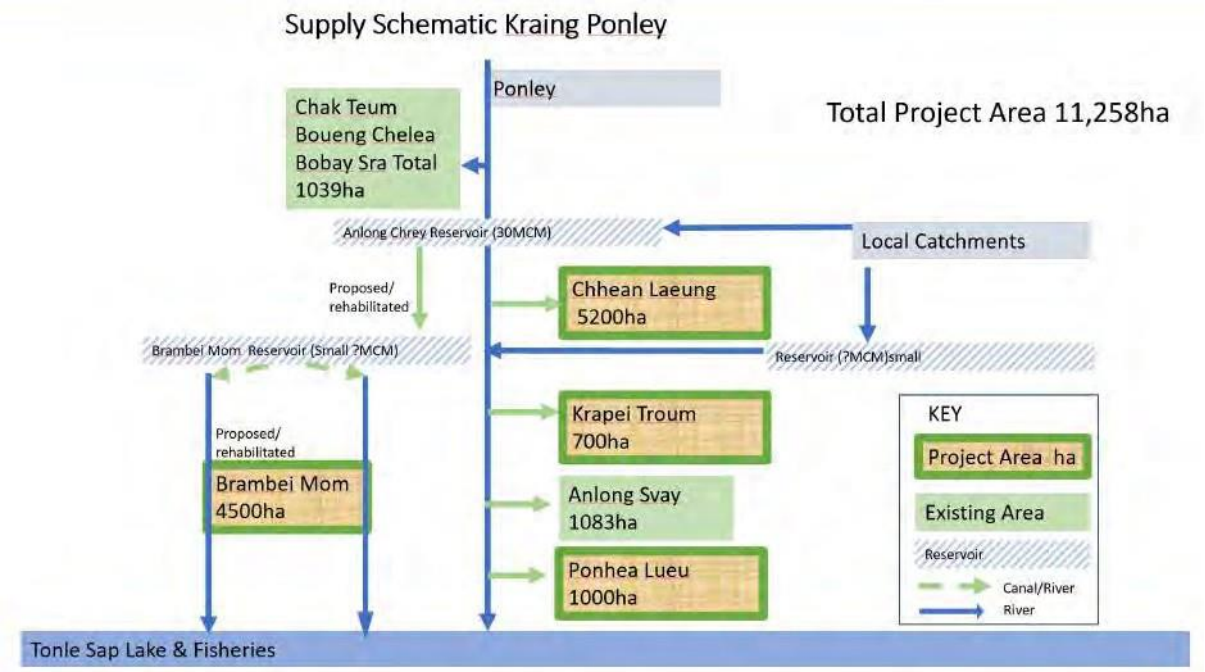
Source: CAISAR Feasibility Study 2023

Figure 4-3 Lum Hach Feasibility Level Canal Layouts and Storage (excluding JICA System)

91 Krang Ponley scheme differs from the Ou Ta Paong and Lum Hach schemes in that it consists of 4 separate command areas. These are grouped according to their hydrological connectivity via the Ponley River and geographical proximity in the North East of the Kampong Speu province and crossing slightly into Kampong Chhnang and Kandal (Source: CAISAR Feasibility Study 2023

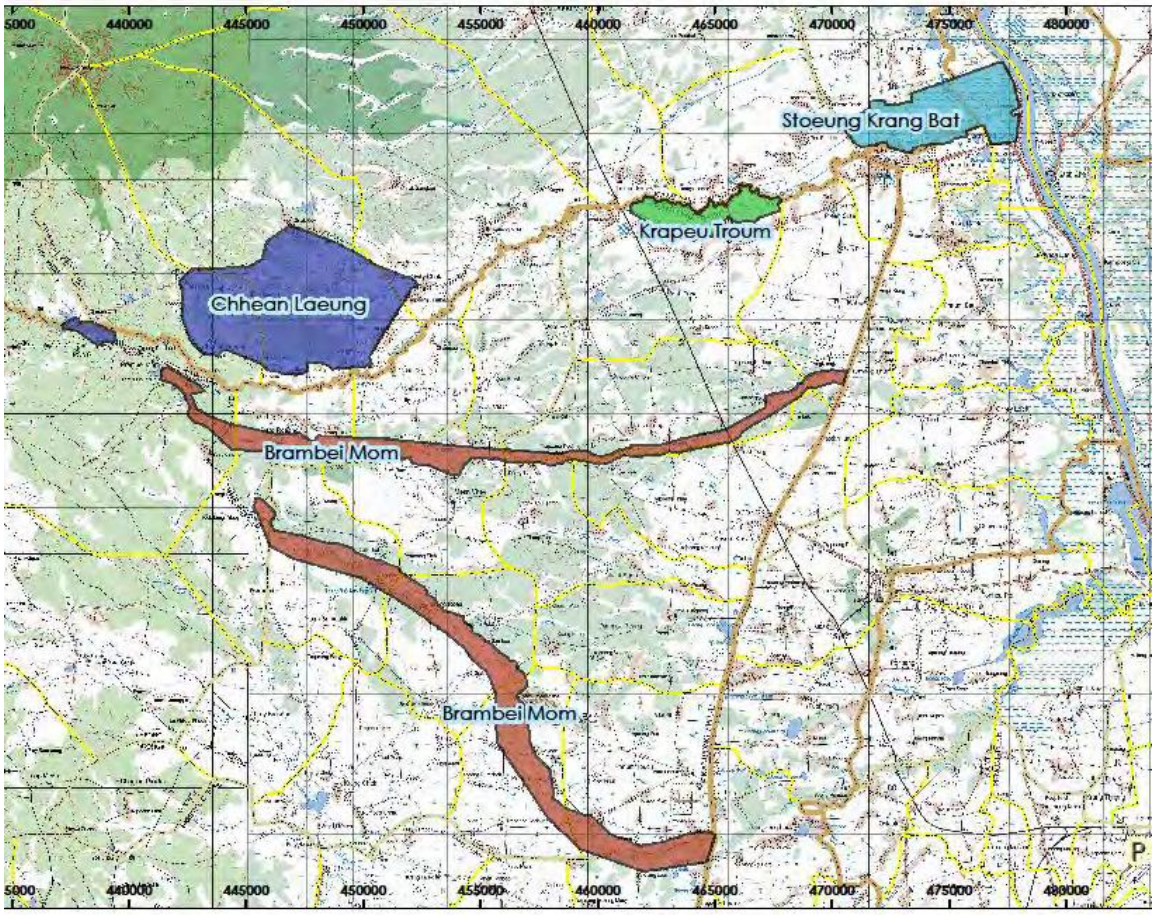
92 Figure 4-3 to Source: CAISAR Feasibility Study

93 Figure 4-7).



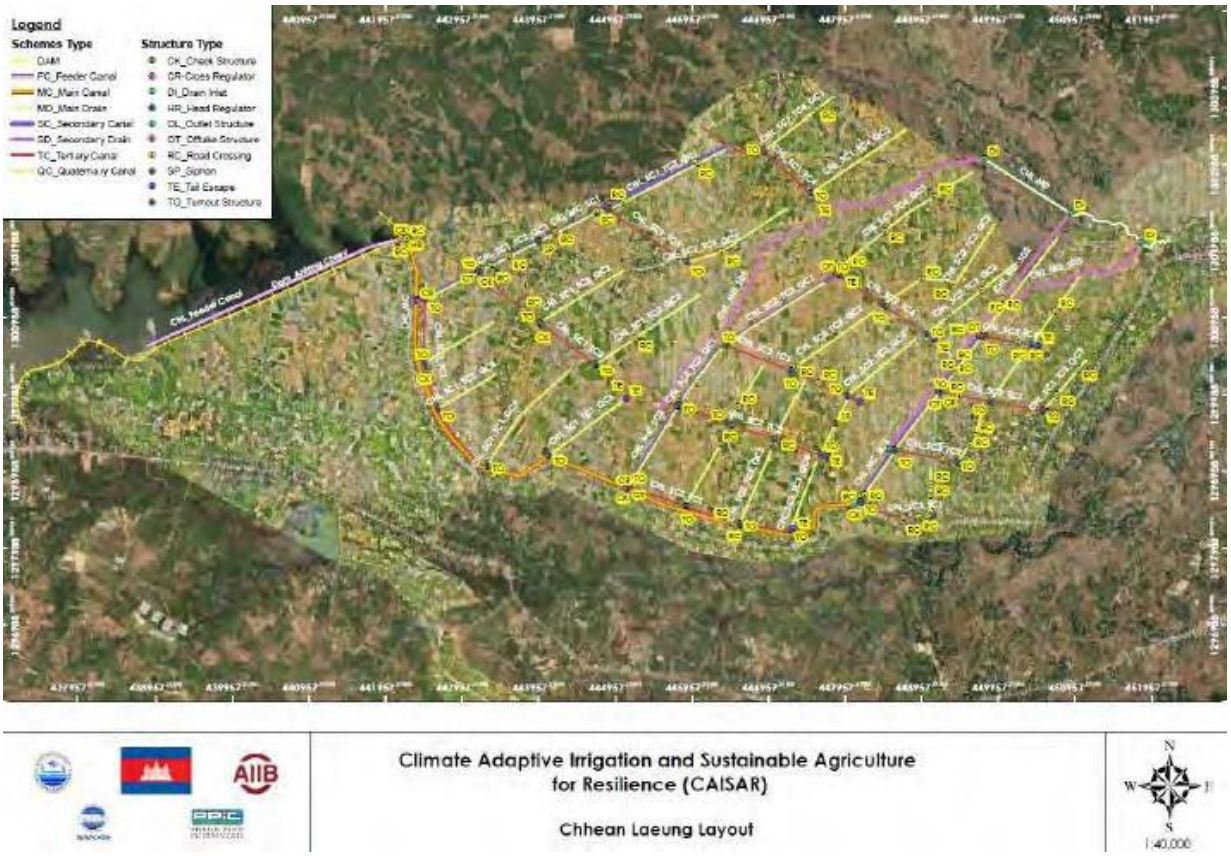
Source: CAISAR Feasibility Study

Figure 4-4: Krang Ponley overview schematic



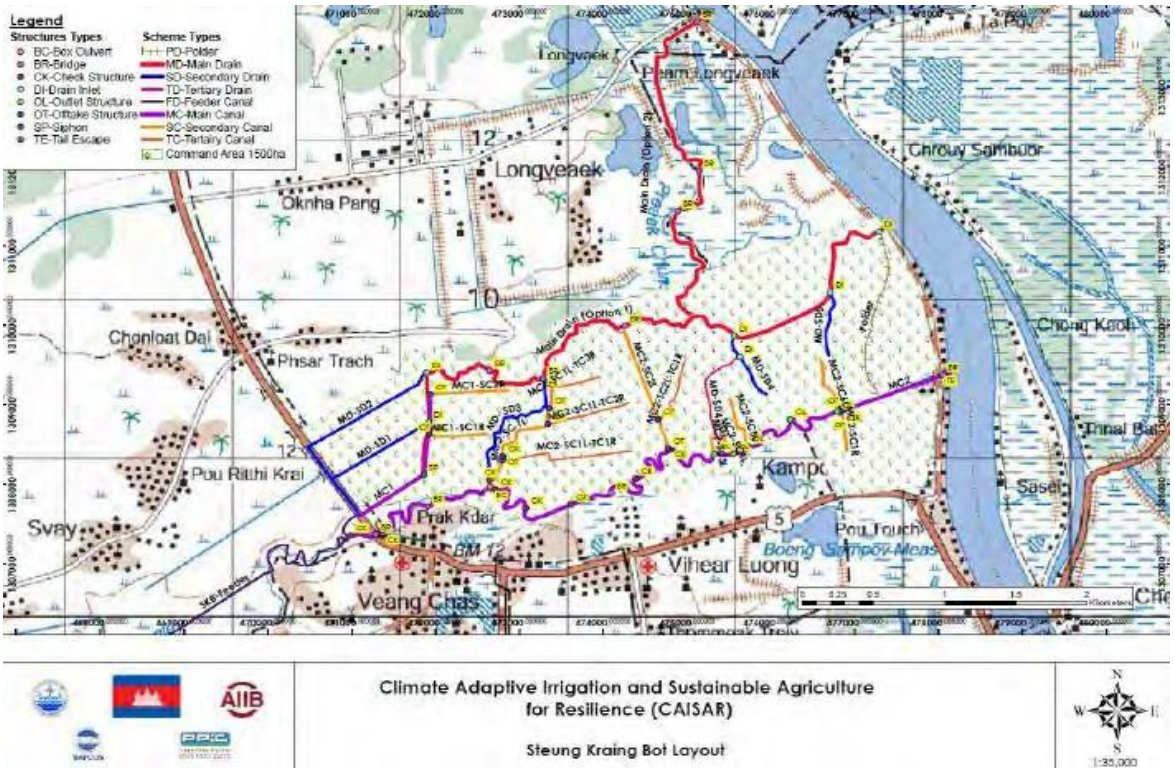
Source: CAISAR Feasibility Study

Figure 4-5: Location of Krang Ponley Irrigation Schemes



Source: CAISAR Feasibility Study

Figure 4-6 Krang Ponley Subproject - Chhean Loeung area canals do not exist,



Source: CAISAR Feasibility Study

Figure 4-7 The Outlet of the Krang Ponley to the Tonle Sap is through Krang Bat area

4.3 Project target areas and beneficiaries

94 The following section describes the CAISAR sub-projects and their beneficiaries.

4.3.1 *Krang Ponley*

95 The Krang Ponley sub-project is located within the Krang Ponley catchment and is made up of four sub areas: Brambei Mom, Krapeu Troum, Krang Bat and Cheung Luong. The Krang Ponley river is long and fed from the Anlong Chrey Reservoir. The reservoir has a storage capacity of 30M m3 and was rehabilitated by KOICA in 2012 as part of the *Krang Ponley Water Resources Development Project*. With the exception of Chhean Laeung, each of the sub-project areas has existing irrigation infrastructure. These were largely constructed under the Khmer Rouge (1975 – 1979) and have since fallen into disrepair despite farmers excavating and maintaining some main and branch canals. Severe sedimentation and embankment erosion resulting from a lack of maintenance has resulted in damaged concrete structures and an inefficient irrigation system.

96 The proposed works are expected to benefit 3 communes across the four separate sub-schemes, making use of both the Anlong Chrey reservoir and the Brambei Mom reservoir. Pond and storage area rehabilitation and excavation, upgrading main, secondary, and tertiary canals as well as a new scheme at Chhean Leung will be hugely beneficial to local communities, increasing their resilience to climate change and enabling them to increase their agricultural outputs resulting in a number of indirect social benefits. In total there are 47,000 households in the Krang Ponley sub-project area. Dry season yields are expected to increase from 4.5 tons/ha to 6.5 tons/ha and during the wet season, they are expected to increase from 3.9 tons/ha to 5.8 tons/ha.

4.3.2 *Lum Hach*

97 The Lum Hach irrigation scheme is in close proximity to the work undertaken by JICA as part of the West Tonle Sap Irrigation Project (2022). Unfortunately, due to the infilling of the 1st January canal from discarded excavated material and the lowering of the headworks on the main canal, the CAISAR Lum Hach scheme can no longer make use of the existing main canal as a water source for irrigation. Therefore, alternative water sources have been assessed and analysed to determine if they are available and sufficient for the new scheme (Annex 1).

98 The existing irrigation infrastructure has received limited farm maintenance by farmers and others. This has resulted in sedimentation, embankment erosion and damaged concrete structures making the current system unreliable.

99 The proposed works are expected to benefit people living in four communes across three districts of Kampong Chhnang Province. The overall design will enhance the existing irrigated area to enable farmers to increase yields during the wet season from 2.5 tons/ha to 4.5 tons/ha. Additionally, with the provision of a reliable water source during the dry season and sufficient training provided through the proposed FWUCs, dry season cropping will be feasible with an estimated yield of 5 tons/ha.

100 Overall there are 18000 households in the Lum Hach sub-project area.

4.3.3 *Ou Ta Paong*

101 The Ou Ta Paong sub-project lies within Pursat Province. The area is highly climate vulnerable due to its proximity to the Tonle Sap lake and the Svay Donkeo river which have shown erratic flood patterns in recent years.

102 The existing irrigation scheme at Ou Ta Paong was constructed during the Khmer Rouge. Some sections have been rehabilitated by farmers and from social funds but due to an overall lack of maintenance and finance, many sections of canal have been damaged from sedimentation and erosion. The main water source is from the Don Nak ChheKrom canal which receives water from the Steng Pursat River.

103 The proposed scheme will include flood defense investment around the command area to enable the community to protect it's farming livelihood from future flood events from the Tonle Sap but taking into consideration the importance of local fisheries.

104 The current irrigation system is not connected to upstream water sources and current farming practices are heavily dependent on rainfall and flood recession agriculture. The design proposals will reduce this climate dependence and vulnerability to climatic changes by providing a reliable source of water for irrigation from the Svay Donkeo River via the Damnak Ampil Canal. 40km of Main Canal will convey water from the Damnak Ampli Head Works via the China Main Canal to feed the irrigation scheme.

105 The scheme will benefit communities living within two communes in the Bakan and Pursat Province and overall, there are 6000 households in the sub-project area. Dry season yields are expected to increase from 5.8 tons/ha to 6.5 tons/ha and wet season yields are expected to increase from 3.9 tons/ha to 5.8 tons/ha.

106 The following provides a summary of the three irrigation and flood control schemes.

Table-4-1: Summary of the Sub Project Elements

Sub Project	Ou Ta Paoung	Lum Hach	Krang Ponley
Area Cultivated (ha)	13,000	17,000	15,000
Water Source	Pursat River and Svay Don Keo	Local Streams and diversion of Boribo tributary	Krang Ponley River with existing storage at Anlong Chrey and Brambei Mom
Nature Based Solution	Restoration of Ou Ta Paoung River, fish passage on Donkeo and OTP, Natural Management of TS floods.	Enhancement of Main Canal environmental features, local storages and riparian corridors along local rivers. 200 Ponds	Control of flood regime at Krang Bat for flood recession and fisheries. Rehabiltate 31 major ponds.
Solar Pump Installations	35 (Not suitable in flood areas)	179	110(BBM)+47(CL)+27(KPT)
Main/Feeder Canals C/L(km)/N	1_8.0km_29	1_30.0_52	
Secondary Canal C/L (km)/N (Exist and New)	8_30.0km_ 13_35.8km_108	12_12.2km_673	
Tertiary Canal C/L (km)/N Exist and New	34_47.5km 139_151.0km_1452	179_107km_1487	
Main/Secondary Drains (C/L km/N)	7_36.3km_15	12_107km_99	
Existing Land Area (Ha)	300	66	144
New Land Area Required (Ha)	278	532	249

Note: (L=km C= Number of Canals, N= Number of Structures)

4.4 Socio-economic context and vulnerability

107 As part of the feasibility study for the CAISAR project, WAPCOS conducted a comprehensive livelihoods and vulnerability study of the target population. The study conducted surveys across more than 630 households in the project areas, 100 focus groups and 100 key informant interviews to understand the social and economic issues affecting the target population in the areas where CAISAR will be implemented. Issues such as poverty rates, land ownership, access to goods, education and health care as well as institutional capacities and gender related issues were all explored and analyzed by the WAPCOS team. It was important for the CAISAR project to assess such issues to get an improved understanding of the social society living in the command areas and any long-standing social inequalities which may impact their ability to adapt and be resilient to climate change. This could then assist the design and implementation of targeted and area specific aspects of both Component 1 and 2.

108 The survey results were assessed and found that the populations of all command areas follow similar social economic indicators, in terms of poverty, income, household debt, education levels, health and vulnerabilities.

109 Most of the population are rural farmers (rice typically), whilst some also supplement their income via alternative jobs such as working in the service sector. Households typically do not have stable annual incomes or expenditures due to the annual cycle of the wet and dry season and the impact this has on agricultural yields and livelihoods. This correlated with the vulnerability analysis which found that the majority of the population is at the edge of poverty despite most respondents having incomes above traditional poverty lines (the World Bank or UNDP thresholds are between 2-8 USD per day). The WAPCOS survey found that based on responses to the monthly income section in the livelihood analysis for the four provinces, the highest proportion of households earn between 200 to 300 USD/month (17.1%) and then 300 to 400 USD/month (16.0%). The high-income band per household of over 1000 USD/month was only attributed to 4.8% of households and the lowest income band of less than 50$/month was attributed to 7% of households. These average income values hide the variability between provinces, for example in Kandal province, 3% of households earn less than $50/month whereas in Kampong Chhnang the number is much higher at 10%. The low number of low-income households in Kandal may be due to the proximity to good transport links and towns/cities such as Phnom Penh. There are less alternative income sources in rural areas, such as selling produce and groceries, business, or service providers, so most households are dependent on agriculture for their livelihoods which typically does not generate large monthly incomes.

110 Since 2007, Cambodia has made significant progress in terms of educating its Children. The number of children enrolled in primary education increased from 82% in 1992 to 97% in 2017/8. However, the country still faces a number of challenges, particularly educating those living in poor rural areas as children are not reaching standards appropriate for their age.

111 At primary level, nearly 25% of children in Grade 3 cannot write a single word in a dictation test. Only 27% of 3 to 5 year old's are developmentally on track in literacy and numeracy and by the time they are 17 years old, 55% of adolescents will have dropped out of school. Overall, large numbers of girls and boys remain out of school at all levels of education, from early childhood through to adolescence. Most children drop out before reaching secondary school. Girls and boys from disadvantaged groups are struggling to realize their potential as they face difficulties getting to, and staying in, school.

112 Across the CAISAR project areas, high school dropout rates are common. The highest education level attained for 59% of households questioned during the survey was primary school. Only 22% had been to secondary school and less than 1% to university. 12% of households had never been to school and of these, 82% could not read or write. It must be noted that these average values hide the range of results which varied by province and sub project area. In Ou Ta Paong, 17% of households had never been to school. For 54% of the households questioned, primary school was their highest education level with 22% going to secondary school and 3% to university. Low education levels in this area will make it more challenging to implement climate resiliency measures.

113 By contrast, in Lum Hach, 7% of households had never been to school and 43% had been to primary school, 13% to secondary school and 2% to university. The variable educational levels attained by the households across the sub-project areas highlights the potential social inequalities experienced by local communities. There are various reasons why children may drop out of school such as cost, distance from home, engagement in agricultural activities. In most provinces of Cambodia, upper secondary schools are mainly located in district or provincial centers. Students in remote areas may therefore not be able to access them due to poor quality roads or general lack of transport. Long distances to schools and bad road conditions often require students to make use of accommodation in another district but this is not possible for the majority of poor rural families, limiting their capacity to meet their potential.

114 High school dropout rates are common in the CAISAR project areas and are typically experienced in these rural areas due to the cost, long travel times and bad road conditions. This is a social issue that the CAISAR project could address by providing good quality roads adjacent to canals and within the command areas.

115 In recent years, consecutive annual crop failures have led to household individuals sourcing other, more profitable non-farm incomes. In 2018, an estimated 1,000,000 Cambodian migrants were registered in Thailand looking for other income sources to support their families. However, the COVID19 pandemic resulted in a backflow of mostly rural labor migrants which posed its own challenges to the agricultural sector in Cambodia (ADB, 2022).

116 There continues to exist a large disparity between the rural and urban populations of Cambodia. In 2016, the estimated average monthly household income was $717 in Phnom Penh and $607 in other urban areas. By contrast, monthly incomes were on average $374 in rural areas (Government of Cambodia, Socio-Economic Survey, 2016). Rural incomes are therefore only about 50% - 60% of all urban areas although the gap does appear to be closing with the disparity in 2012 being 40% - 55% (ADB, 2022).

117 This section has discussed several direct and in-direct beneficiaries living in the project areas. It highlights the importance of surveying communities to identify any existing social inequatlies and looking for opportunities to reduce these. The CAISAR project will look to improve the general wealth, well-being, priorities, and opportunities of communities living within the command areas through providing a reliable irrigation system that is resistant to climate change and will enable farmers to improve their livelihoods.

4.5 Agriculture

118 Agriculture is the primary source of livelihood for the communities living in most provinces of Cambodia and it accounts for 22.5% of the country's Gross Domestic Product and employs over 3 million people. Rice is the dominant food crop grown on an estimated 4.5 million hectares or 70% of the country's total cultivated area (ADB, 2022). The cultivated area of rice in Cambodia increased from 3.2 million ha in 2017 to 3.3 million ha in 2018, comprising of 2.7 million ha of wet-season rice and 0.6 million ha of dry-season rice (ADB, 2022).

119 Each sub-project command area has unique climatic conditions and geology which results in different soil qualities. This in turn affects land use and farming practices as communities have adapted over time to the areas in which they live and the resources that they have.

120 Access to transport and agricultural co-operations additionally influences farming practices. Where there are agricultural co-operations, a network is already established between the farmers growing and selling the vegetables and those buying them. This facilitates vegetable cultivation and marketability, encouraging farmers to move away from rice farming to more diverse horticultural agriculture. Krang Ponley for example is very accessible and close to the city of Phnom Penh. Farmers there produce more vegetables than in other provinces as they have better access to the cities markets to sell their produce.

121 In May-June 2022, the CAISAR team conducted an agronomy survey. Based on the findings, the agronomy experts have suggested proposed cropping patterns for each sub-project area which are discussed below.

122 **In Lum Hach**, the soil quality is particularly low due to the dominance of sandy surface soils. As a result the land is not considered suitable for agricultural use. Crops can be particularly vulnerable to drought stress due to the high hydraulic conductivity of the soils resulting in fast runoff and drainage. In conjunction with insufficient water resources and irrigation supply, this results in high rates of nutrient leaching and low crop yields. The agronomy survey and livelihood survey conducted by WAPCOS found that crop yields in the Lum Hach Command Area are water limited to one annual wet season crop of rice. Interviewed farmers reported average annual yields of 1.5 to 2 tons/ha whereas district statistics report crop yields of 3.2 to 3.8 tons/ha but it is thought that this dataset does not account for failed crop years. Currently only 30% of the Command Area is agricultural land but this is expected to change under the CAISAR project, once a more reliable source of water is provided. With a more reliable water supply, dry season rice cropping would be possible but farmers in Lum Hach explained they have limited technical experience and understanding of dry season rice so in order for this to be a success, it is critical that the CAISAR project provides adequate training.

123 As highlighted in the agronomy survey, the low soil quality in Lum Hach significantly limits crop yields and opportunities for expansion. Therefore, the CAISAR scheme proposes that between wet season rice crops, farmers grow cover crops such as mung bean to improve soil organic matter and fertility. This will have an indirect benefit to crop yields by improving soil productivity and therefore enhancing rice crop yields over time. Using cover crops has a further benefit of reducing input costs as farmers are required to use less fertilizer once the cover crops improve soil fertility. Crop rotation has the added benefit that it reduces the number of pests and diseases thereby reducing crop yield losses.

124 Additionally, farmers in Lum Hach could diversify to alternative horticultural crops such as cucumber, watermelon, pumpkin etc. between wet season crops to help increase soil organic content and interrupt the intensive rice cropping which inhibits the soil from rejuvenating.

125 **The Ou Ta Paong** Command Area is dominated by agricultural land (80%). Soil fertility is high, made up of 69% high productivity soil and 31% medium productivity soil. This is largely due to the low-land nature of the command area with the northern part lying within the active floodplain of the Tonle Sap which floods annually. There are two to three crops per year, producing 3.9 tons/ha in the wet season and 5.8 tons/ha in the dry season. Dry season rice crops typically produce more yield per hectare due to the rice variety that is used during this cropping period and the additional fertilizer that is applied.

126 The improved drainage and more reliable water supply to Ou Ta Paong will enable up to three rice crops per year. In addition, between rice crops, it may be possible for famers to cultivate vegetables. Currently, the majority of farmers are reluctant to do this due to the lack of reliable water source. Once this is resolved by the CAISAR project, farmers have said they would be willing to try vegetable cultivation.

127 The dominant cropping pattern in **Krang Ponley** consists primarily of wet season rice cropping. There is however variation between the provinces depending on soil quality and water availability. Where possible, a dry season recession crop is planted with a typical yield of 4.5 tons/ha. The wet season rice yields are slightly lower at 3.9 tons/ha. However, flood inundation of the command areas can result in crop failures and reduced yields, particularly during the wet season.

128 In Krang Ponley, the overall soil quality is medium and similar to Ou Ta Paong due to the low-lying topography and annual flood inundation (particularly in Krang Bat) of the command area. Due to the proximity to markets in Phnom Penh, more farmers in this sub-project area have moved away from rice farming to horticultural produce such as watermelon, long bean, corn, eggplant and pumpkin. Farmers can either rely solely on vegetables throughout the year or grow vegetables outside of the wet season rice cropping period.

4.6 Water Resources

129 Rainfall is extremely variable across Cambodia both spatially and temporally. The Southwest monsoon in Cambodia provides 87% of the yearly rainfall during the months of May to October (Salvadore

et al, 2020). As a result, Cambodia receives an abundant amount of water during this part of the year but can also experience extreme water shortages during the dry season. The extreme volumes of water during the wet season can lead to extensive flooding which can result in crop and infrastructure damage. This is particularly an issue where flood waters inundate irrigation command areas. On the other hand, prolonged periods of dry days can lead to drought in the dry season. In areas where there are limited areas for water storage, crops can become water stressed and crop yields may be reduced or entire crops may fail. Water scarcity is therefore primarily a result of a lack of water management and water storage capacity rather than an insufficient volume of water available annually (ADB, 2022).

130 The extreme variability in rainfall results in serious challenges for rice farmers, particularly during the first few months of the wet season, when rainfall is most erratic and early season droughts are common. Short droughts can occur prior to the wettest period at the end of August to the end of November. Such short droughts can last 15 days but occasionally they can be prolonged and last up to 60 days after the first monsoon rains (ADB, 2014). This causes additional difficulties for rice farmers, particularly those who are dependent on rain-fed irrigation. Irrigation infrastructure is often lacking or is damaged due to lack of investment and maintenance which should otherwise provide reliable water supplies during these dry periods.

131 Across the three CAISAR project command areas, the majority of rice farmers are reliant on rain-fed irrigation or recession rice which brings both challenges and opportunities. Due to the erratic and unpredictable nature of the climate, farmers are reluctant to take more risks and diversify their cropping patterns as they have no reliable water source to support their crops if a period of drought occurs. In addition, there is a lack of drainage and flood protection which additionally inhibits farmers from meeting their yield potentials. Climate Change will impact Cambodia's water resources and it is critical that this is taken into account at each stage of the CAISAR project including project design and hydrological and hydraulic modelling.

132 Extensive modelling has been undertaken as part of this feasibility study to ensure that there are sufficient water resources both under current and future scenarios, taking uncertainty into account. This is summarized in detail in the D4 modelling report and the results show that the project is feasible in terms of the available of water resources both now and in the future, to support the proposed yield increases in the 45,000 ha CAISAR project command areas.

4.7 Irrigation

133 Access to water is a challenge, particularly for those with irrigation schemes located close to the Tonle Sap as flooding in the wet season and shortage in the dry season can limit annual cropping intensity. Successful water resource management is therefore critical to ensuring that the CAISAR irrigation schemes are a success.

134 Rehabilitation and climate proofing of existing irrigation infrastructure will be key. Constructing irrigation ponds also forms part of an integrated and smart water resource management plan. Climate proofing involves securing the irrigation system's resilience and sustainability against longer droughts in the dry season and to mitigate the impacts of flood events.

135 Irrigation has the potential to increase Cambodia's potential rice yields. Currently, the dominance of low wet-season rice yield limits the productivity and profitability of Cambodian farmers. For example, Cambodia's wet-season rice is about 30% less than that of Thailand's Central Plains region (ADB, 2022). There are opportunities for crop diversification that are being explored but this is likely to be on a smaller scale than rice production.

136 The infrastructure proposed is a full package for water management improvements including storage, gravity supply without repumping where possible and use of solar pumping where it is not, drainage and flood control including allowance for aquatic animals and fish.

4.8 Biodiversity

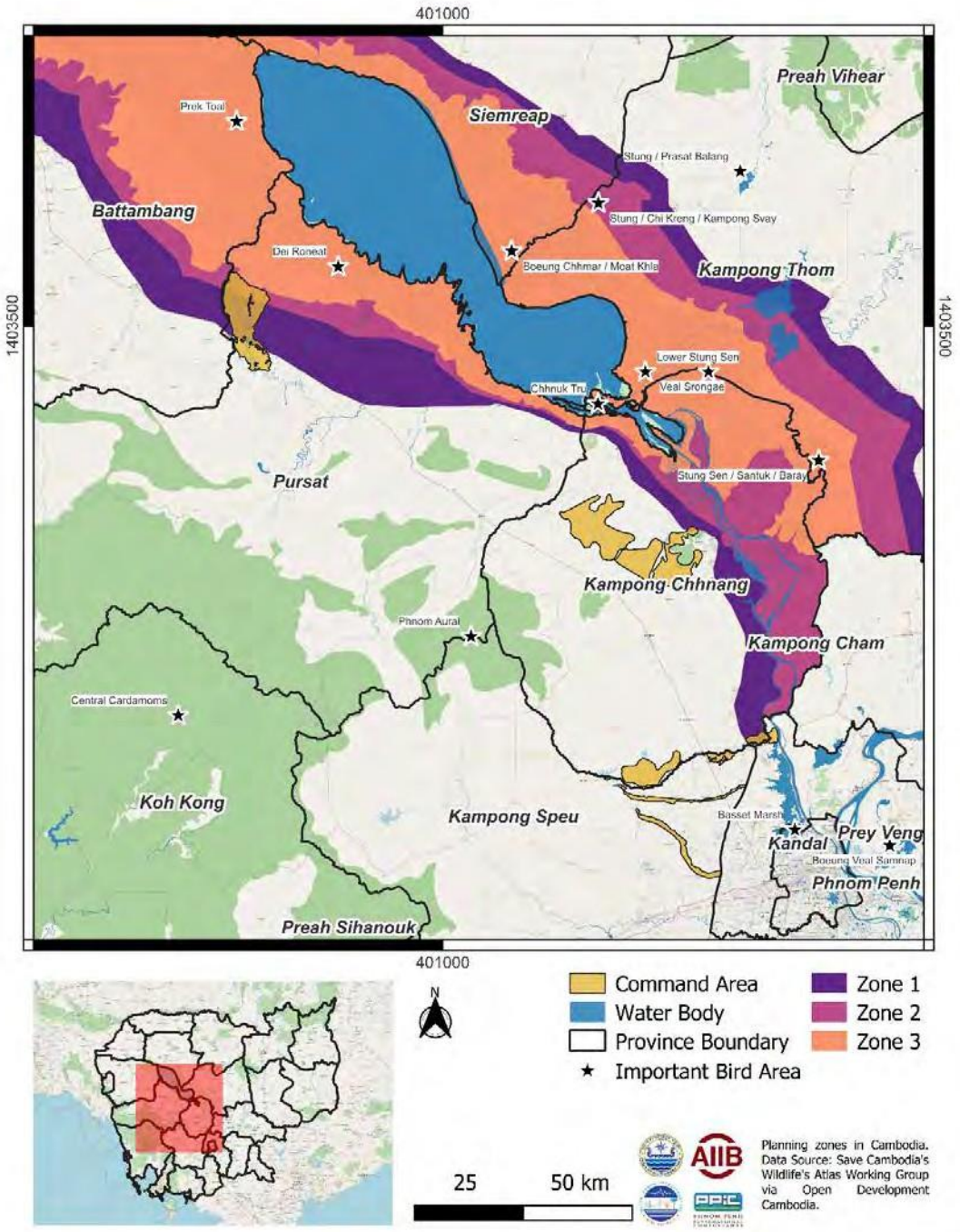
4.8.1 Designated areas and species of interest

137 The Feasibility Studies have noted the unique ecosystem in Tonle Sap lake and floodplain which is protected as a UNESCO Biosphere Reserve. The Great Lake itself if one of the most productive fisheries systems in the world, providing key breeding grounds for fish and 60% of Cambodia's protein intake. In addition, it is home to some of the largest breeding colonies of some of the world's most threatened water birds. This unique ecosystem faces unprecedented threats from population increases and pressure on natural resources. As a result, there are a number of conservation projects taking place to protect this precious environment and in 2021, the conservation areas surrounding the Tonle Sap Great Lake were updated and re-instated.

138 The agricultural protection zones are shown in Source: CAISAR Feasibility Study

139 Figure 4-8. The Zone 1 and 2 are areas where farming is allowed. In zone 1, people can live and obtain land title certificates. In zone 2, local communities are allowed to do land cultivation. In Zone 3, closest to the lake is where agriculture and fishing are officially banned and the areas of flooded forest must be protected and conserved. This re-zoning allows the government an opportunity to restore the Tonle Sap's unique forests.

140 The CAISAR command areas lie outside of zone 3. Most of the Ou Ta Paong command area falls within zones 1 and 2 where agricultural practices are permitted. The majority of the Lum Hach command area lies outside of the protection zones, with a small section to the north falling within zone 1. The majority of the Krang Ponley scheme falls outside of the protection zones although a small section of Krang Bat lies within zone 1. Based on this, there are no limitations on agricultural practices required by the Tonle Sap Agricultural Protection Zones.



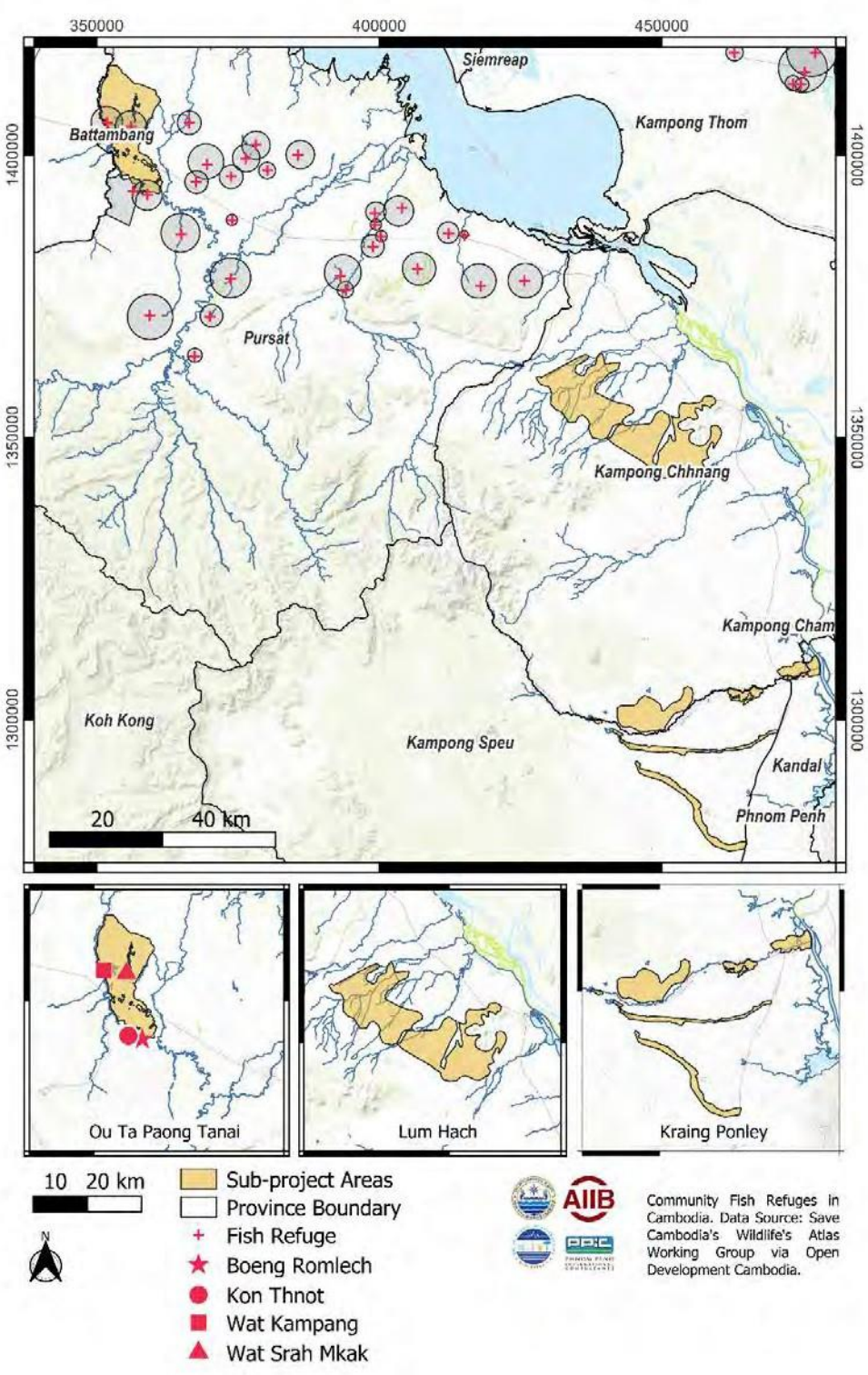
Source: CAISAR Feasibility Study

Figure 4-8 Tonle Sap Agricultural Protection Zones

141 Rice Field Fisheries are a vital source of food and income for almost all rural households in Cambodia. Fishing typically occurs during the wet season from July to February and takes place in and around flooded rice fields. Despite contributing 20-25% of the country's inland fish catch, community fish refuges are often poorly managed and have low productivity. Several projects, such as the USAID-funded Enhancing Rice Field Fisheries project, have been implemented to increase the productivity of these vital food production systems. Through improved management and inclusion of best-practice methods amongst local communities, the projects can ensure that fish are available and accessible to all poor and rural families. The location of Community Fish refuges in the CAISAR Command Areas are shown in
142 Figure 4-9. There are only 2 refuges in the Ou Ta Paong Command Area which should be considered during DED stage and allowance made in the scheme design to expand and enhance the number of fish refuges and the linkage through canals and rice fields.

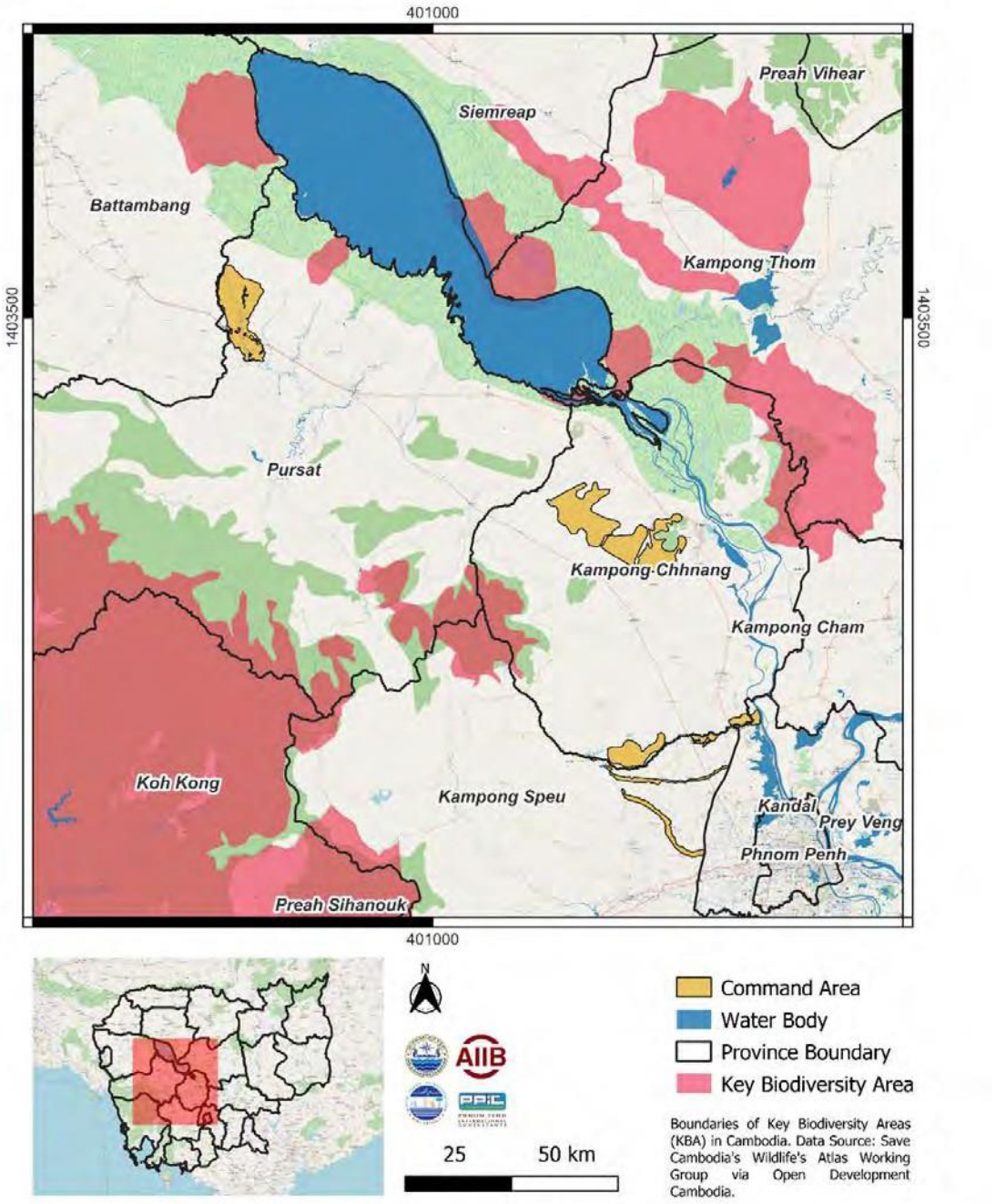
143 The key biodiversity areas are shown in Figure 4-10. The CAISAR Command Areas fall outside of these areas. However, due to the proximity, it is recommended that further analysis is undertaken during the SECAP analysis and DED to determine whether any further environmental considerations are needed.

144 The CAISAR Command areas are located largely outside of all the protected areas. The surrounding land use is dominated by paddy field thus, potential impact on local ecological features is not envisaged although this will be investigated further as part of the ESCIA.



Source: CAISAR Feasibility Study

Figure 4-9 Community Fish Refuges in the CAISAR Command Areas



Source: CAISAR Feasibility Study

Figure 4-10 Key Biodiversity Areas

4.8.2 IBAT Initial Biodiversity Assessment

145 The initial biodiversity assessment utilized the IBAT system. IBAT offers rapid visual screening for critical biodiversity. The tool is used as basic risk screening on biodiversity. This review provides an indication of the potential biodiversity related features including protected areas, key biodiversity areas and species close to the proposed project locations. It provides an early indication of potential biodiversity concerns and can provide valuable guidance in making decisions. The IBAT screening does not provide details of potential indirect, downstream, or cumulative impacts. This information may be helpful when assessing the potential environmental risk and impact of a site, categorizing investments/projects, preparing the terms of

reference or an impact assessment, focusing attention on key species of conservation concern and sites of known conservation value.

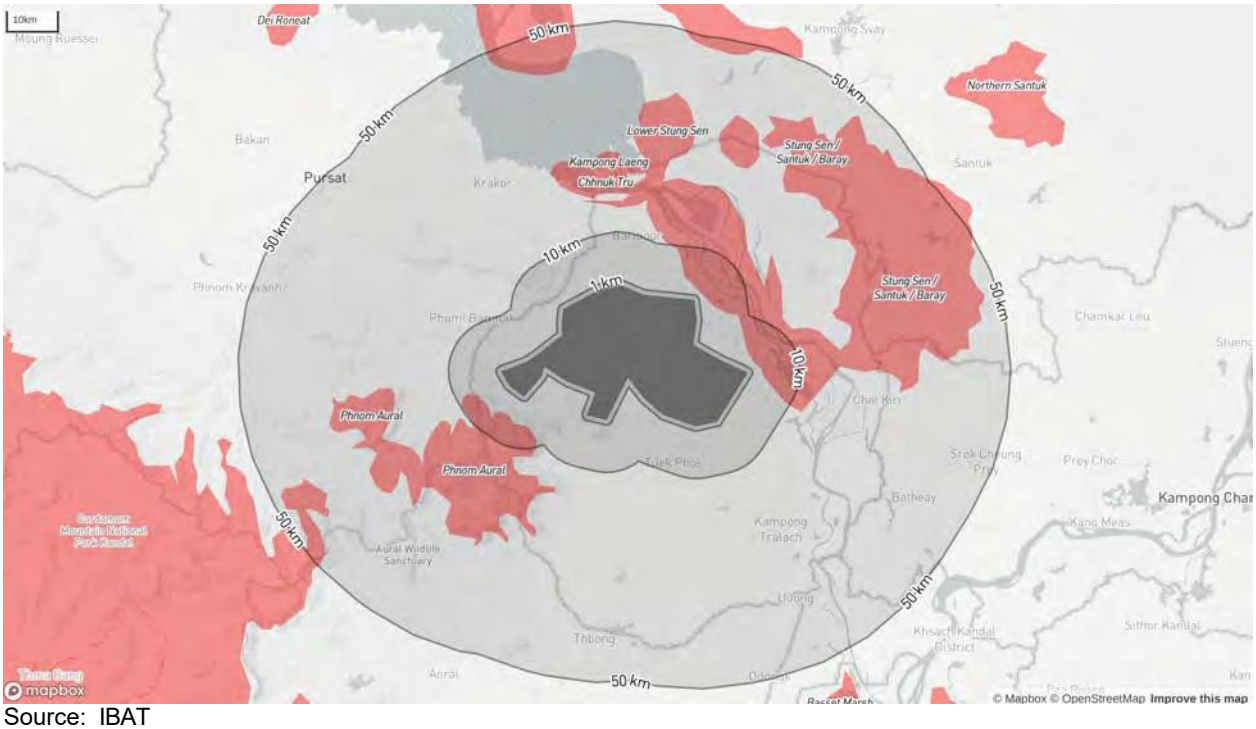
146 IBAT provides information on key biodiversity areas (KBA) which are sites contributing significantly to the global persistence of biodiversity in terrestrial, freshwater and marine ecosystems: information available from the World Database on Protected Areas (WDPA); and information form the IUCN Red List of Threatened Species (also known as the IUCN Red List) which is a compendium of information on threats, ecological requirements, and habitats and on conservation actions that can be taken to reduce or prevent extinctions (Figure 4-11, Figure 4-12, Figure 4-13).

4.8.3 Protected Areas, Key Biodiversity Areas and IUCN Threatened Species

Lum Hach Scheme

147 The IBAT assessment identified the following biodiversity features within a 5 km, 20 km and 50 km distance from the Lum Hach Irrigation and flood protection scheme.

- Protected Areas - 12
- Key Biodiversity Areas - 9
- IUCN Red List of Threatened Species – 96 (Annex ___)



Source: IBAT

Figure 4-11 IBAT Biodiversity Features around Lum Hach Scheme

148 The following protected areas were identified within a 5 km, 20 Km and 50 km radius of Lum Hach Scheme.

LH Protected Areas

Area Name	Within Buffer of KPL Project Area
Phnom Aoral – Wildlife Sanctuary	5 km
Phnom Krang Dey Meas – Protected Landscape	5 km
Tonle Sap – UNESCO-MAB Biosphere Reserve	5 km
Phnom Neang Kong Rey- Phnom Touk Meas – Multiple Use area	20 km
Boeng Chhmar Core Area (Ramsar Site)	50 km
Cardamom Corridor	50 km
Central Kravanh	50 km
North Tonle Sap	50 km
Stung Sen Core Area (Ramsar Site)	50 km

149 Key Biodiversity Areas within 5 km, 20 Km and 50 km of the Lum Hach Scheme included:

LH Key Biodiversity Areas

Area name	Distance
Kampong Laeng	5 km
Phnom Aural	5 km
Chhnuk Tru	20 km
Lower Stung Sen	20 km
Stung Sen / Santuk / Baray	20 km
Boeung Chhmar / Moat Khla	50 km
Central Cardamoms	50 km
Stung / Chi Kreng / Kampong Svay	50 km
Veal Srongae	50 km

150 The IBAT system identified 19 Critically Endangered Species and 31 Endangered Species in the IUCN Red List of Threatened Species within the 5 km, 20 and 50 km buffer areas of the Lum Hach Scheme.

Krang Ponley Scheme

151 The IBAT assessment identified the following biodiversity features within a 5 km, 20 km and 50 km distance from the Krang Ponley Irrigation and flood protection scheme.

- Protected Areas - 6
- Key Biodiversity Areas - 7
- IUCN Red List – 104 (Annex __)



Source: IBAT

Figure 4-12 IBAT Biodiversity Features around Krang Ponley Scheme

152 The following protected areas were identified within a 5 km, 20 and 50 km radius of Krang Ponley Scheme.

KPL Protected Areas

Area Name	Within Buffer of KPL Project Area
Cardamom Corridor	50 km
North Tonle Sap	50 km
Phnom Aoral	50 km
Phnom Krang Dey Meas	50 km
Phnom Neang kong Rey – Phnom Touk Meas	50 km
Souther Kravanh	50 km

153 Key Biodiversity Areas within 5 km, 20 and 50 km of the Krang Ponley Scheme included:

KPL Key Biodiversity Areas

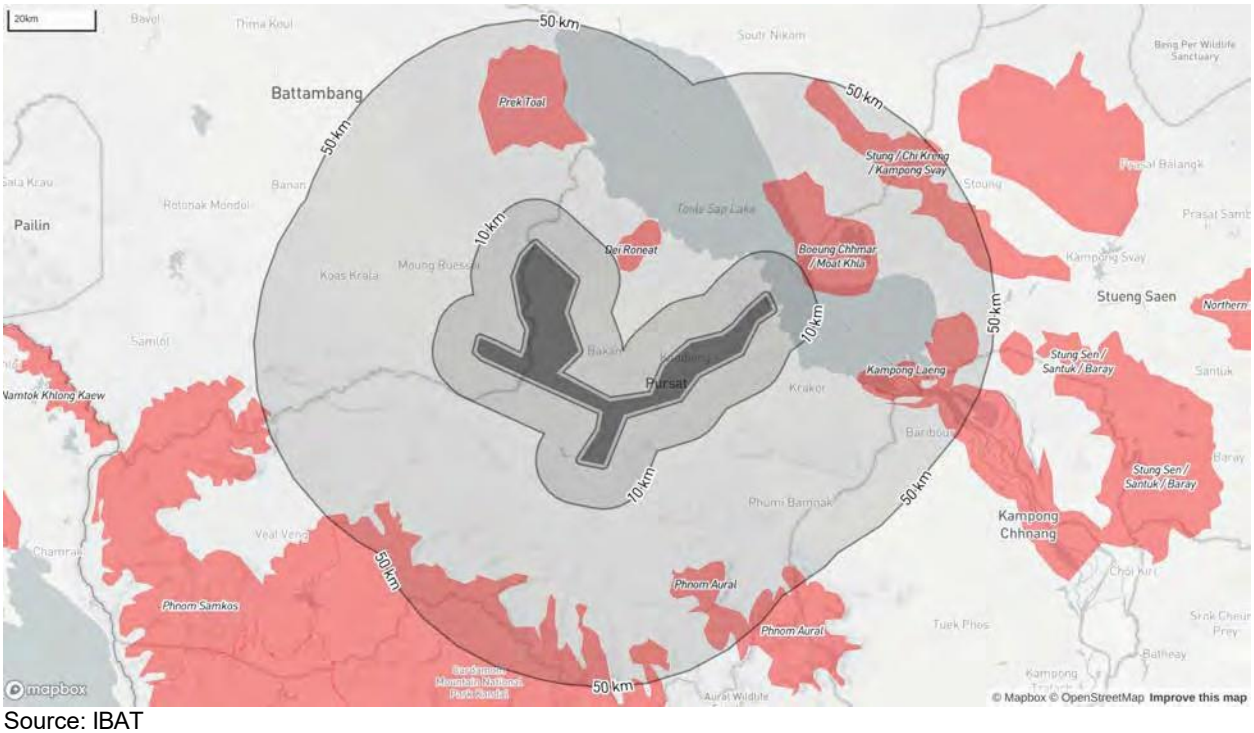
Area name	Distance
Basset Marsh	5 km
Boeung Veal Samnap	20 km
Bassac Marsh	50 km
Kampong Laeng	50 km
Phnom Aural	50 km
Southern Cardamoms	50 km
Stung Sen / Santuk / Baray	50 km

154 The IBAT system identified 18 Critically Endangered Species and 35 Endangered Species in the IUCN Red List of Threatened Species within the 5 km, 20 and 50 km buffer areas of the Krang Ponley Scheme.

Ou Ta Paong Scheme

155 The IBAT assessment identified the following biodiversity features within a 5 km, 20 km and 50 km distance from the Ou Ta Paong Irrigation and flood protection scheme.

- Protected Areas - 13
- Key Biodiversity Areas - 10
- IUCN Red List of Threatened – 97



Source: IBAT

Figure 4-13 IBAT Biodiversity Features around Ou Ta Paong Scheme

156 The following protected areas were identified within a 5 km, 20 Km and 50 km radius of Ou Ta Paong Scheme.

Protected Areas

Area Name	Within Buffer of KPL Project Area
Tonle Sap – UNESCO-MAB Biosphere Reserve	5 km
Boeng Chhmar Core Area (Ramsar Site)	20 km
Cardamom Corridor – Biodiversity Area of Protected Area	20 km
Central Kravanh	50 km
North Tonle Sap	50 km
Phnom Aoral	50 km
Phnom Somkos	50 km
Prek Toal Core Area (Ramsar Site)	50 km
Stung Sen Core Area (Ramsar Site)	50 km

157 Key Biodiversity Areas within 5 km, 20 Km and 50 km of the Ou Ta Paong Scheme included:

Key Biodiversity Areas

Area name	Distance
Boeung Chhmar / Moat Khla	20 km
Dei Roneat	20 km
Central Cardamoms	50 km
Chhnuk Tru	50 km
Kampong Laeng	50 km
Lower Stung Sen	50 km
Phnom Aural	50 km
Phnom Samkos	50 km
Prek Toal	50 km
Stung / Chi Kreng / Kampong Svay	50 km

158 The IBAT system identified 7 Endangered Species in the IUCN Red List of Threatened Species within the 5 km, 20 and 50 km buffer areas of the Ou Ta Paong Scheme.

159 The IBAT system analysis of biodiversity near the project areas suggests that a more detailed biodiversity assessment is required.

4.9 Assessment of Environmental, Social and Climate Risks, Impacts and Mitigation Measures

160 Potential risks, impacts and mitigation measures have been identified for the CAISAR irrigation and flood control protection schemes during the Pre-Construction Phase; Construction Phase and the Operations Phase in the provinces of Kampong Speu, Kampong Chhnang, Kandal, and Pursat Cambodia.

4.9.1 Pre-Construction Phase

161 Potential environmental, social, and climate-related risks and impacts to be considered specifically associated with the pre-construction phase of the planned CAISAR irrigation and flood protection project include:

4.9.1.1 Environmental Risks and Impacts (Pre-construction Phase):

1. **Habitat Assessment:** Before construction begins, there should be a thorough assessment of the project area's habitats to identify potential impacts on local flora and fauna.
2. **Vegetation Clearance**: Clearing land for construction can lead to habitat destruction and loss of biodiversity. Pre-construction activities like land clearing should be carefully planned and managed.
3. **Soil Erosion**: Pre-construction activities like excavation and grading can increase soil erosion, potentially affecting nearby water bodies and ecosystems.
4. **Land Use Changes**: Conversion of land for project purposes may alter local land use patterns, impacting agricultural and forestry activities.
5. **Waterbody Alteration:** The assessment of water bodies like rivers, streams, and wetlands should be conducted to understand potential impacts on aquatic ecosystems.
6. **Waste Management -** increase in volume of hazardous and non-hazardous waste requiring safe disposal.

4.9.1.2 Social Risks and Impacts (Pre-construction Phase):

1. **Land Acquisition:** The process of acquiring land for the project can disrupt local communities, potentially leading to land tenure issues and conflicts.
2. **Livelihood Disruption**: Even before construction starts, the anticipation of project impacts can disrupt local livelihoods as residents may alter their activities or move.

3. **Cultural Heritage**: Pre-construction surveys should identify any cultural heritage sites or traditions that may be affected, and appropriate measures should be taken to protect them.
4. **Community Engagement:** Engaging with local communities during the pre-construction phase is critical to understanding their concerns and needs, helping to design mitigation measures.
5. **Indigenous Peoples Exclusion –** Potential disbenefit to IP's or lack of inclusion in project benefits and opportunities.
6. **Gender Inequities –** Potential inequities and lack of project opportunities and benefits.

4.9.1.3 Climate Risks and Impacts (Pre-construction Phase) (See Annex 13: CAISAR Climate Change Impact Rationale)

1. **Climate Data Analysis:** It's important to analyze historical climate data during the pre-construction phase to identify climate-related risks that may affect project design and location.
2. **Future Climate Projections**: Understanding future climate projections, such as changes in rainfall patterns or increased frequency of extreme weather events, can inform the project's design for resilience.
3. **Adaptation Planning:** Pre-construction phase should involve planning for climate change adaptation measures, ensuring the project can withstand anticipated climate impacts.
4. **Mitigation Strategies:** Identifying opportunities to reduce greenhouse gas emissions associated with pre-construction activities, such as transportation or energy use, is important for climate mitigation.
5. **Data Collection**: Establishing baseline data on environmental conditions, community demographics, and climate variables during the pre-construction phase is crucial for monitoring and evaluation throughout the project's lifecycle.

162 During the pre-construction phase, thorough assessments, community consultations, and climate resilience planning should be integrated into the project's design to minimize environmental, social, and climate-related risks. This will help lay the foundation for a more sustainable and resilient project during the construction and operational phases.

163 Mitigation measures to address the environmental, social, and climate-related issues associated with the **pre-construction** phase of the CAISAR irrigation and flood protection project include:

4.9.1.4 Environmental Mitigation Measures (Pre-construction Phase):

1. **Habitat Assessment and Preservation:**
   - Conduct a detailed habitat assessment and implement measures to preserve critical habitats, such as wetlands and forests, by avoiding or minimizing construction within these areas.
2. **Revegetation and Reforestation**:
   - Implement reforestation and revegetation programs in areas where land clearance is necessary. Use native species to restore habitats.
3. **Soil Erosion Control**:
   - Implement erosion control measures, such as silt fences, erosion control blankets, and sediment basins, to prevent soil erosion during pre-construction activities.
4. **Sustainable Land Use Planning**:
   - Work with local authorities and communities to develop land use plans that minimize negative impacts on agriculture and forestry.
5. **Water Management:**
   - Develop and implement a water management plan to minimize waterbody alteration during pre-construction activities.
6. **Waste Management**:

- Prepare and implement waste management plan.

4.9.1.5 Social Mitigation Measures (Pre-construction Phase):

1. **Land Acquisition and Resettlement:**
   - Follow Resettlement Planning Framework and develop a fair and transparent land acquisition and resettlement plan, ensuring affected communities are adequately compensated and resettled, if necessary.
2. **Livelihood Restoration**:
   - Implement livelihood restoration programs, such as vocational training and alternative income generation activities, to mitigate disruptions caused by pre-construction activities.
3. **Cultural Heritage Protection**:
   - Identify and protect cultural heritage sites and traditions through measures like site preservation, documentation, and community involvement.
4. **Community Engagement**:
   - Engage in meaningful consultations with local communities to gather their input and concerns and incorporate their feedback into project planning and design.
5. **Indigenous Peoples:**
   - Implement IPP and ensure full participation of vulnerable or disadvantages groups (e.g., ethnic minorities).
6. **Gender Participation**:
   - Implement Gender Action Plan and measures to promote female beneficiaries for improved participation in project planning and implementation, and economic empowerment.

4.9.1.6 Climate Mitigation and Adaptation Measures (Pre-construction Phase):

1. **Climate-Resilient Design**:
   - Incorporate climate resilience into the project design by considering future climate projections and ensuring infrastructure can withstand extreme weather events and changing climate conditions.
2. **Low-Carbon Practices**:
   - Minimize greenhouse gas emissions from pre-construction activities by using energy-efficient machinery, promoting green transportation, and reducing construction-related emissions.
3. **Adaptive Management:**
   - Develop adaptive management plans that can be adjusted based on changing climate conditions, ensuring the project's long-term viability.
4. **Baseline Data Collection**:
   - Establish baseline data for environmental, social, and climate variables during the pre-construction phase to enable effective monitoring and evaluation throughout the project's lifecycle.
5. **Climate Risk Assessments:**
   - Regularly assess climate risks and vulnerabilities during the pre-construction phase to identify emerging issues and adjust plans accordingly.
6. **Community Resilience**:
   - Support local communities in building resilience to climate change through capacity-building programs, education, and access to climate-resilient livelihood options.
7. **Green Infrastructure:**
   - Consider the use of green infrastructure solutions, such as natural flood management techniques, to complement traditional engineering approaches and enhance climate resilience.

164 It's essential that these mitigation measures are integrated into the project's planning and design from the early stages of the pre-construction phase. Collaboration with relevant stakeholders, including local communities, environmental experts, and climate specialists, is crucial to ensure the successful implementation of these measures and the overall sustainability of the project. Regular monitoring and evaluation is also essential to assess the effectiveness of these mitigation efforts and make necessary adjustments as needed.

4.9.2 Construction Phase

165 The potential environmental, social, and climate-related risks and impacts to be considered that are associated with the construction phase of the CAISAR irrigation and flood protection project include:

4.9.2.1 Environmental Risks and Impacts (Construction Phase):

1. **Habitat Destruction:** Construction activities can result in the direct destruction of natural habitats, including wetlands, forests, and aquatic ecosystems.
2. **Soil Erosion and Sedimentation:** Excavation, grading, and land clearing can increase soil erosion, leading to sedimentation in nearby water bodies, affecting water quality and aquatic ecosystems.
3. **Water Pollution**: Construction machinery, equipment, and runoff from construction sites can introduce pollutants, such as sediment, oil, and chemicals, into nearby water bodies.
4. **Noise and Air Pollution:** Construction activities generate noise pollution and emissions from heavy machinery, impacting local air quality and disturbing wildlife.
5. **Resource Consumption**: Construction materials, water, and energy are often consumed in large quantities, leading to resource depletion and increased carbon emissions.
6. **Waste Management** – increase in volume of hazardous and non-hazardous waste requiring safe disposal.

4.9.2.2 Social Risks and Impacts (Construction Phase):

1. **Displacement and Resettlement:** The construction phase may require the displacement of local households leading to potential land tenure issues and disruption of livelihoods.
2. **Traffic and Access Disruption**: Increased construction-related traffic can disrupt local transportation networks, impacting communities and businesses along transportation routes.
3. **Health and Safety:** Construction sites pose health and safety risks to workers and nearby communities. Accidents and exposure to construction-related hazards can have serious consequences.
4. **Cultural Heritage:** Construction activities and in migration of labor may threaten cultural heritage sites or disrupt local traditions and practices, leading to social and cultural impacts.
5. **Indigenous Peoples Exclusion –** Potential disbenefit to IP's or lack of inclusion in project benefits and opportunities.
6. **Gender Inequities –** Potential inequities and lack of project opportunities and benefits.

4.9.2.3 Climate Risks and Impacts (Construction Phase):

1. **Emissions**: Construction machinery and transportation can generate significant greenhouse gas emissions, contributing to climate change if not properly managed.
2. **Climate-Related Disruptions**: Extreme weather events, such as heavy rainfall or flooding, can disrupt construction activities, leading to delays and increased costs.
3. **Water Management**: Managing water resources during construction, including temporary diversion of rivers or drainage, can impact local hydrology and potentially lead to downstream flooding.
4. **Infrastructure Vulnerability:** The construction phase may expose infrastructure to climate risks, such as flooding or storm damage, if proper precautions and design considerations are not taken into account.
5. **Temperature Extremes**: Construction workers may be exposed to temperature extremes, including heat stress in hot seasons and cold stress during cooler months, affecting worker health and productivity.

166 To address these risks and mitigate negative impacts during the construction phase, it's essential to implement environmental and social management plans. These plans will include measures to minimize habitat destruction, control pollution, ensure worker safety, and engage with local communities.

167 Additionally, climate resilience measures will be integrated into the construction process to mitigate climate-related risks and ensure the infrastructure's long-term sustainability. Regular monitoring and adherence to best practices will be implemented to minimize adverse effects during this phase of the project.

168 Suggested mitigation measures to address the potential environmental, social, and climate-related risks and impacts associated with the **construction phase** of the CAISAR irrigation and flood protection include.

4.9.2.4 Environmental Mitigation Measures (Construction Phase):

1. **Habitat Protection and Restoration:**
   - Establish construction exclusion zones around sensitive habitats to prevent disturbance.
   - Implement habitat restoration programs in areas where construction has occurred.
2. **Erosion and Sediment Control:**
   - Install erosion control measures such as silt fences, sediment basins, and check dams to prevent soil erosion.
   - Implement best management practices for construction site runoff, including sediment ponds.
3. **Water Pollution Control:**
   - Properly manage construction chemicals, fuels, and waste to prevent water pollution.
   - Use environmentally friendly construction materials and techniques to reduce the risk of pollution.
4. **Noise and Air Pollution Management:**
   - Implement noise barriers and schedule noisy activities during non-sensitive hours.
   - Ensure construction equipment meets emissions standards and maintain equipment properly.
5. **Resource Efficiency:**
   - Reduce resource consumption by optimizing construction material use and recycling where feasible.
   - Implement energy-efficient construction practices and use renewable energy sources where possible.
6. **Waste Management**
   - Implement waste management plan

4.9.2.5 Social Mitigation Measures (Construction Phase):

1. **Community Engagement:**
   - Maintain ongoing communication with affected communities to address concerns and keep them informed about construction activities.
   - Implement grievance mechanism to address community complaints and issues promptly.
2. **Displacement and Resettlement:**
   - Implement resettlement plans, ensuring affected communities receive fair compensation, land, and livelihood restoration support.
   - Support affected households in finding alternative housing and income opportunities.
3. **Health and Safety:**
   - Enforce strict health and safety regulations on construction sites to protect both workers and nearby communities.
   - Provide appropriate training and personal protective equipment to workers.
4. **Cultural Heritage Protection:**

- Conduct archaeological surveys before construction in culturally sensitive areas.
- Develop mitigation strategies to protect cultural heritage sites and involve local communities in preservation efforts.

5. **Indigenous Peoples:**
   - Implement IPP and ensure full participation of vulnerable or disadvantages groups (e.g., ethnic minorities).
6. **Gender Participation:**
   - Implement Gender Action Plan and measures to promote female beneficiaries for improved participation in project planning and implementation, and economic empowerment.

4.9.2.6 Climate Mitigation and Adaptation Measures (Construction Phase):

1. **Emission Reduction:**
   - Use low-emission construction equipment and vehicles.
   - Minimize idling time for construction machinery to reduce emissions.
   - Promote sustainable transportation options for workers and materials.
2. **Climate-Resilient Construction:**
   - Incorporate climate-resilient design features into infrastructure construction to withstand climate-related risks.
   - Implement flood and stormwater management measures to prevent construction site flooding.
3. **Temperature Extremes:**
   - Implement heat stress prevention measures for workers, such as shaded rest areas and hydration stations in hot weather.
   - Provide adequate clothing and equipment for workers during cold weather.
4. **Community Resilience Building:**
   - Support local communities in building climate resilience by providing training and resources for climate adaptation.
5. **Monitoring and Compliance:**
   - Establish regular monitoring and reporting mechanisms to ensure compliance with environmental, social, and climate mitigation measures.
   - Conduct periodic audits to assess the effectiveness of mitigation efforts and make necessary adjustments.

169 These mitigation measures should be integrated into the construction management plan and closely monitored throughout the construction phase. Collaboration with relevant stakeholders, including local communities, environmental experts, and safety professionals, is essential to ensure successful implementation and the overall sustainability of the project.

4.9.3 Operations Phase

170 The potential environmental, social, and climate-related risks and impacts associated with the operations phase of the planned CAISAR irrigation and flood protection project include:

4.9.3.1 Environmental Risks and Impacts (Operations Phase):

1. **Water Management**: Inadequate water management during operations can lead to over-extraction of water resources, which may cause downstream water scarcity, altered hydrology, and harm to aquatic ecosystems.

2. **Water Quality**: The irrigation system's operations can affect water quality, with potential risks of contamination from agricultural runoff, pesticide use, or improper wastewater disposal.
3. **Erosion and Sedimentation:** Ongoing maintenance and operation activities can contribute to soil erosion and sedimentation in water bodies, impacting water quality and aquatic habitats.
4. **Invasive Species:** Poorly managed water flows can facilitate the spread of invasive aquatic species, potentially harming native ecosystems.
5. **Energy Use:** The energy requirements for pump stations, flood control systems, and other infrastructure elements can result in increased carbon emissions if not managed efficiently.
6. **Waste Management -** increase in volume of hazardous and non-hazardous waste requiring safe disposal.

4.9.3.2 Social Risks and Impacts (Operations Phase):

1. **Land Use Conflicts**: Conflicts over water allocation and land use may arise among competing stakeholders, such as farmers, leading to disputes and social tensions.
2. **Access to Water:** Unequal access to water resources during the operations phase can exacerbate social inequalities, impacting vulnerable communities and livelihoods.
3. **Health and Safety:** Ongoing maintenance and operations work can pose health and safety risks to workers and nearby communities, particularly if safety measures are inadequate.
4. **Community Engagement**: Maintaining effective communication and engagement with local communities is crucial to address their concerns and ensure the equitable distribution of benefits.
5. **Indigenous Peoples Exclusion –** Potential disbenefit to IP's or lack of inclusion in project benefits and opportunities.
6. **Gender Inequities –** Potential inequities and lack of project opportunities and benefits.

4.9.3.3 Climate Risks and Impacts (Operations Phase):

1. **Climate Variability:** Changes in rainfall patterns, increased temperature, or more frequent extreme weather events can affect water availability and the effectiveness of flood protection systems.
2. **Extreme Events**: The irrigation and flood protection infrastructure must be resilient to withstand extreme weather events, including floods, droughts, and storms.
3. **Maintenance Challenges**: Climate-related impacts, such as increased sedimentation or infrastructure damage from extreme events, can pose challenges for ongoing maintenance and operations.
4. **Energy Efficiency**: Climate mitigation efforts should focus on optimizing energy use and transitioning to cleaner energy sources to reduce greenhouse gas emissions associated with ongoing operations.
5. **Adaptive Management:** The operations phase should include adaptive management strategies to respond to changing climate conditions and ensure infrastructure remains effective.
6. **Community Resilience**: Local communities will require support to build resilience to climate-related risks, such as training in climate-smart agriculture or flood preparedness.
7. **Water Management**: Climate-related changes may necessitate adjustments in water management practices to ensure sustainable and equitable water distribution.

171 Addressing these potential risks and impacts during the operations phase requires proactive planning, ongoing monitoring, and adaptive management. Sustainable water management practices, efficient energy use, and community engagement are crucial components of mitigating these issues and ensuring the long-term success and resilience of the irrigation and flood protection project. Regular maintenance and assessment of the infrastructure's performance under changing climate conditions are essential for its continued effectiveness.

172 Suggested mitigation measures to address the potential environmental, social, and climate-related risks and impacts during the operations phase of the CAISAR irrigation and flood protection project include:

4.9.3.4 Environmental Mitigation Measures (Operations Phase):

1. **Sustainable Water Management:**
   - Implement efficient water management practices to prevent over-extraction and ensure equitable water distribution.
   - Monitor water quality regularly and implement measures to reduce contamination, such as the responsible use of pesticides and proper wastewater treatment.
2. **Erosion and Sedimentation Control:**
   - Develop and implement erosion control measures to minimize soil erosion and sedimentation in water bodies.
   - Regularly maintain sediment basins and silt fences to manage sediment runoff.
3. **Invasive Species Management:**
   - Implement monitoring and control programs to prevent the spread of invasive aquatic species in irrigation and flood protection infrastructure.
4. **Energy Efficiency:**
   - Optimize energy use through efficient pump systems, renewable energy integration, and regular maintenance of energy-consuming equipment.
5. **Waste Management**
   - Implement waste management plan.

4.9.3.5 Social Mitigation Measures (Operations Phase):

1. **Stakeholder Engagement:**
   - Maintain transparent and ongoing engagement with local communities and stakeholders to address concerns and ensure the equitable distribution of water resources.
   - Establish mechanisms for conflict resolution and dispute management related to land use and water allocation.
2. **Access to Water:**
   - Ensure that water access is fair and inclusive, with mechanisms in place to support vulnerable and marginalized communities in accessing water resources.
3. **Health and Safety:**
   - Continue to enforce strict health and safety regulations for workers and nearby communities during ongoing maintenance and operation activities.
   - Provide ongoing safety training and personal protective equipment to workers.
4. **Indigenous Peoples:**
   - Implement IPP and ensure full participation of vulnerable or disadvantages groups (e.g., ethnic minorities).
5. **Gender Participation:**
   - Implement Gender Action Plan and measures to promote female beneficiaries for improved participation in project planning and implementation, and economic empowerment.

4.9.3.6 Climate Mitigation and Adaptation Measures (Operations Phase):

1. **Climate-Resilient Infrastructure:**
   - Regularly assess and maintain flood protection and irrigation infrastructure to ensure its resilience to changing climate conditions.
   - Develop flood and drought management strategies based on climate projections.
2. **Maintenance and Repairs:**

- Implement a robust maintenance program to promptly address damage or sedimentation issues caused by climate-related events.
- Ensure that infrastructure components remain in good working condition to maintain their effectiveness.

3. **Energy Transition:**
   - Transitioning to cleaner energy sources for operation, implement and maintain solar solar pumps to reduce carbon emissions.
   - Promote energy-efficient practices within the operational phase.
4. **Adaptive Management:**
   - Establish adaptive management plans that allow for adjustments in water management and infrastructure operations in response to climate variability and extreme events.
5. **Community Resilience Building:**
   - Support local communities in building climate resilience through education, capacity-building programs, and climate-smart agriculture practices.
   - Encourage community-led initiatives for flood preparedness and disaster risk reduction.
6. **Water Management Adjustments:**
   - Be prepared to adjust water management practices, such as reservoir release schedules, in response to changing climate conditions and hydrological patterns.
7. **Monitoring and Reporting:**
   - Continue regular monitoring and reporting on environmental, social, and climate-related factors to assess the effectiveness of mitigation efforts and make necessary adjustments.

173 These mitigation measures will be integrated into the ongoing operation and maintenance plan for the CAISAR irrigation and flood protection infrastructure. Collaboration with relevant stakeholders, including local communities, environmental experts, and climate specialists, is essential to ensure the successful implementation of these measures and the long-term sustainability and resilience of the project during the operations phase. Regular evaluation and adaptation are critical components of managing risks and impacts effectively.

174 The CAISAR irrigation and flood protection project is planned to have the following positive environmental, social, and climate impacts:

4.9.4 Positive Environmental, Social and Climate Impacts:

4.9.4.1 Positive Environmental Impacts:

1. **Improved Water Management:** Irrigation systems help optimize water use, reducing wastage and ensuring efficient distribution of water resources. This will mitigate water scarcity issues and enhance ecosystem health.
2. **Increased Crop Yields**: Irrigation can significantly increase agricultural productivity, reducing the need to expand agricultural land into forests and natural habitats, thereby preserving biodiversity.
3. **Reduced Soil Erosion:** Flood protection measures can prevent soil erosion caused by heavy rains and floods, which helps maintain soil fertility and prevents sedimentation in rivers and water bodies.
4. **Enhanced Ecosystem Services**: Sustainable water management will positively impact wetland ecosystems by maintaining water levels and preserving habitats for aquatic plants and wildlife.

4.9.4.2 Positive Social Impacts:

1. **Improved Food Security**: Increased agricultural productivity due to irrigation will lead to greater food security for local communities, reducing dependence on external food sources.
2. **Poverty Alleviation**: Higher crop yields will enhance the income and livelihoods of local farmers, potentially reducing poverty rates in the region.
3. **Health Benefits**: Access to clean water for irrigation will improve public health by reducing waterborne diseases and improving sanitation practices.
4. **Employment Opportunities:** The construction and maintenance of irrigation and flood protection infrastructure will generate employment opportunities for local communities.
5. **Infrastructure Development:** The project will improve transportation and connectivity, making it easier for people to access markets, healthcare, and educational facilities.

4.9.4.3 Positive Climate Impacts:

1. **Climate Resilience:** Flood protection infrastructure will help communities adapt to climate change by reducing the impacts of extreme weather events and flooding.
2. **Carbon Sequestration**: Irrigation will enhance the carbon sequestration capacity of soils, contributing to climate change mitigation efforts.
3. **Reduced Emissions**: By increasing agricultural productivity and reducing the need for land conversion, the project will indirectly help reduce greenhouse gas emissions associated with deforestation and land-use changes.
4. **Improved Water Efficiency**: Efficient irrigation practices will reduce the energy and water requirements for agriculture, which can lower greenhouse gas emissions associated with water pumping and distribution.

175 The success of the CAISAR project depends on effective planning, sustainable practices, and community engagement. Environmental impact assessments and social safeguards will be in place to mitigate any potential negative consequences and ensure the long-term sustainability of these positive impacts.

5. PROCEDURES FOR REVIEW, CLEARANCE, AND IMPLEMENTATION OF SUBPROJECT E&S INSTRUMENTS

5.1 Objective and Approach

176 Since some of the activities and subprojects will be identified during implementation, this ESCMF was prepared to apply to all subprojects and investment activities. The main objective of the ESCMF process is to ensure that the subprojects and activities financed by the project will not create adverse impacts on the local environment and communities, and the residual and/or unavoidable impacts are mitigated in line with the IAAB, IFAD and GCF safeguards standards.

177 During implementation, identified activities/subprojects will be screened for and given a risk classification based on their E&S issues and applicable safeguards standards (ESSs), after which any necessary environmental and social assessment (ESA) and other E&S instruments will be prepared based on the requirements laid out in this ESCMF. The assessments, instruments, and mitigation measures will be proportionate to the nature and scale and the potential risks and impacts of the project and consistent with the requirements of IAAB, IFAD, the GCF, and national laws/regulations. The safeguards plans prepared for subprojects may include but are not limited to: Environmental and Social Management Plans (ESCMPs); including health and workers issues related to sexual exploitation and abuse (SEA); and IP Plans. Terms of reference, work plans, and documents defining the scope and outputs of any site-specific safeguard's capacity building activities (for example, through the annual Information, Education, and Communication program) will be drafted so that the advice and support provided is also consistent with the IAAB, IFAD and GCF safeguards standards. Based on the initial sub-project safeguards screening, any subsequent ESA would: (i) cover the requirements established under the relevant safeguard standard for that subproject; and (ii) identify the environmental and social risks and impacts including direct, indirect, cumulative, and residual impacts.

5.2 Key Steps

178 The ESCMF process is comprised of four steps, as depicted in **Figure 7** and summarized below:

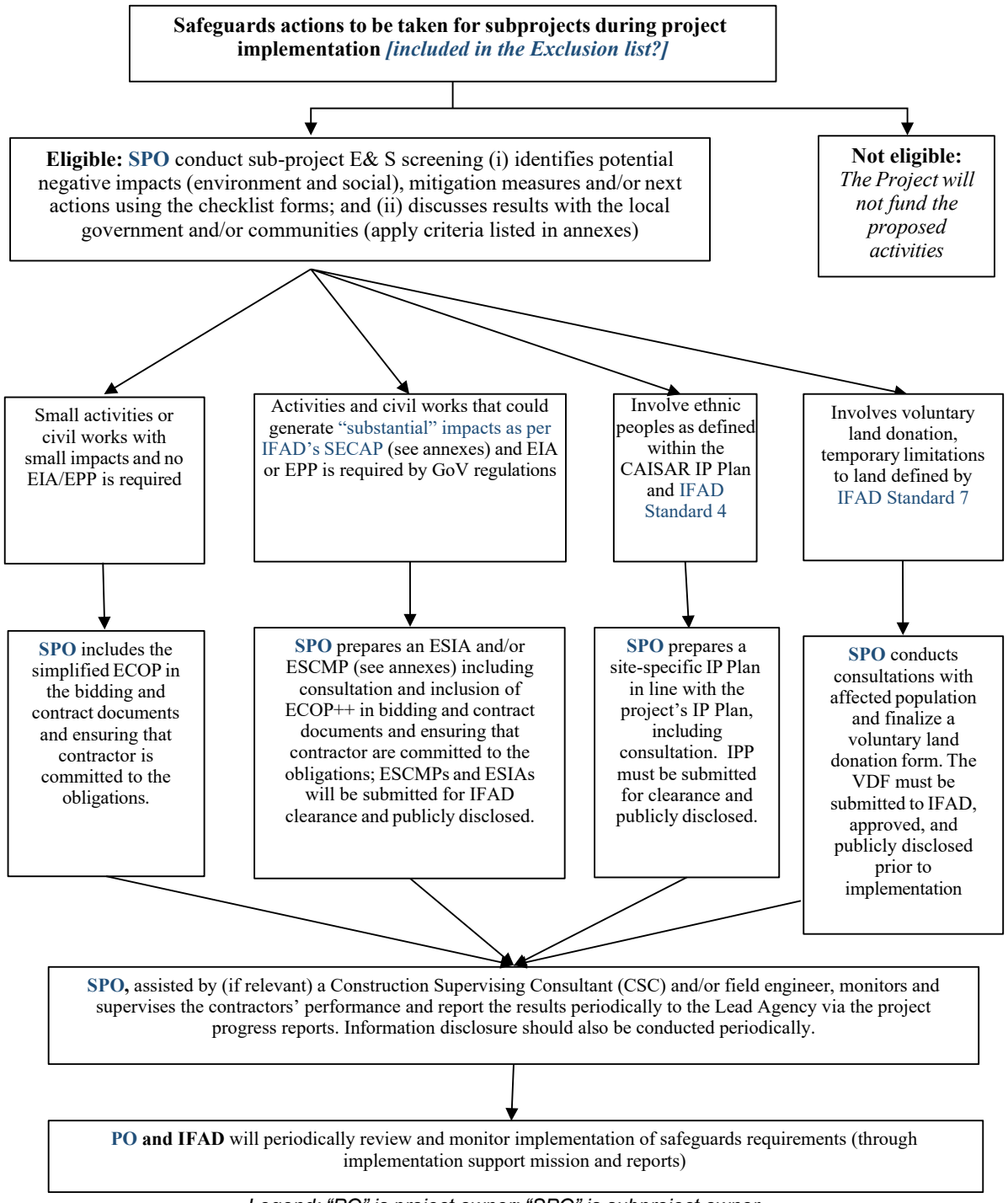
STEP 1: Screening for eligibility and E&S issues including risks and impacts using screening criteria, application of ESSs, and identification of and needs for preparation and implemenation of E&S documents/instruments.

STEP 2: Prepare E&S documents, including the development of mitigation measures in the ESCMP, IP Plan, and RP to be incorporated into bidding and contractual documents and subjected to close monitoring of the contractor performance. ESCMPs clearly identify mitigation measures for potential negative impacts during site clearance and construction, including the management of contractors, chance finds, EHS application, and workers' Codes of Conduct.

STEP 3: Clearance and disclosure of E&S documents; and

STEP 4: Implementation, monitoring, and reporting.

179 The risk analysis, impact assessment, and preparation of E&S documents for all subprojects will be carried out during implementation. A full ESIA is being conducted for the project. Preparation of a subproject ESCMP occurs when the subproject activities have been clearly identified and locations are known. During the preparation of the ESCMP, due attention will be given to address the issues of biodiversity conservation and sustainable management of living natural resources, resource efficiency and pollution prevention, labour and working conditions, community health and safety, indigenous persons/ethnic minorities, women, cultural heritage, and stakeholder engagement and information disclosure.



Legend: "PO" is project owner; "SPO" is subproject owner

Figure 5-1: Flowchart for Safeguard Actions for Subprojects

180 Key safeguards actions can be highlighted as follows:

- Small works to be carried out under Component 2 will incorporate a site-specific ESCMP requirements and an ECOP into the bidding documents and consultant contracts, with contractor performance closely monitored by the responsible persons of the implementing agencies.
- If screening highlights the need for voluntary land donation or temporary disruption to land use, a Voluntary Land Donation form must be prepared and consulted upon (in line with the VGGT principles and IFAD Standard 7), as well as approved and disclosed prior to sub-project implementation.
- If the ethnic minorities are present in the subproject, a site-specific IP Plan will be prepared and implemented according to IFAD Standard 4 and the guidelines can found in the project's overarching IP Plan.
- All the major E&S documents of a given subproject will be submitted for IFAD clearance before their respective approval and implementation.

5.3 E&S Risk and Impact Assessment

181 This step (Step 1) aims to confirm the eligibility of subproject and/or activities to be financed by the Project as well as identify the potential E&S issues and assess potential impacts of the subprojects/activities including needs for preparation of E&S documents as required by IFAD/GCF standards using an E & S screening checklist. The agencies responsible for implementing the subproject/activity will be responsible for undertaking and signing the screening forms. PPMUs will each be responsible for screening their own activities. Consultation with IFAD safeguards specialists can be made as needed, depending on subproject complexity.

5.4 Development of E&S Documents

182 This step (Step 2) is focused on preparing safeguards documents in relation to the issues identified in Step 1. Guidelines for the preparation of an ESCMP are provided in the annexes, whereas a project-level SEP and IP Plan have been developed separately. Again, PPMUs will be responsible for their own activities and subprojects, and their corresponding safeguards specialists will be responsible for the preparation of E&S documents. Consultation with IFAD safeguards specialists for complex subprojects will be made as needed.

183 It is also crucial that the implementing agencies of the subprojects and activities are responsible for preparation of E&S documents (e.g. EPP, EIA, etc.) required by the Government of Cambodia's EIA regulation and secure approval of responsible agencies.

5.5 Review, Approval, and Disclosure of E&S Documents

184 **IFAD review and clearance:** Before approval and commencement of subproject works, the Subproject Officer (SPO) will submit all key E&S documents to IFAD for review, clearance, and public disclosure. For CAISAR, it is suggested that IFAD conduct reviews of the first three ESCMPs prepared by each province and may then reduce (or increase) frequency as needed. The approval process described herein may also be reviewed occasionally, particularly once the E&S capacity of the implementation partners has been built with the support of the E&S capacity-building consultants/project safeguards specialists. At that point, IFAD may choose to review ESCMPs selected at random.

185 All E&S documents will be posted on the official websites of MOWRAM and the project provinces, and hardcopies in the Khmer language will be available at the CPMU, PPMU, and subproject sites. The CPMU and PPMUs must publish a notification of disclosure of information and solicit comments within the month following that disclosure date. The English version of the ESCMPs will be disclosed on the IFAD (and potentially GCF) website(s).

186 Government approval: Responsible agencies are also required to approve the ESIA or EPP documents as required by Government regulation. Any prepared EIA (in Khmer or English) as well as the approval conditions will be provided to IFAD for information and will be disclosed to the public.

5.6 Implementation, Supervision, Monitoring, and Reporting

187 ESCMF implementation, supervision, monitoring, and reporting is an integral part of project and subproject implementation. Each E&S staff is responsible for specific activities. IFAD SECAP specialists also supervise and monitor the implementation of safeguards activities during IFAD project supervision missions. Delegation of responsibilities is as follows:

- ***Gender Action Plan and IP Plan monitoring:*** The PPMU will hire a social inclusion/gender specialist to monitor the implementation of the IP Plan and GAP and report results to IFAD.
- ***E&S monitoring of contractor performance during construction:*** To ensure compliance with the national laws and regulations as well as some specific requirements of the IFAD SECAP standards at subproject level, PPMUs will hire a qualified national consultant to conduct monthly monitoring and reporting while assigning the Construction Supervision Consultant (CSC) or field engineers to be responsible for monitoring and reporting of contractor's compliance to the construction-focused ESCMPs on a day-to-day basis. At the project level, the PPMU Environmental Safeguards Specialist will ensure monitoring of environmental and social performance at sub-project sites and of the construction contractor throughout construction. The Environmental Safeguards Specialist will report their findings in the Project E&S monitoring reports for IFAD and GCF (this will be done on a six-month basis, or as agreed with IFAD and GCF in accordance with the legal agreement). The PPMU will also be responsible for monitoring and evaluating implementation of the Stakeholder Engagement Plan, including responses to grievances and/or complaints of the project/subproject affected peoples as well as the project workers (see Section 10).
- ***E&S monitoring during implementation of activities/operation of infrastructure:*** Specialized training will be provided on risks inherently associated with project activities that involve waste management, occupational health and safety, and community health and safety. E&S staff must pay extra attention – proportional to the more substantial risks – to those activities during implementation. To ensure sustainability after project closure, the awareness and capacity of MOWRAM/PDWRAM staff and related implementing agencies must be increased through trainings and during implementation supervision. This will require E&S capacity building consultants (including extension staff). PPMUs will detail safeguards progress in the subprojects' E&S monitoring reports for submission to the CPMU. The CPMU will then aggregate and submit the information to IFAD and the GCF.

6. IMPLEMENTATION ARRANGEMENTS

6.1 Responsibility for ESCMF Implementation

188 The feasibility study included recommendations on how the CAISAR Project should be implemented and is summarized in the following paragraphs. The CAISAR project has a clear objective related to both climate and poverty, but the ambitious scope requires cooperation between government agencies. The project will be adopted by the existing country program steering committee chaired by the Ministry of Economy and Finance (MEF). The executing agency, the Ministry of Water Resources and Meteorology (MOWRAM) will provide overall management of the project and implementation of Component 2 (Infrastructure). The National Committee for Sub National Democratic Development (NCDD) will be the implementing agency for component 1.

189 The Project Management Unit (PMU) will consist of personnel from MOWRAM, the Department of Hydrology and River Works (DHRW) of MOWRAM, and Provincial Departments of Water Resources and Meteorology (PDWRAMs) of four provinces.

190 The NCDD working with the International Fund for Agricultural Development (IFAD) will lead Component 1, which involves providing farm level support, capacity building and training of FWUCs, and promoting the adoption of efficient and climate resilient farming practices. IFAD will also be responsible for communications and visibility throughout the project's implementation.

191 Other key phases of implementation include a pilot program for solar pumping and geofabrics to identify any inefficiencies before the full construction phase, with a budget of $60k. Surveys will also be carried out on dam structures and river sections and structures to determine where work is required to rehabilitate and climate-proof the infrastructure, with a budget of $70k managed by the PMU. It is known that the Anlong Chrey dam has limited freeboard and MOWRAM wish to improve safety of the structure.

192 Monitoring and evaluation will be a crucial aspect of the project's success, with engagement at the FWUC level monitoring and reporting to ensure capacity is being increased in time to realize the significant benefits expected upon completion of construction. Material effectiveness and quality of design will also be monitored and evaluated to ensure the scheme is delivered to a standard consistent with at least a 25-year asset life.

193 The roles and responsibilities of each organization have been clearly outlined, with MOWRAM responsible for overall supervision and guidance, and the DFWUC responsible for preparing the annual work plan and budgets, initiating, and coordinating communication, coordinating with the Ministry of Agriculture, Forestry and Fisheries (MAFF) on agriculture support activities, and implementing social and environmental safeguards, among other tasks. The PDWRAM will assist the PMU in disseminating information and coordinating with the Ministry of Economy and Finance-General Department of Resettlement (MEF-GDR) to implement the resettlement plan, among other tasks.

194 The project steering committee (PSC), chaired by the Minister of MOWRAM, will provide policy guidance and oversee project implementation, while the Inter-Ministerial Resettlement Committee (IRC), chaired by MEF, will manage resettlement and land acquisition. By following this implementation arrangement, the CAISAR project can proceed smoothly and achieve its goals of improving water resource management and enhancing agricultural productivity in Cambodia.

6.2 Project Implementation Organizations (Component 2)

195 The expansion of irrigated areas and the modernization of irrigation systems are high in the order of priorities of the Royal Government of Cambodia as well as the Ministry of Water Resources and Meteorology (MOWRAM), which is responsible for sustainable water resources management, including irrigation in Cambodia. Proper irrigation O&M can only be successfully implemented when the five basic pillars of irrigation are properly addressed. These five pillars are: (i) security of water

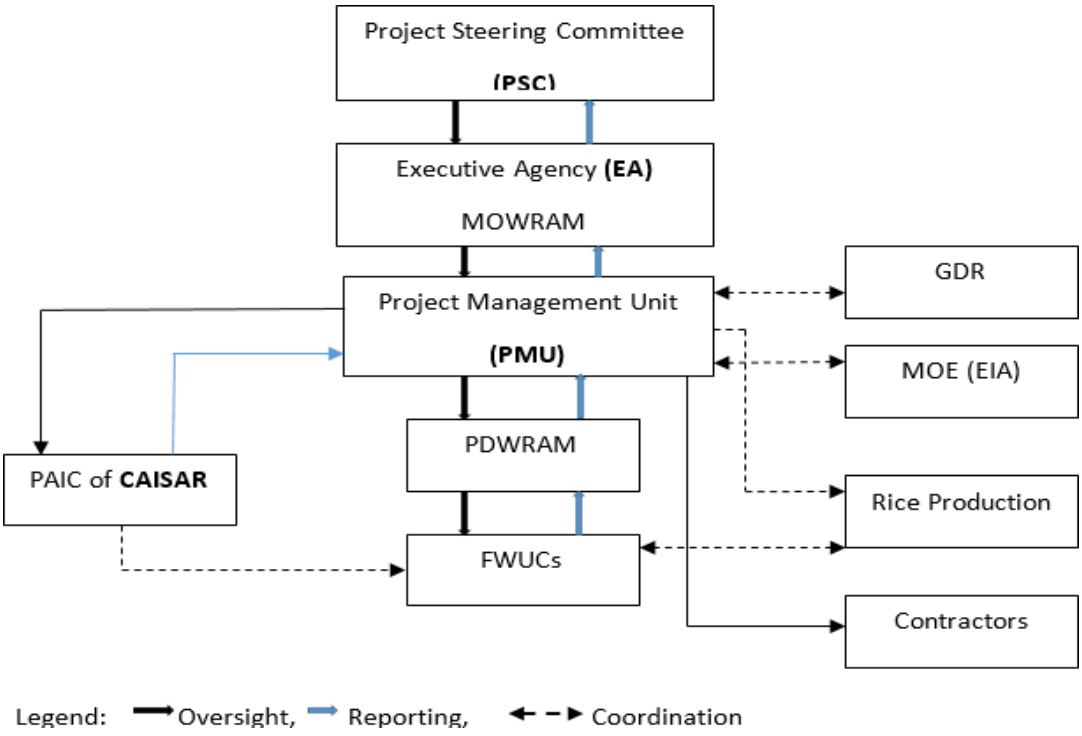
availability; (ii) sustainable infrastructure; (iii) water management, (IV) Irrigation institution and (v) human capital.

196 The FWUC Department has personnel at the Central level but no Office and personnel at the Province and District level so for the effective operation of FWUC the DFWUC should recruit and or appoint additional personnel and train them to meet the right qualification and experience for the FWUC office at the provincial and district levels.

197 A CAISAR project implementation organization chart is defined in Source: Feasibility Study
198 Figure 6-1. MOWRAM is the Executing Agency for implementation of the Project. However, successful implementation of the Project requires the cooperation of several ministries. The project steering committee (PSC) was established to achieve the inter-ministerial coordination and chaired by the Minister of MOWRAM and comprising of senior officials from MOWRAM, MOI (NCDD), MAFF, Ministry of Environment (MOE), Ministry of Economy and Finance (MEF), and the Provincial Governor's Offices of Pursat, Kampong Chhnang, Kandal, and Kampong Speu provinces will oversee project implementation and provide support to the project. The Table 6-1 below show the Management, Executive and Implementation body and Figure 6-1 show the Project organization Structure.

Table 6-1: PSC Management Arrangement.

Descriptions	**Arrangements**
Management	
(i) Oversight Body	**Project Steering Committee (PSC)** Chair: H.E. Lim Kean Hor, Minister, MOWRAM Secretary: H.E. Chann Sinath, Deputy Director General, DFWUC/Project Director Members: H.E. Secretary of State, MOI (NCDD) H.E. Secretary of State, MEF H.E. Secretary of State, MOWRAM H.E. Under Secretary of State, MEF H.E. Under Secretary State, MAFF H.E. Director General, MEF H.E. 4 Provincial Governors Director of Department of Cooperation and Debt Management, MEF Office of Multilateral Cooperation 1, MEF
(ii) Executing Agency	MOWRAM
(iii) Implementation Unit	Establish PMU at MOWRAM Level and possibly PIU at PDWRAM Level



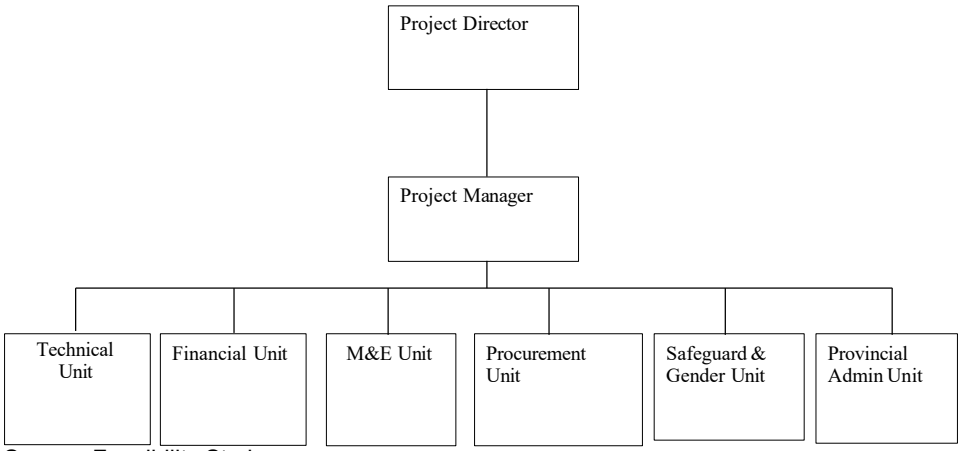
Source: Feasibility Study

Figure 6-1: CAISAR Project (Component 1) Structure Chart

199 A project management unit (PMU) has been established for the CAISAR project. The PMU will be headed by the Secretary of State of MOWRAM as Project Director, with assistance from the DFWUC Director as Project Manager. The PMU will be fully involved in the preparation and implementation of the project. The PMU is composed of designated personnel from MOWRAM, the Department of Hydrology and River Works (DHRW) of MOWRAM, and the PDWRAMs of Pursat, Kampong Chhnang, Kampong Speu, and Kandal provinces.

200 The PDWRAMs are responsible for coordinating all field activities with FWUCs and DFWUC and implementing O&M activities.

201 The PMU is supported by the Project Management Implementation Consulting (PMIC) and consists of Project Director, Project Manager, Technical Unit, M&E Unit, Financial Unit, Procurement Unit, Safeguard & Gender Unit and Provincial Administration Unit as show in Figure 6-2 below.



Source: Feasibility Study

Figure 6-2 PMU Structure Chart.

6.3 Project Implementation Organizations at Sub-National Level

202 Note that the following text applies to Component 2 only. It is envisaged that IFAD will detail further the role of the NCDD and the coordination with the provincial and district agencies for agriculture, rural development etc.

6.4 Provincial Department of Water Resources and Meteorology (PDWRAM)

203 The Provincial Department of Water Resources and Meteorology of MOWRAM is the mandated body tasked to undertake full responsibilities for the O&M of the Main system/scheme. Specifically, PDWRAM is expected to perform the following responsibilities:

a) Ensures that the main canal infrastructure is properly maintained and repaired.
b) Ensures that the seasonal water management plan is endorsed and approved.
c) Ensure that in the dry season the main canal system provides sufficient water.
d) Provide technical assistance to FWUC and its members in the operation and maintenance of the irrigation systems/scheme.
e) Assume leadership in the resolution of conflicts on water disputes.
f) Operation and maintenance of main canal systems with appropriate funding provided by the Royal Government of Cambodia.
g) Implement routine maintenance of the Main Canal system including the structures.
h) Update report to MOWRAM on the deferred maintenance needs of the system including an estimate cost and time repair work.
i) Monitor the volume of water in the main canal and the level of water released to the water users in order for it to function normally.

6.5 Project Implementation Organizations at Scheme Level

204 According to the FWUC Sub-decree of March 2015, a FWUC shall be established and registered with MOWRAM for each irrigation system/scheme in Cambodia. Establishing the FWUC is important in helping sustain the irrigation schemes to be constructed under the Project. Therefore, the Project will establishment an efficient and effective FWUC and will provide adequate inputs and supports to ensure that the FWUC will be able to function effectively.

205 The FWUC will be established as early as possible after a subproject has been proved feasible and endorsed for the construction to enable the local farmers to participate in all stages of the project formulation and implementation.

206 The establishment of a FWUC requires considerable efforts in community organization and training of the established FWUC. The general strategy in mobilizing and organizing the farmers is described below:

(i) One FWUC is organized in each irrigation system/scheme, hence, there will be 4 FWUCs established in the CAISAR, 1 FWUC will need to be restructured or have the committee members re-elected, and 1 FWUC needs more capacity building as mention in Table 6-2 below.
(ii) One FWUG is delineated and organized within the command area of one secondary canal (SC). When the SC area is small, a FWUG could also cover more than one SC.
(iii) One FWUSG is delineated and organized within the command area of one or more tertiary canal (TC)

Table 6-2: Distribution Network & Name of FWUC to be established in the CAISAR Scheme.

No	Scheme Name	Command Area (ha)	Number			Number		
			District	Commune	Village	FWUC	FWUG	FWUSG
1	Ou Tapoang Tanai	13, 270	1	2	31	1	2	31
2	Lum Hach	16,664	3	10	55	1	10	55
3	Chhean Laeung	5,307	1	3	15	1	3	15
4	Stueng Krang Bat	1,500	2	3	13	1	3	13

No	Scheme Name	Command Area (ha)	Number			Number		
			District	Commune	Village	FWUC	FWUG	FWUSG
5	Brambei Mom	16,556	3	12	56	The current FWUC is weak and incapable of collecting ISF. It needs to be restructured and or re-elected as the current FWUC is governed by only 4 communes out of 12 communes in the CAISAR Project scheme.		
6	Krapeu Troum	903	1	1	14	This FWUC is active and they need more capacity building, support and documentation.		

207 After the FWUC's are recognized and officially registered, the Farmer Water User Committee (FWUC) will have full responsibility for the operation and maintenance of the irrigation system as follows:

a) Has the obligation to collect the irrigation service fee (ISF) from all its members for repair and maintenance of the secondary and tertiary irrigation system.
b) Resolve all internal conflicts involving water distribution between and among other FWUC leaders.
c) Convene the General Meeting once a year and other meetings with group and subgroup member as required.
d) Take action to replace vacant position of the structure as required and in accordance with its Statute.
e) Ensure that ISF are collected and kept properly and evaluate expenditures, manage and monitor the level of ISF in each phase and adjust as needed after approval from the members.
f) Assist in facilitating the support of the MOWRAM, PDWRAM and Development Partners on repairs, maintenance, and development of irrigated infrastructure as well as on agricultural development.
g) Mobilize local labor and financial resources to support regularly and seasonally operations and maintenance of irrigation system such as secondary and or tertiary canals and other parts.
h) Review on all kinds of secondary and tertiary canals and structures and Submit report to the PDWRAM.
i) Conduct seasonal maintenance before season of planting.
j) Prepare seasonal water distribution schedule for each growing season and provide a copy to PDWRAM for the preparation of the seasonal water management plan.
k) Manage the distribution of water under the guidance of PDWRAM because these structures are usually under the responsibility of PDWRAM but the operation of these gates will be transferred to the FWUC.

6.6 Procurement

208 The procurement principles to be followed by the CAISAR project were set out in the Aide Memorandum between MOWRAM, AIIB and IFAD following missions in December 2020 and January 2021. Project procurement using AIIB/GCF/IFAD financings will follow the Standard Operating Procedures on Procurement for All Externally Financed Projects/Programs in Cambodia (the SOP 2019/ Procurement Manual) to the extent such are consistent with the IFAD and AIIB Project Procurement Guidelines. NCDD PIU will be directly responsible for project procurement activities of Component 1. MOWRAM PMU will be directly responsible for project procurement activities of Component 2. Procurement review committees for both components will have representatives from both MOWRAM PMU and NCDD PIU.

209 Procurement method thresholds and prior review thresholds for GCF/IFAD financed activities will be determined and specified in the Project Procurement Arrangements Letter (PPA). Requests for IFAD prior review and no objection (for 18-month/annual procurement plans, procurement documents subjected to IFAD prior review) shall be routed through IFAD's web-based procurement management and tracking system (the current NOTUS system to be upgraded in 2023).

210 For the procurement of AIIB/GCF/IFAD financed activities, the standard bidding documents under the MEF's Standard Operational Procedures will be adopted and used with integration of additional provisions in compliance with the AIIB/IFAD Policy on Preventing Fraud and Corruption in its Activities and Operations, and IFAD's Social, Environmental and Climate Assessment Procedures (SECAP).

211 For Component 2 activities, three areas will be identified, (a) Project Management by PMU (b) Preparation of TOR's for DED and Pilots, surveys, detailed engineering design (DED) and contract preparation and tendering towards implementation (c) Packages of work and purchase/Installation of M&E goods such as solar pump stations.

212 For (a) and (b) the PMU already have a procurement plan detailing when the work is expected, how and when it will be procured and budgets. These do not need to be repeated here as they are continually updated by the PMU.

213 For the implementation phase a series of packages for civil works of around $10m-$20m can readily be defined and contracts requiring specific expertise such as the nature-based works on the river restoration work at Ou Ta Poung River, or the heavier engineering work for the upgrading of the offtake structure on the Damnak Ampil and widening/lining of the feeder canal linking to the Ou Ta Paoung River. Lining of secondary offtake canals to increase capacity whilst limiting additional land take may be similarly packaged. For tertiary and quaternary canals significant work with the local communities is needed to finalise design and layout acceptable to the farmers and landowners. To avoid double pumping raised canals and solar pump installations are needed. Land requirements may be reduced through buried pipe or channel systems with access roads above. Continuity for drainage and fish may require small siphons. On the Krang Ponley particularly, expertise in storages and pond restoration is needed as well as more significant drainage works and embankment raising. Creating farm ponds in Cambodia is significantly more expensive than in Thailand where conditions are similar and there is potential for improving efficiencies.

6.7 Monitoring and Reporting Arrangements

214 The E&S performance will be included in the subproject and overall project progress reports. The two safeguards specialists in each of the PPMUs, with assistance from the CSC/field engineers (where relevant), will monitor and report on the E&S performance of the project. The safeguards specialists in the PPMUs will submit E&S performance reports at the subproject level to the CPMU on a monthly basis. At the central level, the CPMU will prepare E&S monitoring report twice per year for submission to IFAD and the GCF, describing the project's progress and compliance with the SECAP/GCF safeguards standards and other requirements.

215 The progress report submitted to the CPMU must include sufficient information on subproject implementation progress and E&S issues related to ESCMF implementation. The overall progress report from CPMU to be submitted to IFAD and the GCF must include adequate information regarding: (i) preparation and disclosure of the E&S instruments for subprojects; (ii) implementation progress of the ESCMP, including incorporation of the ECOP/COC on SEA/other ESCMP requirements pertaining to the contractor in the bidding and contractual documents; (iii) monitoring and supervision on implementation perforamnce of contractors, CSCs, and PPMUs according to the ESCMP, ECOP, and COC on SEA; and (iv) any challenges, solutions, and lessons learned during E&S/ESCMF implementation. Table 6-3 provides a summary of reporting procedures.

Table 6-3: Reporting Procedures

	Report Prepared by	Submitted to	Frequency of Reporting
1	Contractor to the Employer	PPMUs	Once before construction commences and monthly thereafter
2	Construction Supervision Consultant (CSC)	PPMUs	Weekly and monthly

3	Community Monitoring	PPMUs	When the community has any complaint about the subproject E&S/ESCMF implementation
4	PPMUs	CPMU	Monthly
5	CPMU	IFAD and GCF	Once every six-months, in accordance with any signed legal agreements.

6.8 Incorporation of ESCMF into Project Operational Manual

216 The ESCMF process and requirements will be incorporated into the Project Implementation Manual (PIM) and the CPMU will provide training to ensure that the subproject owners (PPMUs) understand them and will supervise and monitor the ESCMF implementation periodically. The E&S section in the POM will also refer to the ESCMF and related safeguards documents, as needed.

7. CAPACITY BUILDING, TRAINING, AND TECHNICAL ASSISTANCE

7.1 Capacity Building for Efficient Project Management

217 Capacity building is a component that will provide supports to MOWRAM/ PMU and PDWRAM to strengthen their capacity with the objective to expedite Project implementation and ensure effective Project management. The capacity building will cover (i) overall Project management, (ii) establishment of FWUCs and capacity building of FWUCs and iii) international and national consultants to fill capacity gaps of MOWRAM/ PMU and PDWRAM.

7.2 MOWRAM/ PMU and PDWRAM

218 The institutional assessment report prepared by PPIC and WAPCOS, December 2022 noted that the weak and insufficient capacity of human resource in all levels of the irrigation management is the primary cause of the slow rural development in Cambodia. The need for adequately trained professionals in water resources and irrigation management in Cambodia is an issue. The capacity building can be performed through education, training, workshop, etc.

219 Based on the institutional assessments report of the Water Resources Management Sector Development Program (WRMSDP), the training for MOWRAM and PDWRAM will include all personnel at the central and provincial levels that are involved in the CAISAR project scheme. This means that the officers who will be involved in the CAISAR project will also be trained. However, the training for FWUCs TOT must be included. For the CAISAR project it is advised that the training plan covers all 6 Irrigation Schemes with both for CAISAR PMU and PDWRAM with topics including 1) Project Orientation and Presentation of Project Plans; 2) FWUC Formation and Strengthening; 3) Gender Awareness and Gender Action Plan; 4) Data Management for Hydro and Meteorological Data and O&M for Meteorological Equipment; 5) Environmental Awareness; 6) Construction Management and Supervision and 7) On-Farm Water Management and Operation and Maintenance.

7.3 FWUC/FWUG/FWUSG

220 To help the trainees clearly understand and be able to apply them to their work, it was noted that each training program needs to dedicate sufficient time for each topic.

221 For FWUC management training programs are needed to strengthen the capacity of existing or new FWUCs that includes: a. Basic administrative management, b. Accounting and finance, c. Conflict resolution, d. Operation and maintenance of irrigation facilities and e. Collection of irrigation service fees.

222 It is suggested that FWUC need to have the opportunity to meet regularly and exchange their personal experiences and to learn from each other regarding FWUC management. Interaction between FWUCs can help to reduce conflicts between FWUCs in the same irrigation scheme/ reservoir.

223 As each FWUC have different geographical characteristics, socio-economic condition and different issues, training materials should be simplified by using the simple words and expressions commonly used by the local people

224 A well-defined FWUC Organizing Framework within MOWRAM/PDWRAM needs to be synchronized with the Water Distribution Schedule and agreed upon within the FWUC and disseminated to all farmer-water users within the Irrigation scheme.

225 The Project should construct the secondary and tertiary canals until the tertiary gates and will assist FWUC in collection of ISF.

226 The institutional assessment report has suggested that Technical and financial support will be provided to the FWUC that will manage the operation of Ou Tapoang, Lum Hach and Kraing Pomley Scheme to ensure that system O&M is conducted in an effective and sustainable manner.

227 To ensure effective and consistent training on E&S, particularly under the new IFAD SECAP (2021) and GCF ESS (2022), training should be provided by qualified national consultants. In addition to refresher training on safeguards pertaining to waste management, use and disposal of pesticides/fertilizers, etc., there must be additional training focused on ensuring the effective performance of contractors – including provision of adequate services related to health, safety of workers and local communities.

7.4 Training and Technical Assistance

228 Training and capacity building on the IFAD SECAP/GCF ESS has been recommended to address the concepts of proportionality and adaptive management as well as cover the implementation of the safeguards documents as they relate to: (i) contractor management and monitoring of E&S issues concerning labour; (ii) community health and safety; (iii) environmental health and safety; and (iv) requirements for systematic stakeholder engagement. The targeted training programs focused on E&S risk management could also help strengthening inter-agency coordination and cooperation which is critical for ensuring effective management of all aspects of climate change adaptation. Given the project structure and the plan to implement a number of subprojects in each province involved, significant inputs from qualified national consultants will be required, along with on-the-job training on assessing risks and impacts management during preparation and implementation.

229 During implementation of Project, E&S training and technical assistance will be provided to the implementing agencies both at the Project and subproject level. During the first three years, the CPMU will conduct at least two safeguard training workshops per year (one on environment and one on social) to the subproject owners regarding the ESCMF process and needs for preparation of safeguard documents (ESCMPs, SEP, IP Plans, and ECOP etc.). When possible, an IFAD SECAP Specialist will participate in these training workshops. Safeguards technical training for any other specific issues and related aspects should occur at least once per year for three years. This could be combined with the annual IEC.

230 Priority for training should include, but is not limited to, the following:

(i) The ESCMF process and guidelines for preparation, implementation, and supervision of E&S instruments designed for CAISAR and its subprojects;
(ii) Specific training on the IP Plans, SEP, and labour management with regard to planning and implementation, including the application of differentiated GRM pathways to more effectively respond to local complaints;
(iii) Specific training on supervision and monitoring of contractor performance, including forms and reporting processes; basic knowledge on health and safety; good construction practices for reducing potential impacts on local environment and local peoples; Codes of Conduct on SEA; and communication and GRM procedures and other social issues related to communicable diseases (including covid-19), etc.;
(iv) Specific training on IPM; safe use and disposal of pesticides/herbicides/chemical fertilizers being used in primary production;
(v) Specific training on waste management, including hazardous and bio-hazardous waste;
(vi) Specific training on the use of PPE and best practices (during construction, pesticide application, etc.).

7.5 Technical Assistance on E&S Capacity Building

231 Given the specific needs related to E&S training and limited capacity of some agencies with respect to the newest IFAD SECAP and GCF ESS, a qualified national firm could be mobilized by the CPMU to provide E&S training, supervision, monitoring, and reporting of the ESCMF implementation and SECAP/ESS compliance to IFAD and the GCF. If required by IFAD and/or the GCF, the CPMU will also mobilize an independent monitoring agency (IMA) for monitoring of IP Plan implementation, voluntary land donation (if applicable), and other E&S consultants to assist in the preparation and/or monitoring of various E&S activities during implementation. PPMUs may mobilize E&S consultants

(either individual or hired through a firm) to assist in the implementation of ESCMF, preparation of E&S documents, and mitigation measures of the subprojects under their responsibility.

232 MoWRAM have significant experience in application of the World Bank ESF and the Asian Development Bank safeguards policy through a number of similar projects over the past several years. Through this project, MoWRAM have maintained a proven track record for safeguards compliance. MoWRAM keep improving their capacities, through continued capacity development of staff of the Environmental and Social Office (ESO). Some of the staff within the ESO have solid working experience in engineering, community development, environment, social and public administration, engaging with indigenous people, and most have been trained by the World Bank on various topics related to environment and social management in rural development projects. The ESO with MoWRAM have a total of 7 staff (4 are female) who are assigned to different projects. The ESO will need additional technical support during the WASAC project implementation from E&S specialized staffs. MoWRAM will engage additional national consultants to work alongside staff of ESO to support the PMUs of MoWRAM in day-to-day E&S implementation and management.

Review of MoWRAM/PMUs capacity in prevention of SEA/SH risks

233 The MoWRAM PMUs have experience in identifying SEA/SH risks and prevention of SEA/SH based on lessons learned from several previous projects. Under this project, based on identified risks of SEA/SH, an approach and framework for management of SEA/SH risks has been proposed, and further addressed in the Labor Management Procedures. PMUs will appoint one social officer and one GRM officer to ensure the SEA/SH risks are monitored and reported. In addition, the MoWRAM PMUs have assigned a gender focal point to provide on-the-job training to the Contractors.

234 At an early stage of project implementation, MoWRAM PMUs will recruit E&S consultants, and engage a consultant specialized in SEA/SH to carry out SEA/SH trainings for PMU members and relevant members of MoWRAM, ESOs. MoWRAM also ensure that SEA/SH risks will be updated based on local experience and site conduct at respective subprojects. Accordingly, actions to be taken to prevent SEA/SH will be updated and included as part of the ESCMPs, and which will be subsequently applied as part of construction Contractor responsibilities (as prescribed in the Contractors' Work Contract). Budget will also be allocated (in Contractor's bill-of-quantity) to ensure the Contractor has budget in place to recruit a SEA/SH consultant to conduct public awareness raising on SEA/SH at subprojects, and to undertake SEA/SH management measures on the part of Contractors' workers and staff to minimize the risks of SEA/SH. In case where SEA/SH incidence is frequent or a significant episode has occurred.

235 Land acquisition and voluntary donations training will be conducted by the E&S Consultant. It is expected this training could be started as soon as E&S specialized staff are engaged by MoWRAM. Additional support from E&S staffs will be needed monthly or bimonthly during the construction phase, and quarterly or biannually during maintenance phase based on the need for support for the select subprojects. These training initiatives will be carried out face-to-faced. In case COVID-19 restrictions return, virtual training will be conducted. Zoom or Webex will be used for online training, The training will have knowledge session combined with discussion/exercises/role plays/quiz with Questions & Answers session at the end of each day. The training will be delivered in different time format, depending on the topics, number of participants, time availability, and may typically range from one day to three days. MoWRAM and PMUs will engage qualified trainers for the above training topics. For new topics, MoWRAM can ask support from the AIIB and IFAD to support in terms of sharing training material, references, and assist in training facilitation, if possible, to provided MoWRAM PMUs with practical, hands-on experience at the first stage of project implementation, particularly soon after project effectiveness.

8. ESCMF IMPLEMENTATION BUDGET

236 The roles and responsibilities of each organization have been clearly outlined, with MOWRAM responsible for overall supervision and guidance, and the DFWUC responsible for preparing the annual work plan and budgets, initiating, and coordinating communication, coordinating with the Ministry of Agriculture, Forestry and Fisheries (MAFF) on agriculture support activities, and implementing social and environmental safeguards, among other tasks. The PDWRAM will assist the PMU in disseminating information and coordinating with the Ministry of Economy and Finance-General Department of Resettlement (MEF-GDR) to implement the resettlement plan, among other tasks.

237 The E&S performance will be included in the subproject and overall project progress reports. The two safeguards specialists with assistance from the CSC/field engineers (where relevant), will monitor and report on the E&S performance of the project. The safeguards specialists in the PPMUs will submit E&S performance reports at the subproject level to the CPMU on a monthly basis.

238 The ESCMF process and requirements will be incorporated into the Project Implementation Manual (PIM) and the PMU will provide training to ensure that the subproject owners (PMUs) understand them and will supervise and monitor the ESCMF implementation periodically. The E&S section in the POM will also refer to the ESCMF and related safeguards documents, as needed.

239 Monitoring and evaluation will be a crucial aspect of the project's success, with engagement at the FWUC level monitoring and reporting to ensure capacity is being increased in time to realize the significant benefits expected upon completion of construction. Material effectiveness and quality of design will also be monitored and evaluated to ensure the scheme is delivered to a standard consistent with at least a 25-year asset life.

240 The following ESCMF implementation costs include two safeguards' specialists in the PMU, Their responsible include: (a) preparation of E&S documents of subprojects, including consultation with local authorities and communities; (b) supervision, monitoring, and training workshops on E&S issues; (c) implementation and monitoring of the ESCMPs, SEP, IP Plan, and Gender Action Plan. (with the support of the project's Monitoring & Evaluation Specialist); and (d) ensuring contractors implement their respective Environmental Code of Practice and Codes of Conduct for Gender Based Violence (GBV) and Violence Against Children (VAC) and any site-specific measures. The budget also includes the social economic survey including the census for the resettlement plan. A budget for an Independent E&S Monitoring Consultant for an estimated 6 year construction period for the 6 schemes.

241 MoWRAM will appoint at least one Environmental Specialist, one Social Specialist, and one GRM Focal Point (hereinafter ESOs) for full time support for the project. The ESOs of MoWRAM will be instrumental in ensuring the environmental and social performance of the project. The ESOs, who are supported by Design and Supervision consultants and E&S consultants, will be responsible for ensuring effective environmental and social management for all project activities. The ESOs, Design and Supervision consultants and E&S consultants will work together as a team in which ESOs play the lead role in E&S monitoring for the whole project. In particular, ESOs will review all related project and E&S documents which are prepared by E&S consultants. Where necessary, ESO will conduct site visits, interview contractor, construction supervisors, workers, provincial-level government staff of MoWRAM, local authorities and local communities to collect necessary E&S information for the purpose of internal monitoring. The ESO will monitor Contractors' compliance with Construction-ESCMP and visit each subproject location at least once a month during construction. Upon completion of each site visit, the MoWRAM'S ESOs should prepare a Monitoring Report reflecting main issues found, resolution arrangements and timing for the resolution.

The **ESOs** will be responsible for:

- Implementing and monitoring performance of environment and social mitigation measures, including health and safety;

- Conducting screening and scoping on environment and social impacts, including screening for land acquisition impacts based on the guidance in the RPF and presence of Indigenous Peoples based on the guidance in the IPPF;
- Conducting trainings on health, safety, gender, SEA/SH, VAC, labor rights, HIV/AIDS, STDs, Covid-19 and the grievance redress mechanism to project communities, and monitoring contractor's training for their workers on Workers' Code of Conduct which covers SEA/SH/VAC, HIV/AIDS, STDs, and COVID-19 and the workers' grievance redress mechanism;
- Monitoring environmental and social activities of the project, in particular the implementation of the ESCMPs for subprojects, and any other relevant project documents such as RP and IPP;
- Monitor, including ensuring effective functioning of project's Grievance Redress Mechanism and solve grievances submitted to the PMUs level;
- Leading all stakeholder engagement activities, including information disclosure, consultations, reporting back to stakeholders, according to the provisions in the SEP;
- Working closely with Provincial Department of Water Resource and Meteorology, General Department of Resettlement, and other line ministries and/or relevant departments as necessary;
- Prepare monthly reports on E&S implementation and submit to the PM and PD.

E&S Consultants

242 The E&S consultants are responsible for assisting the ESO in monitoring and reporting on the safeguard implementation performed by the contractors.

- Develop screening checklist to assess risks and potential environmental and social impacts for each subproject;
- Take lead in building capacity for the project (based on list of potential training topics, including periodic provision of on-the-job training to contractors, ESO and PMUs on the implementation and management of E&S risks and impact at subproject level;
- Review C-ESCMP and ensure C-ESCMP is consistent and cover all risks and potential impacts identified in site-specific ESCMP, particularly risks related to OHS, CHS, SEA/SH/VAC taking into account local knowledge and experience in prevention and management of these risks.
- Ensure C-ESCMP have actionable plan to addressed identified risks and potential impacts, including allocation of resources to implement fully such actions.
- Make recommendation for improvement before PMU's and PMU's DISS Consultant's approval of C-ESCMP;
- Conduct site visit to construction sites and worker camp and make above assessment as part of monitoring and reporting responsibility;
- Develop E&S monitoring checklist and reporting template;
- Participate and support ESO in monthly safeguard monitoring and reporting;

243 The Government of Cambodia and AIIB, IFAD and GCF will co-finance the ESCMF implementation budget, except for costs related to all aspects of land acquisition, resettlement, and livelihood restoration. When needed, qualified national (individual or firm) consultants for capacity building and training on ESCMF implementation and the concepts of the AIIB's ESF, IFAD's SECAP and GCF's ES Policy will be provided. Budget for trainings and capacity building are mainstreamed into the project budget across project outputs/components, so are not listed explicitly in the ESCMF implementation budget. Likewise, the budget for preparation of the Biodiversity Impact Assessment and related Biodiversity Management Plan, if any, are not listed in the ESCMF implementation budget, as they have already been contracted by MOWRAM as part of the ESCIA.

244 Costs related to staffing, implementation, and monitoring of the ESCMF, as well as costs more broadly focused on safeguards are built into existing project activities/components, can be found in Table 8-1.

Table 8-1: Estimated ESCMF Implementation Cost

Line Item	Estimated cost (USD)	Remarks
Environment & Climate Safeguards Specialist	USD 240,000 (60 months at USD 4000 per month) per PMU	The PMU will be responsible for management of this budget.
Gender & Social Safeguards Specialist	USD 240,000 (60 months at USD 4000 per month) per PMU	
GRM Focal Point	USD 240,000 (60 months at USD 4000 per month) per PMU	
Socioeconomic and census survey for Resettlement Plan 840 ha impacted (private & public) with estimate of 10 households per ha	USD 250,000	
Independent E&S Monitoring Consultant (Estimated 6 year project implementation period)	USD 500,00	
TOTAL	**USD 1,470,000**	

9. GRIEVANCE REDRESS MECHANISM (GRM)

245 As part of environmental and social policies of the AIIB, IFAD, and GCF, the Lead Agency is required to establish and implement a GRM to respond to concerns and grievances of project-affected parties related to the E&S performance of the project/subprojects in a timely manner. The GRM may include: (a) different ways in which users can submit their grievances, including submission in person, by phone, text messages, mail, email or via a web site; (b) a log where grievances are registered in writing and maintained in a database; (c) publicly advertised procedures, setting out the length of time users can expected to wait for acknowledgement, response, and resolution of their grievances; (d) transparency about the grievance procedures, governing structure, and decision makers; and (e) an appeals process (including the natural judiciary) to which unsatisfied grievances may be referred when resolution of grievance has not been achieved. The project/subject owner may provide mediation as an option where users are not satisfied with the project's resolution. Project/subproject owners must establish and implement the project GRM to receive and facilitate resolution of such concerns and grievances. As best practice, this ESCMF stipulates that contracted workers will have access to the project GRM to also raise workplace-related concerns. Those workers will be informed of the GRM upon their recruitment, as well as the measures put in place to protect them against any reprisal for its use.

246 As part of overall implementation of the subproject, the GRM will be established by the implementing agencies. The GRM identifies procedures, responsible persons, and contact information; will be readily accessible for the public; and will handle grievances and resolve them at the lowest level required and as quickly as possible. The GRM provides the framework within which complaints about environmental and safety issues can be handled, grievances can be addressed, and disputes can be settled quickly. The GRM will be in place before the subproject activities commence.

247 General Process: Complaints and claims through the project GRM can be lodged verbally, in writing, or by telephone/email. On receipt of a complaint, or project representative will register the complaint in the Complaints File and maintain a Log of Events pertaining to the complaint, until its resolution. Information to be recorded in the Complaints Log will include:

- The date and time of the complaint;
- The name, address and contact details of the complainant;
- A short description of the issue of complaint;
- Actions taken to address the complaint, including persons contacted and findings of each step in the complaint redress process;
- The dates and times when the complainant is contacted during the redress process;
- The final resolution of the complaint;
- The date, time and manner in which the complainant was informed thereof; and
- The complainant's signature when resolution has been obtained.

9.1 Objectives of the Project GRMs

248 The objective of the GRM is to provide affected persons with redress procedures that can be conveniently used to raise a project related concern or grievance. The GRM guides how a complaint can be lodged, including forms and channels through which a complaint can be submitted. To facilitate the grievance resolution process, grievances received will be acknowledged in writing and solved within a specified timeframe. During the resolution process, where necessary, dialogue will be held with aggrieved person for mutual understanding and effective resolution. Once a complaint is resolved, the aggrieved person will be notified of the resolution results.

249 The GRM has sequential steps that aggrieved person can use. If the aggrieved person is not satisfactory with the grievance resolution result, or if their complaint is not resolved within the timeframe specified for a particular step, aggrieved person can move on to the next step which is higher in resolution hierarchy. The project has an appeal process where complainant can resort if they

are not satisfied with a resolution decision at a particular step, or their complaints are not resolved within a specified timeframe.

9.2 Summary of national legislation related to grievance and complaint

250 The RGC has various laws and sub-decrees that have been in place to guide the implementation of the complaint resolution process. These documents specify the right of the complainants as well as the responsibilities of concerned governmental agencies as to complaint resolution. Relevant legal documents include:

- Law on Expropriation (dated 26 February 2010);
- Labor Law (dated 13 March 1997, amended on 20 July 2007 and 26 June 2018);
- Law on Prevention of Domestic Violence and Protection of Victims (dated 24 October 2005);
- Sub-decree No. 22 ANK/BK (2018) on Standard Operating Procedures for Land Acquisition and Involuntary Resettlement for Externally Financed Projects in Cambodia. Guidelines for Grievance Redress Mechanism (Appendix 8);
- Law on Administrative Management of Capital, Provinces, Municipalities, Districts and Khans (dated 22 May 2008) – Section 6 on Solution of Local Conflicts;
- Sub-decree No. 22 (25 March 2002) on Decentralization of Roles, Functions, and Power to Commune Councils (Article 61: duty to promote the role of conciliating disputes between citizens);
- Sub decree No 47 ANK.BK (31 May 2002) on Organization and Functioning of the Cadastral Commission (Chapter 4 – District/Khan Level Conciliation).

9.3 Principles of the Project GRMs

251 Under CAISAR, the following principles will be applied:

- **Channels.** Different channels are established to enable affected person to submit their grievances, including submission to village committee, as well as district and provincial levels.
- **Forms.** Grievances can be submitted in writing and verbally, and either directly by the affected households, or by a person delegated by the complainant.
- **Complainant can delegate a representative who acts on their behalf.** A person lodging a grievance can ask assistance from their family or from individual to act as their representative.
- **Disclosure.** GRM procedures are disclosed in public domain (e.g., websites of PMU, public notice board at village hall, and in front of substation).
- **Documentation.** A grievance logbook will be maintained at substation (subproject level) and at PMU level (through PMU GRM focal point).
- **Transparency.** Grievance procedures include steps, time frame for grievance resolution for each step, notification to affected person, how decision is made.
- **Acknowledgement.** The unit in charge of complaint resolution will notify complainant upon complaint receipt and will initiate the complaint resolution process.
- **Appeal.** If the agency in charge does not resolve a grievance in a manner that is satisfactory to the affected person, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court.
- **Monitoring.** All grievances received are recorded by PMU and relevant substations, and are processed/resolved in a given timeframe, and are monitored by PMU GRM focal point.
- **Time-limit.** Time-limit is specified for each step in the grievance resolution process.
- **Complainants bear no costs.** Complaint resolution is free of charge to aggrieved person. However, if the complaints bring their case to court, they will bear the costs associated with their lawsuit.
- **Any grievance concerning urgent health and safety issues** shall be resolved immediately.

252 The project has in place complaint handling procedures for three types of potential grievances, including grievances related to 1) land acquisition, 2) labor and working conditions, and 3) sexual exploitation and abuse and sexual harassment (SEA/SH/GBV/GBV), and 3) general complaints. These procedures are established based on the above GRM principles and are in accordance with pertinent national legislation. The GRM for complaints related to land acquisition is provided in the project's Resettlement and Policy Framework (RPF) and that for IPs is provided in the project's IPPF. Summary for the above four procedures is provided below:

9.4.1 Redress Procedure for Complaints related to Land Acquisition

9.4 Project's Redress Procedures

253 Under this project, to facilitate the grievance redress, the informal and formal steps are combined for convenient use of affected people, as follows:

- **Step 1 − Commune/Sangkat level.** APs will seek assistance from commune/Sangkat chief or community elderlies who will discuss with the leader of the PRSC-WG to find a solution. Verbal grievance can be provided to the commune/Sangkat chief or community elderlies. So, no written complaint is required. It is noted that even if the complaint is made verbally, the complaint will be registered in project's logbook, including resolution process and result for such verbal grievance for monitoring purpose. Upon receipt of the verbal complaint, the PRSC-WG will consult with the IRC-WG to ensure the complaint is addressed timely. If the grievance is not resolved to the satisfaction of the AP, or if the AP prefers, s/he may lodge their complaint through the formal route which includes the steps below.
- **Step 2 − District level**. AH can lodge a written complaint to the Head of the District Office (where the subproject is located). The AH can bring a community elderly or their representative to discuss their grievance at the District Office. A conciliation meeting shall be held and a decision be made within 15 working days from the date of complaint is received by the District Office. If the complaint is resolved to the satisfaction of the AH, the IRC-WG will inform GDR's Department of Internal Monitoring and Data Management (DIMDM) who will review and seek the approval of the Director General of GDR for appropriate remedial action. GDR will inform the AF of the decision/ remedial action within 15 working days from the receipt of the grievance by the District Office. If the complaint is rejected at this step, District Office will inform the AH of the rejection in writing. If the complainant is not satisfied with the decision/resolution result, s/he can proceed to step 3 (below).
- **Step 3 − GDR level.** The complainant who is not satisfied with proposed resolution from Step 2 shall lodge a written complaint to the GDR for resolution.The GDR, through its DIMDM, will carry out a holistic review of the complaint and submit a report on its findings with the relevant recommendations, if any, to the Director General of GDR for review and decision. GDR may conduct a field visit to meet the complaint and the IRC-WG to gather relevant information. The final report must be completed within 30 working days from the date of receipt of the complaint by GDR for submission to the Director General of GDR who will make a final decision within 5 working days of receipt of the final report. In the event that the subject matter requires a policy level intervention, it will be referred to the IRC for a decision which may require that an additional 10 working days be extended from the original deadline for final decision.
- **Step 4 − Provincial level.** AH will submit a written complaint to the PGRC through the Provincial Governor's Office. The complainant or a representative will be given an opportunity to present its case during a meeting and the PGRC may consider any compelling and special circumstances of the AH to inform their decision. The GDR will send a representative, as a non-voting member, to provide an explanation to the rejection of the complaint at Step 3 with the GDR. The decision of the PGRC must be made on a consensus basis and will be final and binding except when the matter relates to government's policy. Decisions related to government's policy matters on land acquisition and resettlement are decided by the IRC. The PGRC will have 40 working days from the date of receipt of the complaint to reach a final decision. The decision of the PGRC will be sent to the IRC (through the GDR) for endorsement before any remedial action is taken.

  There are no fees or charges levied on the AH for their lodgment of complaint and for complaint resolution for the above 4 steps.
- **Step 5 − Court of Law**. If the aggrieved person prefers filing a lawsuit at the Provincial/Municipal Courts, as applicable, to seek a resolution, AP can do so but will bear cost related to the lawsuit as per the Expropriation Law. When the case is brought to a Court

of Law, there is no involvement of the GDR, PRSC or IRC-WG unless there is a judicial order from the competent courts.

9.4.2 Redress Procedure for Complaints related to Labor and Working Conditions

254 Project workers can lodge their grievance/complaint as follows:

- **Step 1 – Employer Level (Contractor and Subcontractor).** Aggrieved person (AP) can submit their grievance to their Employer who serves as the first focal point for receiving and resolving grievance. Grievance can be lodged verbally or in writing, in person or by phone, text message, mail or email (anonymous complaint is accepted). The Employer involved will resolve the case no later than 15 working days. Once resolved and the AP is satisfactory, the Employer will report the case, including resolution process and results, to the SEO of the MOWRAM for information and record. If the AP is not satisfied with the resolution of their Employer, the Employer will refer the AP to the SEO of MOWRAM, if needed and inform the AP of this referral. It is noted that if a complaint concerns the safety and health of one or several individuals, such complaint shall be resolved as soon as possible – depending on the nature and urgency of the grievance.
- **Step 2 – PMU level.** MOWRAM SEO will resolve the complaint referred to by the Employer (Step 1) and acknowledge receipt of the AP's complaints within two weeks from the date of complaint receipt. If the SEO of MOWRAM cannot resolve the complaint, the SEO Team will consult with the Project Manager/Director for resolution. The SEO of the MOWRAM will inform the AP (in writing) of the PMU's resolution result within 30 days from the date of complaint receipt. If the AP is not satisfied with the resolution result proposed by PMU, PMU will refer the case to the Project Steering Committee of the project and shall inform the AP (in writing) of this referral.
- **Step 3 – Project Steering Committee level.** At this level, the case will be resolved no later than 21 days. The AP will be informed of the resolution decision in writing. In case the grievance has not been solved within the specified timeframe, or the AP does not agree with the proposed resolution, the AP can approach the Labor Inspector of his/her province or municipality.
- **Step 4 – Court of Law.** If the AP is not satisfied with the resolution proposed above, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court. If the grievance could not be resolved satisfactorily by the multistakeholder committee, the affected person may resort to the court of law. The cost associated with the lawsuit shall be borne by the AP. The decision of the Court will be final.

9.4.3 Redress Procedure for Complaints related to SEA/SH/GBV

255 Under the project, the GRM for SEA/SH/GBV mainly serves to: (i) refer complainants to a local GBV service provider; and (ii) record resolution of the complaint. In line with the above, the following principles apply so as to recognize SEA/SH/GBV victim as principal decision makers in their own care, and treat them with agency, dignity and respect for their needs and wishes:

- **Multiple channels** are in place for easy access and lodge complaints.
- **SEA/SH/GBV survivors will be referred to a local GBV service provider** for immediate support if they make a complaint directly to PMU.
- **Confidentiality of survivors is protected.** GM operator (at PMU and local GBV service providers) will keep confidential for SEA/SH/GBV allegation report.
- **No identifiable information on the survivor shall be collected and stored** in Project Grievance Logbook.
- **Costs of operating the SEA/SH/GBV GRM will be covered by the project**.

256 **It is noted that under this project, GBV service provider will be engaged** for subprojects that are rated "High" or "Substantial" for SEA/SH/GBV risks − based on SEA/SH/GBV risk assessment as part of site-specific ESMP.

The following channels can be used to submit a grievance related to SEA/SH/GBV:

+ Channel 1 – AP who believe the SEA/SH/GBV incidence is related to project workers can follow steps outlined in Section 6.4.2 (above) to lodge a SEA/SH/GBV complaint.

+ Channel 2 – Alternatively, AP can lodge their complaint, verbally or in writing, to the GRM's Focal Point within the SEO of MOWRAM for advice and resolution (contact of GRM Focal Point is provided in Section 5.1 (Resources).

+ Channel 3 – If AP wants to bring the case to the Court of Law, AP can follow steps below for prosecution. Prosecution related to SEA/SH/GBV is administered under the Criminal Code and the Code of Criminal Procedure and is as follows:

- **Step 1 – Judicial Police.** SEA/SH/GBV victim or a representative can submit their grievance to a local Judicial Police (JP) Officer. JPs include a) Commune/ Sangkat Chief, b) Commune/ Sangkat/ District/ Provincial/ National Police, and c) District/ Provincial/ National Military Police. The JP is responsible for receiving, recording complaints, and may conduct preliminary investigations to identify and arrest the perpetrator. The JP will also collect evidence to support the prosecutors. If the SEA/SH/GBV happens at home and/or falls under the domain of domestic violence (as per Law on the Prevention of Domestic Violence and Protection of Victims), the SEA/SH/GBV survivor may seek support from a local qualified Judiciary Police Officer (appointed by the Ministry of Women's Affairs) who can act as a complaining party on behalf of the SEA/SH/GBV survivor15.
- **Step 2 – Prosecutor.** Upon receiving the completed written record from the JP, the prosecutor can decide on if the prosecutor will hold a file without processing it further or conduct proceedings against the perpetrator. The prosecutor may bring the case to the Court of Law and present the evidence in Court hearings.
- **Step 3 – Investigation by Judge.** During this step, the investigating Judge will conduct interrogation of the charged person and perform other required investigation procedure.
- **Step 4 – Hearing.** After issuing an order of indictment, the investigating Judge will submit the case to the trial court president who shall arrange a date for the trial. The decision of the Court on SEA/SH/GBV resolution is final.

9.4.4 Redress Procedure for General Complaints

257 In case individuals, households, or communities are affected by any other aspects, for instance, environmental impacts such as increased dust, noise, or lack of safety measures that increase risks of traffic accident to road users or to local EM, various channels will be established for convinient use by affected parties, including IPs. These include:

- **PMU GRM focal point's telephone** (See Section 5.1 – Resources).
- **Local EM leaders** (in case affected individual/households are EM)
- **Contractor's hotline:** to report cases that they think contractors can solve timely (contact detail of Contractos will be posted at construction sites, and distributed to IPs (through Subproject Information Booklet) during consultation, and post at public billboard of Commune/Sangkat offices, pagodas, etc.
- **Commune/Sangkat offices**

9.5 Registration of Project Grievance

258 The SEO, Project 6.Managers within MOWRAM is responsible to establishing and maintaining the project grievance logbook (PGL). The PGL will be established by the SEO to record all concerns/ grievance that are submitted by project stakeholders during project implementation. In case there is serious complaint, the World Bank should be notified of these complaints within 24 hours of complaint receipt (See Annex 3 for Guidance for establishing and maintaining Project Grievance Logbook).

[15] In 2007, Inter-Ministerial Prakas No. 64 was issued by the Ministry of Women's Affairs (MoWA) and the Ministry of Justice (MoJ) appointing MoWA officials who have legal qualifications to be officials of the MoWA Judicial Police. The roles and authority of the JPO under MoWA is defined in the MoWA's Prakas No. 072 KKN/BS (2007) and is as follows: (1) act as a plaintiff representing the victim (2) prepare reports and records (3) monitor and follow up on relevant investigations (4) follow up on Court's procedures (decisions and convictions). In addition, Prakas of the Ministry of the Interior (No. 3840, 2020) on Establishment and Functioning of the Commune/ Sangkat Committee for Women and Children, has defined the roles and responsibilities of these Committees in prevention, mitigation and collaboration with juridical agencies to prevent, resolve cases related to domestic violence, sexual abuses, sexual harassment, human trafficking (such as exportations of women and children in commune/ sangkat for sexual exploitation).

259 **The GRM is an integral project management element** that intends to seek feedback from beneficiaries and resolve of complaints on project activities and performance. The GRMs for the project are based on IAAB, IFAD, UN, and GCF requirements and, most importantly, national requirements for solving potential problems between project owners and local residents/persons affected by the subproject(s).

10. ESCMF STAKEHOLDER CONSULTATION AND DISCLOSURE

10.1 Consultation Requirements

260 AIIB, IFAD and GCF require that consultations be held with the project affected peoples, local communities, vulnerable persons/ethnic minorities, and other relevant stakeholders. The consultations should provide information on the following aspects: a) purpose of the project; b) results of the environmental and social assessment; and c) presentation of the complementary studies required, in any instances where they apply. This ESCMF has been prepared through a detailed consultative process at both the field and central level, and consultations findings may also be used for subsequent safeguards documents.

261 Consultation through community outreach during project implementation is good practice to ensure that the potential adverse impacts and concerns are properly addressed during project construction and operation. Consultation with affected populations and ethnic minorities is required when the activities involve physical relocation, land acquisition, and ethnic minorities.

10.2 Consultation Process Summary

262 Public consultation is a key component of CAISAR and it was pivotal in preparation of the following documents:

- Environmental and Social Management Framework (ESCMF)
- Resettlement Planning Framework (RPF)
- Indigenous Peoples Planning Framework (IPPF)
- Gender Assessment & Social Inclusion Plan
- Stakeholder Engagement Plan (SEP), and
- Environmental, Social, Climate Assessment report (ESCA)

10.3 Initial Stakeholder Consultation Results

263 A number of missions and stakeholder engagement meetings have been held which are all part of the process of informing stakeholders about the proposed project, getting understanding and acceptance of the project, and getting input to further optimize the design and implementation of the project.

10.3.1 *Missions 1 and 2*

264 A two-stage joint mission was conducted by the Asian Infrastructure Investment Bank (AIIB), the International Fund for Agricultural Development (IFAD) and Ministry of Water Resources and Metrology (MoWRAM) for design and review of progress on the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project (the Project) from 11 to 24 December 2022[1] and 9 to 19 January 2023.[2]

265 During the mission, discussions were held with key stakeholders in Phnom Penh and field visits to four provinces (Pursat, Kampong Chnang, Kampong Speu, and Kandal province) were conducted. Mission members visited all the key points of the irrigation areas guided by the Secretary of State His Excellency Chan Sinath and the directors of the Provincial Water Resource Management (PDWRAM). Districts and commune administrations, farmers and agribusiness entrepreneurs were met to determine and reach agreement on the directions and focus of the Project design and to review progress to date.

266 The objectives of the mission were (a) to check the requirements at the Project sites and review preparation progress, (b) to prepare all necessary information, studies and relevant documentation necessary for completing the Feasibility Study (FS), Green Climate Fund (GCF) Project Concept Note (CN) and GCF's Full Funding Proposal package, and (c) to define and

check the key studies required for the feasibility study and carry out the relevant consultations for the design mission.

10.3.2 *Mission 3*

267 A third field mission was conducted during the period of 18-26 May 2023 to Ou Tapoung (Pursat Province), Lum Hach (Kampong Chhnang Province) and Krang Ponley (Kampong Pseu, Kandal Province). The objectives of this mission were to: 1. Conduct discussions with provincial agencies with respect to planned projects and possible issues, and 2. Better understand the irrigation and flood control schemes as well as the smart irrigation needs; 3. Investigate the potential environmental and social issues related to the planned project schemes; and 4. To discuss appropriate environmental, social and climate safeguard measures suitable for the project (Annex 12).

10.3.3 *Ou Tapoung Feasibility Study Consultations*

During the preparation of the Ou Tapoung Feasibility Study, several meetings were held with FWUC commune representatives. These included:

- Meeting with Village Leaders from the Ou Ta Paong tail-end area, which included the following Villages of Ou Ta Paong Commune:
    1) Prey Yeang
    2) Robors Reang
    3) Chamkar Muol
    4) Chamkar Khluy
    5) Ou Tapoang
    6) Anglong Kray
    7) Srash Mkak
    8) Bot Kokichas
    9) Sdok Khlork
    10) Chhouk Krobao
    11) Somroung Pok
    12) Psar Angdoeurk
    13) Ornga Mean,
    14) Srash Ron
    15) Bot Kokithmey
    16) Ta nai
    17) Ou Bot
    18) Tuol Rokeang
- Meeting with FWUC of Kampang Irrigation Scheme on Svay Doun Kaev River
- Meeting with Bakan District Chairman
- Meeting with FWUC Damnak Ampil
- Meeting with FWUC Krouch Saeuch

PDWRAM explained that most of the systems in the DAC command area have at one or another time in the past 15 years undergone a rehabilitation. OTP is sort of a 'left-over'. PDWRAM explained that the rehabilitation of the OTP system is included in the current Five-Year Plan (PDWRAM). PDWRAM envisages that the OTP command area will receive its irrigation water via a gate on Damnak Ampil Canal (DAC).[16] An existing branch of Damnak Ampil Canal (DAC) is destined as the most logic route for delivering water to OTP River.

The feasibility study is to recommend options for improvement of the irrigation services in the area between the rivers Kambot and Svay Doun Khay. The work to be undertaken includes rehabilitation, upgrading, and extension of existing infrastructure systems for irrigation, drainage, flood protection, water storage, and transport.

[16] The ToR for the CAISAR Consultancy Services states:

10.3.4 *First Round of Stakeholder Engagement Meetings*

268 The first round of stakeholder meetings were held during the 26th to 30th June 2023 at commune and provincial levels in all three subprojects and six irrigation schemes. There were potential affected people and local authorities in the subproject areas and command areas that attended the consultation meetings at commune level, while representatives from provincial administration and provincial departments attended the public consultation meeting at provincial level.

269 The SECAP team provided a presentation at each meeting that included the following topics:

- Background of the CAISAR project
- Purpose of the Public Consultation
- Technical scope of each scheme
- Anticipated environmental and social risks and impacts
- Environmental and social safeguards documents to be prepared
- Grievance redress mechanism

270 Key comments and concerns raised by meeting participants included:

- Is there a **compensation** program for affected people?
- How can **complaints** be lodged if there is an issue?
- Participants generally expressed support for the project to be implemented soon

271 The key recommendations from the first round of stakeholder meetings include:

- Brambei Mom (Kampong Speu): there is a community forestry of 800ha. Wild animals such as wild boar, peafowl, tiger cat, banteng, gaur and so on.
- UXO: still found in some areas.
- Kampong Chhnang Department of Agriculture: suggested further assessment for the reservoir of Lum Hach.
- Reservoir of Lum Hach was reserved for irrigation purpose and it is state land. However, local people encroach and occupy the land inside the Lum Hach reservoir over the past years.
- Provincial Department of Health: recommended to ensure the health and safety of workers in the project (e.g., disease transmission and medical staff should standby at each construction site.
- Provincial Department of Education: should avoid adverse impacts on schools and students.

10.4 Information Disclosure

272 AIIB, IFAD and GCF funded projects are required to disclose all safeguards related documents locally in an accessible place and in a form and language understandable to key stakeholders (in this instance, Khmer and English) and on the external website of MOWRAM and of IFAD and the GCF prior to appraisal.

REFERENCES

1. United Nations. (2018). The least developed country category: 2018 country snapshots. Available- https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/Snapshots2018.pdf.
2. World Food Programme. (2023). Saving Lives Changing lives. Available- https://docs.wfp.org/api/documents/WFP-0000147767/download/?_ga=2.188002408.1116277075.1681899242-636470978.1669479646
3. World Bank Group. (2016). *Cambodia Economic Update, April 2016: Improving Macroeconomic and Financial Resilience*. World Bank. Available at- https://openknowledge.worldbank.org/entities/publication/78d3d276-3a5f-5bf2-915d-2d0381a13930
4. Kono, A. and Chey, T. 2019. Rapid assessment of upland cashew, mango, organic rice, and vegetable production. Actions for Climate-resilient and Sustainable Agricultural Production in the Northern Tonle Sap Basin. FAO.
5. RGC, 2020. Cambodia's Updated NDC. Retrieve from: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Cambodia%20First/20201231_NDC_Update_Cambodia.pdf
6. The Asia Foundation (2018). cambodia-atlas-on-gender-and-environment.pdf.pdf (opendevelopmentmekong.net)
7. Kampong Spoeu, one of the four target provinces, reported the highest number of droughts (one of the eight main natural hazards in Cambodia) between 1996 and 2013. (https://www.unccd.int/sites/default/files/country_profile_documents/1%2520FINAL_NDP_Cambodia%255B1157%255D.pdf).
8. Thoeun, H. C. (2015) Observed and projected changes in temperature and rainfall in Cambodia. Weather and Climate Extremes. 7:61. [old reference]
9. MAFF (2017) MAFF Annual Report 2016-17
10. Climate risk country profile, Cambodia. 2021. https://climateknowledgeportal.worldbank.org/sites/default/files/2021-08/15849-WB_Cambodia%20Country%20Profil
11. Data for 2020, World Bank, World Development Indicators
12. The ESCMF examines the risks and impacts when a project consists of a program and/or a series of subprojects, and the risks and impacts cannot be determined until the program or subproject details have been identified.
13. The 1989 Pelosi Amendment requires disclosure of environmental impacts at least 120 days prior to board approval for high- and sometimes substantial-risk projects (URL: https://www.gao.gov/archive/2000/ns00192.pdf)
14. Data for 2020, World Bank, World Development Indicators
15. The ToR for the CAISAR Consultancy Services states:
16. Ministry of Environment. (2002). Report on the Impact of Drought in Cambodia. Available online
17. The World Bank Group & Asian Development Bank. (2021). Climate Risk Profile: Cambodia. Available online https://www.adb.org/sites/default/files/publication/722236/climate-risk-country-profile-cambodia.pdf
18. ActionAid Cambodia. (2022). Cambodia Women's Resilience Index. Available online https://cambodia.actionaid.org/publications/2022/cambodia-womens-resilience-index-2022#downloads
19. Royal Government of Cambodia (2014-2023). Cambodia Climate Change Strategic Plan. Available online https://www4.unfccc.int/sites/NAPC/Documents/Parties/Cambodia_CCCSP.pdf
20. Alvar-Beltrán, J., Soldan, R., Ly, P., Seng, V., Srun, K., Manzanas, R., ... & Heureux, A. (2022). Modelling climate change impacts on wet and dry season rice in Cambodia. Journal of Agronomy and Crop Science, 208(5), 746-761.
21. The Ministry of Water Resources and Meteorology (MOWRAM) (July 2023). The 'Climate Adaptive Irrigation and Sustainable Agriculture for Resilience' project (CAISAR), Feasibility Study and Project Preparation AIIB PPSF, Grant S0452A, Code 00-452-PPSF-DTA
22. Ministry of Environment (2022), Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR)

ANNEX 1: EXCLUSION LIST

Any sub-project that meets one or more of the following screening criteria will not be approved for financing under the project:

- Rural roads with total length of more than 10 kilometres per scheme;
- Irrigation canals with base width more than 10m; sluices with total drainage width more than 10m; irrigation embankments to protect cultivation areas of more than 500 hectares; large dams (higher than 15m) or any dams resulting in a high-risk rating (in terms of environment, social, and/or dam safety).
- Reservoirs with capacity of more than 3 million cubic meters;
- Infrastructure schemes that require physical resettlement of more than 20 people per subproject area or affect more than 10 percent (in value term) of assets of an individual household, or adversely impacts security of tenure of EM households.
- Any sub-project that physically displaces EM or dilutes/changes their security of tenure.
- Relocation and/or demolition of any permanent houses or business.
- Use of the project as an incentive and/or a tool to support and/or implement involuntary resettlement of local people and village consolidation.
- Land appropriation
- New settlements or expansion of existing settlements.
- Activities that would likely create adverse impacts on ethnic groups/indigenous peoples within the village and/or in neighboring villages, or activities unacceptable to ethnic groups living in an ethnic homogenous village or a village of mixed ethnic composition.
- Damage or loss to cultural property, including sites having archeological (prehistoric), paleontological, historical, religious, cultural and unique natural values.
- Resources access restriction (e.g. restricted access to farming land) that could not be mitigated and will result in adverse impacts on the livelihoods of ethnic groups and disadvantage peoples.
- Purchase of banned pesticides, insecticides, herbicides and other unbanned pesticides, unbanned insecticides and unbanned herbicides and dangerous chemicals exceeding the amount required to treat efficiently the infected area. However, if pest invasion occurs, the use of small amounts of eligible and registered pesticides in Cambodia will be allowed if supplemented by additional training of farmers to ensure pesticide safe uses in line with IFAD/GCF ESS policies and procedures. Highly Hazardous Pesticides (HHP) will not be used by the project.
- Purchase of destructive farming gear and other investments detrimental to the environment.
- Unsustainable exploitation of natural resources.
- Introduction of non-native species, unless these are already present in the vicinity or known from similar settings to be non-invasive.
- Significant conversion or degradation of natural habitat or where the conservation and/or environmental gains do not clearly outweigh any potential losses.
- Production or trade in any product or activity deemed illegal under Cambodia's laws or regulations or international conventions and agreements, or subject to international bans.
- Labor and working conditions involving harmful, exploitative, involuntary or compulsory forms of labor, forced labor[17], child labor[18] or significant occupational health and safety issues.
- Trade in any products with businesses engaged in exploitative environmental or social behavior. Sub-activities that require full EIA will not be funded including any projects that will use or induce the use of hazardous materials (including asbestos) or any banned chemicals.

[17] Forced labor means all work or service, not voluntarily performed, that is extracted from an individual under threat of force or penalty.

[18] Harmful child labor means the employment of children that is economically exploitive, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health, or physical, mental, spiritual, moral, or social development.

ANNEX 2: IUCN RED LIST OF THREATENED SPECIES

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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Crocodylus siamensis	Siamese Crocodile	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys grandis	Giant Asian Pond Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys annandalii	Yellow-headed Temple Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Pangasianodon gigas	Mekong Giant Catfish	ACTINOPTERYGII	CR	Decreasing	Freshwater
Pangasius sanitwongsei	Giant Pangasius	ACTINOPTERYGII	CR	Decreasing	Freshwater
Probarbus jullieni	Jullien's Golden Carp	ACTINOPTERYGII	CR	Decreasing	Freshwater
Batagur a nis	Southern River Terrapin	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
Catlocarpio siamensis	Giant Carp	ACTINOPTERYGII	CR	Decreasing	Freshwater
Datnioides pulcher	Siamese Tiger Perch	ACTINOPTERYGII	CR	Decreasing	Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Heliopais personatus	Masked Finfoot	AVES	CR	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Emberiza aureola	Yellow-breasted Bunting	AVES	CR	Decreasing	Terrestrial, Freshwater
Pelochelys cantorii	Asian Giant Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
Indotestudo elongata	Elongated Tortoise	REPTILIA	CR	Decreasing	Terrestrial
Manis javanica	Sunda Pangolin	MAMMALIA	CR	Decreasing	Terrestrial
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
Gyps tenuirostris	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial
Panthera pardus ssp. delacouri	Indochinese Leopard	MAMMALIA	CR	Decreasing	Terrestrial
Rucervus eldii	Eld's Deer	MAMMALIA	EN	Decreasing	Terrestrial, Freshwater
Laubuka caeruleostigmata	Flying Minnow	ACTINOPTERYGII	EN	Decreasing	Freshwater
Cuora amboinensis	Southeast Asian Box Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Lutra sumatrana	Hairy-nosed Otter	MAMMALIA	EN	Decreasing	Terrestrial, Marine, Freshwater
Siebenrockiella crassicollis	Black Marsh Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Fluvitrygon oxyrhynchus	Marbled Whipray	CHONDRICHTHYES	EN	Decreasing	Freshwater
Pangasianodon hypophthalmus	Striped Catfish	ACTINOPTERYGII	EN	Decreasing	Freshwater
Urogymnus polylepis	Giant Freshwater Whipray	CHONDRICHTHYES	EN	Decreasing	Marine, Freshwater
Asarcornis scutulata	White-winged Duck	AVES	EN	Decreasing	Terrestrial, Freshwater
Rynchops albicollis	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
Mycteria cinerea	Milky Stork	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
Leptoptilos dubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Scleropages formosus		ACTINOPTERYGII	EN	Decreasing	Freshwater
Bos javanicus	Banteng	MAMMALIA	EN	Decreasing	Terrestrial

Cuon alpinus	Dhole	MAMMALIA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Elephas maximus	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
Hylobates pileatus	Pileated Gibbon	MAMMALIA	EN	Decreasing	Terrestrial
Macaca fascicularis	Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
Pteropus vampyrus	Large Flying-fox	MAMMALIA	EN	Decreasing	Terrestrial
Pterocarpus macrocarpus	Burma Padauk	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Hopea helferi		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Shorea hypochra	White Meranti	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Hopea ferrea		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Anisoptera costata		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Dipterocarpus intricatus		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Vatica philastreana		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Nycticebus bengalensis	Bengal Slow Loris	MAMMALIA	EN	Decreasing	Terrestrial

Trachypithecus germaini	Indochinese Silvered Langur	MAMMALIA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Viverra megaspila	Large-spotted Civet	MAMMALIA	EN	Decreasing	Terrestrial
Pavo muticus	Green Peafowl	AVES	EN	Decreasing	Terrestrial
Tectona grandis	Teak	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Calostoma insigne		AGARICOMYCETES	EN	Decreasing	Terrestrial
Macaca fascicularis ssp. fascicularis	Common Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial

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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Crocodylus siamensis	Siamese Crocodile	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys grandis	Giant Asian Pond Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys annandalii	Yellow-headed Temple Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater

| Species Name | Common Name | Taxonomic Group | IUCN Category | Population Trend | Biome |

Crocodylus siamensis	Siamese Crocodile	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys grandis	Giant Asian Pond Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys annandalii	Yellow-headed Temple Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
Gyps tenuirostris	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial
Panthera pardus ssp. delacouri	Indochinese Leopard	MAMMALIA	CR	Decreasing	Terrestrial
Rucervus eldii	Eld's Deer	MAMMALIA	EN	Decreasing	Terrestrial, Freshwater
Laubuka caeruleostigmata	Flying Minnow	ACTINOPTERYGII	EN	Decreasing	Freshwater
Cuora amboinensis	Southeast Asian Box Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Lutra sumatrana	Hairy-nosed Otter	MAMMALIA	EN	Decreasing	Terrestrial, Marine, Freshwater

Siebenrockiella crassicollis	Black Marsh Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Fluvitrygon oxyrhynchus	Marbled Whipray	CHONDRICHTHYES	EN	Decreasing	Freshwater
Pangasianodon hypophthalmus	Striped Catfish	ACTINOPTERYGII	EN	Decreasing	Freshwater
Urogymnus polylepis	Giant Freshwater Whipray	CHONDRICHTHYES	EN	Decreasing	Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Asarcornis scutulata	White-winged Duck	AVES	EN	Decreasing	Terrestrial, Freshwater
Rynchops albicollis	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
Mycteria cinerea	Milky Stork	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
Leptoptilos dubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Scleropages formosus		ACTINOPTERYGII	EN	Decreasing	Freshwater
Bos javanicus	Banteng	MAMMALIA	EN	Decreasing	Terrestrial
Cuon alpinus	Dhole	MAMMALIA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Elephas maximus	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
Hylobates pileatus	Pileated Gibbon	MAMMALIA	EN	Decreasing	Terrestrial
Macaca fascicularis	Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial
Manouria impressa	Impressed Tortoise	REPTILIA	EN	Decreasing	Terrestrial
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
Pteropus vampyrus	Large Flying-fox	MAMMALIA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Pterocarpus macrocarpus	Burma Padauk	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Anisoptera costata		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Dipterocarpus intricatus		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
Nycticebus bengalensis	Bengal Slow Loris	MAMMALIA	EN	Decreasing	Terrestrial
Trachypithecus germaini	Indochinese Silvered Langur	MAMMALIA	EN	Decreasing	Terrestrial

Viverra megaspila	Large-spotted Civet	MAMMALIA	EN	Decreasing	Terrestrial
Pavo muticus	Green Peafowl	AVES	EN	Decreasing	Terrestrial
Calostoma insigne		AGARICOMYCETES	EN	Decreasing	Terrestrial
Macaca fascicularis ssp. fascicularis	Common Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial

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Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Crocodylus siamensis	Siamese Crocodile	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Heosemys grandis	Giant Asian Pond Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Heosemys annandalii	Yellow-headed Temple Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Pangasianodon gigas	Mekong Giant Catfish	ACTINOPTERYGII	CR	Decreasing	Freshwater
Pangasius sanitwongsei	Giant Pangasius	ACTINOPTERYGII	CR	Decreasing	Freshwater
Batagur a nis	Southern River Terrapin	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Catlocarpio siamensis	Giant Carp	ACTINOPTERYGII	CR	Decreasing	Freshwater
Datnioides pulcher	Siamese Tiger Perch	ACTINOPTERYGII	CR	Decreasing	Freshwater
Terniopsis ubonensis		MAGNOLIOPSIDA	CR	Unknown	Freshwater
Heliopais personatus	Masked Finfoot	AVES	CR	Decreasing	Terrestrial, Freshwater
Emberiza aureola	Yellow-breasted Bunting	AVES	CR	Decreasing	Terrestrial, Freshwater
Indotestudo elongata	Elongated Tortoise	REPTILIA	CR	Decreasing	Terrestrial
Manis javanica	Sunda Pangolin	MAMMALIA	CR	Decreasing	Terrestrial
Aquilaria crassna	Agarwood	MAGNOLIOPSIDA	CR	Decreasing	Terrestrial
Houbaropsis bengalensis	Bengal Florican	AVES	CR	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Gyps bengalensis	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
Sarcogyps calvus	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Gyps tenuirostris	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial
Panthera pardus ssp. delacouri	Indochinese Leopard	MAMMALIA	CR	Decreasing	Terrestrial
Laubuka caeruleostigmata	Flying Minnow	ACTINOPTERYGII	EN	Decreasing	Freshwater
Cuora amboinensis	Southeast Asian Box Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Lutra sumatrana	Hairy-nosed Otter	MAMMALIA	EN	Decreasing	Terrestrial, Marine, Freshwater
Siebenrockiella crassicollis	Black Marsh Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Fluvitrygon oxyrhynchus	Marbled Whipray	CHONDRICHTHYES	EN	Decreasing	Freshwater
Cyclemys atripons	Western Black-bridged Leaf Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Pangasianodon hypophthalmus	Striped Catfish	ACTINOPTERYGII	EN	Decreasing	Freshwater
Terniopsis chanthaburiensis		MAGNOLIOPSIDA	EN	Decreasing	Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Asarcornis scutulata	White-winged Duck	AVES	EN	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
Mycteria cinerea	Milky Stork	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
Leptoptilos dubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Scleropages formosus		ACTINOPTERYGII	EN	Decreasing	Freshwater
Bos javanicus	Banteng	MAMMALIA	EN	Decreasing	Terrestrial
Cuon alpinus	Dhole	MAMMALIA	EN	Decreasing	Terrestrial
Elephas maximus	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
Hylobates pileatus	Pileated Gibbon	MAMMALIA	EN	Decreasing	Terrestrial
Macaca fascicularis	Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial
Manouria impressa	Impressed Tortoise	REPTILIA	EN	Decreasing	Terrestrial
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
Pteropus vampyrus	Large Flying-fox	MAMMALIA	EN	Decreasing	Terrestrial
Dipterocarpus intricatus		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Nycticebus bengalensis	Bengal Slow Loris	MAMMALIA	EN	Decreasing	Terrestrial
Trachypithecus germaini	Indochinese Silvered Langur	MAMMALIA	EN	Decreasing	Terrestrial
Viverra megaspila	Large-spotted Civet	MAMMALIA	EN	Decreasing	Terrestrial
Philautus cardamonus		AMPHIBIA	EN	Unknown	Terrestrial
Pavo muticus	Green Peafowl	AVES	EN	Decreasing	Terrestrial
Cnemaspis neangthyi	Neang Thy's Rock Gecko	REPTILIA	EN	Unknown	Terrestrial
Calostoma insigne		AGARICOMYCETES	EN	Decreasing	Terrestrial
Macaca fascicularis ssp. fascicularis	Common Long-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial

ANNEX 3: TERMS OF REFERENCE FOR E&S SAFEGUARDS MONITORING CONSULTANT

The following is meant to serve as a sample Terms of Reference and should, therefore, be amended accordingly to fit the context of the CAISAR project once final decisions have been made about budget and division of tasks (e.g. whether the project's Monitoring & Evaluation (M&E) specialist will be separate from the Safeguards M&E consultant).

BACKGROUND

[Hiring unit should insert background information on the CAISAR project within the given Provincial PMU and project area here]

OBJECTIVES OF THE ASSIGNMENT

MOWRAM seeks the Consultancy Services of an experienced Individual Consultant "Environmental & Social Safeguards and Project Monitoring & Evaluation Consultant" as part of the Provincial Project Management Unit (full-time engagement). The objective of this assignment is monitoring compliance of the project activities with Environmental & Social Safeguards instruments. In addition, the Consultant will support the Project's overall M&E.

SCOPE OF WORK

Duties and Responsibilities:
The specific tasks stipulated in this ToR to be undertaken by the Environmental & Social Safeguards and Project M&E Consultant include, but are not limited to the following:

With regard to Environmental and Social Safeguards:
The Consultant will assist the Project Coordinator/Project Manager and will work closely with the Environmental & Social Safeguards staff within the Provincial PMU to handle Environmental and Social Safeguards related responsibilities. Specifically:

- Undertake site visits and on-ground review, check and document compliance with site-specific measures as presented in site-specific ESCMPs.
- Provide guidance to contactors, site supervisors, and other stakeholders on manners of implementation and documentation of compliance related to environmental mitigation and monitoring measures, as presented in site-specific ESCMPs.
- Check that all documents necessary to ensure full compliance with Environmental & Social Safeguard instruments, in particular, Environmental and Social Management Plans (ESCMPs) and Indigenous Peoples' Plans (IPPs) are prepared, regularly updated, and available to relevant stakeholders;
- Ensure that project activities, being developed as a part of the Project, are designed to include avoidance of potential social and environmental risks, as recommended in the ESCMPs and annual IP Plans already prepared;
- Provide overall Environmental and Social Management oversight during the implementation of CAISAR's activities and advise the implementation agencies in addressing the environmental issues;
- Ensure that each subproject and related activities under the project are subject to the Project's ESCMP procedures;
- Review subproject and activity plans, design, costs, and bidding documents and be involved in procurement of Civil Works and Supervision to ensure that Civil Works and Supervision contracts include provisions concerning the Environmental and Social Safeguard issues;
- Coordinate with relevant agencies for obtaining environmentally related permits, as necessary;
- Communicate with local governments, contractors, and with any Environmental, Social, Health and Safety (ESHS) Experts that may be part of the subproject supervision team in all matters related to design, implementation, documenting and reporting on environmental compliance, as indicated in site-specific ESCMPs;

- Monitor implementation of site-specific ESCMPs by the Contractors to ensure that appropriate management process and procedures are in place, that Environmental and Social Safeguards related measures are adequately addressed and to ensure that in the event of a noncompliance agreed remedial actions are applied and documented;
- Check and ensure that the regular reports are prepared and timely submitted by the Contractor as per content agreed and provide comments, as appropriate;
- Contribute to, along with the E&S Provincial PMU Specialists, preparation of semi-annual ESCMP Compliance Reports for IFAD and the GCF
- Participate in missions and technical visits by IFAD, and work closely with the IFAD SECAP Specialists and Provincial PMU E&S Specialists to ensure the Project's compliance with relevant environmental and social policies.
- Undertake other actions related to environmental and social aspects of the Project, as may be instructed by the Project Manager/Coordinator from time to time and/or the E&S Specialists in the Provincial PMU, in order to ensure full compliance of the Project with national and international environmental and social standards and legislation.

With regard to Project Monitoring & Evaluation:

The Consultant will be in charge of the Project's Monitoring & Evaluation (M&E), design the strategic and technical approach to implementing project goals within the technical framework outlined for the Results Monitoring. The Consultant will coordinate and work with other members of the Provincial PMU, particularly any staff which DARD has assigned to operate the REDD+ MIS SIS and/or Project MIS, to ensure adequate monitoring of progress against the project indicators. In addition, the Consultant will also work closely with any specialists hired to carry out Mid-Term and/or Terminal Project Monitoring & Evaluation and facilitate the gathering of information.

- Review and familiarize themselves with the Project's documents, in particular with Project Operational Manual (POM) and Monitoring Information System (MIS) already established;
- Carry out the preparation and implementation of the M&E program and keep records on achievements, breakdowns of indicators;
- Continuously monitor progress towards the project's objectives and according to agreed Performance Monitoring Indicators;
- Report in semi-annual reports on the project objectives and Results Framework updates;
- Monitor the project's implementation and evaluate outcomes and results for each Component and Subcomponent, using the MIS;
- Determine whether the inputs in the project are well utilized;
- Monitor the project's implementation against the planned activities (physical and financial), analyze reasons for delays (if any), and propose measures and solutions to overcome delays;
- Ensure that the project's activities are properly implemented as per the agreed program, and take corrective actions when necessary;
- Identify good practices and advantages within the project, recording lessons-learned for future consideration;
- Carry out the roles and responsibilities given by the Project Coordinator/Manager;
- Support the beneficiary survey and other end-of-project evaluations
- Take all necessary measures for the maintenance of the MIS to keep it operational.

QUALIFICATIONS REQUIREMENTS

The person suitable for the position of the Environmental & Social Safeguard and Project Monitoring & Evaluation Consultant should have the following qualifications:

- Master's degree, preferable in the Environmental Sciences, Environmental Engineering or equivalent professional qualifications appropriate to the Consultancy Services requested;
- A minimum of 5 (five) years of relevant experience in Environmental & Social Safeguard Monitoring;
- Knowledge of Cambodia's regulations and laws (particularly in the EIA processes) is required;
- Familiarity with the IFAD, GCF, and REDD+ Safeguard policies will be an advantage;
- Knowledge and experience in Project Monitoring & Evaluation is desirable;

- Proficiency in using computer and office software packages (word processing, spreadsheet etc.). Experience in the handling of web-based data and Management Information Systems will be an added advantage;
- Fluent written and spoken Khmer and English.

REPORTING OBLIGATIONS

The Consultant will work under the direction of and report to the CAISAR Project Manager/Coordinator within the PMU, and in close consultation with the E&S Specialists of the PMU. The Consultant will deliver monthly progress reports concerning the accomplishment of their assignments.

In addition, concerning the overall Project M&E, the Consultant shall prepare semi-annual and annual surveys on project outcomes indicators and prepare semi-annual and annual project progress reports, updating relevant parts of the Result Framework, as appropriate. This work shall be conducted in close consultation with any relevant specialists with the PMU.

CLIENT'S INPUTS

The Consultant will be based and work in the Provincial PMU office. MOWRAM, as host of the Provincial PMU, will provide the office space and equipment required to perform the tasks assigned.

TERMS OF THE ASSIGNMENT AND DURATION

- The Consultant will work on full-time basis.
- Remuneration will be paid on a monthly basis.
- The Consultant will be offered the opportunities to grow up professionally by attending relevant training events and courses during the term of the contract.
- The initial contract with the Consultant will cover one year, with a 3 month probation period, at which time the performance of Consultant shall be evaluated and extension may be made annually pending continued performance.
- Evaluation of the 3 (three) month probation period and any contract extension would be fully based on the consultant's performance certified by the Project Coordinator/Manager and as agreed with IFAD.

ANNEX 4: CHANCE FINDS PROCEDURE

The following *"chance find"* procedures must be included in all third-party contracts (e.g. Letters of Agreement) in instances where the contracted party is assisting with project implementation and/or construction activities.

Provincial PMUs will ensure that the bidding documents and work contract for civil works contractors include clauses on chance find procedures. Specifically, the clause will stipulate that if the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during project implementation, the Contractor shall:

- Stop the activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local or provincial authorities take over;
- Notify the supervisory Safeguards Specialist within the PMU who, in turn, will notify the responsible local and provincial authorities immediately (within 24 hours or less);
- Responsible local and/or provincial authorities would oversee protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by government approved archeologists. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values;
- Decisions on how to handle the finding shall be taken by the responsible local and provincial authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage;
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities; and
- Project activities could resume only after permission is given from the responsible local or provincial authorities concerning safeguard of the heritage.

Note that the reporting of chance finds only occurs when an item/area/etc. of cultural significance is found, and is only carried out insofar as what is detailed above (i.e. reporting the find, reporting how the item/area will be treated moving forward). Reporting begins with the local level implementer (e.g. staff tasked to the implement the project within a village) notifying the Safeguards Specialist, after which, the Safeguards Specialist guides the process according to the instructions above (e.g. notifying the relevant government authorities).

ANNEX 5: E & S CODES OF PRACTICE FOR CONSTRUCTION

Generic contract clauses are provided to assist with environmental and social management works. These clauses are general and should be modified as needed. These clauses are intended to be included as requirements in the works contract and shall remain in force throughout the contract period.

Clause on ESCMP

The Contractor is required to implement this ESCMP. The Contractor is responsible for the implementation of construction and rehabilitation activities for the sites and for implementing the impact mitigation measures in the construction phase. The Contractor's approach shall be detailed in the Contractor's Management Plan.

The Contractor shall include a suitably qualified and experienced Environmental, Occupational Health and Safety Officer (and other staff or consultants as necessary) to be specifically responsible for preparation and regular update and supervision of the ESCMP. The Environmental, Occupational Health and Safety Officer is responsible for the daily supervision and monitoring of the Contractors implementation of the Plan and compliance with the Project ESCMP for the duration of the contract. The Contractor's approach to comply with the ESCMP shall be approved by PMU prior to the Contractor's mobilization to the site.

The Contractor will be required to report on the implementation status of the ESCMP to PMU. The damages due to the violation of the stipulations by the Contractor shall be compensated and/or restored by the Contractor at his or her own expense. Performance will be monitored by PMU and will be enforced by withholding of payments (refer to relevant clause in the bid documents).

Other Standard Clauses

Permits and Approvals

The contractor shall be responsible for ensuring that he or she has all relevant legal approvals and permits required to commence works.

Site Security

The contractor shall be responsible for maintaining security over the construction site including the protection of stored materials and equipment. In the event of severe weather, the contractor shall secure the construction site and associated equipment in such a manner as to protect the site and adjacent areas from consequential damages. This includes the management of onsite, construction materials, construction and sanitary wastes, additional strengthening of erosion control and soil stabilization systems and other conditions resulting from contractor activities which may increase the potential for damages.

Discovery of Antiquities and Cultural Heritage

If, during the execution of the activities contained in this contract, any material is discovered onsite which may be considered of historical or cultural interest, such as evidence of prior settlements, native or historical activities, evidence of any existence on a site which may be of cultural significance, all work shall stop and the supervising contracting officer shall be notified immediately and the Chance Find Procedures followed (Appendix 5). The area in which the material was discovered shall be secured, cordoned off, marked, and the evidence preserved for examination by the local archaeological or cultural authority. No item believed to be an artefact must be removed or disturbed by any of the workers. Work may resume, without penalty of prejudice to the contractor upon permission from the contracting officer with any restrictions offered to protect the site.

Worker Occupational Health and Safety

The contractor shall ensure that all workers operate within a safe environment. Sanitation facilities shall be provided for all site workers. All sanitary wastes generated as a result of project activities shall be managed in a manner approved by the contracting officer and the local authority responsible for public health. The contractor shall ensure that there are basic medical facilities on site and that there are staff trained in basic first aid. Workers must be provided with the necessary protective gear as per their specific tasks such as hard hats, overalls, gloves, goggles, boots, etc. The contractor shall

provide the contracting officer with an occupational health and safety plan for approval prior to the commencement of site activities.

The contractor must ensure that all workers operate within a safe environment. All relevant Labor and Occupational Health and Safety regulations must be adhered to ensure worker safety. Sanitary facilities must be provided for all workers on site. Appropriate posting of information within the site must be done to inform workers of key rules and regulations to follow.

Noise Control

The contractor shall control noise emissions generated as a result of contracting activities to the extent possible. In the case of site locations where noise disturbance will be a concern, the contractor shall ensure that the equipment is in good working order with manufacturer supplied noise suppression (mufflers etc.) systems functioning and in good repair.

Where noise management is a concern, the contractor shall make reasonable efforts to schedule activities during normal working hours (between 7 am and 5 pm). Where noise is likely to pose a risk to the surrounding community either by normal works or working outside of normal working hours or on weekends, the contractor shall inform the contracting officer and shall develop a public notification and noise management plan for approval by the contracting officer.

Use and Management of Hazardous Materials, fuels, solvents and petroleum products

The use of any hazardous materials including pesticides, oils, fuels and petroleum products shall conform to the proper use recommendations of the product. Waste hazardous materials and their containers shall be disposed of in a manner approved by the contracting officer in accordance with State and/or national laws and the Project ESCMP. A site management plan will be developed by the contractor if the operation involves the use of these materials to include estimated quantities to be consumed in the process, storage plans, spill control plans, and waste disposal practices to be followed. Any plans required shall be approved by the contracting officer.

Elements of the hazardous materials management shall include:

- Contractor must provide temporary storage on site of all hazardous or toxic substances in safe containers labeled with details of composition, properties and handling information;
- Hazardous substances shall be placed in a leak-proof container to prevent spillage and leaching; and
- Wastes shall be transported and disposed of in a manner outlined in the ESCMP, and cleared by the PMU Safeguards Team compliant with national laws and policies and the ESCMP.

12.

Use and Management of Pesticides

Any use of pesticides shall be approved by the contracting officer and shall conform to the manufacturers' recommendations for use and application. Any person using pesticides shall demonstrate that they have read and understood these requirements and are capable of complying with the usage recommendations to the satisfaction of the contracting officer. All pesticides to be used shall conform to the list of acceptable pesticides that are not banned by the relevant local authority.

If termite treatment is to be utilized, ensure appropriate chemical management measures are implemented to prevent contamination of surrounding areas, and use only licensed and registered pest control professionals with training and knowledge of proper application methods and techniques.

Use of Explosives

No explosives shall be used on the Project.

Site Stabilization and Erosion Control

The Contractor shall implement measures at the site of operations to manage soil erosion through minimization of excavated area and time of exposure of excavated areas, preservation of existing ground cover to the extent possible, provision of approved ground cover and the use of traps and filtration systems. Where excavations are made, contractor shall implement appropriate stabilizing techniques to prevent cave-in or landslide. Measures shall be approved by the contracting officer.

The contractor must ensure that appropriate erosion control measures such as silt fences are installed. Proper site drainage must be implemented. Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. The use of retaining

structures and planting with deep rooted grasses to retain soil during and after works must be considered. The use of bio-engineering methods must be considered as a measure to reduce erosion and land slippage. All slopes and excavated areas must be monitored for movement.

The contractor will establish appropriate erosion and sediment control measures such as hay bales, sedimentation basins, and / or silt fences and traps to prevent sediment from moving off site and causing excessive turbidity in nearby streams, rivers and wetlands. Construction vehicles and machinery will be washed only in designated areas where runoff will not pollute natural surface water bodies.

Air Quality

The Contractor shall comply with the Project ESCMP requirements for dust management.

Traffic Management

In the event that construction activities should result in the disruption of area transportation services, including temporary loss of roadways, blockages due to deliveries and site related activities, the contractor shall provide the contracting officer with a traffic management plan including a description of the anticipated service disruptions, community information plan, and traffic control strategy to be implemented so as to minimize the impact to the surrounding community. This plan shall consider time of day for planned disruptions, and shall include consideration for alternative access routes, access to essential services such as medical, disaster evacuation, and other critical services. The plan shall be approved by the contracting officer.

Elements of the traffic management plan to be developed and implemented by contractor shall include:

- Alternative routes will be identified in the instance of extended road works or road blockages;
- Public notification of all disturbance to their normal routes;
- Signage, barriers and traffic diversions must be clearly visible, and the public warned of all potential hazards;
- Provision for safe passages and crossings for all pedestrians where construction traffic interferes with their normal route;
- Active traffic management by trained and visible staff at the site or along roadways as required to ensure safe and convenient passage for the vehicular and pedestrian public; and
- Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours or times of livestock movement.

13.

Water Quality

The Contractor shall comply with the Project ESCMP requirements for water quality. Under no circumstances shall the contractor permit the collection of standing water as a consequence of contractor activities to ensure that it does not create breeding grounds for any pests such as mosquitoes.

Management of Solid Wastes and Construction Debris

The contractor shall provide a solid waste management plan that conforms to the national solid waste management policies and regulations and the site-specific ESCMP for approval by the PMU and IFAD (see Appendix 3 for an outline of a site-specific ESCMP). The site's waste management plan shall include a description of waste handling procedures including collection, storage and disposal through the national waste management system. There will be no open burning of waste material and the contractor shall endeavor to recycle wastes as appropriate. Under no circumstances shall the contractor allow construction wastes to accumulate so as to cause a nuisance or health risk due to the propagation of pests and disease vectors.

Management of Workers

The Contractor will prepare a specific Code of Conduct (see Appendix 9) to describe the expected behaviors of their project worker in relation to the local communities and their social sensitivities. This is to avoid creating demand for illegal sex work, avoid SEA/SH and Violence against Children, manage alcohol consumption and avoid the use of illegal substances, and abide by cultural and social norms of the host community. The Contractor is to ensure no children (persons under the age of 18) are hired to work in the project.

The Contractor is to ensure that all overseas project staff undergo a training on the Staff Code of Conduct. Gender based violence and HIV/AIDS and communicable disease awareness raising and resources shall also be provided to all workers. MARD shall provide to the Contractor a list of approved service providers, which shall include recognized NGOs and others for conducting this training.

The Contractor is to stipulate the conditions under which visitors may attend the workers' accommodation, including curfews. The Contractor shall ensure that basic social/collective rest and recreation spaces and activities within the workers accommodation to help minimize the impact that the workers would have on the leisure and recreational facilities of the nearby communities. The Contractor must comply with the Guidelines for Worker's Camps (Appendix 7).

As per guidelines in the ESCMP, the Contractor must ensure that Worker's Camps are located at least 500m from nearby communities and schools (see Appendix 7).

ANNEX 6: GUIDELINES FOR WORKERS' CAMPS

To ensure the compliance to the OHS and ESF requirement, these guidelines will help the contractor when setting up worker's camps.

GENERAL

The Workers Camp Management Plan will be compliant with the specific prescriptions of the site-specific ESCMP. Contractors must ensure that Worker's Camps are located at least 500m from nearby communities and schools.

WORKER RECRUITMENT

The Contractor is required to minimise the number of skilled workers that are recruited from overseas. No unskilled labour will be sourced from overseas. Local communities should be prioritized for unskilled labour, including a target of 15% female unskilled workers when/where applicable. The Contractor will maximize the number of skilled and unskilled workers that are recruited from the communities along the project site.

The Contractor will be required to provide justification for any skilled workers recruited from overseas and explain why this position cannot be filled locally.

WORKERS CAMP FACILITIES

All facilities in the Workers Camp must be complaint with the stipulations of the ESCMP. The camp shall be provided with the following minimum facilities:

- Eating space and dormitories as required shall be constructed of suitable materials to provide a safe healthy environment for the workforce and which facilitate regular cleaning and the provision of ventilation and illumination.
- At least one water closet toilet, one urinal and one shower per 10 personnel engaged either permanently or temporarily on the project. Separate toilet and wash facilities shall be provided for male and female employees, including ensuring that toilets are available close to working sites/road sections where women are working.
- A sick bay and first aid station.
- Sewage collection facilities to allow for the treatment of black and grey wastewater discharge from toilets, washrooms, showers, kitchens, laundry and the like. The management of all camp wastewater water shall be as prescribed in the ESCMP.
- All camp facilities shall be maintained in a safe clean and or appropriate condition throughout the construction period.
- Throughout the period of the contract the employer, the engineer, or their representatives shall have uninterrupted access to and from the camp for the purpose of carrying out routine inspections of all buildings, facilities or installations of whatever nature to ensure compliance with this specification.

WORKERS CAMP OPERATIONS

- The Contractor will be required to provide adequate provisions for the workers for the duration of the project so as not to be a burden on the food or water security of the surrounding communities. The Contractor will strive to hire local labour to provide cleaning and food services.
- All wastewater, solid waste, freshwater usage, noise levels, handling and storage of hazardous materials shall be as prescribed in the ESCMP.

MANAGEMENT OF OFF DUTY WORKERS

- The Contractor will prepare ensure all staff sign and adhere to the Workers' Code of Conduct to describe the expected behaviours of their project worker in relation to the local communities and their social sensitivities.

- The Contractor is to ensure that all overseas project staff, not already living in Cambodia undergo a cultural familiarisation session as part of their induction training. The purpose of this induction will be to introduce the project staff to the cultural sensitivities of the local communities and the expected behaviours of the staff in their interactions with these communities.
- The Contractor is to stipulate the conditions under which visitors may attend the workers camp. Strict visiting hours should be enforced, and all visitors will be required to sign in and out of the worker's camp. No overnight visitors will be allowed.
- The Contractor shall ensure that basic social/collective rest spaces are provided equipped with seating within the Workers Camp to help minimise the impact that the workers would have on the leisure and recreational facilities of the nearby communities. Provisions should also be made to provide the workers with an active recreation space within the camp.

WORKERS CAMP MANAGEMENT PLAN

A Worker Camp Management Plan shall be submitted by the Contractor to the Provincial PMU. The Workers' Camp Management Plan shall describe how this document and the ESCMP shall be implemented in the following:

- Recruitment strategy
- Accommodation
- Canteen and dining areas
- Ablutions
- Water supply
- Wastewater management system
- Proposed power supply
- Code of Conduct for Workers
- Recreational/leisure facilities for workers
- Visitors to the Workers Camp
- Interactions with the local communities

ANNEX 7: CONTRACTORS' COVID-19 GUIDELINE

The objective of the Contractors' General Guideline on COVID-19 Considerations in Construction Works is to provide guidance on Prevention Measures and Response to possible cases of COVID-19 following the update-to-day guidance of the Ministry of Health.

Prevention Measures:

- Dissemination of COVID-19 prevention measures to staff and workers through orientation or distributing leaflet/poster at information/safety board at each construction and camp site
- Daily checking temperature of staff and workers prior to start working
- Staff and workers are wearing masks all the time
- Do not share personal items or supplies such as phones, pens, notebooks, tools, etc
- Avoid common physical greetings, such as handshakes
- Maintain a minimum physical distance of one metre from others if possible
- Wash hands often with soap and water for at least 20 seconds after using the washroom, before handling food, after blowing nose, coughing, or sneezing, and before smoking. If hands are not visibly soiled, and soap and water are unavailable, alcohol-based hand sanitizer can be used
- All offices and jobsites implement additional cleaning measures of common areas. All door handles, railings, ladders, switches, controls, eating surfaces, shared tools and equipment, taps, toilets, and personal workstation areas are wiped down at least twice a day with a disinfectant, such as disinfectant wipes. Individuals are responsible for cleaning and disinfecting their workstations
- Commonly touched surfaces on vehicles and equipment are thoroughly cleaned and disinfected at the end of shifts and between users
- Coughing or sneezing into a tissue or the bend of your arm, not your hand; dispose of used tissues you have as soon as possible in a lined waste basket and wash your hands afterwards
- Complying with any instructions announced by the Ministry of Health

Response to Possible Cases of COVID-19

- Individuals who have been potentially exposed to the virus, or who are exhibiting flu-like symptoms such as fever, tiredness, coughing, or congestion are instructed to:
  - Not come to work;
  - Contact their supervisor and/or human resources department;
  - Stay at home and self-isolate; and
  - Contact local health authorities for further direction.

- Such individuals are required to follow the directions of the local health authority and may not return to work until given approval by the proper health authorities;
- Individuals who begin to display flu-like symptoms on site are instructed to avoid touching anything, take extra care to contain coughs and sneezes, and return home immediately to undergo self-isolation as directed by the local health authority;
- All areas on site potentially infected by a confirmed or probable case are barricaded to keep individuals two meters away until the area is properly cleaned and disinfected.

ANNEX 8: WORKERS' CODE OF CONDUCT

Instructions: This Code of Conduct should be included in bidding documents for the civil works contractor(s) and in their contracts once hired. This Code of Conduct should also be included in bidding documents, and the contracts, of construction contractor. This Code of Conduct is to be signed by all contractor, including subcontractors, if any, including contractors and subcontractors' managers who work under the CAISAR project.

I, _____, acknowledge that adhering to environmental, social, health and safety (ESHS) standards, following the project's occupational health and safety (OHS) requirements, and preventing Sexual Exploitation Abuse (SEA)/Sexual Harassment (SH) is important.

The Contractor/DDIS considers that failure to follow ESHS and OHS standards, or to partake in activities constituting SEA and SH be it on the work site, the work site surroundings, at workers' camps, or the surrounding communities—constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. Prosecution by the Police of those who commit VAC, SEA/SH may be pursued if appropriate.

I agree that while working on the project I will:

- Carry out his/her duties competently and diligently;
- Comply with this Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person;
- Maintain a safe working environment including by:
- Ensure that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health;
- Use appropriate measures relating to chemical, physical and biological substances and agents; and
- Follow applicable emergency operating procedures.
- Report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and danger to his/her life or health;
- Consent to a background check in any place I have worked for more than six months.
- Attend and actively partake in training courses related to ESHS, OHS, VAC, SEA/SH as requested by my employer.
- Will wear my personal protective equipment (PPE) at all times when at the work site or engaged in project related activities.
- Take all practical steps to implement the environmental and social management plan (ESCMP).
- Implement the OHS Management Plan.
- Adhere to a zero-alcohol policy during work activities, and refrain from the use of narcotics or other substances which can impair faculties at all times.
- Treat women, children (persons under the age of 18), and men with respect regardless of race, color, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
- Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- Not sexually exploit or abuse project beneficiaries and members of the surrounding communities.

- Not engage in sexual harassment of work personnel and staff —for instance, making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature is prohibited: i.e. looking somebody up and down; kissing, howling or smacking sounds; hanging around somebody; whistling and catcalls; in some instances, giving personal gifts.
- Not engage in sexual favors —for instance, making promises of favorable treatment (i.e. promotion), threats of unfavorable treatment (i.e. loss of job) or payments in kind or in cash, dependent on sexual acts—or other forms of humiliating, degrading or exploitative behavior.
- Not use prostitution in any form at any time.
- Not participate in sexual contact or activity with children under the age of 18—including grooming or contact through digital media. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense or excuse.
- Unless there is the full consent[19] by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex (including prostitution). Such sexual activity is considered "non-consensual" within the scope of this Code.
- Consider reporting through the GRM or to my manager any suspected or actual SEA/SH by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.
- Complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation, and Sexual Assault (SEA);
- Report violations of this Code of Conduct; and

With respect to children under the age of 18:

- Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
- Wherever possible, ensure that another adult is present when working in the proximity of children.
- Not invite unaccompanied children unrelated to my family into my home unless they are at immediate risk of injury or in physical danger.
- Not use any computers, mobile phones, video and digital cameras or any other medium to exploit or harass children or to access child pornography (see also "Use of children's images for work related purposes" below).
- Refrain from physical punishment or discipline of children.
- No hiring of children for any CAISAR project activity (no persons under the age of 18).
- Comply with all relevant local legislation, including labor laws in relation to child labor and World Bank's safeguard policies on child labor and minimum age.
- Take appropriate caution when photographing or filming children (see x-bb below). Photos or films of children should generally not be taken in the CAISAR, except in instances showing the benefits or impacts of road works, such as impacts to schools or school safety trainings.

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

- Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this I must explain how the photograph or film will be used.

[19] **Consent** is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained using threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even if national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

- Ensure photographs, films, videos and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Raising Concerns

If any person observes behavior that he/she believes may represent a violation of this Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done in either of the following ways:

- Contact [enter name of the Contractor's Social Expert with relevant experience in handling gender-based violence, or if such person is not required under the Contract, another individual designated by the Contractor to handle these matters] in writing at this address [ ] or by telephone at [ ] or in person at [ ]; or
- Call [ ] to reach the Contractor's hotline (if any) and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

Sanctions

I understand that if I breach this Workers' Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning;
- Formal warning;
- Additional Training;
- Loss of up to one week's salary;
- Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months;
- Termination of employment;
- Report to the Police if warranted.

I understand that it is my responsibility to ensure that the environmental, social, health and safety standards are met. That I will adhere to the occupational health and safety management plan. That I will avoid actions or behaviors that could be construed as VAC or SEA/SH. Any such actions will be a breach this Workers' Code of Conduct. I do hereby acknowledge that I have read the foregoing Workers' Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, VAC and SEA/SH issues. I understand that any action inconsistent with this Workers' Code of Conduct or failure to act mandated by this Workers' Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____
Printed Name: _____
Title: _____
Date: _____

ANNEX 9: SAMPLE TORS FOR AN ENVIRONMENT & CLIMATE SAFEGUARDS SPECIALIST

BACKGROUND: [This section must include the project background, ideally tailored to the specific PPMU]

OBJECTIVE:

The Environment & Climate Safeguards Specialist will be responsible for the implementation, monitoring, and reporting of all environment and climate-related safeguards for the project. This will include, when relevant, implementation of the project's Grievance Redress Mechanism (GRM), and any items listed in the Environmental, Social, and Climate Management Framework (ESCMF). You will work in close collaboration with the Gender & Social Safeguards Specialist, as well as the project's Monitoring & Reporting specialist. You will report to the lead of the Provincial Project Management Unit.

RESPONSIBILITIES:

- Prepare, implement, and monitor environmental safeguards instruments, including the environmental & climate-risk aspects of ESCMPs and any Biodiversity Management Plans.
- Compile the environmental baseline data for ESCMPs and Biodiversity Management Plans (when applicable) at sub-project sites based on requirements of the Government of Cambodia, IFAD, and GCF
- Identify key issues & ways to manage issues pertaining to the environment and climate.
- Conduct consultations, in collaboration with the Gender & Social Safeguards Specialist, with target communities in the project area to assess the (i) current environmental situation (at local level, this includes peoples' perception of the situation); (ii) environmental & climate-related impacts of sub-projects; and (iii) mitigation measures (including the communities' recommendations/solutions) that can be taken pertaining to any negative environmental/climate impacts
- Obtain data from, sensitize, and clearly explain to relevant government staff (or civil society organizations/partners, etc.) the data, M&E, and compliance requirements for environmental safeguards & climate risk considerations during project implementation.
- Manage, along with the Gender & Social Safeguards Specialist, the project's Grievance Redress Mechanism.

MINIMUM REQUIREMENTS:

- Manage, along with the Gender & Social Safeguards Specialist, the project's Grievance Redress Mechanism.
- Advanced University degree in Environmental Science, Biology, Environmental/Civil Engineering, or any related field.
- Minimum of 5 years of relevant operational experience and proven track record in working agricultural, forest management, and construction activities, including compliance with Environmental and Social standards
- Familiarity with climate science and management of climate risks
- Working knowledge of English and Khmer proficiency.
- National of Viet Nam.

CORE COMPETENCIES:

- Results Focus
- Teamwork
- Communication
- Building Effective Relationships
- Knowledge Sharing and Continuous Improvement

TECHNICAL/FUNCTIONAL SKILLS:

- Work experience in implementation and management of international safeguards standards pertaining to environment, climate, and agroforestry activities.
- Knowledge of issues pertaining to environment, climate, and biodiversity.

- Knowledge of computer-aided design programs, AutoCAD required and Structural Analysis programs.
- Knowledge and understanding of international environmental and social safeguards standards and practices

SELECTION CRITERIA:

- Demonstrated capacity supervise agricultural, forest management, and construction activities, including compliance with Environmental and Social standards
- Demonstrated ability to liaise with multiple agencies and contractors, effectively building an understanding and partnership with other UN bodies, NGOs, government agencies, and contractors
- Ability to plan, organize, implement, and report
- Excellent communication, writing, and presentation skills in English and Khmer
- Teamwork spirit, ability to work under minimum supervision
- Ability to build effective working relationships with national and international colleagues, with different cultural and technical backgrounds
- Proven strong communication, interpersonal and negotiation skills
- Analytical skills and experience.
- Ability to keep sensitive information as confidential.

ANNEX 10: SAMPLE TORS FOR A GENDER & SOCIAL SAFEGUARDS SPECIALIST

BACKGROUND: [This section must include the project background, ideally tailored to the specific PPMU]

OBJECTIVE:

The Gender & Social Safeguards Specialist will be responsible for the implementation, monitoring, and reporting of all environment and climate-related safeguards for the project. This will include, when relevant, implementation of the project's Grievance Redress Mechanism (GRM), and any items listed in the Environmental, Social, and Climate Management Framework (ESCMF). You will work in close collaboration with the Gender & Social Safeguards Specialist, as well as the project's Monitoring & Reporting specialist. You will report to the lead of the Provincial Project Management Unit.

RESPONSIBILITIES:

- Prepare, implement, and monitor social safeguards instruments, including the social aspects of ESCMPs, the Labour Management Plan, and IP Plan.
- Compile the social baseline data for ESCMPs, LMPs, and IP Plans at sub-project sites with information on demographics, ethnic/religious minorities and indigenous populations, overall population, education, health, social protection, language(s), religion, and any other areas required based on IFAD and GCF guidelines
- Identify key issues & ways to manage issues pertaining to gender, IP, and social inclusion.
- Conduct consultations, in collaboration with the Environment & Climate Specialist, with target communities in the project area to assess the (i) current social situation (at local level, this includes peoples' perception of the situation); (ii) social impacts of sub-projects; and (iii) mitigation measures (including the communities' recommendations/solutions) that can be taken pertaining to any negative social impacts
- Obtain data from, sensitize, and clearly explain to relevant government staff (or civil society organizations/partners, etc.) the data, M&E, and compliance requirements for social safeguards & gender/IP/social inclusion during project implementation.
- Manage, along with the Environment & Climate Safeguards Specialist, the project's Grievance Redress Mechanism.

MINIMUM REQUIREMENTS:

- Advanced University degree in Social Sciences, Gender Studies, International Development, or any related field to social inclusion/gender and social safeguards.
- Minimum of 5 years of relevant operational experience and proven track record in working on development projects in the agriculture/forest sector.
- Working knowledge of English and Khmer proficiency.
- National of Viet Nam.

14.

CORE COMPETENCIES:

- Results Focus
- Teamwork
- Communication
- Building Effective Relationships
- Knowledge Sharing and Continuous Improvement

TECHNICAL/FUNCTIONAL SKILLS:

- Work experience in implementation and management of gender and social inclusion activities, and social safeguards to international standards.
- Knowledge of issues pertaining to ethnic minorities, Indigenous Persons, gender, youth, and other vulnerable populations.
- Knowledge and understanding of international environmental and social safeguards standards and practices

SELECTION CRITERIA:

- Demonstrated capacity supervise agricultural, forest management, and construction activities, including attention to issues of gender and social inclusion and compliance with Environmental and Social standards
- Demonstrated ability to liaise with multiple agencies and contractors, effectively building an understanding and partnership with other UN bodies, NGOs, government agencies, and contractors
- Ability to plan, organize, implement, and report
- Excellent communication, writing, and presentation skills in English and Khmer
- Teamwork spirit, ability to work under minimum supervision
- Ability to build effective working relationships with national and international colleagues, with different cultural and technical backgrounds
- Proven strong communication, interpersonal and negotiation skills
- Analytical skills and experience.
- Ability to keep sensitive information as confidential.

ANNEX 11: MISSION 3 LIST OF PARTICIPANTS

MINISTRY OF ECONOMY AND FINANCE(MEF)

1.	1.	Heng Hanglim, Deputy Director, GDR
2.	2.	Khem Sopheamony, Officer, GDR
3.	3.	Huy Cahnnan, Officer, GDR

PMU ADB & WB MOWRAM

1.	4.	H.E Chann Sinath, Secretary of State and Director of PMU-ADB&WB MOWRAM
2.	5.	Im Soursdey, Deputy Director of DFWUC and IAIP Project Manager
3.	6.	Chhim Sophea, Irrigation Engineer
4.	7.	Ngorn Ly Leakina, Officer Administration Office of DoFWUC
5.	8.	Chev Dalis, Procurement Assistant and Officer of DoFWUC
6.	9.	Kim Vann, Finance Officer, DoFWUC
7.	10.	Thou Vannak, Consultant
8.	11.	Lang Sokkim, Vice Chief Officer
9.	12.	Pol Saren, Deputy Director of Department
10.	13.	Tan Naren, Chief of Office
11.	14.	Hem Visal, Vice Chief Officer
12.	15.	Prum Vanndy, Officer
13.	16.	Vann Vathanak, Officer
14.	17.	Eam Sophorn, Officer
15.	18.	Vann Munirath, Officer
16.	19.	Heng Sovannara, Director, TSA
17.	20.	Khvan Pheaktra, Officer, TSA
18.	21.	Tong Seng, Chief of Office, DHRW
19.	22.	Chhun Thai Sreng,PMU
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ANNEX 12: TOR BIODIVERSITY MANAGEMENT SPECIALIST

TERMS OF REFERENCE

International Biodiversity Specialist

Background

The Government of Cambodia (GoC) has applied for financing from the Asian Infrastructure Investment Bank (AIIB or the Bank) toward the cost of the Climate Adaptive Irrigation Supporting Agricultural Resilience (CAISAR) which will support the GoC's efforts to sustain food security and improve climate resilience during and after the COVID-19 crisis through restoration and enhancement of smart and climate-resilient irrigation systems and associated ecosystems, flood control management and disaster resilience measures in 3 irrigation schemes situated in four provinces, namely: Kampong Speu, Kampong Chhnang, Kandal, and Pursat. The development objective of the CAISAR project is to restore and enhance the adaptive capacity and resilience of rural populations and agronomic systems to cope with climate change, including and disaster risk brought on by extreme events (flooding and drought), to achieve increased food security, agro-economics, and the maintenance of the companion biodiversity and ecosystem services that support it.

The estimated budget of the CAISAR project will exceed US 240 Million with AIIB being the major lender but with substantial grant co-financing for Green Climate Fund (GCF) and IFAD. MOWRAM has received a project preparation grant from AIIB (PPSF) for project preparation. The project will be implemented through the following 3 components: 1) Improving farm-level climate resilience and water use efficiency, 2) Climate-proofing water infrastructure for increased resilience and 3) Institutional Strengthening. In 2022/23, under this PPSF grant, MOWRAM implemented a first project formulation and feasibility study (FIRM) to provide the basis for the GCF funding proposal. MOWRAM is now seeking additional TA to complement this FIRM reporting and support the formulation of the Full-Funding Proposal.

General

Based on an assessment of climate change risk analyses, the Biodiversity Consultant will identify and assess the manner in which climate change is likely to impact biodiversity in the project area; with particular attention to species that either support agriculture (e.g. wild fish, birds, pollinators, soil micro-biome,) or conflict with agriculture (e.g. crop pests, displaced wildlife, alien invasive species). The climate and project risks to Threatened species existing in the project area would also be assessed and potential mitigation responses identified. This analysis will be used to generate a number of practical and cost effective recommendations to be included in a Biodiversity Management Plan.

The Consultant will also work in collaboration with the multidisciplinary CAISAR team to help identify biodiversity risk to and opportunities associated with proposed project agricultural interventions/adaptive solutions and to provide timely recommendations for their more sustainable design, selection, implementation, monitoring and associated local, inclusive, capacity building.

The Consultant will also provide guidance related to consideration, selection and development of biodiversity offsets where unavoidable residual impacts associate with proposed project interventions, can be offset and in some cases applied to Kunming declaration objectives.

The analysis will prioritize biodiversity mitigation and management programs based on their relevance and cost-effectiveness, to address the risks and opportunities associated with climate change and project initiatives. The prioritization exercise would include consideration of opportunities to adaptively enhance and benefit from the cultivation of local heirloom genetic varieties, wild cultivars and potential enhanced propagation of more resilient native fish and potential other faunal species. To the extent possible, solutions that are adapted to the needs of the poor, women, youth, and indigenous groups should be highlighted.

To achieve the above objective with high quality deliverables, the international climate change biodiversity specialist is required to fulfil the following tasks and responsibilities:

1. *Describe the methodology, location time and costs for a series of strategic biodiversity surveys within the CAISAR project study area to validate and expand on the existing IBAT data set. The data collected will provide baseline data against which project intervention, project impact and climate driven change can be monitored. These data will provide essential information that can be used to apply adaptive management practices to ensure project initiatives optimize positive biodiversity and ecosystem service outcomes.*

   ***Deliverable**: Guidance document detailing methodology to be used for biodiversity surveys.*

2. *Identify species of flora and fauna, including threatened and invasive species in the project area, most likely to be impacted by Climate change, climate extremes and expansion of agriculture, including CAISAR projects, as well as species used by local communities and or, on which there are dependencies.*

   ***Deliverable**: **prioritized flora and fauna species list** with summary data on species habitat associations, conservation status, record of occurrence in the project area, probable key habitats, population trends, population drivers, and assessment of climate risk to species*)

3. *Prepare a high-level/landscape-level? Biodiversity Management Plan (BMP) addressing each of the 6 CAISAR sub-project areas. The BMP will highlight species and habitats of concern, and Identify potential approaches to deliver positive environmental externalities (e.g. air quality, soil, water quality and availability, ecosystem services, biodiversity) that can be incorporated into CAISAR initiatives. CAISAR BMP will include guidance for the assessment of residual biodiversity impacts, provision for adaptive management, monitoring requirements, and development of site-specific Biodiversity Action Plans.*

   Deliverable: CAISAR Landscape Level BMP

4. *Refine biodiversity sensitivity mapping based on available data and make this available to the CAISAR planning and design process.*

   ***Deliverable: refined biodiversity sensitivity map** for the CAISAR project area and each of the 6 sub-project areas)*

5. *Prepare a community biodiversity survey questionnaire to better understand biodiversity trends, perceived drivers, local use and community perspectives on biodiversity conservation and local importance in the CAISAR study area/area of influence. A detailed methodology, including questions, target communities, time and costs estimate would be prepared.*

   ***Deliverable: Local Biodiversity Knowledge Questionnaire and Survey Guidance document**.*

6. *Identify key biodiversity stakeholders to be engaged while identifying biodiversity conservation priorities and concerns, development of biodiversity management/action plans, and residual impact biodiversity offsets,*

   ***Deliverable: Biodiversity Stakeholders List and contact information**)*

7. *Identify potential priority biodiversity offset locations and site management requirements based on site analysis and consultation with government and community authorities.*

   ***Deliverable: List of priority biodiversity offset sites** proximate to each of the 6 CAISAR project areas that would be more suitable and relevant for the development of biodiversity offsets.*

8. *Integrate biodiversity initiatives into the overall CAISAR stakeholder engagement plan identifying the relevant stakeholder groups and the engagement process to be followed.*

   ***Deliverable: Specific reference to biodiversity in the CAISAR stakeholder Engagement Plan**.*

9. *Work collaboratively and cooperatively with the CAISAR multi-disciplinary team to ensure biodiversity conservation and enhancement is practically integrated into project planning, design elements and companion documentation.*

Deliverable: Reference to biodiversity considerations where appropriate in CAISAR assessments, design, execution, and reporting*.*

10. *Ensure the biodiversity component of the CAISAR project provides for local, inclusive, capacity building where practical and appropriate.*

    Deliverable: specific reference to opportunities for engagement of a broad cross section or local society in biodiversity-related initiatives *and documentation of participants in same.*

Key Deliverables

The main task of the International Climate Change Adaptation Biodiversity Specialist (CCABS) will be to provide discipline input to the Full Funding Proposal and the associated Annexes based on the guidance given in GCF's programming manual. With regard to biodiversity, the GEF programming manual highlights the following considerations:

1. "*The project/programme is expected to promote positive* ***environmental externalities*** *(e.g. air quality, soil*)". The CAISAR biodiversity specialist is expected to help ensure the project delivers enhanced ecosystems services to the intervention area.
2. "*Since project activities often target multiple areas and provide multiple benefits (e.g. co-benefits from improved agricultural productivity,* ***biodiversity conservation benefiting from improved ecosystems management****), additional financial contributions from other donors should be sought, where possible."*
3. "*The excessive development of land for agriculture worldwide has impacted the Earth's climate by reducing the carbon stored in intact forests, and has caused* ***biodiversity and ecosystem service losses***." The CAISAR biodiversity specialist is expected to strive to ensure the project results in a net improvement in local ecosystems services as a result of the project.
4. "*As may be required by specific environmental and social safeguards, the Environmental and Social Policy and the Indigenous Peoples Policy, additional stand-alone assessment and management plans may need to be prepared and disclosed. Examples of additional instruments include: a resettlement policy framework, resettlement action plan, Indigenous peoples planning framework, Indigenous peoples plan, and* ***biodiversity action plan*****"**

Consultant qualifications

Environmental specialist with a minimum Masters level degree in applied environmental science with expertise in biodiversity, biodiversity management and action plans, conservation biology and environmental planning. The consultant should have at least 10 years related experience, be comfortable working in a multi-disciplinary and cultural environment as well have working experience in South Asia. The consultant should have completed at least 5 previous biodiversity management plans and have recent experience with critical habitat assessment.

Duration: 60 working days from mid-June to mid-September 2023.

Location: Phnom Penh, Cambodia with field visits in lower Tonle Sap basin.

ANNEX 13: CAISAR CLIMATE CHANGE IMPACT RATIONAL

Project activity	Description and promotion strategy in the project	specific practice	adaptation or mitigation	Primary climate benefits	Climate rational (primary impact)	Climate rationale (secondary impact	Climate co primary is a prim
Component 2. Upgrading and climate-proofing water infrastructure for increased resilience							
Outcome 2.1. Modernization of irrigation scheme and ponds							
2.1.1.Technical analysis, field survey and preparing plan for system upgrading	This activity involves conducting a technical analysis and field survey of the existing irrigation system. The purpose is to identify areas that require upgrading or rehabilitation and to assess the feasibility of constructing new irrigation schemes and storage ponds. The promotion strategy will likely involve engaging farmers and stakeholders in the survey process to ensure a participatory approach. The findings from the analysis will be used to prepare a comprehensive plan for upgrading the irrigation system.	The specific practices under this sub-component include: o Rehabilitating and upgrading existing irrigation schemes. o Constructing new irrigation schemes and storage ponds where feasible and appropriate. o Deploying ecosystem-based solutions that better serve the environment. o Implementing energy-efficient measures to reduce greenhouse gas (GHG) emissions. o Utilizing high-efficiency irrigation systems like drip and sprinkler irrigation to minimize water losses. o Replacing current diesel pumps with single-point solar pumping systems. o Integrating nature-based solutions and Indigenous materials for constructing flood protection embankments.	The specific practices listed above include both adaptation and mitigation measures: o Adaptation: Upgrading and modernizing irrigation systems, establishing early warning systems, and flood-proofing infrastructure to cope with increasing flood and drought conditions. o Mitigation: Deploying energy-efficient irrigation technologies, replacing diesel pumps with solar pumps, and utilizing nature-based solutions to reduce GHG emissions.	The primary climate benefits of these practices are: o Improved resilience of the water delivery system, reducing damage to crops and infrastructure during extreme wet days and upstream flooding. o Enhanced climate adaptation through climate-proofing measures, allowing the irrigation system to cope with changing climate conditions.	The climate rationale or primary impact is to ensure a climate-resilient water supply for farmers. The project aims to reduce the negative climate impacts of droughts, dry spells, and flood during the monsoon season by upgrading the irrigation system and implementing climate-adaptive measures.	The secondary impact is the creation of green opportunities and additional benefits, such as: oIncreased water availability and storage capacity for irrigation. o Implementation of crop diversification and new income-generating activities like fish farming or duck breeding. oCreation of employment opportunities, especially for young people. o Time and labor savings, particularly for women, through the use of efficient irrigation technologies.	The Climate co-b o Mitigation: Red the use of en solar pumping, an o Adaptation: Im infrastructure, le coping with extrem
2.1.2.Implementation of infrastructure upgrading	Sub-Component 2.1.2 involves the actual implementation of infrastructure upgrading activities identified in the technical analysis and plan prepared in Sub-Component 2.1.1. The upgrading process may include rehabilitating existing irrigation systems, modernizing infrastructure, and constructing new irrigation schemes and storage ponds as required. The promotion strategy is likely to focus on engaging stakeholders, including farmers, in the implementation process to ensure their active participation and buy-in.	Specific practices under this sub-component include: o Executing the rehabilitation and modernization plans for irrigation systems and infrastructure. o Constructing new irrigation schemes and storage ponds according to the prepared plans. o Utilizing climate-proofing measures to enhance the resilience of the irrigation system against extreme weather events. o Implementing engineering techniques and nature-based solutions to ensure the long-term sustainability of the upgraded infrastructure.	The specific practices listed above are primarily adaptation measures aimed at: o Enhancing the resilience of the irrigation system to cope with increasing flood and drought conditions. o Reducing the damage and destruction of irrigation infrastructure during extreme weather events.	The primary climate benefits of Sub-Component 2.1.2 are: oImproved climate resilience of the irrigation system, ensuring consistent water delivery to farmers. oMinimized damage to crops and infrastructure during flood and drought events.	The climate rationale or primary impact is to ensure a climate-resilient water supply for farmers by implementing infrastructure upgrades and modernization to withstand the impacts of changing climatic conditions.	The secondary impact is the creation of green opportunities and additional benefits, including: oIncreased water availability and storage capacity for irrigation purposes. o Potential for crop diversification and income generation through alternative farming activities. o Employment opportunities, especially for young people involved in the implementation and maintenance of the upgraded infrastructure.	The Climate co-b oMitigation: Poten through the use o systems and ec techniques. oAdaptation: Impr water infrastructur events.
2.1.3.Preparing canal O&M plans including application of ICT and SCADA for operation. The implementation will follow a participatory approach involving farmers right from survey, design, prioritization, and construction implementation. This subcomponent will be financed by GCF, IFAD and Government. Moreover, these technologies will allow to save time and labour, especially for women, and offer opportunities to engage rural youth.	Sub-Component 2.1.3 involves the preparation of Operation and Maintenance (O&M) plans for the upgraded irrigation canals and systems. This includes integrating Information and Communication Technology (ICT) and Supervisory Control and Data Acquisition (SCADA) systems for efficient operation. The promotion strategy may involve raising awareness among stakeholders about the benefits of adopting ICT and SCADA technologies to optimize water management and ensure effective maintenance.	Specific practices under this sub-component include: oDeveloping comprehensive O&M plans for the upgraded irrigation canals. oIncorporating ICT and SCADA systems for real-time monitoring and control of water flow and distribution. oUtilizing modern technology to optimize water allocation and minimize water losses. oTraining personnel in the operation and maintenance of the new systems.	The specific practices listed above are primarily adaptation measures aimed at: oEnhancing the resilience of the irrigation system through efficient water management. oCoping with changing climate conditions and reducing vulnerability to extreme weather events.	The primary climate benefits of Sub-Component 2.1.3 are: oImproved water efficiency and reduced water losses through advanced monitoring and control systems. oIncreased climate resilience of the irrigation infrastructure through effective O&M practices.	The climate rationale or primary impact is to ensure the sustainable and climate-resilient operation of the irrigation system through the adoption of modern technologies and efficient water management practices.	The secondary impact includes: oEnhanced water resource management and allocation. oImproved agricultural productivity through optimized water distribution. oReduction of maintenance costs and increased system longevity.	The Climate co-b oMitigation: Redu energy consumpti management and technologies. oAdaptation: Impr irrigation infrastru coping with chang
Outcome 2.2: Flood-proofing and Drainage improvements							
2.2.1.Establish flood monitoring, information, and early warning systems.	Sub-Component 2.2.1 involves the establishment of flood monitoring, information, and early warning systems. This includes setting up mechanisms to monitor weather conditions, water levels, and other relevant data to detect potential floods. The promotion strategy may involve raising awareness among stakeholders about the importance of early warning systems, training local communities to respond to flood warnings, and ensuring effective dissemination of flood-related information.	Specific practices under this sub-component include: oInstalling flood monitoring equipment and sensors in vulnerable areas. oSetting up a system to collect and analyze meteorological and hydrological data. oDeveloping protocols for issuing flood warnings and disseminating information to affected communities.	The specific practices listed above are primarily adaptation measures aimed at: oEnhancing disaster prevention and protection of farmlands and assets by providing early warnings to vulnerable communities.	The primary climate benefits of Sub-Component 2.2.1 are: oImproved disaster preparedness and reduced vulnerability to flood events through early warning systems. oEnhanced ability to respond proactively to potential flood situations.	The climate rationale or primary impact is to strengthen flood preparedness and response capacities to cope with the increasing threat of floods under changing climate conditions.	The secondary impact includes: oReduction of damages to farmlands and assets due to improved flood protection measures. oEnhanced safety and well-being of vulnerable communities through timely flood warnings.	The Climate co-b oMitigation: Poten property damage which enable pro management. oAdaptation: Impr climate-related flo vulnerable comm
2.2.2.Strengthening and construction of flood control and drainage infrastructures. It will be implemented in an integrated manner with component 2.1 activities as required. The climate information and early warning activities will be strengthened as part of component 3 and are detailed in that section	Sub-Component 2.2.2 focuses on strengthening and constructing flood control and drainage infrastructures. The project will prioritize areas identified as flood-prone based on hydrological modeling and stakeholder consultation. The promotion strategy may involve community engagement and participation in the planning and implementation of flood control measures.	Specific practices under this sub-component include: oStrengthening existing drainage networks through excavation and widening. oConstructing new flood protection embankments using resilient indigenous materials and nature-based solutions. oInstalling sub-surface drainages in needy areas to improve water drainage.	The specific practices listed above are primarily adaptation measures aimed at: oEnhancing the resilience of the drainage networks and flood embankments to protect farmlands and assets from flood events.	The primary climate benefits of Sub-Component 2.2.2 are: oImproved flood protection and drainage infrastructure to minimize damages during flood events. oIncreased resilience of the irrigation system against intensifying flood threats under changing climate conditions.	The climate rationale or primary impact is to strengthen flood protection measures and improve drainage systems to cope with the increasing frequency and intensity of floods resulting from climate change.	The secondary impact includes: oEnhanced protection of agricultural lands and infrastructure from flood damages. oImproved water management and reduced flood-induced risks for farmers.	The Climate co-b oMitigation: Utiliz and resilient mate measures can co and reduce emiss methods. oAdaptation: Incr system and farml flood events.
Outcome 2.3.: Establishments and training of Farmers Water User Communities (FWUC)							
2.3.1.Formation of institutional strengthening of the FWUC	Sub-Component 2.3.1 focuses on forming and strengthening Farmers Water User Communities (FWUCs). FWUCs play a crucial role in the sustainable operation and maintenance of irrigation schemes. The promotion strategy may involve encouraging community participation, providing training in FWUC management, and promoting inclusivity in decision-making processes.	Specific practices under this sub-component include: oEstablishing new FWUCs and strengthening existing ones. oImproving capacities in O&M activities, water use efficiency, and green technology adoption. oEnhancing the arrangement of water rights and water allocation to promote equitable and efficient water use.	The specific practices listed above are primarily adaptation measures aimed at: oStrengthening institutional capacity to effectively manage and operate the irrigation system. oPromoting sustainable water use practices and climate adaptation strategies among farmers.	The primary climate benefits of Sub-Component 2.3.1 are: oEnhanced sustainability and long-term operation of the climate-smart and climate-proof irrigation systems. oImproved capacity of FWUCs to cope with climate-related challenges and implement climate adaptation strategies.	The climate rationale or primary impact is to ensure the sustainable operation and maintenance of the irrigation system under changing climate conditions through the establishment and strengthening of FWUCs.	The secondary impact includes: oImproved water use efficiency and equitable water allocation. oIncreased capacity of farmers to adopt climate-smart practices and technologies.	The Climate co-b oMitigation: Adop sustainable practi reduced emission oAdaptation: Incr system through ef adaptation strateg
2.3.2 Build technical capacities of FWCU for canal O&M	Sub-Component 2.3.2 focuses on building the technical capacities of Farmers Water User Communities (FWUCs) in canal operation and maintenance (O&M). The project will provide training and support to FWUC members to effectively manage and operate the irrigation canals. The promotion strategy may involve conducting training sessions, workshops, and capacity-building programs for FWUC members to enhance their technical skills.	Specific practices under this sub-component include: oConducting technical training for FWUC members on canal O&M. oEquipping FWUCs with the necessary knowledge and skills for efficient water distribution and maintenance. oImplementing best practices in water resource management.	The specific practices listed above are primarily adaptation measures aimed at: oStrengthening the capacity of FWUCs to cope with changing climate conditions and efficiently manage water resources.	The primary climate benefits of Sub-Component 2.3.2 are: oEnhanced climate resilience of the irrigation system through improved canal operation and maintenance. oIncreased efficiency in water distribution, reducing water losses during irrigation.	The climate rationale or primary impact is to empower FWUCs with the technical skills needed to effectively manage the irrigation system under changing climate conditions.	The secondary impact includes: oImproved water use efficiency and reduced water wastage. oEnhanced agricultural productivity through efficient water distribution.	The Climate co-b oMitigation: Effici reduced water los contributing to low oAdaptation: Incr irrigation system practices.
2.3.3prepare long term financing plan for WUAS: This will require an identification of the capacity needs, membership, functionality of the FWUCs in the area . This will be followed by assisting them in developing a business model for the operation and maintenance of each irrigation scheme on a self-sustaining basis in partnership with the private sector. This will entail the development of an O&M plan for the infrastructure investments, assessment of the willingness and ability of the users to pay for the services and a regulatory framework that gives the WUAs the authority to collect the fee and assess the basis on which water fee will be paid as irrigation fees can be based on the size of the land being irrigated or the volume of water used. These elements will be further reviewed during the preparation of the FFP.	Sub-Component 2.3.3 involves preparing a long-term financing plan for Water User Associations (WUAs). This plan will outline the financial resources required for the sustainable operation and maintenance of the irrigation system. The promotion strategy may involve working with relevant stakeholders, including private sector partners, to develop a financially viable plan.	Specific practices under this sub-component include: oIdentifying the financial needs of WUAs for irrigation system operation and maintenance. oAssessing the willingness and ability of users to pay for irrigation service. oDeveloping a regulatory framework for water fee collection.	The specific practices listed above are primarily adaptation measures aimed at: oEnsuring the long-term sustainability of the irrigation system by securing adequate financial resources.	The primary climate benefits of Sub-Component 2.3.3 are: oIncreased financial resilience of WUAs to cope with climate-related challenges in the operation and maintenance of the irrigation system. oEnhanced capacity to sustainably manage the irrigation infrastructure under changing climate conditions.	The climate rationale or primary impact is to develop a long-term financing plan that enables WUAs to effectively manage and maintain the irrigation system in the face of climate-related risks.	The secondary impact includes: oImproved financial sustainability of the irrigation system. oEnhanced capacity of WUAs to invest in climate-resilient infrastructure and technologies.	The Climate co-b oMitigation: Finan more likely to in friendly irrigation t emissions. oAdaptation: Incr climate impacts th financing.

ANNEX 14 – INDIGENOUS PEOPLES PLANNING FRAMEWORK

Table of Contents

LIST OF TABLES 132
LIST OF FIGURES 132
ABBREVIATIONS 133
DEFINITIONS 134
1. INTRODUCTION 143
1.1 PROJECT BACKGROUND 143
1.1.1 Project Context 143
1.1.2 Project Development Objective and Project Components 143
1.2 OBJECTIVES AND PRINCIPLES OF THE INDIGENOUS PEOPLES PLANNING FRAMEWORK 144
1.2.1 Objectives 144
1.2.2 Principles 145
2. LEGAL FRAMEWORK 146
2.1 OVERVIEW 146
2.2 NATIONAL LAWS AND REGULATIONS RELATED TO INDIGENOUS PEOPLES 146
2.3 AIIB'S ESS3 ON INDIGENOUS PEOPLES 150
2.4 GAPS BETWEEN NATIONAL POLICIES & DONOR'S ENVIRONMENTAL AND SOCIAL POLICIES 152
3. RISKS, IMPACTS AND MITIGATION MEASURES 155
3.1 OVERVIEW OF INDIGENOUS PEOPLES 155
3.1.1 Overview of IPs in Cambodia 155
3.1.2 Overview of IPs in the Project Area 156
3.2 PROJECT'S ENVIRONMENTAL AND SOCIAL RISK AND IMPACTS 156
3.3 MITIGATION MEASURES 157
4. PREPARATION OF INDIGENOUS PEOPLES PLAN 158
4.1 SCREENING FOR ETHNIC GROUPS/ INDIGENOUS PEOPLES (EG/IP) 158
4.2 PREPARING AN IPP 158
4.3 UPDATING AN IPP ..... ERROR! BOOKMARK NOT DEFINED.
4.4 APPROVING AN IPP 159
4.5 DISCLOSING AN IPP 160
4.6 IMPLEMENTING AN IPP 160
5. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE 160
5.1 PURPOSE OF ENGAGING IP DURING PROJECT PREPARATION AND IMPLEMENTATION 160
5.2 CONSULTATION RESULTS DURING PROJECT PREPARATION 160
5.3 CONSULTATION WITH IPS DURING PROJECT IMPLEMENTATION 160
5.3.1 Overview of consultation process 160
5.3.2 Free, Prior and Informed Consultation/Consent 161
5.4 INFORMATION DISCLOSURE 163

6. GRIEVANCE REDRESS MECHANISM 163
6.1 PURPOSE OF PROJECT'S GRM 164
6.2 GRIEVANCE REDRESS PROCEDURES 164
6.2.1 Grievances related to Land Acquisition 164
6.2.2 Grievances related to Gender Based Violence/SEA/SH 164
6.2.3 Grievances related to any other aspects not covered in the above GRM 164
7. IMPLEMENTATION ARRANGEMENTS 166
7.1 IMPLEMENTATION ARRANGEMENTS 166
7.2 CAPACITY BUILDING 166
7.3 MONITORING & EVALUATION 166
7.4 REPORTING 167
8. COSTS AND BUDGET 167
8.1 COSTS 167
8.2 BUDGET 168
ANNEXES 170
ANNEX 1 – SUMMARY OF CONSULTATION DURING PROJECT PREPARATION ..... ERROR! BOOKMARK NOT DEFINED.
ANNEX 2 – IP SCREENING FORM 170
ANNEX 3 – OUTLINE OF AN IPP 174
ANNEX 4 –INDICATORS FOR IPP IMPLEMENTATION MONITORING 177

List of Tables

Table 1 – Distribution of Indigenous People Groups in Project Provinces 156
Table 2 – Key activities and costs for supporting IPP implementation (in US Dollars) 169

List of Figures

Figure 2 – Map showing seven irrigation schemes located in four provinces 144

Abbreviations

CAISAR	Climate Adaptive Irrigation and Sustainable Agriculture for Resilience
COI	Corridor of Impact
DDIS	Detailed Design Implementation and Supervision
EA/IA	Executing Agency/Implementing Agency
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESO	Environmental and Social Officers
ESS	Environmental and Social Standards
FPICon	Free Prior and Informed Consultation
IDA	International Development Association
ILO	International Labour Organization
IP	Indigenous People
IPP	Indigenous Peoples' Plan
IPPF	Indigenous Peoples Planning Framework
MoWRAM	Ministry of Water Resources and Meteorology
MoSALVY	Ministry of Social Affairs, Labor, Vocational Training and Youth Rehabilitation
NCDD	National Committee for Sub-National Democratic Development
NGO	Non-Government Organization
PDWRAM	Provincial Department of Water Resources and Meteorology
PMU	Project Management Unit
PIU	Project Implementation Unit
PPC	Project Preparation Consultants
RGC	Royal Government of Cambodia
RP	Resettlement Plan
RPF	Resettlement Planning Framework
SA/SIA	Social Assessment/ Social Impact Assessment
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SIB	Subproject Information Booklet
VAC	Violence Against Children

Definitions

Disadvantaged individuals/groups

Refers to individuals or groups who, due to certain own circumstances such as their age, gender, disabilities, health, economic and ethnic status, and so forth, are more likely affected adversely by the project impacts and/or more limited in their ability to take advantage of project benefits. Disadvantaged individuals/groups are more likely excluded from, or unable to participate fully in the mainstream consultation process. Thus, they may require specific assistance to stay engaged during project planning and implementation. In this project, disadvantaged individuals/ groups are defined as those who have the following characteristics: i) from an ethnic group, (ii) landless/ limited productive land, (iii) female headed household with dependents, (iv) frequent lack of male labor at home (e.g. migrant workers); (v) jobless, or limited economic opportunities; (vi) family member(s) with chronic illness, or disabilities; (vii) elderlies who live on their own; (viii) youth, particularly very young couple with children (early marriage), (ix) live in an especially difficult circumstance, and (x) don't meet above criteria but are concurred by local community as vulnerable to poverty and need project's support to reduce their vulnerability. Disadvantaged individuals are usually from a poor, or a near poor household.

Environmental and social risk

Environmental (including climate change and natural disasters) and social risks are determined by a combination of project design and operational characteristics, together with exogenous factors, which: (i) may adversely affect the ability of a project to achieve and sustain its development objective(s); and (ii) define the nature, scale and significance of direct and indirect environmental and social impacts.

Free, Prior, and Informed Consultation (FPICon)

According to ESS 3 of AIIB's ESF, FPICon is established as follows:

- The scope of FPICon applies to project design, implementation arrangements and expected outcomes related to risks to, and impacts on, the affected Indigenous Peoples;
- FPICon builds on the process of meaningful consultation and requires good faith negotiation between the Client and the affected Indigenous Peoples;
- The Client documents: (a) the details of the process by which the support of the affected local indigenous communities will be determined, in a written consultation process agreement with these communities; and (b) the details of the Project-related matters on which their broad community support has been obtained, in a consultation statement, which includes all agreements reached as well as dissenting views; and
- FPICon does not require unanimity and may be achieved even when individuals or groups within or among these affected Indigenous Peoples explicitly disagree with support for the Project.

Inclusion

Inclusion means empowering all people to participate in, and benefit from, the development process. Inclusion encompasses policies to promote equality and nondiscrimination by improving the access of all people, including the poor and disadvantaged, to services and benefits such as education, health, social protection, infrastructure, affordable energy, employment, financial services and productive assets. It also embraces action to remove barriers against those who are often excluded from the development process, such as women, children, persons with disabilities, youth and minorities, and to ensure that the voice of all can be heard.

Indigenous Peoples

According to the AIIB's Environment and Social Framework, the term "Indigenous Peoples" is used in a generic sense to refer exclusively to a distinct social and cultural group possessing all the following characteristics – in varying degrees:

- Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others; and
- Collective attachment[1] to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas; and
- Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture, and
- A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.

According to IFAD's SECAP, IPs are defined as follows:

- Priority in time, with respect to occupation and use of a specific territory;
- The voluntary perpetuation of cultural distinctiveness, which may include aspects of language, social organization, religion and spiritual values, modes of production, laws and institutions;
- Self-identification, as well as recognition by other groups, or by state authorities, as a distinct collectivity; and
- An experience of subjugation, marginalization, dispossession, exclusion or discrimination.

According to GCF's Indigenous People Policy, IPs are defined as follows:

- Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others;
- Collective attachment to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation as well as to the natural resources in these areas;
- Customary cultural, economic, social, or political systems that are distinct or separate from those of the mainstream society or culture; and
- A distinct language or dialect, often different from the official language or languages of the country or region in which they reside. This includes a language or dialect that has existed but does not exist now due to impacts that have made it difficult for a community or group to maintain a distinct language or dialect.

Information disclosure

[1] Collective attachment means that for generations there has been a physical presence in and economic ties to land and territories traditionally owned, or customarily used or occupied, by the group concerned, including areas that hold special significance for it, such as sacred sites.

The process of disseminating project information to stakeholders to allow them to understand the risks and impacts of the project, and potential opportunities. Information disclosure should be in line with the project's Stakeholder Engagement Plan which is in line with the requirements of the ESF of AIIB, SECAP of IFAD, and Information Disclosure Policy of GEF. It is required that the disclosure of project information include: (a) purpose, nature and scale of the project; (b) duration of proposed project activities; (c) environmental and social risks and potential impacts of the project on local communities, particularly the vulnerable/disadvantaged groups and proposed mitigation measures; (d) proposed stakeholder engagement process highlighting approach that will be taken to promote meaningful participation of project affected persons; (e) time and venue of proposed public consultation meetings, and the process by which meetings will be notified, meeting results summarized, and reported back to project stakeholders; and (f) process and means by which grievances can be received and addressed timely.

Meaningful consultation

Two-way process that (a) begins early in project planning process to gather initial views on project proposal and inform project design; (b) encourages stakeholder feedback, particularly as a way of informing project design and engagement by stakeholders in the identification and mitigation of environmental and social risks and impacts; (c) continues on an ongoing basis, as risks and impacts arise; (d) is based on prior disclosure and dissemination of relevant, transparent, objective, meaningful and easily accessible information in a timeframe that enables meaningful consultation with project stakeholders in a format culturally appropriate, and in relevant local language(s) and is understandable to stakeholders; (e) considers and responds to feedback; (f) supports active and inclusive engagement with project-affected parties; (g) is free of external manipulation, interference, coercion, discrimination, and intimidation; and (h) is documented and disclosed by the Government.

Vulnerable individuals /groups

Refers to individuals/groups who, by virtue of factors beyond their control, are: (a) more likely to be adversely affected by the Project's environmental and social impacts; (b) more likely than others to be limited in their ability to claim or take advantage of Project benefits. Such individuals or groups are also more likely to be excluded from or unable to participate fully in the mainstream consultation process and may require specific measures or assistance (or both) to do so.

Based on the results of the vulnerability assessment conducted for the project, vulnerable individuals/groups need differentiated mitigation measures to cope with project's adverse impacts (e.g. loss of productive land/ income source), take advantage of project's intended benefits, and fully participate in meaningful consultation process during project design, implementation, and operations. Therefore, under this project, the following groups are considered vulnerable under this project: (i) poor[2] and near-poor[3], (ii) female headed households with dependents; (iii) households from Indigenous Peoples or Ethnic Minority group that meet the definitions of Indigenous Peoples of AIIB, IFAD, and GCF, (iv) households headed by an elderly, or a disabled person with no regular income, (v) household having at least a family member with chronic illness that needs regular medical treatment.

[2] The poor are those who a) live below the poverty line (which is KHR 10,951 per person per day as defined by the World Bank for Cambodia), or b) have IDPoor 1 (very poor) or IDPoor 2 (poor).

[3] The near-poor are those whose daily per capita consumption lies between poverty line and 1.25 times the poverty line – as proposed by the World Bank. Near-poor households also have not only lower income per capita but also less diversified incomes than non-poor households (cf. WB 2022, Cambodia Poverty Assessment – Toward A More Inclusive and Resilient Cambodia).

Executive Summary

This Executive Summary summarizes the main points in the project's Indigenous Peoples Planning Framework (IPPF) which was prepared by the Ministry of Water Resources and Meteorology. This IPPF will be applied to all activities that will be carried out under the CAISAR. This IPPF is a living document which may be updated as required during project implementation. If updated, the latest IPPF version will be disclosed through the same channels.

Project Development Objective and Project Components

The project objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces: Pursat , Kampong Chhnang, Kampong Speu, and Kandal.

The project will be implemented through various activities organized through the following three components:

- Component 1. Improving farm-level climate adaptation, resilience, and water use efficiency
- Component 2. Upgrading and climate-proofing water infrastructure for increased resilience
- Component 3. Institutional strengthening

Purpose of the Indigenous Peoples Planning Framework

This framework is a guide to screening, assessment, and planning, including an arrangement of the outline of culturally appropriate and meaningful consultations with Indigenous peoples, conducting social impact assessments (SIA) and preparation of the IPP that pertains to any specific subproject. The purpose of this Indigenous Peoples Planning Framework (IPPF) is to set out the requirements of the AIIB's ESS3 on Indigenous Peoples and the IFAD's SECAP Standard 4, and the RGC's policy on development of Indigenous Peoples. Based on the gaps between the AIIB's ESS3, IFAD's SECAP Standard 4, and RGC's policies, measures are proposed to close the gaps through implementation arrangements, procedures, design criteria, etc. to be applied to all subprojects and project components that were confirmed during project preparation and will be identified during project implementation.

Gaps between National Policies & Donor's Environmental and Social Policies

Despite the fact that Cambodia has a policy that recognizes the rights of IPs to culture, education, justice, health, environment, land, agriculture, water resources and infrastructure among others, there are no decrees, sub-decrees or procedures for specific safeguards to protect the interest of IPs, other than those related to land or forestry. The Cambodia Land Law does recognize the right of indigenous communities in Cambodia to own immovable property - their land - with collective title. However, in practice, the procedure to register collective title can be very time consuming and only a few indigenous communities have received collective title since the Land Law was enacted in 2001. Similarly, the Forest Law also guarantees and recognizes the right of IPs to continue the use and access to certain forest areas that they traditionally use and practice.

Overall, there is an acceptable level of consistency between the government system, the AIIB'ESS and the IFAD standards on IPs. The self-identification process of indigenous communities defined in the national

policy is broadly consistent with international good practice. The national framework does not exclude communities who have become more mainstream, and indigenous communities may apply for legal status regardless of whether or not they still use their own language or practice traditional agriculture.

However, while there are some complementary links between Cambodian laws and regulations related to IPs and the ESS 3, there are no sufficiently detailed regulations or operating procedures to facilitate full implementation of the IPPs. Therefore, this IPPF has been prepared on the basis of the ESS 3 by considering relevant Cambodian policies and regulations. The IPPF also outlines the Grievance Redress Mechanism (GRM), based on the GRM that is used for the Project, which will need to be further refined in consultation with IPs, if any are found to be residing at any subproject sites.

Project's Environmental and Social Risk and Impacts

The project will bring about an overall positive impact to local farmers. In subproject where IP peoples have farmland in the command area, these IPs will benefit from improved irrigation, water supply, government's agricultural extension services, and services from local farmers' cooperatives. As IPs participate in project activities, particularly agricultural extension services, they can grow more crops, participate in value chain, increase income, and eventually improve their livelihoods. Reliable water access and promising farming opportunities thanks to improved irrigation and extension services also keep the poor, including the poor IPs, from migrating to other areas in search for income generation opportunities. Adverse impacts on IPs are foreseen. However, these impacts are mostly local, small-scaled, such as minor land acquisition in some subproject to allow construction of irrigation canal. Land impacts would be very small at household level (e.g. loss of strip of land) which would not affect the livelihoods of the IP remarkably.

During subproject construction and operation, there are a number of environmental and social risks that may apply to local people, including IP peoples who may happen to be present in a subproject area. Environmental and social risks and impacts that have been identified during project preparation have been discussed in consultation meetings with a) IP peoples who are present in subproject area, and b) other project stakeholders at commune, district, provincial and central level. These consultations aim to ensure potentially affected people, and relevant project stakeholders, are aware of such risks and stay engaged during subproject preparation and implementation for risk prevention and mitigation (Please see full list of social and environmental risks in the project's ESCMF (Section E&S Risks and Impacts) that may apply to any ethnic minorities who are present in subproject area. See also SEP, particularly section (Proposed Strategy for Consultation with Vulnerable/Disadvantaged Groups) for guidance on conducting consultation with IPs when IPs are present in the subproject area.

Mitigation Measures

Although above risks and impacts will be validated, and assessed at further length when subproject locations become known, IP(s) in a subproject's area may be affected disproportionately compared to the mainstream group. The distinctive cultural and socioeconomic characteristics of the IPs, including their existing livelihoods, etc. may expose IPs to further risks and impacts, increase their vulnerability and compromise their ability to respond to such risks and impacts – if a holistic approach is not in place. Effective communication, such as IEC, and active participation of involved IPs, are among important factors that contribute to effective engagement of IPs for meaningful consultation during subproject preparation and participatory monitoring during subproject implementation. The coordination of project stakeholders, including PMU, Contractors, local authorities, local agencies, local service providers, and

most notably the active and full participation of IPs, collectively contribute to minimizing identified risks and potential impacts at identified subprojects.

Detailed mitigation measures for the above risks and potential impacts are proposed in the project's ESCMF. These mitigation measures are specific for design stage, pre-construction stage, construction stage, and operation stage,

Purpose of Engaging IP during project preparation and implementation

The AIIB's ESF defines stakeholder engagement as a process of identifying relevant stakeholders, conducting stakeholder analysis, and organizing a series of consultations to meet with project stakeholders for collecting stakeholders' feedback and concerns on project's risks and impacts, as well as stakeholders' development needs in relation to project purposes and activities. This aims to ensure the project's adverse impacts on IPs can be avoided, or minimized and mitigated if avoidance is not possible. For this project, it is important that IPs need to be consulted on their development needs (in relation to project purposes) to ensure they can receive socioeconomic benefits that are appropriate to them culturally.

Information Disclosure

Prior to conducting consultations, MoWRAM will notify the concerned IPs of the consultation plan during preparation. MoWRAM will provide affected IPs with initial subproject information in the form of booklet in both Khmer and local language (if applicable). This initial information should be provided to IP at least two weeks prior to consultation. If the concerned IPs do not have a written language, the IP will be provided the information in Khmer and are explained verbally in the local language of the concerned IP to ensure the IP are fully informed of the consultation purpose and initial subproject information.

> For public consultation, the draft IPPF (in English) and its Executive Summary (in Khmer) was (should be?) disclosed on MoWRAM's website on XXX (https://www.). The Executive Summary (in Khmer) was also disclosed in hard copy at MoWRAM's public library in Phnom Penh, and in the offices of Provincial Departments of Water Resources and Meteorology in all four project provinces. Once finalized, the IPPF will be re-disclosed again through the above channels prior to AIIB's and IFAD's project appraisal. The draft and final IPPF will be disclosed in English on the AIIB's and IFAD's website.

During project implementation, all draft IPPs, once completed by MoWRAM and submitted to the Bank for review, shall be disclosed to affected IP communities in Khmer language. The summary of the IPP (in the form of an Information Booklet) will be translated into IP's language if the consulted IPs have their own written language. Public meetings will be hold with the affected IP(s) to explain the contents of the relevant IPP in their mother language to ensure affected IPs understand what and how the activities under the IPP will be carried out, including E&S risks and impacts of subproject activities, and how the IPs will be engaged by MoWRAM in consultation meetings during subproject preparation, and in monitoring during subproject implementation to minimize identified E&S risks and impacts. IPPs – prepared for relevant subprojects, will be disclosed locally in Khmer and local IP language (if applicable), as well as in Khmer and English language on MoWRAM's website. The English version of the IPPs will be disclosed on the AIIB's and IFAD's website.

Grievance Redress Procedures

The following section outlines complaint handling procedures that are designed to assist affected Indigenous Peoples (IPs) in making complaints regarding the project. These procedures are designed to address potential impacts and risks during project preparation and cover the following key areas: a) land

acquisition, where individual IP land is acquired either permanently or temporarily during construction, b) Gender based violence, where IPs are victims, survivors, witnesses, or otherwise affected by SEA/SH actions related to the project, and c) general complaints and concerns related to project design, adverse impacts on IPs such as dust, noise, vibration, and any other aspects that IPs attribute to project activities.

Implementation Arrangements

The MoWRAM will be responsible for implementing this IPPF. The Project Director (PD) at MoWRAM will be responsible for providing overall guidance, policy advice, conducting internal coordination, discussing and resolving issues at project level − in association with relevant government agencies where needed. The Project Manager (PM) at MoWRAM will provide day-to-day support to the PD and will be responsible for ensuring that the IPPF will be followed. The PM will oversee the work of the ESOs and ensure proper screening of IP groups will be carried out for each subproject, and steps for IP screening and social assessment described in this IPPF are followed. Within MoWRAM, the ESOs will be responsible for carrying out day-to-day activities set forth in this IPPF. An IP specialist will be appointed within MoWRAM's PMU (in addition to a Resettlement and Environmental Specialist) to provide guidance to Provincial PDWRAM in conducting consultation with affected IP in respective subprojects.

The MoWRAM needs to inform the AIIB and IFAD of the IP screening results and steps that MoWRAM will take in case IPs are present in the subproject area. When IPs are found in the subproject, MoWRAM will engage IP consultants to work closely with PMU's IP Specialist and PDWRAM to conduct Social Assessment and prepare IPPs. PMU's IP specialist and IP consultants will visit the subproject sites and work closely with PDWRAM, local authorities, relevant agencies, NGOs, particularly local IP leaders and IP members, including vulnerable groups of affected IP communities, to conduct Social Assessment.

Capacity Building

Since the MOWRAM is new to AIIB's ESF and IFAD's SECAP, and have not been familiar with requirements of AIIB's ESS3 and IFAD's SECAP Standard 4, they may not be able to conduct meaningful consultation from initial years of project implementation. In the first year, these specialists will be trained by the AIIB task team on ESF with a particular focus ESSs and IFAD's SECAP with a particular focus Standard that apply to this project to enable newly appointed ES specialists at the MOWRAM to provide appropriate support. Where needed, IP consultant will be engaged to provide additional support to PMUs' specialist, particularly in the initial years of project implementation. Since independent ES monitoring consultant will be engaged by PMU at MoWRAM, feedback from this consultant, alongside internal monitoring results, will provide regular feedback to PMU on how IPPF/IPP is carried out so that adjustment/improvement could be made appropriately and timely.

Monitoring & Evaluation

The application of this IPPF and preparation and implementation of subproject IPPs will be monitored internally by the MoWRAM. Adverse impact on IPs (if any) due to land acquisition will be monitored by GDR and MoWRAM as part of implementation arrangement set forth in Section 9.1.2 of project's Resettlement Planning Framework (RPF).

Within MoWRAM, the ESOs or the Detailed Design Implementation and Supervision (DDIS) will be responsible for conducting quarterly monitoring activities of the activities set for under all subproject IPPs. Monitoring of IPPF/IPP implementation will focus on assessing the compliance of IPP implementation against the followings:

- IP screening process and results;

- Quality of Social Assessment and adequacy of IPPs prepared based on SAs;
- Information disclosure;
- Functioning of project's GRM (as customized to the respective IP groups present in each subproject area to ensure the GRM is culturally appropriate to the local IPs);
- Development activities carried under IPPs (based on development needs of IPs);
- Results and impacts of IPPs (in ensuring the affected IP receive socioeconomic benefits of the project that is culturally appropriate, gender and intergenerational inclusive, and contributing to achieving the objective of the AIIB's ESS3 and IFAD's SECAP Standard 4).

In addition to internal monitoring, the project will encourage IPs in subproject areas to participate in monitoring and evaluation of IPP implementation process and implementation outcome which affects them. During SA exercise, feedback and suggestions from IPs will be solicited as to how they wish to participate in monitoring and evaluation of IPP activities.

MOWRAM will provide a quarterly IPP implementation report to the AIIB and IFAD. These results will be incorporated into MoWRAM's consolidated Environmental and Social Compliance Report (ESCR) (See Annex 5 for Indicative Indicators for Internal Monitoring of IPP implementation).

Reporting

MoWRAM's ESOs will ensure feedback from affected and interested IP, as well as grievances submitted by affected IPs, are resolved timely and effectively, and that resolution results are reported timely back to the aggrieved IPs. The method of reporting back depends on the stakeholders, and as follows:

- For stakeholders at national level, email and/or official letter will be used to report back to stakeholders following consultations and/or workshops. The content of the report will summarize what comments, suggestions, concerns that have been received, by whom and when, and how such comments, suggestions, concerns were considered.
- For stakeholders at local level, follow-up meetings/consultations will be conducted to informed stakeholders know on how comments, suggestions, concerned were considered.
- For Indigenous Peoples, project's responses to their comments, suggestions, concerns are reported back to them in subsequent face-to-face consultations – in line with the project's SEP and the IPPF, including how the project had considered and addressed their concerns through concrete actions to be carried out during subproject implementation process and through IPP implementation.

Grievances of all project IP will be reported back to them through project's GRM channels within the timeframes specified for each step of the above GRM procedure.

Costs

Indicative costs for IPPF implementation are estimated during project preparation for the purpose of budget planning. The actual costs of IPPF implementation depend on the number of IPPs, including scope and activities to be carried out under each IPP, during project implementation. The estimated cost below may be updated once the list of subprojects is finalized. Costs incurred as compensation payment for land acquisition and associated impacts are covered by counterpart funds and are estimated in the project' Resettlement Planning Framework (RPF).

Budget

The budget for implementing IPPF/IPPs will be allocated from counterpart funding. implementation, based on infrastructure construction subprojects that will be identified/confirmed during project implementation, this budget plan will be updated to ensure funding is sufficiently planned annually to ensure timely and effective activities in Figure below.

1. INTRODUCTION

1.1 Project Background

1.1.1 Project Context

Cambodia's irrigated agriculture faces increasing challenges from adverse impacts of climate change, especially the changes in rainfall patterns, duration and timing of the rainy season, and climate induced water disasters such as floods and droughts. Climate Resilient (CR) and low emission practices and investments in agriculture and water management are therefore crucial to protect and enhance Cambodia's agricultural production and productivity which will in turn contribute to poverty reduction and increased food security.

Addressing the complex impacts of climate change on rain fed and irrigated agriculture requires action at both farm and irrigation scheme, including enabling environment at regional and national level. Farm level actions will help communities adapt to climate change while also saving water and decreasing GHG emissions from BAU of agriculture, water use and management. This will help farmers to diversify their farming while also addressing changing rainfall patterns and increasing drought conditions throughout the growing season. Actions at system level will help achieve a modernized and climate proofed irrigation infrastructure delivering irrigation services to farmers in line with the requirements at the farm level. It will also protect the natural capital stocks, especially the land and water against the increasing threats of flood. In addition, replacement of diesel pumps with solar pumps and combination of both grey and green solutions for irrigation modernization and flood proofing works will help reduce GHG emissions.

The integrated actions combining both farm and system levels has a transformative potential to reduce vulnerability of water and agriculture systems to climate change impacts while also reducing GHG emissions and enhancing the livelihood of rural populations who primarily depend on agriculture.

The theory of change demonstrates how the project shifts the BAU from poorly constructed and maintained irrigation systems to a smart, climate resilient water management system with climate proofed irrigation and flood control infrastructures for smallholder farmers. The project's outcomes and outputs are in-line with GCF's adaptation and mitigation goals, objectives, and long-term sustainability principles.

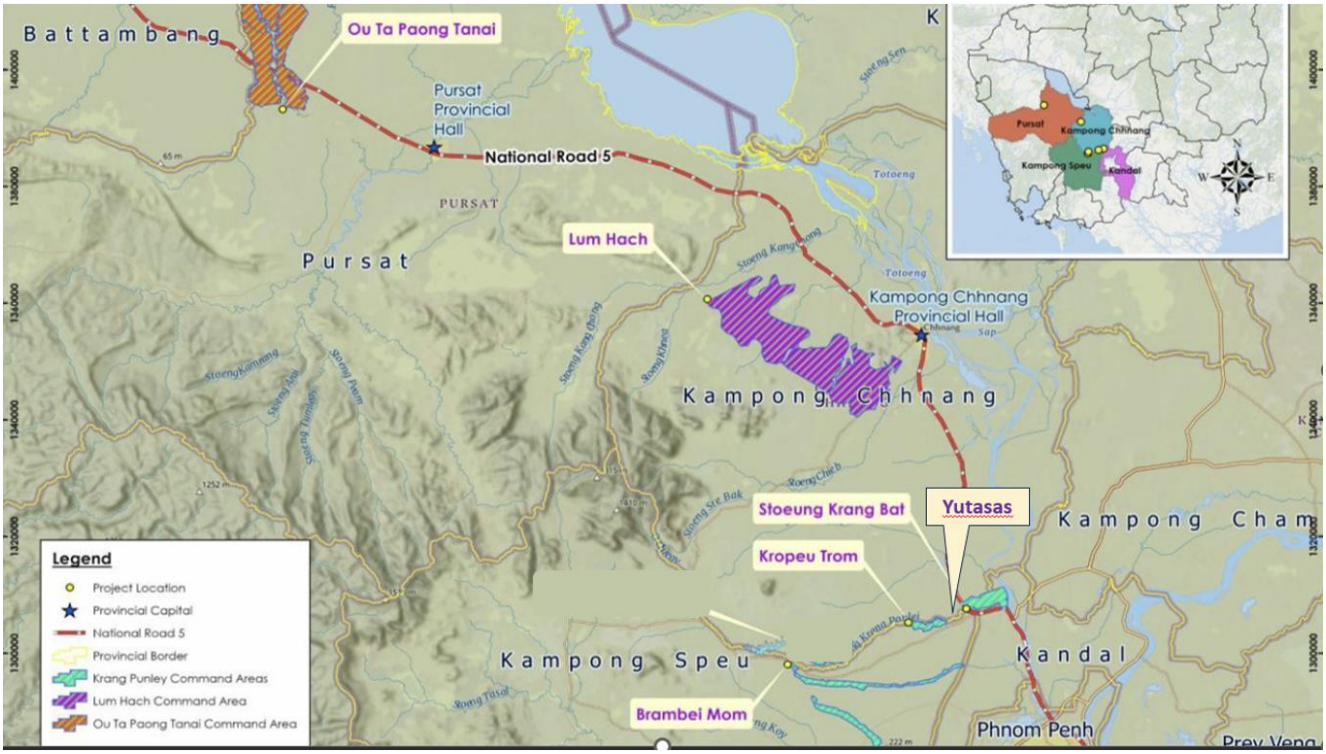
The paradigm shifting aspects of the project will include the data driven climate-proofing of irrigation infrastructure and focus on last-mile engagement of vulnerable communities. The TOC shows that IF climate resiliency of irrigated agriculture is enhanced then the agricultural outputs and income of small-scale farmers will increase, as well as the climate resilience of vulnerable households and in particular to women will increase because water and food systems are less vulnerable to increasing temperatures, changing rainfall patterns and the extreme water events, AND low-emission irrigation and sustainable agriculture adaptation practices will contribute to NDC mitigation targets.

The project's goal stated above shall be achieved through the generation of the following three outcomes: (1) Improved resiliency of small holder farmers (2) Resilient water control infrastructure and water service delivery with less crop and asset damage and (3) Reduced GHG emission. These three outcomes are derived from interventions at farm and irrigation system level together with institutional strengthening of relevant stakeholders (MoWRAM, NCDD, MoF, and MAAF) and will contribute towards an irrigated agricultural system that is climate resilient and productive ultimately reducing the climatic vulnerability of poor farmers in the project areas.

1.1.2 Project Development Objective and Project Components

The project objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia in Kampong Speu, Kampong Chhnang, Kandal, and Pursat province (see map below).

Figure 1 – Map showing six irrigation schemes located in four provinces



The project will be implemented through various activities organized through the following three components:

- Component 1. Improving farm-level climate adaptation, resilience, and water use efficiency
- Component 2. Upgrading and climate-proofing water infrastructure for increased resilience
- Component 3. Institutional strengthening

1.2 Objectives and Principles of the Indigenous Peoples Planning Framework

1.2.1 Objectives

This Indigenous Peoples Planning Framework (IPPF) is prepared in case the project is affect any Indigenous Peoples. This framework guides screening, assessment, and planning, including an arrangement of the outline of culturally appropriate and meaningful consultations with Indigenous peoples, conducting social impact assessments (SIA), and preparing the IPP for any specific subproject. This IPPF is prepared in accordance with the requirements of the AIIB's ESS3 on Indigenous Peoples and the IFAD's SECAP Standard 4, and the RGC's policy on development of Indigenous Peoples. Based on the gaps between the AIIB's ESS3, IFAD's SECAP Standard 4, and RGC's policies, measures are proposed to close the gaps through implementation arrangements, procedures, design criteria, etc. to be applied to all subprojects and project components that were confirmed during project preparation and will be identified during project implementation.

The objectives of this IPPF are:

- Ensure the Project is designed and implemented in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, economies and cultures, as defined by the Indigenous Peoples

themselves, so that they a) Receive culturally appropriate social and economic benefits; b) Do not suffer adverse impacts as a result of Projects; and c) Can participate actively in Projects that affect them.

In particular, IPPF aims to subproject's activities:

- Avoid adverse impacts of the project on IP communities. When avoidance is not possible, minimize, mitigate and/or compensate for such impacts.
- Promote sustainable development benefits and opportunities for IP communities in a manner that is accessible, culturally appropriate and inclusive.
- Improve subproject design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the IP communities affected by CAISAR throughout project cycle.
- Recognize, respect and preserve the culture, knowledge, and practices of IP communities, and provide IPs with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.

1.2.2 Principles

To achieve the above mentioned objectives, the following principles will be observed – at subproject level:

a) Early screening to determine IP presence and/or collective attachment to the Project area as well as potential impacts on IPs.

b) Conduct of culturally appropriate, gender-sensitive and technically backed-up social impact assessment where full consideration to IP−generated options as regards benefits and mitigation measures are considered and translated into the IP plans.

c) Undertake meaningful consultations with affected IP communities and concerned organizations to solicit their participation across the subproject cycle to avoid adverse impacts or in cases when avoidance is not possible, to minimize, mitigate, or compensate for such effects by establishing culturally appropriate and gender inclusivecapacity development modalities and grievance mechanisms.

d) Ensure free, prior and informed consent of affected IP communities to project activities that may introduce commercial development of cultural resources and indigenous knowledge, physical displacement from traditional or customary land, and commercialdevelopment of natural resources within customary lands that impact on livelihoods or cultural uses that define the identity and community of IPs. Consent refers to a collective expression by affected IP communities, through individuals and/or their recognized representatives, of broad community support for Project/project activities even if some individuals or groups object.

e) Avoid restricted access to and physical displacement from protected areas and naturalresources but when not possible, ensure that affected IP communities participate in allaspects of the subproject cycle and that their benefits are equitably shared.

f) An IPP will be prepared that is based on the social impact assessment with the assistance of qualified and experienced experts that draw on indigenous knowledge through consultation with affected IP communities. The IPP will include a framework for continued consultation with the affected IP communities during project implementation; specifies measures to ensure that IPs receive culturally

appropriate benefits; identification of measures to avoid, minimize, mitigate, or compensate for any adverse project impacts; culturally appropriate grievance procedures; M&E arrangements, and a budget and time-bound actions for implementing the planned measures.

g) The draft IPP after approval by the AIIB is disclosed including documentation of the consultation process and the results of the social impact assessment in a timely manner and made available in an accessible place and in a form and local languages understandable to affected IPs communities and other stakeholders. The final IPP andits updates will also be disclosed to the affected IP communities and other stakeholders.

h) Prepare an action plan for legal recognition of customary rights to lands and territories or ancestral domains when the project involves (i) activities that are contingent on establishing legally recognized rights to lands and territories that IPs have traditionallyowned or customarily used or occupied, or (ii) involuntary acquisition of such lands.

i) Monitor implementation of the IPP using qualified and experienced experts; adopt a participatory monitoring approach, wherever possible; and assess whether the IPP's objective and desired outcome have been achieved, considering the baseline conditions and the results of IPP monitoring and disclose the monitoring report.

2. LEGAL FRAMEWORK

2.1 Overview

Over 97 percent of Cambodia's population belongs to the Khmer ethnic group, while the remainder comprise a range of ethnic groups, including Chams (predominantly Muslim), ethnic Vietnamese, ethnic Chinese, and indigenous Khmer Loeu (hill-tribes). Amongst the non-ethnic groups, only the hill-tribes are categorized as IPs by the government. There are also isolated villages Cham (Muslim) communities that are non-Khmer ethnic groups, but they are generally well assimilated in Khmer society and not recognized as IPs.

2.2 National Laws and Regulations Related to Indigenous Peoples

Cambodia has a number of laws and policies that protect the rights of local communities, including IPs. Since the IPs have strong ties to the land and natural resources, the Land Law (2001) is the most significant for them because it sets out the basis for their rights to land. Article 25 provides for the collective ownership of land, while Article 26 recognizes the role of traditional authorities, mechanisms and customs in decision-making and exercising ownership rights. The subsequent Policy and Sub-decree for Indigenous Peoples Registration of Collective Land Rights sets the incorporation of the community as a legal entity as a condition for receiving a collective title. National policies applicable to the indigenous peoples include:

Cambodia Constitution (1993). Article 31 stipulates that Khmer citizens are entitled to the same rights, freedom and duties and are equal before the law, regardless of their race, color, sex, language, beliefs, religions, political tendencies, birth of origin, social status, resources, and any position. Article 44 guarantees all persons, individually or collectively, shall have the right to own property. Only natural persons or legal entities of Khmer nationality shall have the right to own land. Legal private ownership shall be protected by law. Expropriation of ownership from any person shall be exercised only in the public interest as provided for by law and shall require fair and just compensation in advance.

Land Law (2001) recognizes the collective land rights of indigenous communities by the State that offer a unique chance for indigenous peoples in Cambodia to exercise their right to self-determined development that include Article 26: Ownership of the lands is granted by the State to indigenous communities as collective ownership, including all the rights and protections enjoyed by private owners. The exercise of collective ownership rights are the responsibility of the traditional authorities and decision-making mechanisms of the indigenous community, according to their customs and subject to laws such as the law on environment protection; Article 28: No authority outside the community may acquire any rights to immovable properties belonging to an indigenous community. Indigenous communities have the right to collective ownership of their lands, which gives them all the rights and protection of ownership as enjoyed by private landowners. The lands of indigenous communities include residential and agricultural land and encompass land actually cultivated and the lands reserved/fallow land for shifting cultivation. Indigenous communities shall continue to manage their community land according to their traditional customs, pending the determination of their legal status. Once they are registered as legal entities, communities can apply for the registration of their collective title (Land Law 2001, Article 23 to 25). Article 43 stipulates the Commune Council's role in protecting and preserving the environment and natural resources. They also have a role in the classifying and setting of boundaries for all forests in their area of jurisdiction, in coordination with the Ministry of Agriculture, Fisheries and Forestry (Forestry Law 2002, Article 10).

Land Concessions 2003 and 2005. A sub-decree on Social Land Concessions (SLC)was established in 2003 to accompany the implementation of the Land Allocation for Social and Economic Development Project (LASED). The SLC aims at providing state private land for purposes of settlement and family farming to private families particularly the poor, disabledsoldiers, and families of deceased soldiers who have no or not enough land.

In late December 2005, the ELC sub-decree was established, defining a mechanism to grant state private land through a specific ELC contract to a concessionaire to use the land for agricultural and agro-industrial production. This refers to the cultivation of food or industrial crops, animal raising and aquaculture and the construction of facilities for the processing of domestic agricultural raw materials (Sub-Decree No.146 on ELC, article 2). For an ELC, which can be granted to private or investment companies, it must have been classified and registered in the Land Register as state private land, complying with the necessary legal procedures (Land Law 2001 Article 17, Sub-Decree No.118 on State Land Management article. 3 & 21, Sub- Decree No. 146 on ELC article. 2).

All responsibilities and authorities in granting ELCs lie with the MAFF. The concession land cannot exceed 10,000 ha and may only be granted when some additional requirements are fulfilled as follows (sub decree No.146 on ELC, article 4 & 5):

a) A land use plan for the land has been adopted by the Provincial or Municipal State Land Management Committee, and the land use is consistent with the plan.

b) Environmental and social impact assessments have been completed with respect to the land use and development plan.

c) There are solutions for resettlement issues in accordance with the existing legal framework and procedures. There shall be no involuntary resettlement and access to private land shall be respected.

d) Public consultations have been conducted with territorial authorities and local residents, relating to economic land concession projects or proposals.

Moreover, the proposal for ELC has to be evaluated against criteria that include the promotion of people's living standards, perpetual environmental protection and natural resource management, avoidance or minimization

of adverse social impacts, creation of increased employment and with linkages and mutual support between SLC and ELC.

Organic Law (2008) recognizes the vulnerability of the indigenous peoples in Cambodia. It mandates that provincial and district councils in rural areas, capital, municipal and khan levels in urban areas formulate development plans that identify the needs of vulnerable groups, including those from the IP communities.

Protected Area Law (2008) defines the framework of management, conservation and development of protected areas. The law aims to ensure effective management and conservation of biodiversity, and sustainable use of natural resources in protected areas. The law recognizes the right of forest-dependent indigenous peoples to live within the protected areas and to use sustainably the natural resources. Under this law, protected areas are divided into four zones, including core zone, conservation zone, sustainable use zone, and community zone. The law has provisions that define how land can be used and managed in each zone.

Forestry Law 2003 authorizes the granting of forest concessions. The sub-decree on the Management of Forest Concessions states that cancelled or revoked forest concessions shall revert to natural forest protected areas and cannot be converted into an Economic Land Concession (ELC) or awarded to other companies.

Law on Education (2007) aims to promote development of human resources of the nation by providing lifetime education to all people to enable their improvements in terms of knowledge, skills, capacities, dignity, good moral behaviors and characteristics. It also encourages people to learn to better understand, love and protect the national identity, cultures and language. Article 11, 15, 16, and 40 of the Forest Law (2002) recognizes and protects the rights of indigenous peoples to access and use certain forest areas, which they traditionally rely on to sustain their way of life and enjoy the benefits of the forest

Sub-Decree No. 83 ANK, BK (2009) on Procedures of Registration of Land of Indigenous Communities. The objective of this Sub-Decree is to provide indigenous communities with legal rights to land tenure, ensure land tenure security, and protect collective ownership by preserving the identity, culture, good custom and tradition of each indigenous community.

Policy on Environmental and Social Safeguards for Sub-National Democratic Development (RGC-NCDD, 2019) states in the strategy No.7 that Indigenous Peoples also are known in Cambodia as 'Khmer Leou' who have their own cultures and customs and make their own living in a way that is significantly different from those of 'Khmer Kroam' who live in small groups. The "Khmer Leou" is considered vulnerable IP groups and receive special care and attention by the government. It is required that development projects implemented at sub-national administration should not negatively impact their lives, and traditions and customs of the "Khmer Leou", particularly with regards to resettlement and land. In terms of application, specifically in land acquisition and resettlement, this policy is applied through the RGC's SOP-LAR (2018) – Land Acquisition and Involuntary Resettlement, which requires the avoidance of land acquisition or minimization of its use where avoidance is not possible.

Manual for Indigenous Communities Identification; Legal Entity Registration; and Communal Land Registration Process *(*OHCHR, MoI, MRD, MLMUPC (2018) *provide detailed guidance on steps and measures that need to be taken for identification of indigenous communities, registration of legal entities, and community land registration process.*

RGC (2018) Land Acquisition and Involuntary Resettlement, Standard Operating Procedures for Externally Financed Projects in Cambodia. In Section E (Impact on Indigenous Peoples), it is stipulated that land acquisition and resettlement that potentially affects indigenous people should be avoided – to the maximum extent possible, through selection of site, alignment, and land demarcation. However, when land acquisition is not avoidable, a separate social impacts assessment will need to be carried out to understand clearly how the indigenous peoples use their land; how they conduct their economic activities; how they organize their social

activities; and how the project would potentially affect the IP's identity, culture, and customary livelihoods. As per the decree, a separate Indigenous Peoples Plan (IPP) must be developed to address social impacts, compensation and resettlement packages, and implementation arrangements. The consultation process should consider customary practices, and in most cases, tribal or customary leaders will be consulted as they make decisions for their people. The Project Preparation Consultants (PPC), along with the Executing Agency/Implementing Agency (EA/IA) and local commune authorities, typically prepare the IPP. This is separate from the preparation of the BRP and DRP, although the latter will include a compensation package for the displaced indigenous peoples.

Registration of Lands of Indigenous Communities 2009. Sub-decrees on tenurial security have been issued by the GKC to put in place procedures whereby IPs can process claims to their rightful lands (provided they are the majority population at commune level). Recognition and certification of lands among IPs are ongoing with the issuance of the 2009 Sub-Decree on Procedures of Registration of Lands of Indigenous Communities.

National Policy on the Development of Indigenous Peoples (NPDIP). The Council of Ministers approved the NPDIP on 24 April 2009, serving as a guiding document for the implementation of government policies related to Indigenous Peoples across various sectors such as culture, education, health, land, agriculture, infrastructure, justice, tourism, industry, and energy. The NPDIP recognizes the necessity of specific policies for indigenous communities and establishes principles for their formal registration as legal entities with their own bylaws. Additionally, the NPDIP supports the participation of indigenous communities in economic development that affects their lives and cultures, ensuring their full entitlement to express their opinions and make decisions on the development of the economy, society and their cultures towards societal growth. The NPDIP promotes the use of local languages in multilingual primary education, media, and public consultation. It also lists ten brief sector strategies dedicated to culture, education and vocational training, health, environment, land, agriculture, water resources, infrastructure, justice, industry and mines and energy. The NPDIP calls for conducting impact assessments for all infrastructure projects: "Development projects in the living areas of indigenous peoples can function only if there has been an environmental and social impact assessment and publicity to relevant indigenous peoples' communities in advance in order for those people to have an opportunity to provide input about their need." The NPDIP recognizes the rights of indigenous peoples in traditional lands, culture and traditions. This is consistent with the national Land Law (2001).

Policy on Registration and Right to Use of Land of Indigenous Communities: The Council of Ministers approved on April 24, 2009. The Prime Minister signed a Sub-Decree on procedures of registration of Land of indigenous communities on June 9, 2009. This policy was developed on basis of the Land Law (2001), which recognizes the right of the indigenous communities to possess and use land under their collective ownership. The policy states that the registration of indigenous communities' land, as collective ownership, is different from the registration of individually owned land parcel. This is because land registration of the indigenous communities entails the registration of all land parcels that the communities own and use. The policy consists of both State Public Land and State Private Land in accordance with articles 25, 26, and 229 of the Land Law (2001) and related Sub-decrees. These land parcels vary in size and can be located within the same or different communes/ sangkat. Therefore, the registration of land parcels of indigenous communities requires a separate Sub-decree that supplements the existing procedures for sporadic and systematic land registration.

Other Policy Considerations. Apart from its Constitution and other national laws, Cambodia has adopted and supports the UN Declaration of Rights of Indigenous Peoples (IP)by way of ending discrimination and promoting the rights of Cambodia's recognized IPs.

2.3 AIIB's ESS3 on Indigenous Peoples

The AIIB Environmental and Social Framework (ESF) sets out the requirements for all Bank supported operations to comply with the Bank policies addressing environmental and social impacts, among other policies[4]. The ESF includes three mandatory Environmental and Social Standards (ESSs) that detail the requirements applicable to Bank clients on, respectively: Environment and Social Assessment and Management (ESS 1), Land Acquisition and Involuntary Resettlement (ESS 2) and Indigenous Peoples (ESS 3).

Objective. The objective of the ESS 3 is to enable the design and implementation of Projects in a way that fosters full respect for IPs identity, dignity, human rights, economies and cultures, as defined by the IPs themselves, so that: (a) they receive culturally appropriate social and economic benefits; (b) they do not suffer adverse impacts as a result of Projects; and (c) can participate actively in Projects that affect them.

[4] https://www.aiib.org/en/policies-strategies/_download/environment-framework/AIIB-Revised-Environmental-and-Social-Framework-ESF-May-2021-final.pdf

Scope and application.

The ESS 3 applies if IPs are present in, or have a collective attachment to, the proposed area of a subproject, and are likely to be affected by the subproject. The term IP is used in a generic sense to refer to a distinct social and cultural group possessing the following characteristics in varying degrees: (a) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; (b) collective attachment to geographically distinct habitats, ancestral territories or areas of seasonal use or occupation in the subproject area and to the natural resources in this area; (c) customary cultural, economic, social or political institutions that are distinct or separate from those of the dominant society or culture; and (d) a distinct language or dialect, often different from the official language or languages of the country in which they reside. 4 In considering these characteristics, national legislation, customary law and any international conventions to which the member in whose territory the subproject is located is a party may be considered. A group that has lost collective attachment to geographically distinct habitats or ancestral territories in the Project area because of forced severance remains eligible for coverage as an IP under ESS 3.

Indigenous Peoples Planning Framework: An Indigenous Peoples Planning Framework (IPPF) is prepared when a Project is likely to involve IPs and consist of a program or series of activities whose details had not yet been identified at the time the Project was approved by the Bank. In the case of this Project, and under exceptional circumstances, the AIIB determined that the environmental and social assessment of the identified Project activities could be conducted using a phased approach as defined under Section E, Special Circumstances of the IPP of the ESS 3, during the development of the activities in conformity with the IPPF that is approved by the Bank.

Indigenous Peoples Plan. Generally, if the subproject process determines that IPs are present in, or have collective attachment to, a subproject area, and furthermore are likely to be affected by the subproject, the Project is required to prepare an Indigenous Peoples Plan (IPP). The IPP should draw on indigenous knowledge and participation by any affected IP communities and take into consideration differentiated impacts of the Project with respect to gender and different generations. The IPP includes (a) a framework for continued consultation with those affected IPs during the subproject implementation; (b) measures to provide these IPs with gender sensitive and culturally appropriate benefits; (c) measures to avoid, minimize. Mitigate, offset or compensate for any adverse subproject impacts, and actions to address these impacts on the different groups in the community; (d) culturally appropriate grievance procedures, monitoring and evaluation arrangements; and (e) a budget and time-bound actions for implementing the planned measures.

In the event where project activities: (a) have impacts on land and natural resources subject to traditional ownership or under customary occupation or use; (b) cause relocation of IP and/or EM from land and/or limitations on access to natural resources subject to traditional ownership or under customary occupation or use; or (c) have significant impacts on Indigenous Peoples' cultural resources, the project needs to engaged the affected IP communities in a Free, Prior and Informed Consultation (FPICon) and thereafter obtain the broad support of the affected IP/EM communities for project activities that affect them.

For CAISAR, based on the current assessment, it is anticipated that the project would not affect any land and/or natural resources that are traditionally owned or under customary occupation or use by IP and/or EM, nor their cultural resources. Therefore, FPICon is not likely triggered under the Project albeit the applicability of FPICon will be determined based on the SIA to be carried for relevant subprojects.

2.4 Gaps between National Policies & Donor's Environmental and Social Policies

Despite the fact that Cambodia has a policy that recognizes the rights of IPs to culture, education, justice, health, environment, land, agriculture, water resources and infrastructure among others, there are no decrees, sub-decrees or procedures for specific safeguards to protect the interest of IPs, other than those related to land or forestry. The Cambodia Land Law does recognize the right of indigenous communities in Cambodia to own immovable property - their land - with collective title. However, in practice, the procedure to register collective title can be very time consuming and only a few indigenous communities have received collective title since the Land Law was enacted in 2001. Similarly, the Forest Law also guarantees and recognizes the right of IPs to continue the use and access to certain forest areas that they traditionally use and practice.

Overall, there is an acceptable level of consistency between the government system, the AIIB'ESS and the IFAD standards on IPs. The self-identification process of indigenous communities defined in the national policy is broadly consistent with international good practice. The national framework does not exclude communities who have become more mainstream, and indigenous communities may apply for legal status regardless of whether or not they still use their own language or practice traditional agriculture.

However, while there are some complementary links between Cambodian laws and regulations related to IPs and the ESS 3, there are no sufficiently detailed regulations or operating procedures to facilitate full implementation of the IPPs. Therefore, this IPPF has been prepared on the basis of the ESS 3 of AIIB and Standard 4 of IFAD (Indigenous Peoples), considering relevant Cambodian policies and regulations. The IPPF also outlines the Grievance Redress Mechanism (GRM), based on the GRM that is used for the Project, which will need to be further refined in consultation with IPs, if any are found to be residing at any subproject sites.

Items for Clarification	RGC's Policies	AIIB's ESS3	IFAD's SECAP Standard 7	Clarifications
Definition of IPs	Have list of IPs that are officially recognized as IPs	• Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others; and • Collective attachment[5] to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas; and • Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture, and • A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.	• Priority in time, with respect to occupation and use of a specific territory; • The voluntary perpetuation of cultural distinctiveness, which may include aspects of language, social organization, religion and spiritual values, modes of production, laws and institutions; • Self-identification, as well as recognition by other groups, or by state authorities, as a distinct collectivity; and • An experience of subjugation, marginalization, dispossession, exclusion or discrimination.	Screening of IP will be conducted based on all ethnic groups to identified in the subproject's area of influence. Screening of IP will be based on the definitions of IP in AIIB's ESS 3 and IFAD's ESS4.
FPIC	No requirements about FPIC	***Environmental and Social Standard 3*** Conduct meaningful consultation (based on **Free, Prior, Informed Consultation** – FPICon) to obtain broad support from affected IP community when project activities: • Have impacts on land and natural resources subject to traditional ownership or under customary occupation or use; • Cause relocation of Indigenous Peoples from land and natural resources subject to traditional ownership or under customary occupation or use;	***SECAP standard 4*** Conduct meaningful consultations to obtain **Free, Prior, Informed Consent** from affected IPs when project activities: • Have an impact on the land access and use rights of rural communities; and • Target indigenous peoples or rural areas that are home to indigenous peoples. Engagement with indigenous peoples will be undertaken in good faith, in a culturally appropriate manner and with full regard to these peoples'	

[5] Collective attachment means that for generations there has been a physical presence in and economic ties to land and territories traditionally owned, or customarily used or occupied, by the group concerned, including areas that hold special significance for it, such as sacred sites.

Items for Clarification	RGC's Policies	AIIB's ESS3	IFAD's SECAP Standard 7	Clarifications
		• have significant impacts on Indigenous Peoples' cultural resources. Apply Free, Prior and Informed Consent if the laws of the Member in whose territory the Project is located mandate free, prior and informed consent (FPIC) if AIIB has determined that the requirements of such FPIC are consistent with those of FPICon.	institutions, governance systems, customs and methods of decision-making.	

3. RISKS, IMPACTS AND MITIGATION MEASURES

3.1 Overview of Indigenous Peoples

3.1.1 Overview of IPs in Cambodia

There are 22 indigenous groups that are recognized by the RGC in Cambodia. The total population of these 22 indigenous groups is 171,193 people. Most of the indigenous people (92.4%, 2013) live in the northern and eastern parts of country, particularly in provinces of Ratanakiri, Mondulkiri, Kratie, Stung Treng, Kampong Thom, and Preah Vihear provinces. Of 22 indigenous groups, 6 groups are considered major groups as they have more than 10,000 people each. These 6 groups account for 88% of the total ethnic population of the country, including Tampuan, Pnong, Kreung, Kuy, Jarai, and Prev[6].

The indigenous families are larger than the average family size of the Cambodian population, with an average of 5.3 members per family in 2008 and 4.9 in 2013. Female-headed household accounted for 14% in 2008 and 22% in 2013.

Education. Among the indigenous population aged 15 and over, almost 66% did not attend a school or complete any educational degrees. In comparison, 24.1% attended only primary school (in total, 90% had little or no education). About 10% have at least completed lower secondary education, of which 4% have joined upper secondary education, and less than 1% have received a high school diploma. However, the data show that younger indigenous peoples have a better education rate than the older indigenous peoples, and men are more educated than women.

Employment and Economic Situation. The employment rate is 87.7% among men and 85.5% among women. According to different indigenous groups, the larger indigenous groups tend to have higher labor force participation rates, such as Tampuan, Pnong, Kreung, Preu, Kuy, Kraol, and Kavet. However, the majority of indigenous peoples work without pay (57.3%) and are self-employed (38%), with more men being self-employed (58.9%) and the majority of women working without pay (78.4%). In terms of the economic sectors, the vast majority of indigenous peoples aged 15 and over are employed in agriculture (93.3% of the population, 90.6% of men, and 95.9% of women), a few in the industry sector (total 1.6%, men 1.8%, and women 1.4%), and in the services sector (total 5.1%, men 7.6%, and women 2.8%).

Health and Hygiene. There is no data on indigenous peoples' health problems other than the data on disability from the censuses and intercensal population surveys, and the data on disability, maternal health, access to health and childcare services from Cambodian Socio-Economic Surveys containing only the information about local ethnic minority groups in Cambodia. According to the 2015 Cambodia Socio-Economic Survey, 14% of local ethnic minorities were sick in 30 days before the survey, with children and the elderly being sick the most and the working-age population being sick the least. In addition, boys and older men were twice as likely to be ill as girls and older women, and adult women were 2.7 times as likely to be sick as adult men. The fact that boys were more likely to be sick than girls can be explained by the fact that boys tend to accompany their parents to work in agriculture or collect nontimber forest products. The most common diseases are malaria, respiratory diseases, typhoid fever, and tuberculosis. The health services visited include pharmacies, public hospitals, and private clinics.

Housing and ownership. In 2013, more than 95% of indigenous families had their own houses (96.3% in 2013). The majority of indigenous households used kerosene lamps and batteries as the main source of light. In contrast, 20.6% of households used electricity or their own generators as the main light source in 2013. For the primary fuel type for cooking, most indigenous households used firewood (95% in 2013). For household items

[6] Report on the Demographic and Socio-economic Situation of Indigenous Peoples in Cambodia (2021).

for information and communication, almost a third of indigenous households have television, 110% have mobile phones, and less than 1% have internet. For traveling, 76.1% of indigenous households had motorbikes, 2.2% had cars, 9.1% had tractors, 7.8% had boats, and 37.4% had bicycles (2013).

3.1.2 Overview of IPs in the Project Area

IPs were found in the four project provinces including Pursat, Kampong Chhnang, Kampong Speu, and Kandal. (See Table 2 below).

Table 1 – Distribution of Indigenous People Groups in Project Provinces

No.	Province	Indigenous Groups (>= 1000 people)	Indigenous Groups (>= 100 people)	Indigenous Groups (<100 people)
1	Pursat		Jarai, Poar	Kavet, Kleung, Kuoy, Kreung, Stieng, Ja'ong, Kroul, S'och, Kajrouk
2	Kampong Chhnang		Jarai	Kavet, Kleung, Kuoy, Kreung, Lun, Tampuon, Stieng, Ja'ong, Kroul, Rodae, S'och, Kajrouk
3	Kampong Speu		Jarai, Souy	Kavet, Kleung, Kuoy, Kreung, Lun, Stieng, Ja'ong, Kroul, Mel, Kajrouk
4	Kandal		Jarai, Kleung, Stieng, Ja'ong	Kavet, Kuoy, Lun, Bunong, Praov, Tampoun, Kroul, Rodae, L'moon, Souy, Kajrouk, Mon

Source. *Ministry of Planning and Ministry of Rural Development (2021) Report on Demographic and Socio-economic Situation of Indigenous Peoples in Cambodia.*

3.2 Project's Environmental and Social Risk and Impacts

The project will bring about an overall positive impact to local farmers. In subproject where IP peoples have farmland in the command area, these IPs will benefit from improved irrigation, water supply, government's agricultural extension services, and services from local farmers' cooperatives. As IPs participate in project activities, particularly agricultural extension services, they can grow more crops, participate in value chain, increase income, and eventually improve their livelihoods. Reliable water access and promising farming opportunities thanks to improved irrigation and extension services also keep the poor, including the poor IPs, from migrating to other areas in search for income generation opportunities. Adverse impacts on IPs are foreseen. However, these impacts are mostly local, small-scaled, such as minor land acquisition in some subproject to allow construction of irrigation canal. Land impacts would be very small at household level (e.g. loss of strip of land) which would not affect the livelihoods of the IP remarkably.

During subproject construction and operation, there are a number of environmental and social risks that may apply to local people, including IP peoples who may happen to be present in a subproject area. Environmental and social risks and impacts that have been identified during project preparation have been discussed in consultation meetings with a) IP peoples who are present in subproject area, and b) other project stakeholders at commune, district, provincial and central level. These consultations aim to ensure potentially affected people, and relevant project stakeholders, are aware of such risks and stay engaged during subproject preparation and implementation for risk prevention and mitigation (Please see full list of social and environmental risks in the project's ESCMF (Section E&S Risks and Impacts) that may apply to any ethnic minorities who are present in subproject area. See also SEP, particularly section (Proposed Strategy for Consultation with Vulnerable/Disadvantaged Groups) for guidance on conducting consultation with IPs when IPs are present in the subproject area.

3.3 Mitigation Measures

Although above risks and impacts will be validated, and assessed at further length when subproject locations become known, IP(s) in a subproject's area may be affected disproportionately compared to the mainstream group. The distinctive cultural and socioeconomic characteristics of the IPs, including their existing livelihoods, etc. may expose IPs to further risks and impacts, increase their vulnerability and compromise their ability to respond to such risks and impacts – if a holistic approach is not in place. Effective communication, such as IEC, and active participation of involved IPs, are among important factors that contribute to effective engagement of IPs for meaningful consultation during subproject preparation and participatory monitoring during subproject implementation. The coordination of project stakeholders, including PMU, Contractors, local authorities, local agencies, local service providers, and most notably the active and full participation of IPs, collectively contribute to minimizing identified risks and potential impacts at identified subprojects.

Detailed mitigation measures for the above risks and potential impacts are proposed in the project's ESCMF. These mitigation measures are specific for design stage, pre-construction stage, construction stage, and operation stage,

During subproject design and pre-construction stage:

To avoid, minimize potential impacts related to land acquisition:

- Effort will be made by PMU to ensure irrigation and road design avoid acquisition of land from IPs;
- In case where avoidance is not feasible (because of technical requirements), minimize the need for land acquisition through alternative designs;
- Compensate affected IP in accordance with RPF, if avoidance is not possible.
- Provide additional financial and developmental support, as needed, based on meaningful consultation, to support affected IPs to fully and timely restore their livelihoods and income to the pre-project level, as a minimum.

During pre-construction stage:

To address identified risks for affected IPs at subproject level, PMU will implement the following:

- Prepare site-specific ESCMP
- Screen for presence of IP(s) in subproject area, based on detailed design
- Conduct Social Assessment (based on site-specific ESCMP)
- Develop IPPs, incorporating results from SA, including mitigation measures, etc. based on meaningful consultations
- Implement IPP (as part of site-specific ESCMP)
- As part of IPP, conduct Behavior Change Communication using audio-visual and local IP language to provide knowledge, raise awareness, change attitude, and promote behavior change among IP and local stakeholders to respond effectively to identified risks, particularly risks related to SEA/SH/VAC, communicable disease, traffic safety, culture related conflicts, etc.
- Where necessary, engage service provider (e.g. SEA/SH service providers) (for subproject being risk "high" or "substantial" on SEA/SH risk (risk is assessed as part of preparation of site specific ESCMP).

During construction stage:

- Implement the following as an integrated approach:
  i. PMU to implement site-specific ESCMP
  ii. PMU to continue implementing IPP – as part of site specific ESCMP (in close collaboration with IPs and local partners)
  iii. Contractor to implement C-ESCMP (including IEC campaign)
  iv. PMU to allow budget fully and timely (based on budget plan in IPP, Contractors' bill-of-quantity)
  v. PMU will enhance monitoring process to ensure risks are minimized. This can be achieved through coordinated works of SEO-PMU, DDIS consultant, E&S consultant, and independent E&S monitoring consultant, and participatory consultation of local IPs.

During operation stage:

- Ensure safety measures are in place (e.g. signpost, warnings, safe crossing, etc.)
- Continue IEC campaign, where need, to raise awareness of IPs on safe driving before new road is open to traffic
- PMU to maintain GRM's focal point (particularly during liability stage of contractors following construction completion)
- Ensure routine maintenance is carried out to ensure the road functions as designed

4. PREPARATION OF INDIGENOUS PEOPLES PLAN

When Indigenous Peoples and/or Ethnic Minority groups are present in a subproject area, PMU needs to prepare an IPP for the respective subproject. It is noted the IPP shall be prepared whether the identified IPs/EMs are affected positively (as subproject beneficiaries), or adversely, or both. To prepare an IPP for a subproject, a social assessment will be conducted for that subproject to inform the content development for the IPP and guide the IPP implementation. To ensure the social assessment focuses, social assessment shall be conducted vis-à-vis investment activities that are proposed under the mentioned subproject.

The following three steps shall be followed to prepare an IPP: 1) Screen for Indigenous Peoples/ Ethnic Minorities, 2) Conduct social assessment to develop IPP, and 3) Write-up the IPP:

4.1 Screening for Indigenous Peoples/ Ethnic Minorities (IP/EM)

Once the six subprojects (Ou Ta Pong, Lum Hach, Brambei Mom, Krapeau Trom, Yotassas, and Steung Krang Bat are approved, PMU's Consultant will conduct IP screening for these seven subprojects. The IP Screening involves two key tasks: 1) Define subproject area (based on subproject's area of influence), and 2) Screen for IP/EMs in the subproject area (See Annex 2 for more guidance). If the IP screening indicates that IP and/or EMs are present in the subproject area, an IPP has to be prepared.

4.2 Preparing an IPP

Preparation of an IPP involve two key steps: 1) conducting a Social Assessment and 2) writing up the IPP.

Step 1. Conduct a Social Assessment (SA)

The purpose of the social assessment is to identify and examine the potential impacts of the approved subproject on the livelihoods of the IP/EMs. In particular, the SA explores how the environmental and social risks and impacts associated with the proposed subproject activities affect the IP/EM. Based on this understanding, measures will be proposed to avoid, or mitigate the adverse impacts and risks and meanwhile enhancing the intended positive impacts of the subproject. The social assessment shall be conducted in a manner that is inclusive, culturally appropriate and gender sensitive. The depth and breadth of the SA should be based on the scope, scale and nature of the subproject impacts and risks. These are determined based on:

a) The magnitude of subproject's impacts on the affected IP/EM, including: (i) customary rights of use and access to land and natural resources; (ii) socioeconomic status; (iii) cultural and communal integrity and heritage; (iv) health, education, livelihood systems and social security status; and (v) indigenous knowledge; and
b) The vulnerability of the affected IP/EM.

The social assessment needs to have the following key elements:

a) Description of the subproject, including a map of the subproject area;
b) Policy, legal and administrative framework, including the international and national legal framework applicable to the subproject;
c) Scoping, including stakeholder identification and consultation plan;
d) Baseline environmental and social data;
e) Evaluation of environmental and social risks and impacts;
f) Development of mitigation, monitoring and management measures and actions.

Step 2. Write-up an IPP

Based on the information generated from the above social assessment, PMU's consultant will write up the IPP. An IPP shall include the key following elements, as a minimum.

a) A framework for continued consultation with these affected Indigenous Peoples during Project implementation;
b) Measures to provide these Indigenous Peoples with gender sensitive and culturally appropriate benefits;
c) Measures to avoid, minimize, mitigate, offset or compensate for any adverse Project impacts, and actions to address these impacts on the different groups in the community;
d) Culturally appropriate grievance procedures, monitoring and evaluation arrangements; and
e) A budget and time-bound actions for implementing the planned measures.

It is recommended that the IPP should be developed as an overall community development plan to address specific issues associated with the needs of the affected IP/EM. The IPP needs to address not only any adverse impacts and risks, but also enhance the intended positive impact of the subprojects through a continuous IP/EM engagement process during sub-sheme design, implementation, monitoring. This aims to promote the ownership of affected IP/EM and enhance subproject's development effectiveness.

4.3 Approving an IPP

PMU will submit all IPPs to the AIIB for review and clearance prior to IPP implementation.

4.4 Disclosing an IPP

All IPPs, once cleared by AIIB, will be disclosed locally in both English and Khmer at subproject area and will be posted on the websites of MoWRAM and MAFF. The same version will also be disclosed on AIIB's and IFAD's website.

4.5 Implementing an IPP

The IPP should be implemented in coordination with the local authorities and affected IP. The activities and the outcomes of the IPPs implementation should be monitored and evaluated (See also Section 7.3). MoWRAM and MAFF will ensure sufficient financial and human resources available timely prior to embarking IPP implementation.

5. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

5.1 Purpose of Engaging IP during project preparation and implementation

The AIIB's ESF defines stakeholder engagement as a process of identifying relevant stakeholders, conducting stakeholder analysis, and organizing a series of consultations to meet with project stakeholders for collecting stakeholders' feedback and concerns on project's risks and impacts, as well as stakeholders' development needs in relation to project purposes and activities. This aims to ensure the project's adverse impacts on IPs can be avoided, or minimized and mitigated if avoidance is not possible. For this project, it is important that IPs need to be consulted on their development needs (in relation to project purposes) to ensure they can receive socioeconomic benefits that are appropriate to them culturally.

5.2 Consultation results during Project Preparation

Consultation on project design and related IP issues was conducted in XXX 2023 at national level (as listed below), and with IPs potentially affected at subprojects during 25-30 June 2023 (on proposed project), and XXX September 2023 (based on initial design). (See summary of consultation results at Annex 1).

5.3 Consultation with IPs during Project Implementation

5.3.1 Overview of consultation process

During project implementation, consultations with IPs will be carried out for subprojects where IP screening has confirmed that IPs, as per AIIB ESS3 and IFAD's SECAP Standard 4, are present in the subproject areas. The consultations with identified IPs will be carried out on an iterative basis throughout subproject cycle, to ensure affected IP are informed of the risks and impacts identified for the subproject, and provide meaningful feedback. To ensure relevant IP stakeholders are engaged in project consultations, MoWRAM will identify IP group(s) present in subprojects, then conduct consultations with them – as per Section 4.2. The consultations with identified IP groups will be conducted in a culturally appropriate manner that takes into consideration gender sensitivity and intergenerational perspectives.

The consultations will seek also feedback from IPs on subproject's risks and impacts, suggestions to avoid or mitigate such risks and impacts, and developmental needs of the IP in relation to the project goal and subproject activities. To promote effective project design and build project support and ownership of local IPs, while reducing risk of potential delays during subproject implementation, MoWRAM will apply the engagement strategy. The engagement process will include analysis of IPs as project stakeholders, engagement planning, disclosure of information, and conducting meaningful consultations with the affected IP(s). The consultations will be based on the existing customary institutions and decision-making processes of the consulted IPs to

promote IP's participation and support for the subprojects. In particular, the consultations to be conducted by MoWRAM at subproject level will:

a) Involve the participation of IPs' representative bodies and organizations, such as councils of elders or village councils, or chieftains. Where appropriate, consultations shall be carried out with other members of the IP communities;

b) Allow for IPs to participate effectively in the design of project activities or mitigation measures that could potentially affect them – either positively or negatively;

c) Provide IPs sufficient time to confirm the broad support from the affected IP for proposed project activities, and associated risks and impacts.

Stage	Stakeholders	Activities	Outcomes
1. Subproject identification	▪ MoWRAM and MAFF ▪ Implementing agency at provincial and district level (e.g. PDWRAM, PDAFF) ▪ Commune and village authorities ▪ Target beneficiary households, including poor, vulnerable, and disadvantaged groups	▪ Government and agency meetings to explain need for safeguards, agree on selection criteria. ▪ Scoping – visiting potential sites, physical inspection. ▪ Meetings and briefings with provincial and district agencies. ▪ Meetings with commune and village authorities. ▪ Meetings with target beneficiaries.	▪ Agreement on objectives, priorities. ▪ Indicative development priorities for community. ▪ Identification of problems and issues. ▪ Basic design needs. ▪ Records of community participation disaggregated by sex and ethnicity.
2. Subproject preparation	▪ MoWRAM and MAFF ▪ Implementing agency at provincial and district level (e.g. PDWRAM, PDAFF) ▪ Commune and village authorities ▪ Target beneficiary households, including poor, vulnerable, and disadvantaged groups	▪ data requirements, participatory methods, consultation process and need for indigenous people /ethnic minority	▪ Data for preparation of socioeconomic profiles. ▪ Needs and constraints identified. ▪ Special considerations identified.

	▪ Commune and village authorities ▪ Target beneficiary households ▪ Members of vulnerable or minority groups ▪ Project technical assistance	▪ Open village meeting to explain purpose and process of consultations. ▪ Field level data collection – socio- economic data and surveys.	▪ Identification of gender issues, women's needs, and priorities. ▪ Identification of specific needs for tailoring innovative behavior change campaign
		▪ Household level and focus group discussions for identifying needs ▪ IP/ Ethnic minority households and separate focal discussion groups by gender. ▪ Discuss proposed project design. ▪ Obtain feedback, determine level and scope of support. ▪ Update briefings for provincial and district agencies.	▪ Identification of indigenous peoples/ethnic minority households that will be qualified/covered under the IP/EM ▪ Identification of needs for Information, Education and Communication material to be prepared in IP/EM language. ▪ Records of community participation and consultation results.
3. Subproject completion and evaluation	▪ MoWRAM and MAFF ▪ Implementing agency at provincial and district level (e.g. PDWRAM, PDAFF) ▪ Commune and village authorities ▪ Target beneficiary households, including poor, vulnerable, and disadvantaged groups	▪ Meetings with commune and village officials to discuss benefits and issues. ▪ Focus group discussions to review/evaluate benefits received, implementation issues, and improvements needed. ▪ Separate focal group discussion (by gender) where needed.	▪ Feedback on implementation progress, issues, and constraints. ▪ Suggestions for future improvements ▪ Records of community participation and consultation results

5.3.2 Free, Prior and Informed Consultation/Consent

The project will be designed to avoid any project activities that may

(a) have impacts on land and natural resources subject to traditional ownership or under customary occupation or use;
(b) cause relocation of Indigenous Peoples from land and/or limitations on access to natural resources subject to traditional ownership or under customary occupation or use; or
(c) have significant impacts on Indigenous Peoples' cultural resources.

The SIA process will determine the applicability of FPIC but on top of it, the project will ensure engaged the affected IP/EM in a meaningful consultation process by adopting the Informed Consultation and Participation (ICP) approach to ensure affected IP/EM are engaged in the informed consultation process and participating in project's consultation sessions. The consultation process adopted will be inclusive and iterative and promote in-depth exchange of views and information. PMU will ensure the views of the affected IP/EM concerning matters that affect IP/EM directly are considered and incorporated into subproject's design and implementation, particularly into proposed mitigation measures, sharing of development benefits and opportunities, and implementation issues.

The consultation process will also aim to capture both men's and women's views that are obtained from separate engagements/meetings, and will reflect men's and women's different concerns and priorities about subproject's risks and impacts, mitigation mechanisms, and benefits, in subproject implementation process. PMU will document the consultation process, particularly measures that PMU will take to avoid or minimize risks to and adverse impacts on affected IP/EM, and inform affected people of how their concerns have been considered and taken into action.

5.4 Information Disclosure

Prior to conducting consultations, MoWRAM will notify the concerned IPs of the consultation plan during preparation. MoWRAM will provide affected IPs with initial subproject information in the form of booklet in both Khmer and local language (if applicable). This initial information should be provided to IP at least two weeks prior to consultation. If the concerned IPs do not have a written language, the IP will be provided the information in Khmer and are explained verbally in the local language of the concerned IP to ensure the IP are fully informed of the consultation purpose and initial subproject information.

For public consultation, the draft IPPF (in English) and its Executive Summary (in Khmer) will be disclosed on MoWRAM's website on XXX (https://www.). The Executive Summary (in Khmer) will also be disclosed in hard copy at MoWRAM's public library in Phnom Penh, and in the offices of Provincial Departments of Water Resources and Meteorology in all four project provinces. Once finalized, the IPPF will be re-disclosed again through the above channels prior to AIIB's and IFAD's project appraisal. The draft and final IPPF will be disclosed in English on the AIIB's and IFAD's website.

During project implementation, all draft IPPs, once completed by MoWRAM and submitted to the Bank for review, shall be disclosed to affected IP communities in Khmer language. The summary of the IPP (in the form of an Information Booklet) will be translated into IP's language if the consulted IPs have their own written language. Public meetings will be hold with the affected IP(s) to explain the contents of the relevant IPP in their mother language to ensure affected IPs understand what and how the activities under the IPP will be carried out, including E&S risks and impacts of subproject activities, and how the IPs will be engaged by MoWRAM in consultation meetings during subproject preparation, and in monitoring during subproject implementation to minimize identified E&S risks and impacts. IPPs – prepared for relevant subprojects, will be disclosed locally in Khmer and local IP language (if applicable), as well as in Khmer and English language on MoWRAM's website. The English version of the IPPs will be disclosed on the AIIB's and IFAD's website.

6. GRIEVANCE REDRESS MECHANISM

6.1 Purpose of Project's GRM

The purpose of the GRM in this IPPF is to provide aggrieved IP with grievance redress procedures that are accessible, easily used, and free of charge to ensure that the grievances submitted by the affected IPs are solved timely. The GRM in this IPPF guides how a complaint of affected IP can be lodged, including forms of grievance lodging, channels, and steps that can be taken.

The GRM also describes the time-limits, where possible, for each step, such as time-limit for acknowledging receipt of complaints, notification of resolution decision. During the grievance resolution progress, where necessary, dialogues will be held between the aggrieved IP and project's GRM focal point that are designated for each step. Dialogues with affected IP during complaint resolution process aims to promote mutual understanding and collaboration among concerned parties.

The project also includes an appeal process that a complainant can use when they are dissatisfied with the resolution results/decision, or their complaints are not resolved within a specified timeframe. During subproject implementation, IPs in the subproject area will be reminded of the availability of this GRM and will be explained during consultations about how to use it.

6.2 Grievance Redress Procedures

The following section outlines complaint handling procedures that are designed to assist affected Indigenous Peoples (IPs) in making complaints regarding the project. These procedures are designed to address potential impacts and risks during project preparation and cover three key areas: a) land acquisition, where individual IP land is acquired either permanently or temporarily during construction, b) gender based violence, where IPs are victims, survivors, witnesses, or otherwise affected by SEA/SH actions related to the project, and c) general complaints and concerns related to project design, adverse impacts on IPs such as dust, noise, vibration, and any other aspects that IPs attribute to project activities.

6.2.1 Grievances related to Land Acquisition

The project has prepared a standardized GRM for stakeholders affected by land acquisition, including IPs. However, given the presence of various IP groups in project provinces, the IP groups in each subproject area will be consulted for feedback on the project's standardized GRM, as presented below. The purpose of consultation on the GRM in this IPPF is to ensure that the standardized steps and process below are culturally appropriate to the affected IP group. If required by the consulted IPs, the GRM below will be updated to reflect the customary complaint handling procedures currently practiced by the consulted IP and/or may be preferred by the affected IPs, based on the Social Assessment of IPs once site-specific subprojects are identified or confirmed during project implementation (See detailed Procedures at Section 6.2.2 of project's Resettlement Policy Framework).

6.2.2 Grievances related to Gender Based Violence/SEA/SH

In case the IP wishes to submit a grievance related to gender based violence, they can lodge their grievance using the Redress Procedure for Complaints related to gender (See Section 6.4.3 in the Stakeholder Engagement Plan for details).

6.2.3 Grievances related to any other aspects not covered in the above GRM

If environmental factors, such as elevated levels of dust or increased noise during evening hours, negatively impact the living or business activities of IPs, several channels will be established for their convenience. These channels may include:

- **PMU GRM focal point's telephone;**

- **Local IP leaders;**
- **Contractor's hotline:** to report cases that they think contractors can timely address them (contact detail of Contractors will be posted at construction sites, and distributed to IPs (through Subproject Information Booklet) during consultations, and posted at public billboards of Commune/Sangkat offices, pagodas; and
- **Commune/Sangkat offices**

7. IMPLEMENTATION ARRANGEMENTS

7.1 Implementation Arrangements

The MoWRAM will be responsible for implementing this IPPF. The Project Director (PD) at MoWRAM will be responsible for providing overall guidance, policy advice, conducting internal coordination, discussing and resolving issues at project level – in association with relevant government agencies where needed. The Project Manager (PM) at MoWRAM will provide day-to-day support to the PD and will be responsible for ensuring that the IPPF will be followed. The PM will oversee the work of the ESOs and ensure proper screening of IP groups will be carried out for each subproject, and steps for IP screening and social assessment described in this IPPF are followed. Within MoWRAM, the ESOs will be responsible for carrying out day-to-day activities set forth in this IPPF. An IP specialist will be appointed within MoWRAM's PMU (in addition to a Resettlement and Environmental Specialist) to provide guidance to Provincial PDWRAM in conducting consultation with affected IP in respective subprojects.

The MoWRAM needs to inform the AIIB and IFAD of the IP screening results and steps that MoWRAM will take in case IPs are present in the subproject area. When IPs are found in the subproject, MoWRAM will engage IP consultants to work closely with PMU's IP Specialist and PDWRAM to conduct Social Assessment and prepare IPPs. PMU's IP specialist and IP consultants will visit the subproject sites and work closely with PDWRAM, local authorities, relevant agencies, NGOs, particularly local IP leaders and IP members, including vulnerable groups of affected IP communities, to conduct Social Assessment.

7.2 Capacity Building

Since the MOWRAM is new to AIIB's ESF and IFAD's SECAP, and have not been familiar with requirements of AIIB's ESS3 and IFAD's SECAP Standard 4, they may not be able to conduct meaningful consultation from initial years of project implementation. In the first year, these specialists will be trained by the AIIB task team on ESF with a particular focus ESSs and IFAD's SECAP with a particular focus Standard that apply to this project to enable newly appointed ES specialists at the MOWRAM to provide appropriate support. Where needed, IP consultant will be engaged to provide additional support to PMUs' specialist, particularly in the initial years of project implementation. Since independent ES monitoring consultant will be engaged by PMU at MoWRAM, feedback from this consultant, alongside internal monitoring results, will provide regular feedback to PMU on how IPPF/IPP is carried out so that adjustment/improvement could be made appropriately and timely.

7.3 Monitoring & Evaluation

The application of the IPPF, including implementation of subproject IPPs, will be monitored internally by the MoWRAM. Adverse impact on IPs (if any) due to land acquisition will be monitored by GDR and MoWRAM as part of implementation arrangement set forth in Section 9.1.2 of project's Resettlement Planning Framework (RPF).

Within MoWRAM, the ESO will be responsible for conducting quarterly monitoring activities of the activities set for under all subproject IPPs. Monitoring of IPPF/IPP implementation will focus on assessing the compliance of IPP implementation vis-à-vis the followings:

- IP screening process and results;
- Information disclosure;
- Quality of Social Assessment and of IPP preparation;
- IPP implementation process, the level of achievement at output, outcome, and purpose levels;

- Functioning of project's GRM (as customized to respective EG/IP groups present in each subproject area to ensure the GRM is culturally appropriate to the local EG/IPs);
- Development activities carried under IPPs (based on development needs of IPs);
- Results and impacts of IPPs (in ensuring the affected IP receive socioeconomic benefits of the project that is culturally appropriate, gender and intergenerational inclusive, and contributing to achieving the objective of the AIIB's ESS3 and IFAD's SECAP Standard 4).

In addition to internal monitoring, the project will encourage IPs in subproject areas to participate in monitoring and evaluation of IPP implementation process and implementation outcome which affects them. During SA exercise, feedback and suggestions from IPs will be solicited as to how they wish to participate in monitoring and evaluation of IPP activities.

MOWRAM will provide a quarterly IPP implementation report to the AIIB and IFAD. These results will be incorporated into MoWRAM's consolidated Environmental and Social Compliance Report (ESCR) (See Annex 4 for Indicative Indicators for Internal Monitoring of IPP implementation).

7.4 Reporting

MoWRAM's ESOs will ensure feedback from affected and interested IP, as well as grievances submitted by affected IPs, are resolved timely and effectively, and that resolution results are reported timely back to the aggrieved IPs. The method of reporting back depends on the stakeholders, and as follows:

- For stakeholders at national level, email and/or official letter will be used to report back to stakeholders following consultations and/or workshops. The content of the report will summarize what comments, suggestions, concerns that have been received, by whom and when, and how such comments, suggestions, concerns were considered.
- For stakeholders at local level, follow-up meetings/consultations will be conducted to informed stakeholders know on how comments, suggestions, concerned were considered.
- For Indigenous Peoples, project's responses to their comments, suggestions, concerns are reported back to them in subsequent face-to-face consultations – in line with the project's SEP and the IPPF, including how the project had considered and addressed their concerns through concrete actions to be carried out during subproject implementation process and through IPP implementation.

Grievances of all project IP will be reported back to them through project's GRM channels within the timeframes specified for each step of the above GRM procedure.

8. COSTS AND BUDGET

8.1 Costs

Indicative costs for IPPF implementation are estimated during project preparation (See Figure below) for the purpose of budget planning. The actual costs of IPP implementation depend on the number of IPPs, including scope and activities to be carried out under each IPP, during project implementation. The estimated cost below may be updated once the list of subprojects is finalized.

8.2 Budget

The budget for implementing IPPs will be allocated from project's financing (See Figure below). Implementation, based on subprojects that will be identified/confirmed during project implementation. This budget plan will be updated to ensure funding is planned annually to ensure timely and effective implementation of proposed activities.

Table 2 – Key activities and costs for supporting IPP implementation (in US Dollars)

No.	Key activities	Stakeholders involved	Estimated costs (per province x 4)	Sub-Total (Counterpart Budget)	Sub-Total (AIIB finance)	Sub-Total (IFAD finance)	Total
1	Recruitments of IP consultants to conduct screening and SA	• MoWRAM (oversight) • ESO (implement)	3,000 x 4	12,000	-		12,000
2	Recruitment of bilingual facilitators to support consultations as part of SA	• MoWRAM • ESO (implement)	1,000 x 4	4,000	-		4,000
3	Conduct Social Assessment and Prepare subproject IPPs	• MoWRAM (oversight) • ESO (lead) • IP Consultant (implement)	5,000 x 4	20,000	-		20,000
4	Conduct mitigation measures, development activities, and relevant activities, as part of IPP (based on the needs of consulted IPs, e.g. trainings for IP on good agriculture practices such as Integrated Pest Management, water saving technology (e.g. alternative wet dry, fertilizer needs assessment/ application, alternative job that is not land based for income generation activities which are culturally appropriate, etc.)	• MoWRAM (lead) • Consultant (implement)	5,000 x 4	20,000	-		20,000
5	Monitoring and Evaluation, Reporting	• MoWRAM (oversight) • ESO (implement)	2,000x4	8,000	-		8,000
6	Staff allowance	• MoWRAM (oversight) • ESO (implement)	$34 x 7 staffs x 10 days x 4 provinces	9,520	-		9,520
7	Transport		1,000 x 4	4,000	-		4,000
8	Data collection		1,000x 4	4,000	-		4,000
9	Others		500 x 60	30,000	-		30,000
10	Contingency (10% of above 9 items)						11,152
					Grand-Total		**122,672**

ANNEXES

Annex 1 – Guidance for Screening for Indigenous Peoples/Ethnic Minorities

Once a subproject is approved, PMU's Consultant will conduct initial screening for the presence of IP/EM in the subproject area. The following steps could be followed:

1) **Define area of influence** (subproject area): subproject area needs to be defined, spatially, based on the subproject area described in the most updated Environmental and Social Impact Assessment/ Environmental and Social Management Plan prepared for the subproject.

2) **Screening.** Screening of IP/EM consist of two key tasks: desktop review and field works.

Desktop screening. Conduct IP/EM screening vis-à-vis above defined subproject. Identification of potential presence of IP/EM could be carried out initially based on the IP database managed by the Ministry of Rural Development and the Ministry of Planning. In addition, commune authorities within the subproject area could be asked to provide the most updated information about IP/EM groups living in their respective communes to facilitate consultant's initial desktop screening. It is noted that Ethnic Minorities refer to all groups by their own ethnicity and IP in the context of Cambodia refers to IP groups that are officially recognized. Screening results need to be updated if there is change to subproject area.

Consultant's screening needs to cover IP groups (that are recognized by the Government), and other ethnic groups based on the definition of IP of AIIB and IFAD (See also Definitions section of this document).

Field visit. After completing desktop review, PMU's consultant will visit the subproject's area of influence to validate their above initial screening results In addition to face-to-face validation with local commune authorities (and district authorities if needed) on initial screening result, the consultant need to conduct field observation in area where identified IP/EM are living, and their production area. Consultant may need to interview IP/EM and their respective leaders living in subproject area, and local people who are knowledgeable about IP/EM such as the village chiefs, opinion leaders, mass organizations such as commune women's union, farmers' association, to understand more about the socioeconomic and cultural life, livelihood activities, cultural heritages of the identified IP/EM in the subproject area. Consultant needs to visit the field again if there is change to subproject area.

While doing desktop screening and making field visit for validation of desktop review, the following guiding questions and IP screening form can be used:

- Are there socio-cultural groups in or use the subproject area who may be considered as hill tribes, ethnic minorities or indigenous communities within the subproject area?
- Are there national or local laws or policies as well as anthropological research or studies that consider these groups residing in or using the subproject area as belonging to ethnic minorities, IPs or cultural communities?
- Do such groups identify themselves as being part of a distinct social or cultural group?
- Do such groups maintain collective attachments to distinct habitats or ancestral territories and/or to the dominant society in these habitats and territories?
- Do such groups maintain cultural, economic, social and political institutions distinct from the dominant society and culture?
- Do such groups speak a distinct language or dialect?
- Have such groups been historically, socially and ecologically marginalized, disempowered, excluded and/or discriminated against?
- Are such groups represented as IPs in any formal decision-making bodies a the National of local levels?

- Do such groups experience subjugation, marginalization, dispossession, exclusion or discrimination?
- How vulnerable the groups are under the subproject's impacts and risks?

If screening result indicates that the ethnic groups being considered matches the definition of IPs as per AIIB's ESS 3 and IFAD's Standard 4 (See definition of IPs at section "Definitions" of this document), the IP screening results should be documented fully in the form of IP Screening Report and recommend that an IPP will be prepared for the relevant subproject.

Province-Capital:	**Municipality-District-Khan:**	**Location map attached**	
		Yes	No
Commune-Sangkat:	**Village:**	**Street-road No.:**	
Type of civil work/activity:			
Brief description of work/activity and location of civil work*: [Roads, community pond. required/purpose of civil work, (table/explain each activity) number of village (number of population) affected with explanation aboutthe affected community]*			

Screening checklist				
Questions	**Yes**	**No**	**Not known**	**Remarks**
A. Indigenous Peoples Identification				
1. Are there socio-cultural groups present in or usethe Project/Subproject area who may be considered as "tribes" (hill tribes, schedules tribes,tribal peoples), "minorities" (ethnic or national minorities), or "indigenous communities" in the Subproject area?				
2. Are there national or local laws or policies as wellas anthropological research/studies that consider these groups present in or using the subproject areas belonging to "ethnic minorities", scheduled tribes, tribal peoples, national minorities, or cultural communities?				
3. Do such groups self-identify as being part of a distinct social and cultural group?				
4. Do such groups maintain collective attachmentsto distinct habitats or ancestral territories and/or tothe natural resources in these habitats and territories?				

5. Do such groups maintain cultural, economic, social, and political institutions distinct from the dominant society and culture?				
6. Do such groups speak a distinct language or dialect?				
7. Has such groups been historically, socially and economically marginalized, disempowered, excluded, and/or discriminated against?				
8. Are such groups represented as "Indigenous Peoples" or as "ethnic minorities" or "scheduled tribes" or "tribal populations" in any formal decision-making bodies at the national or local levels?				

Questions	**Yes**	**No**	**Not known**	**Remarks**
B. Identification of potential impacts *(provide elaboration in Remarks column)*				
9. Will the subproject directly or indirectly benefit or target IPs?				
10. Will the subproject directly or indirectly affect Indigenous Peoples' traditional sociocultural and belief practices? (e.g. childrearing, health, education, arts, and governance)				
11. Will the subproject affect the livelihood systemsof Indigenous Peoples? (e.g., food production system, natural resource management, crafts and trade, employment status)				
12. Will the subproject be in an area (land or territory) occupied, owned, or used by Indigenous Peoples, and/or claimed as ancestral domain?				
C. Identification of Specialist Requirements				
13. Commercial development of the cultural resources and knowledge of IPs?				
14. Physical displacement from traditional or customary lands?				
15. Commercial development of natural resources (such as minerals, hydrocarbons, forests, water, hunting or fishing grounds) within customary lands under use that would impact the livelihoods or the cultural, ceremonial, spiritual uses that define the identity and community of Indigenous Peoples?				
16. Establishing legal recognition of rights to landsand territories that are traditionally owned or customarily used, occupied or claimed by IPs?				
17. Acquisition of lands that are traditionally ownedor customarily used, occupied or claimed by IPs?				

Anticipated impact on IPs

Subproject activities		**Expected positive impact**	**Expected negative impact**

Subproject Category	Subproject eligibility	Next steps
A. Subproject has impacts (negative or positive) on IP communities residing withinthe subproject area.	A/B	Prepare IPP describing the completion of meaningful consultations with the IPs and the identification of appropriate mitigation measures to obviate or mitigate any identified negative impacts.
B. Subproject has no impacts sine there are no IP communities residing in thesubproject area.	C	No IPP required and no further action is needed.

IP Screening checklist by:

	Name	Position:
	Signature	Date:

Annex 2 – Guidance for Preparing an Indigenous People Plan (IPP)

As mentioned in Section 4.2, preparation of an IPP involves two key steps: conducting a Social Assessment (SA) and writing up the IPP.

1. Conducting a Social Assessment for the purpose of IPP

The SA aims to understand how the IP is affected by the subproject's activities, which informs how mitigation and development measures shall be proposed. The SA aims to explore measures to ensure a) affected IPs shall receive socioeconomic benefits culturally appropriate to them; b) if there are any potential adverse impacts and risks for IPs, such risks and impacts will be avoided to extent possible; c) where avoidance is not possible, measures are proposed to minimize, mitigate, and compensate for unavoidable adverse impacts. Mitigation and development measures will be proposed based on meaningful consultations with the IP households affected by subproject's investment activities.

The scope of SA will be proportionate to: (a) the magnitude of subproject's risks and impacts on the IP; socioeconomic status; cultural and communal integrity and heritage; health, education, livelihood systems and social security status; and indigenous knowledge; and (b) the vulnerability of the affected Indigenous Peoples. The IPP will also need to complement the broader coverage of environmental and social risks and impacts identified in subproject's Environmental and Social Impact Assessment that is conducted to develop subproject Environmental and Social Management Plan. The IPP need to provide specialized guidance on how specific issues associated with the needs of affected IP shall be addressed.

The level of detail and comprehensiveness of the IPP should be proportionate to subproject's risks and impacts. Mitigation and development measures that are proposed for the affected IPs should be culturally appropriate to the IPs.

2. Writing up the IPP

An Indigenous Peoples Plan (IPP) is required for subprojects that have impacts on IPs (positive, adverse, or both). The level of detail and comprehensiveness of IPP is commensurate with the significance of potential impacts on indigenous peoples. The substantive aspects of this outline will guide the preparation of IPPs,although not necessarily in the order shown.

1. **Executive Summary of the Indigenous Peoples Plan**
   This section concisely describes the critical facts, significant findings, and recommended actions.

2. **Description of the Project**
   This section provides a general description of the subproject, discusses the subproject interventions and activities that may bring impacts on indigenous peoples; and identifies the subproject area.

3. **Social Impact Assessment**
   This section:
   a) Reviews the legal and institutional framework applicable to IPs in the subproject context.
   b) Provides baseline information on the demographic, social, cultural, and political characteristics of the affected indigenous peoples communities; the land and territoriesthat they have traditionally owned or customarily used or occupied; and the natural resources on which they depend.

c) Identifies key Project stakeholders and elaborate a culturally appropriate and gender- sensitive process for meaningful consultation with indigenous peoples at each stage of subproject preparation and implementation, taking the review and baseline informationinto account.
d) Assesses, based on meaningful consultation with the affected indigenous peoples, thepotential adverse and positive effects of the Project. Critical to the determination of potential adverse impacts is a gender-sensitive analysis of the relative vulnerability of,and risks to, the affected indigenous peoples given their particular circumstances andclose ties to land and natural resources, as well as their lack of access to opportunitiesrelative to those available to other social groups in the communities, regions, or national societies in which they live.
e) Includes a gender-sensitive assessment of the affected IPs perceptions about the project and its impact on their social, economic, and cultural status.
f) Identifies and recommends, based on meaningful consultation with the affected IPs, the measures necessary to avoid adverse effects or, if such measures are not possible,identifies measures to minimize, mitigate, and/or compensate for such effects and to ensure that the indigenous peoples receive culturally appropriate benefits under the Project.

4. Information Disclosure, Consultation, and Participation

This section: (i) describes the information disclosure, consultation, and participation process with the affected indigenous peoples that was carried out during subproject preparation; (ii) summarizes their comments on the results of the ESIA and identifies concerns raised during consultation and how these have been addressed in the Project design; (iii) in the case of Project activities requiring broad community support, documents the process and outcome ofconsultations with affected IPs and any agreement resulting from such consultations for the Project activities and safeguard measures addressing the impacts of such activities; (iv) describes consultation and participation mechanisms to be used during implementation to ensure ethnic minority participation during implementation; and (v) confirms disclosure of thedraft and final IPP to the affected IPs.

5. Beneficial Measures

This section specifies the measures to ensure that the IPs receive social and economic benefits that are culturally appropriate, and gender responsive.

6. Mitigation Measures

This section specifies the measures to avoid adverse impacts on IPs; and where the avoidance is impossible, specifies the measures to minimize, mitigate and compensate for identified unavoidable adverse impacts for each affected indigenous peoples.

7. Capacity Building

This section provides measures to strengthen the social, legal, and technical capabilities of (i)government institutions to address IPs issues in the Project area; and (ii) IPs organizations inthe Project area to enable them to represent the affected IPs more effectively.

8. Grievance Redress Mechanism

This section describes the procedures to redress grievances by affected IPs. It also explains how the procedures are accessible to indigenous peoples and culturally appropriate and gender sensitive.

9. Implementation Arrangement

This section describes institutional arrangement responsibilities and mechanisms for carryingout the various measures of the IPP. It also describes the process of including relevant local organizations and nongovernment

organizations in carrying out the measures of the IPP.

10.Monitoring, Reporting and Evaluation

This section describes the mechanisms and benchmarks appropriate to the Project for monitoring and evaluating the implementation of the IPP. It also specifies arrangements for participation of affected indigenous peoples in the preparation and validation of monitoring, and evaluation reports.

11.Cost Estimate and Financing

This section provides an itemized budget for all activities described in the IPP.

Annex 3 – Indicators for IPP Implementation Monitoring

Monitoring indicators should assist the project to assess progress of the Indigenous Peoples Plan (IPP) and whether mitigation measures are effective, resulting in desired outcomes. This enables the project to respond to any issues and manage change accordingly.

Indicators that show implementation progress are called process indicators and give some certainty that the project is proceeding according to plan.

Indicators that measure whether the IPP mitigation measures are successful are called outcome indicators and reflect the results of the process.

It is important that an appropriate number of indicators be included in the monitoring plan. Too few may leave gaps in critical areas. Too many may overburden the collection process, and diminish quality. Use the minimum but necessary number of monitoring indicators to ensure adequate IPP implementation and expected outcomes.

Some examples of process and outcome indicators are shown below. They are not an exhaustive list, and should be selected as required.

Example of Process Indictors	
Demographic baseline	• The numbers of affected Indigenous Peoples (IP) by category of impact, gender, age, habitat (village etc.), income, status and position • Number of households with handicapped, elderly or invalid members • Number of female headed households • Number of vulnerable households (poor, elderly) • Number of households by ethnic group • Number of births and deaths
Consultation and participation	• Number of consultation and participation activities that occur—meetings, information dissemination, brochures; flyers, training • Percentage of IP women as participants; number of meetings exclusively with IP women • Percentage of vulnerable IP groups represented / attending meetings; number of meetings exclusively with vulnerable IP groups. • Languages used at meetings • Good faith negotiations—recording of process, participants, locations, correspondence • Broad community support—record of processes, participants, locations and agreement obtained • Consultation and participation progress against plan and budget
Mitigation measures	• Progress of implementation of mitigation / beneficial measures against plan • Number of activities that occur/completed—such as construction, livelihood restoration, disbursements, training • Percentage progress against timelines and budget
Grievance redress	• Total number of people/groups using the grievance redress procedure. • Number of distinct people/groups. Any IP group with significantly more grievances? • How many times has a household submitted the same grievance? • Number of grievances resolved? • Length of time taken to be resolved? • Types of grievance categories and prevalence

Implementation problems	• Identified delays — (days, cost) due to personnel, capacity, insufficient funds, etc. • Number of times implementation schedule revised
Example of Outcome Indicators	
Consultation and participation program	• Awareness of IP issues among implementing stakeholders in each sector • Awareness of IPP mitigation and beneficial measures amongst recipients • Awareness of project details amongst stakeholders • IP perception of effectiveness, cultural appropriateness and inclusiveness of consultation measures • Attendance at consultation and participation activities Level of involvement by IP and representatives in the design and implementation of consultation and participation
Enhanced dignity of IP groups, integrity of traditional kinship networks and livelihood patterns	• Changes in religious/cultural practices • Changes in cultural governance • Participation in cultural governance (by gender, status) • Number of people (age and sex) who can speak national language and/or local dialect • Changes in condition of schools, community buildings, temples structures • Numbers of religious/cultural events and persons (monk shamans, priests etc.) • Participation in cultural/religious events (by gender, time/resources allocated)
Livelihoods and living standards	• Major asset inventory—e.g. vehicle, phone, tools, kitchen equipment • Changes in patterns of IP occupation, production, and resource use • Changes in income and expenditure patterns among IP households • Savings • Change in food used by IP—amount, nutrition source • Cost of living changes—market prices etc. • Changes in key social parameters—gender roles of production • Vulnerable groups—status, relative income, livelihood · Education—literacy and numeracy level in national/ethnic language • School attendance of IP children (by sex and age) • Key health indicators of IP (by gender, age)

IFAD
Investing in rural people

Cambodia

Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: Annex 6 A Caisar Land Acquisition Resettlement Planning Framework

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Asia and the Pacific Division
Programme Management Department

KINGDOM OF CAMBODIA

Nation – Religion – King

MINISTRY OF WATER RESOURCES AND METEOROLOGY

CLIMATE ADAPTIVE IRRIGATION AND SUSTAINABLE AGRICULTURE FOR RESILIENCE PROJECT

ANNEX 6.A
Land Acquisition and Resettlement Planning Framework

February 2024

Prepared by
the Ministry of Water Resources and Meteorology with the assistance of consultants under the guidance of the General Department of Resettlement of the Ministry of Economy and Finance.

Table of Contents

LIST OF TABLES III

LIST OF FIGURES III

ABBREVIATIONS IV

DEFINITIONS V

EXECUTIVE SUMMARY IX

1. INTRODUCTION 1

1.1 PROJECT BACKGROUND 1

1.1.1 Project Context *1*

1.1.2 Project Development Objective and Project Components *1*

1.1.3 Project Budget and Implementation Agency *2*

1.2 RATIONALE AND PURPOSE OF THE RESETTLEMENT PLANNING FRAMEWORK 2

1.2.1 Rationale *2*

1.2.2 Purpose *2*

2. PRELIMINARY ASSESSMENT OF LAND ACQUISITION & RESETTLEMENT IMPACT 3

3. LEGAL FRAMEWORK GOVERNING LAND ACQUISITION & INVOLUNTARY RESETTLEMENT 4

3.1 NATIONAL LAWS AND REGULATIONS 4

3.2 AIIB'S ENVIRONMENTAL AND SOCIAL FRAMEWORK (ESF) 6

3.3 INTERNATIONAL FUND FOR AGRICULTURE DEVELOPMENT'S SECAP 7

3.4 GAP ANALYSIS: AIIB ESS2, IFAD SECAP, AND RGC SOP-LAR 7

4. SCOPE AND APPLICATION, PRINCIPLES AND PROCESS 11

4.1 SCOPE AND APPLICATION 11

4.2 ELIGIBILITY CRITERIA 11

4.2.1. Category of Project Affected Persons *11*

4.2.2 Cut-Off-Date *12*

4.3 PROCESS FOR LAND ACQUISITION 12

4.3.1 Principles of Land Acquisition and Resettlement *12*

4.3.2 Key Tasks during Resettlement Process *13*

4.3.3 Approach for Negotiated Settlement *17*

4.3.4 Approach for Voluntary Donation *18*

4.4 PROJECT'S COMPENSATION AND SUPPORT POLICY 21

4.4.1 Compensation and other Resettlement Assistance *21*

4.4.2 Vulnerable Groups *22*

4.4.3 Livelihood Restoration Program *22*

4.4.4 Contracts with AHs and Compensation Payments *23*

5. INSTITUTIONAL AND IMPLEMENTATION ARRANGEMENTS 24

5.1 MINISTRY OF WATER RESOURCE AND METEOROLOGY 24

5.2 INTER-MINISTERIAL RESETTLEMENT COMMITTEE 25

5.3 GENERAL DEPARTMENT OF RESETTLEMENT 25

5.4 INTER-MINISTERIAL RESETTLEMENT COMMITTEE WORKING GROUP 26

5.5 PROVINCIAL RESETTLEMENT SUB-COMMITTEE 26

5.6 PROVINCIAL RESETTLEMENT SUB-COMMITTEE WORKING GROUP 26

5.7 CADASTRAL ADMINISTRATION OFFICE 27

5.8 THE CONCERNED LOCAL ADMINISTRATIVE AUTHORITIES (DISTRICT, COMMUNE AND VILLAGE) 27

6. GRIEVANCE REDRESS MECHANISM 27

6.1 Overview of Grievance Redress Mechanism....27
6.1.1 Provincial Grievance Redress Committee....27
6.2 Grievance Redress Procedure....28
6.2.1 Types of Complaints....28
6.3 Recording and Documentation of Grievances....29
7. FUNDING AND IMPLEMENTATION ARRANGEMENTS....30
7.1 Budget and Financing....30
7.2 Implementation Plan....30
7.2.1 Voluntary Donations....30
7.2.2 Land Acquisition....30
8. INFORMATION DISCLOSURE AND STAKEHOLDER CONSULTATION....31
8.1 Information Disclosure....31
8.2.1 Voluntary Donation....31
8.2.2 Land Acquisition....31
8.2 Stakeholder Consultation....32
8.1.1 Consultation and Stakeholder Engagement for Voluntary Donation....32
8.1.2 Consultation and Stakeholder Engagement for Land Acquisition and Involuntary Resettlement....32
9. MONITORING AND REPORTING....33
9.1 Internal Monitoring....33
9.1.1 Voluntary Donations....34
9.1.2 Land Acquisition and Involuntary Resettlement....34
9.2 External Monitoring....35
ANNEXES....37
Annex 1 – Screening Form for Land Acquisition and Resettlement....37
Annex 2 – Voluntary Asset/Land Donation Form....38
Annex 3 – Entitlement Matrix....40
Annex 4 – Indicative Internal Monitoring Indicators for Land Acquisition....45

List of Tables

Table 1 –Summary of Gaps and Clarifications Between RGC's SOP-LAR, AIIB's ESS2, and IFAD's SECAP Standard 7.... 8
Table 2 – Key Tasks on the Preparation of Detailed Resettlement Plan.... 16

List of Figures

Figure 1 – Map showing six irrigation schemes located in four provinces.... 2
Figure 2 – Estimated land need (hectare) for construction of irrigation system.... 3
Figure 3 – Estimated land acquisition by type of construction.... 4
Figure 4 – Summary of Key Task in the Resettlement Process.... 13

Abbreviations

ADB	Asian Development Bank
AIIB	Asian Infrastructure Investment Bank
AH	Affected Household
ARP	Abbreviated Resettlement Plan
CAISARP	Climate Adaptive Irrigation and Sustainable Agriculture for Resilience Project
COD	Cut-Off Date
COI	Corridor of Impact
DED	Detailed Engineering Design
DIMDM	Department of Internal Monitoring and Data Management
DMS	Detailed Measurement Survey
DRP	Detailed Resettlement Plan
ESF	Environmental and Social Framework
ESS	Environment and Social Standards
GDR	General Department of Resettlement
GHG	Green House Gas
GRM	Grievance Redress Mechanism
IFAD	International Fund for Agriculture Development
IOL	Inventory of Loss
IRC	Inter-Ministerial Resettlement Committee (Project-Level)
IRC-WG	Inter-Ministerial Resettlement Committee Working Group
Km	Kilometer
LAR	Land Acquisition and Involuntary Resettlement
LARPF	Land Acquisition and Resettlement Planning Framework
MoWRAM	Ministry of Water Resources and Meteorology
PDWRAM	Provincial Department of Water Resources Management and Meteorology
PGRC	Provincial Grievance Redress Committee
PIB	Project Information Booklet
PRSC	Provincial Resettlement Subcommittee
PRSC- WG	Provincial Resettlement Subcommittee Working Group
RCS	Replacement Cost Study
RGC	Royal Government of Cambodia
ROW	Right-of-Way
SECAP	Social, Environmental and Climate Assessment Procedures
SEO	Social and Environment Officer
SOP-LAR	Standard Operating Procedures for Land Acquisition and Involuntary Resettlement

Definitions

Affected People (AP)/Affected Households (AHs). In the context of involuntary resettlement, APs are those who are physically displaced (relocation, loss of residential land, or loss of shelter) and/or economically affected (loss of land, assets, access to assets, income sources, or means of livelihood) as a result of (i) land acquisition and involuntary resettlement; or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. In the case of AP/AHs, it includes all members residing under one roof and operating as a single economic unit who is adversely affected by the project or any of its components. They can also be referred to as Displaced Persons. In this Land Acquisition and Resettlement Planning Framework (LARPF), the term used will be "AH."

Abbreviated Resettlement Plan (ARP). Where impacts on the entire displaced population are minor, or fewer than 200 people are displaced, the Client may, with the prior approval of the Bank, prepare an abbreviated resettlement plan, covering such elements as the Bank may specify. Impacts are considered "minor" if the affected people are not physically displaced and less than 10 percent of their productive assets are lost.

Corridor of Impacts (COI). It is the area which is required for construction of the planned civil works under the Project. The COI is agreed by the implementing agency and is demarcated by the civil work consultant within which the construction activities will take place.

Cut-Off Date (COD). Date established by the government that establishes the eligibility of the AHs for receiving compensation and resettlement assistance. For this project, the COD of each subproject financed under the Project will be date of the completion of the census undertaken during the detailed measurement survey (DMS) stage. The COD will be announced in the consultation meeting prior to DMS. Any persons who encroach upon the subproject's COI after the COD will not be eligible for any compensation or assistance. Persons not covered in the census result can be eligible for compensation if they can show proof that they have been inadvertently missed during the census survey.

Detailed Measurement Survey (DMS). With the aid of detailed engineering design, this activity involves finalization of the results of the inventory of losses, measurement of affected land and assets attached to land, 100% socioeconomic survey and 100% census of AHs.

Detailed Resettlement Plan (DRP). To be prepared following the completion of the Detailed Measurement Survey when impacts on land, assets, livelihood activities of affected people become known following the DMS.

Economic displacement. Loss of land, assets, access to assets, income sources, or means of livelihood as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas.

Eligibility. All AHs confirmed to be residing in, doing business, or cultivating land within the project affected area or land to be acquired or used for the project before the COD are eligible for resettlement compensation for their affected properties.

Eminent Domain. The right of Cambodia using its sovereign power to acquire land for public purposes. National law establishes which public agencies have their prerogative to exercise eminent domain.

Entitlements. Refers to a range of measures comprising compensation for loss of assents, resettlement assistance, income restoration, etc. which are due to the AHs, depending on the type and severity of their losses, to restore their economic and social base.

Expropriation. Process whereby a public authority, usually in return for compensation, requires a person, household, or community to relinquish rights to land that it occupies or otherwise uses. Expropriation under the Cambodian law refers to the confiscation of ownership or real right to immovable property of a natural person,

private legal entity, and legal public entity, which includes land, buildings, and cultivated plants and economically productive crops/trees, for the purpose of constructing, rehabilitating, or expanding public physical infrastructure for the national and public interests with prior and fair compensation.

Grievance Redress Mechanism. Refers to a mechanism established under the project to receive, facilitate, resolve, and report back to affected persons the grievance resolution outcome. In the context of this LARPF, the GRM aims to address timely and effectively the grievances arising from involuntary land acquisition, physical resettlement, accesses restrictions as well as economic displacement.

Host communities. Communities receiving physically affected persons of a project as re-settlers.

Income Restoration. Improve, or at least restore, the livelihoods of all persons displaced by the Project through: (i) where possible, land-based resettlement strategies when affected livelihoods are land-based or where land is collectively owned; or cash compensation at replacement value for land, including transitional costs, when the loss of land does not undermine livelihoods; (ii) prompt replacement of assets with assets of equal or higher value; (iii) prompt compensation at full replacement cost for assets that cannot be restored; and (iv) capacity building programs to support improved use of livelihood resources and enhance access to alternative sources of livelihood.

Income Support. Re-establishing the productive livelihood of the AHs to enable income generation equal to or, if possible, better than that earned by the AHs before the project.

Indigenous Peoples. "Indigenous Peoples" is used in a generic sense to refer exclusively to a distinct social and cultural group possessing all the following characteristics in varying degrees: Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others; and Collective attachment[1] to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas; and Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture, and A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.

Information Disclosure. The process of disseminating project information to stakeholders to allow them to understand the risks and impacts of the project, and potential opportunities.

Inventory of Losses. This is the process where all fixed assets (i.e. lands used for residence, commerce, agriculture, including ponds; dwelling units; stalls and shops; secondary structures, such as fences, tombs, wells; trees with commercial value; etc.) and sources of income and livelihood inside the Project right of way are identified, measured, their owner identified, their exact location pinpointed, and their replacement costs calculated.

Involuntary Resettlement. Resettlement is considered involuntary when directly affected persons or communities do not have the right to refuse project-related land acquisition or restrictions on land use that result in their displacement.

Land Acquisition. Refers to process and methods that are adopted to acquire land for the project purpose. This may include outright purchase, expropriation of property and acquisition of access rights, such as easements or rights of way. Land acquisition may also include: (a) acquisition of unoccupied or unutilized land whether or not the landholder relies upon for income or livelihood purpose; (b) repossession of public land that is used or occupied by individuals or households; and (c) project impacts that result in land being flooded or otherwise rendered unusable or inaccessible. Land acquisition refers to anything growing on or permanently affixed to land, such as crops, buildings, and other improvements.

[1] Means that for generations there has been a physical presence in, and economic ties to, land and territories traditionally owned, or customarily used or occupied, by the group concerned, including areas that hold special significance for it, such as sacred sites.

Land Acquisition and Resettlement Planning Framework (LARPF). Prepared when project components are not known and therefore land acquisition needs cannot be identified. The LARPF will guide the preparation of future Resettlement Plans if these become necessary.

Meaningful consultation. Two-way process that (a) begins early in project planning process to gather initial views on project proposal and inform project design; (b) encourages stakeholder feedback, particularly as a way of informing project design and engagement by stakeholders in the identification and mitigation of environmental and social risks and impacts; (c) continues on an ongoing basis, as risks and impacts arise; (d) is based on prior disclosure and dissemination of relevant, transparent, objective, meaningful and easily accessible information in a timeframe that enables meaningful consultation with project stakeholders in a format culturally appropriate, and in relevant local language(s) and is understandable to stakeholders; (e) considers and responds to feedback; (f) supports active and inclusive engagement with project-affected parties; (g) is free of external manipulation, interference, coercion, discrimination, and intimidation; and (h) is documented and disclosed by the Government of Cambodia. Under this LARPF, which is specific for land acquisition and involuntary resettlement, the meaningful consultation refers to consultation in respect of land acquisition, economic displacement, and physical resettlement which is clearly stipulated in the Government's Standard Operating Procedures (SOP) for Land Acquisition and Involuntary Resettlement (LAR) and incorporates all the above elements.

Physical Displacement. Relocation, loss of residential land, or loss of shelter as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas.

Relocation. This is the physical relocation of an AH from her/his pre-project place of location and/or business to another location.

Replacement cost. A method of valuation that yields compensation sufficient to replace affected assets, plus necessary transaction costs associated with asset replacement. Where markets are active, replacement cost is the market value as established through independent and competent real estate valuation, plus transaction costs. Where functioning markets do not exist, replacement cost may be determined through alternative means, such as calculation of output value for land or productive assets, or the undepreciated value of replacement material and labor for construction of structures or other fixed assets, plus transaction costs. In all instances where physical displacement results in loss of shelter, replacement cost must at least be sufficient to enable purchase or construction of housing that meets acceptable minimum community standards of quality and safety. The valuation method for determining replacement cost should be documented. Transaction costs include administrative charges, registration or title fees, reasonable moving expenses, and any similar costs imposed on affected persons.

Relocation Assistance. Support provided to persons displaced by the Project, including the following: (i) if there is relocation, security of tenure (with tenure rights that are as strong as the rights the displaced persons had to the land or assets from which they have been displaced) of relocation land (and assets, as applicable), proper housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities and extension of Project benefits to host communities to facilitate the resettlement process; (ii) transitional support and development assistance, such as land development, credit facilities, training or employment opportunities, food, shelter, transportation; and (iii) civic infrastructure and community services, as required.

Right-of-Way. It is a government owned strip of land following a centerline (such as for roads, canals, etc.) providing an area of access.

Voluntary donation. Defined as the ceding of a property by an owner who is (a) appropriately informed about the project and their right to seek compensation and (b) can refuse to donate. This does not apply to voluntary,

legally recorded market transactions unless such voluntary land transactions may result in displacement of persons other than the seller.

Poor and Vulnerable Persons/Groups.[2] A distinctive group of APs who by virtue of factors beyond their control: (a) are to be more adversely affected by the project's environmental and social impacts; and (b) may be more limited than others in their ability to claim or take advantage of project benefits. Such individuals or groups are also more likely to be excluded from or unable to participate fully in the mainstream consultation process and may require specific measures or assistance (or both) to do so. Poor and vulnerable persons are categorized as: (i) households living below the poverty rate as established by the Royal Government of Cambodia; (ii) elderly people headed households with no means of support; (iii) female headed households with dependents living below the poverty rate; (iv) disabled headed households, (v) landless poor living below the national poverty rate; and (vi) indigenous peoples (who often have traditional land rights but no formal titles).

Due to their vulnerability, particular attention will be paid to such displaced persons to provide them with an opportunity to improve their status and benefit from development/resettlement to the same extent as other displaced persons. This group of displaced persons will be provided with additional assistance to re-establish their livelihood status if they lose their livelihood source permanently.

[2] The group is classified under Sub-Decree No. 291 ANKr. BK on identification of Poor and Vulnerable Households issued with ID Poor Cards by Royal Government of Cambodia.

Executive Summary

1. This is an Executive Summary of the main points discussed in this Land Acquisition Resettlement Planning Framework (LARPF). The Executive Summary should not be relied on for full information; the full LARPF should be read for this purpose.

2. This LARPF has been prepared by the Ministry of Water Resources and Meteorology (MoRWAM) for the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience Project (CAISARP) with the guidance and direction of the General Department of Resettlement (GDR) of the Ministry of Economy and Finance (MEF). This LARPF will be applied to all investments to be financed under this CAISARP irrespective of financing source (e.g. the AIIB, IFAD, and Royal Government of Cambodia). The LARPF has been prepared in line with the Royal Government of Cambodia's (RGC) Standard Operating Procedures on Land Acquisition and Resettlement (RGC's SOP-LAR), the Asian Infrastructure Investment Bank's (AIIB) Environment and Social Framework, 2022 (ESF), and International Fund for Agriculture Development's (IFAD) Social, Environmental and Climate Assessment Procedures 2020 (SECAP) Standard 7.

3. This document is considered a living document and shall be modified and updated in line with the changing situation or scope of the activities. The Detailed Resettlement Plans (DRPs) and Abbreviated Resettlement Plans (ARPs) will be developed when and if necessary, in close consultation with affected stakeholders and the AIIB and IFAD. Clearance of future DRPs/ARPs by the AIIB will be necessary.

4. The objective of CAISARP is to improve aspects of water security and increase agricultural water productivity in Kampong Speu, Kampong Chhnang, Kandal, and Pursat province.

5. The CAISARP will be implemented through various activities organized through the following three components: (i) Component 1. Improving farm-level climate adaptation, resilience, and water use efficiency; (ii) Component 2. Upgrading and climate-proofing water infrastructure for increased resilience; and (iii) Component 3. Institutional strengthening.

6. In Cambodia, the Expropriation Law (2010) is the main legal framework that governs land acquisition and involuntary resettlement (LAR). Under the Article 3 that governs the provision for projects financed by development partners in Cambodia, the RGC issued in 2018 the Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR). The GDR of the MEF is responsible for providing guidance and clarification to users of SOP-LAR. Given that the proposed CAISARP is financed by the Asian Infrastructure Investment Bank (AIIB) and International Fund for Agriculture Development (IFAD), the SOP-LAR is the guiding RGC's sub-decree for land acquisition and should be read together with this document. This LARPF also complies with the AIIB's Environment and Social Standard (ESS2) and IFAD's Social, Environmental and Climate Assessment Procedures (SECAP) Standard 7. There are some minor, but no significant gaps between the policies of the SOP-LAR, AIIB's ESS2, and IFAD's SECAP Standard 7. Two most relevant is that the SOP-LAR does not have a provision for voluntary donations (VDs) and negotiated settlement as the SOP-LAR addresses involuntary resettlement. This LARPF describes a process for VDs consistent with the AIIB's ESS2, which will be followed for the CAISARP and the required steps and documentation. The approach to manage resettlement under CAISARP follows the mitigation hierarchy by:

- Adjusting designs to avoid impact on land and assets;
- When impacts cannot be avoided, minimize them;
- Once risks and impacts have been minimized or reduced, mitigate through compensation payment for affected assets and income generation activities; and
- Where land acquisition impacts remain, compensate people as per this LARPF.

7. This LARPF covers resettlement: (i) where land, or assets, are voluntarily donated; (ii) where land, or assets, are involuntarily acquired. Voluntary contributions, with proper information and documentation as explained in this LARPF, can be justified because irrigation infrastructure rehabilitation will directly benefit farmers for irrigation, water consumptions and fisheries. However, the benefit from an irrigation infrastructure rehabilitation may far outweigh the impact on a small asset such as a small temporary movable farm cottage, trees/crops. Besides the process for VD and involuntary land acquisition, the LARPF also details the institutional arrangements and responsibilities, consultations, information disclosure, funding arrangements and monitoring and reporting.

8. The LARPF applies to permanent or temporary physical and economic displacement as described in the SOP-LAR, and compliant with AIIB's ESS2 and IFAD's SECAP Standard 7. All affected households (AHs) who have assets in the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation as described in this LARPF, regardless of their legal status. COD is the date established by the government that establishes the eligibility for receiving compensation and the resettlement assistance by the project affected persons. The COD needs to be well-documented. Persons not covered may be eligible in case they can show proof that they have inadvertently missed out during the census.

9. Based on the scope, scale, and nature of potential subprojects, the CAISARP may involve minor land acquisition – both permanent and temporary, to facilitate rehabilitation/upgrading of existing reservoirs, irrigation canals, weirs, barrage, including construction of new water distribution system (to increase command areas), and so forth. Physical resettlement of local people is envisaged but could be avoided through alternative designs since existing works are in remote rural areas where local population is small and scattered. If permanent land acquisition is required at subproject level, public land will be prioritized. If not feasible because of technical requirements, private agricultural land would be acquired which is anticipated to be of small-scale at household level due to linear land impact, particularly where land is required for building new canals to extend existing water distribution system for new command area. It is noted that as existing reservoirs are upgraded to increase water retention capacity (impounding additional water amount), both upstream and downstream impacts are anticipated but scope and magnitude of land impacts may vary depending on various factors such as maximum water retention capacity, water flow regulation during subproject operation, seasonal rainfall, current land use (for upstream) and water use (for downstream). Upstream impact might include extended inundation (area and time duration) which may restrict local land access for agriculture/non-agricultural income generation activities, and/or animal raising, etc. Downstream impact may include restricted access to normal volume of water for farming/water supply purposes, and so on.

10. The LARPF outlines the Grievance Redress Mechanism to be established as a locally based arrangement for receiving, recording, assessing, and facilitating the resolution of complaints and grievances raised by the affected persons in relation to the CAISARP. The LARPF also describes the process for consultation and information disclosure in cases of VDs and for land acquisition.

1. INTRODUCTION

1.1 Project Background

1.1.1 Project Context

11. Cambodia's irrigated agriculture faces increasing challenges from adverse impacts of climate change, especially the changes in rainfall patterns, duration and timing of the rainy season, and climate induced water disasters such as floods and droughts. Climate Resilient and low emission practices and investments in agriculture and water management are therefore crucial to protect and enhance Cambodia's agricultural production and productivity which will in turn contribute to poverty reduction and increased food security.

12. Addressing the complex impacts of climate change on rain fed and irrigated agriculture requires action at both farm and irrigation scheme, including enabling environment at regional and national level. Farm level actions will help communities adapt to climate change while also saving water and decreasing Green House Gas (GHG) emissions from BAU of agriculture, water use and management. This will help farmers to diversify their farming while also addressing changing rainfall patterns and increasing drought conditions throughout the growing season. Actions at system level will help achieve a modernized and climate proofed irrigation infrastructure delivering irrigation services to farmers in line with the requirements at the farm level. It will also protect the natural capital stocks, especially the land and water, against the increasing threats of flood. In addition, replacement of diesel pumps with solar pumps and combination of both grey and green solutions for irrigation modernization and flood proofing works will help reduce GHG emissions.

13. The integrated actions combining both farm and system levels has a transformative potential to reduce vulnerability of water and agriculture systems to climate change impacts while also reducing GHG emissions and enhancing the livelihood of rural populations who primarily depend on agriculture.

14. The theory of change diagram demonstrates how the project shifts the BAU from poorly constructed and maintained irrigation systems to a smart, climate resilient water management system with climate proofed irrigation and flood control infrastructures for smallholder farmers. The project's outcomes and outputs are in-line with Global Climate Fund's adaptation and mitigation goals, objectives, and long-term sustainability principles.

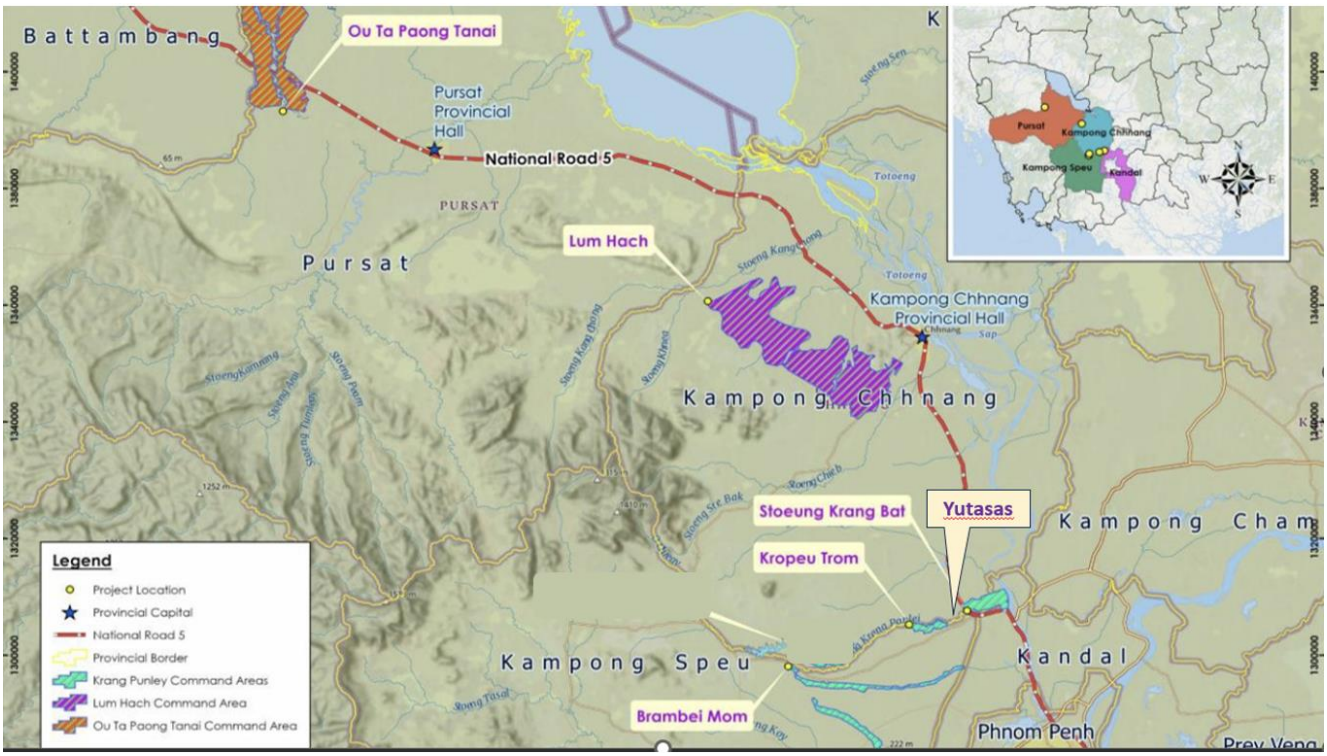
15. The paradigm shifting aspects of the CAISARP will include the data driven climate-proofing of irrigation infrastructure and focus on last-mile engagement of vulnerable communities. The Terms of Condition shows that if climate resiliency of irrigated agriculture is enhanced then the agricultural outputs and income of small-scale farmers will increase, as well as the climate resilience of vulnerable households and in particular to women will increase because water and food systems are less vulnerable to increasing temperatures, changing rainfall patterns and the extreme water events, and low-emission irrigation and sustainable agriculture adaptation practices will contribute to Nationally Determined Contributions mitigation targets.

16. The project's goal stated above shall be achieved through the generation of the following three outcomes: (1) Improved resiliency of small holder farmers (2) Resilient water control infrastructure and water service delivery with less crop and asset damage and (3) Reduced GHG emission. These three outcomes are derived from interventions at farm and irrigation system level together with institutional strengthening of relevant stakeholders and will contribute towards an irrigated agricultural system that is climate resilient and productive ultimately reducing the climatic vulnerability of poor farmers in the CAISARP areas.

1.1.2 Project Development Objective and Project Components

17. The objective of CAISARP is to increase climate adaptation, mitigate the negative impact of extreme climate events and improve livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia in Kampong Speu, Kampong Chhnang, Kandal, and Pursat province (Figure 1).

Figure 1 – Map showing six irrigation schemes located in four provinces



Source: CAISAR Feasibility Study July 2023

18. The proposed CAISARP will be implemented through various activities organized through the following three components:

- Component 1. Improving farm-level climate adaptation, resilience, and water use efficiency
- Component 2. Irrigation Infrastructure for increased resilience
- Component 3. Institutional strengthening

1.1.3 Project Budget and Implementation Agency

19. The proposed CAISARP will be implemented by the Ministry of Water Resources and Meteorology (MoWRAM) from 2025 to 2031 with an estimated cost of US$240 million.

1.2 Rationale and Purpose of the Resettlement Planning Framework

1.2.1 Rationale

20. The Asian Infrastructure Investment Bank's (AIIB) Environment and Social Standard (ESS2) on Land Acquisition and Involuntary Resettlement (LAR) and the International Fund for Agriculture Development's (IFAD) Social, Environmental and Climate Assessment Procedures (SECAP) Standard 7 requires that Borrowing country prepares a Land Acquisition and Resettlement Planning Framework (LARPF) in case a project requires land acquisition and/or have restriction on land use, but impact zones of the subprojects cannot be determined during project preparation. Under this CAISARP, since land acquisition are anticipated and the number, nature, and scale of subprojects have not been confirmed during project preparation stage, this LARPF is prepared in accordance with AIIB's Environmental and Social Framework (ESF), specifically: ESS1 and ESS2; the IFAD's SECAP – Standard 7, and in compliance with the Royal Government of Cambodia's relevant laws and regulations, including the Sub-Decree No.22 ANK/BK (2018) on Promulgation of the Standard Operating Procedures for Land Acquisition and Involuntary Resettlement (SOP-LAR) for externally financed Projects in Cambodia.

1.2.2 Purpose

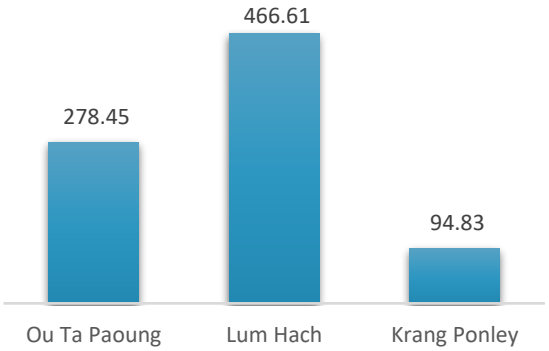
21. The purpose of this LARPF is to establish principles and procedures for consultation with affected households, compensation payment, resettlement, eligibility criteria for affected households, entitlements and

livelihoods restoration plan, implementation arrangements, a grievance redress mechanism, monitoring and reporting arrangements, estimated costs and budget, etc. which are to be applied to prepare Resettlement Plan(s) for relevant subprojects to be finalized/confirmed during CAISARP's implementation. This LARF is intended to avoid or minimize any adverse impacts associated with physical or economic displacement, and to ensure arrangements are in place to mitigate any adverse impacts that may occur. The Borrower agrees to apply the principles, procedures, and standards incorporated in ESS2 of the AIIB ESF and the IFAD's SECAP Standard 7 if obtaining any sites for project use would cause economic displacement or physical displacement.

2. PRELIMINARY ASSESSMENT OF LAND ACQUISITION & RESETTLEMENT IMPACT

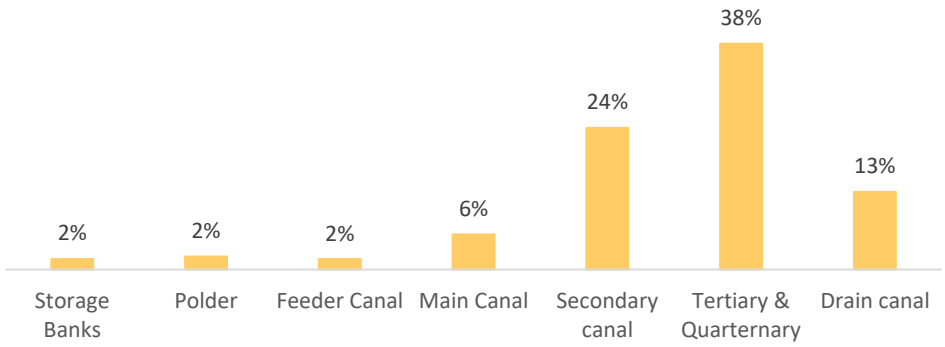
22. The proposed CAISARP will rehabilitate existing irrigation canals and build new irrigation channels in an estimated six schemes located in four provinces (Kampong Speu, Kampong Chhnang, Kandal, and Pursat). In some subprojects, small-scale roads will be built alongside existing/new canals to improve transportation of farm produce for the rice farmers. Due to the construction of new canals and roads, land acquisition of small scale may be required. However, the scope of land acquisition is expected to be small at household level (linear impact) and as such would not affect remarkably the livelihood of those who are land based. Physical resettlement is anticipated but the number of affected households would be very small because most land acquisition (required for construction) would take place in the command area where residential houses are not present. An estimated 839ha of public and private land (Figure 2) would be required for the planned construction of irrigation systems at subproject command areas, including Ou Ta Paong Tanai, in Pursat province, Lum Hach in Kampong Chhnang province, and Krang Ponley which including sub project areas—Brambei Mom, Chhean Laeung, Krapeu Trom, Stoeng Krang Bot, in Kampong Chhnang, Kapong Speu and Kandal provinces (Figure 1).

Figure 2 – Estimated land need (hectare) for construction of irrigation system



23. Of the total land (about 839ha) to be required for construction, most of the land that are required for project construction are within the command areas and are at tertiary and quaternary canals (38%), followed by secondary canal (24%), drain (13%) (Figure 3).

Figure 3 – Estimated land acquisition by type of construction



- **Physical resettlement**

24. The proposed CAISARP makes every effort to avoid physical resettlement. However, physical resettlement may not be avoidable, particularly in some road sections (located along main canals) where existing roads could be widened which requires some households to resettle.

- **Temporary Restriction of Irrigation Access**

25. During subproject construction, in some irrigated areas, water from existing reservoir may be restricted to facilitate the construction process. However, this temporary impact is anticipated to be minor since most of the current project area is rainfed.

- **Impact on collective land owned by IPs**

26. Based on the above preliminary assessment of the locations of land impact, it is anticipated that there is no land collectively owned by IP community located in the command area (where most land acquisition is required). Under the proposed CAISARP, impact on land collectively owned by IP community, if any, will be avoided through alternative designs.

3. LEGAL FRAMEWORK GOVERNING LAND ACQUISITION & INVOLUNTARY RESETTLEMENT

3.1 National Laws and Regulations

27. **The Expropriation Law (2010)** is the key legal framework that governs land acquisition and involuntary resettlement in the Kingdom of Cambodia. The law defines land expropriation in the Kingdom of Cambodia by specifying principles, mechanisms, procedures required for land expropriation and for fair and just compensation for affected peoples under any construction, rehabilitation, and public infrastructure projects implemented for public and national interest, and for the development of Cambodia. The law defines the development of public infrastructure as one of its objectives and extends the definition of public infrastructure to any infrastructure "required by the Nation in accordance with the determination made by the government." Public interest is also understood in a broad manner as "the use of land or property by the public or by public institutions or their agents." The expropriation of the ownership of immovable property and real right to immovable property can be exercised only if the Expropriation Committee has paid fair and just compensation to the owner and/or holder of real right in advance.

28. Key articles of the Expropriation Law (2010) are:

- **Article 2**: The law aims to: (i) ensure just and fair deprivation of legal rights to private property, (ii) ensure prior fair and just compensation, (iii) serve the national and public interest, and (iv) develop public physical infrastructures;
- **Article 3**: Under the Article 3 of the Expropriation Law (2010) that governs the provision for projects financed by Development Partners in Cambodia, the RGC issued the SOP-LAR in 2018. The SOP-LAR reflects the polices, regulations and procedures relating to the acquisition of land and the involuntary

resettlement consistent with the safeguard policies and procedures of the development partners like AIIB, IFAD, ADB, WB, and incorporates international good practices in resettlement planning, implementation, monitoring and reporting. The SOP-LAR has a specific provision which stipulates that where a provision conflicts with the mandatory safeguard requirement of the Development Partner, then the later will prevail;

- **Article 7**: Only the State may carry out an expropriation for use in the public and national interests;
- **Article 22**: The amount of compensation to be paid to the owner of and/or holder of real right to the immovable property shall be based on the market prices or replacement costs as of the issuance date of the declaration on the expropriation project. The market prices or replacement costs shall be determined by an independent committee or agent appointed by the Expropriation Committee;
- **Article 29**: A tenant of the immovable property with proper contract shall be entitled to allowance for disturbances because of the expropriation including the dismantling of structures, materials, and transportation to the new relocation site. A tenant of the immovable property who is operating a business shall be entitled to compensation for the impact on their business operation and to additional assistance at fair and just compensation to the capital value actually invested for the business operation activities as of the date of the issuance of the declaration on the expropriation project. For the expropriation of a location that is operating business activities, the owner of the immovable property shall be entitled to additional compensation at fair and just compensation against the value of the property actually affected by the expropriation as of the date of the issuance of the declaration on the expropriation project.

29. **RGC's Sub-Decree No. 22 ANK/BK (2018) on the Promulgation of the Standard Operating Procedures for Land Acquisition and Involuntary Resettlement (SOP-LAR) for Externally Financed Projects in Cambodia**. The General Department of Resettlement (GDR) of the Ministry of Economic and Finance (MEF) is responsible for providing guidance and clarification to users regarding the SOP-LAR. Given that the proposed CAISARP will use counterpart funding for compensation and support, the provisions of SOP-LAR will apply to the proposed CAISARP and therefore should be read in conjunction with this LARPF.

30. **Sub-Decree No.19 on Social Land Concession of March 2003** provides for allocations to landless people of state lands for free for residential or family farming purposes, including the provision of replacement land lost in the cases of involuntary resettlement.

31. **RGC's Sub-Decree No.118 ANK/BK (2005) on State Land Management.** The Sub-Decree defines principles, procedures, mechanisms, and institutional arrangement for state land management. In line with key sections of Article 4, public state land has a public interest use and falls within one of the following specific types of property having a public interest use:

32. Properties that have a natural origin, such as

- Forests
- Courses of navigable or floatable water
- Natural lakes
- Banks of navigable or floatable waters

33. Properties available in its natural state or specifically developed for public use, such as

- Roads
- Tracks
- Oxcart ways
- Pathways
- Gardens and public parks
- Reserved land

34. **RGC's Sub-Decree No.98 ANK/BK (2015) on River Basin Management.** The Sub-Decree regulates the management, conservation, and development of the river basins in a manner that is effective and sustainable – as stated in the Law on Water Resources Management in the Kingdom of Cambodia (2007). The Sub-Decree specifies procedures for establishment and implementation of the plans for management, conservation and development of the river basin, sub-river basin, watershed, ground water and aquifer.

35. Key chapters and articles of RGC's Sub-Decree No.98 ANK/BK (2015) on River Basin Management are:

- **Chapter 3 River Basin Zoning and Delineation of Riparian Land, Article 8**: The distance of riparian and coastal strips along key natural water features and water works in rural areas of river basins is defined below:
  - Coastal strip and estuary 100 (one hundred) meters from the coastal bank and estuary bank;
  - River 50 (fifty) meters from its bank;
  - Stream 30 (thirty) meters from its bank;
  - Creek 20 (twenty) meters from its bank;
  - Small stream 10 (ten) meters from its bank;
  - Main channel 10 (ten) meters from the terrace of channel embankment;
  - Distribution channel 5 (five) meters from the terrace of channel embankment;
  - Irrigation channel 3 (three) meters from the terrace of channel embankment;
  - Basin area 100 (one hundred) meters from the maximum water level from the basin water surface;
  - Lakes 50 (fifty) meters from the maximum water level allocated in the reservoir;
  - Basin embankment 20 (twenty) meters from the terrace beneath the basin embankment of less than 04 (four); 100 (one hundred) meters from the terrace between 4 to 8 meters high. In case the embankment height exceeds 8 (eight) meters high, it shall be determined by separate sub-decree.

36. The riparian land as stated above is the state's public asset. The delineation of riparian land has no retroactivity on existing land with ownership titles issued before this sub-decree is in force.

- **Chapter 4 – Jurisdiction, Mechanism and Committee for River Basin Management, Article 10:** The MoWRAM is responsible in leading, monitoring and coordinating and consulting with concerned institutions for the management, conservation, and development of all river basins in the Kingdom of Cambodia.

3.2 AIIB's Environmental and Social Framework

37. The AIIB Environmental and Social Framework (ESF) sets out the requirements for all Bank supported operations to comply with the Bank policies addressing environmental and social impacts, among other policies[3]. The following AIIB's Environmental and Social Standards (ESSs) applies to this LARPF:

- **ESS1: Environment and Social Assessment and Management**
  The objectives of ESS1 are to achieve the environmental and social soundness and sustainability of Projects and to support the integration of environmental and social considerations into Project decision-making process and implementation. The ESS1 applies if the Project is likely to have adverse environmental risks and impacts or social risks and impacts (or both). The scope of the environmental and social assessment and management measures are proportional to the risks and impacts of the Project. ESS1 provides both for quality environmental and social assessment and for management of risks and impacts through effective mitigation and monitoring measures during the course of Project implementation.
- **ESS2: Land Acquisition and Involuntary Resettlement**
  The objectives of ESS2 are (a) to avoid Involuntary Resettlement wherever feasible; (b) to minimize Involuntary Resettlement by exploring Project alternatives; (c) where avoidance of Involuntary Resettlement is not feasible, to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-Project levels and to provide resettlement assistance; (d) to understand and

[3] https://www.aiib.org/en/policies-strategies/_download/environment-framework/AIIB-Environmental-and-Social-Framework_ESF-November-2022-final.pdf

address gender-related risks and differential impacts of Involuntary Resettlement; (e) to improve the overall socioeconomic status of the displaced poor and other vulnerable groups; and (f) to conceive and implement resettlement activities as sustainable development programs, providing sufficient resources to enable the persons displaced by the Project to share in Project benefits.

3.3 IFAD's Social, Environmental and Climate Assessment Procedures

38. The IFAD's Social, Environmental and Climate Assessment Procedures (SECAP) comprise key requirements for the environmental and social sustainability of projects. Under the CAISARP, IFAD's SECAP Standard 7 − Physical and economic resettlement applies.

39. The objectives of SECAP Standard 7 are (i) Avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring alternative project designs and sites; (ii) Avoid forced eviction; (iii) Ensure that resettlement activities are planned and implemented collaboratively with the meaningful participation of affected people; (iv) Enhance and restore the livelihoods of all displaced people; and (v) Provide explicit guidance to borrowers/recipients/partners on the conditions that need to be met regarding involuntary resettlement.

40. This Standard applies to CAISARP because the project involves displacement and resettlement. The displacement may be full or partial, permanent, or temporary, and could result from a variety of project activities. This Standard also applies to any physical or economic displacement for purposes relevant to the project before IFAD's involvement. Application of this Standard must be consistent with universal respect for fundamental human rights and freedoms, the principles of non-discrimination, equal opportunity and fair treatment, and the right to private property, adequate housing and improvement of living conditions.

3.4 Gap Analysis: AIIB ESS2, IFAD SECAP, and RGC SOP-LAR

41. The AIIB's ESS2 and IFAD's SECAP Standard 7 recognizes that project related land acquisition and restrictions on land use can have impacts on communities and persons. AIIB's ESS2, IFAD's SECAP Standard 7, and RGC's SOP-LAR have specified its objectives and principles of LAR to ensure affected people are not worse off because of land acquisition. The principles of the AIIB's ESS2, IFAD's SECAP Standard 7, and the RGC's SOP-LAR are largely similar on consultation, grievance redress, social support, livelihood restoration, resettlement assistance, standard of living of poor and vulnerable, entitlements for persons without title or legal rights except for land, information disclosure, payment of compensation and entitlements prior to physical displacement, and the supervision and monitoring of implementation of resettlement plans. The key departure is on the requirement on **negotiated settlement**.

However, in terms of procedures, the SOP-LAR does not have procedures for negotiated settlement and Voluntary Donations (VD). Since the GDR has a lot of experience in acquiring land through a negotiated settlement, particularly under Asian Development Bank and World Bank financed projects, the negotiated settlement approach could be applied to CAISARP. To assist the GDR in conducting acquisition of land through a negotiated settlement, this LARPF spells out the detailed procedures that the GDR will follow in case involuntary acquisition of land through negotiated settlement.

42. The key requirements under AIIB ESS2, IFAD SECAP 7 and the corresponding provisions in the RGC's SOP-LAR demonstrating any gaps in voluntary land donations and clarifications on LAR are summarized in Table 1.

Table 1 – Summary of Gaps and Clarifications Between RGC's SOP-LAR, AIIB's ESS2, and IFAD's SECAP Standard 7

Items for Clarification	RGC's SOP-LAR	AIIB's ESS2	IFAD's SECAP Standard 7	Clarifications
Livelihood Restoration	SOP-LAR details specific measures to restore livelihoods which are land-based, employment-based and business-based.	Restore livelihoods through (i) land-based resettlement strategies, where possible or cash compensation at replacement values plus transitional cost; (ii) prompt replacement of assets with assets or equal or higher value; (iii) prompt compensation at replacement value; (iv) capacity building programs; additional revenues through benefit sharing.	Action plans have been designed to enhance and restore the standards of living and livelihoods of affected persons. Such plans will address, at a minimum, the following element: Established eligibility criteria, cut-off dates, compensation and entitlements for all categories of affected persons. Measures to provide (a) fair and just compensation; (b) transition support (both financial and in-kind); and (c) assistance such as land development, credit facilities, direct benefits, training and provision of expertise, as appropriate.	There are no gaps. Based on RGC's SOP-LAR, an Income Restoration Program would be provided in order to re-establish sources of livelihoods for all APs who have permanently lost any of their sources of livelihood. If applicable in CAISARP, DRPs will include provisions to ensure livelihood restoration programs are robust and can accurately meet the livelihood restoration objectives in line with AIIB's ESS2 and IFAD's SECAP Standard 7.
Compensation and Resettlement Assistance	The SOP-LAR includes the compensation and transition/disturbance allowance to the DPs in its entitlement. The SOP-LAR has provisions for relocation land (for DPs with title or recognized rights to land) and are subject to conditions (e.g., availability of government land).	Provide DPs needed assistance: (i) • If relocated, security of tenure rights as strong as DP had to the prior land; • Proper housing at resettlement sites with comparable access to employment/production opportunities; and • Social and economic integration into host communities. (ii) • Transitional support; and • Development assistance such as land development assistance, credit facilities, training or employment opportunities (ii) civic infrastructure and community services	Provide (i) fair and just compensation at full replacement cost prior to displacement (based on the cost of replacement at resettled sites and locations) for any losses of personal, real or other property or goods, noting that compensation and support may be collective in nature; (ii) transitional support (both financial and in-kind) based on reasonable estimates of the time required to restore and improve income earning capacity, production levels and living standards; and (iii) assistance with land development, credit facilities, direct benefits, training or employment opportunities, and expertise as needed (the combination of compensation, transitional support and assistance is aimed at enhancing and restoring displaced persons' pre-displacement productive capacity and earning potential).	There are no gaps. This LARPF will align with the SOP-LAR's provisions on compensation and assistance.

Items for Clarification	RGC's SOP-LAR	AIIB's ESS2	IFAD's SECAP Standard 7	Clarifications
Grievance Redress Mechanism	Appendix 8 of the SOP-LAR provides the structure and details on the operating guidelines and procedures of an effective functioning Grievance Redress Mechanism. It provides a 3-step process including the registration and recording of complaints and the judicial process if the complaints remain unresolved at the administrative level. The detailed procedures for at each step are also provided in the SOP-LAR.	Establish a suitable grievance mechanism to receive and facilitate the resolution of concerns of DPs; utilize existing formal or informal grievance mechanism; supplemented by the project specific mechanism.	All borrowers/recipients/partners must ensure that an effective, accessible and culturally appropriate grievance redress mechanism is established to facilitate the resolution of concerns and complaints (e.g., compensation, relocation or livelihood restoration) by affected individuals.	There are no gaps. The SOP states that there will be consultations with APs at various stages including during Basic Resettlement Plan and RP preparation. Prior to the preparation of the RP, consultation is carried out to confirm eligibility criteria and discuss entitlement matrix, as well as to introduce GRM. In addition, the copies of the Guidelines for GRM are translated in Khmer or/and IPs' language and provided and explained in detail to the APs during the public consultation process. There are clear mechanisms for grievance redress in the SOP. While the mechanisms are clearly set out, GDR will ensure it is accessible to all APs, in particular vulnerable APs and women.
Consultations and Stakeholder Engagement	• The SOP-LAR details out a number of steps to carry out consultations at various stages of the land acquisition and resettlement process and compensation. • Para 126 mentions that the consultation is undertaken throughout the project cycle. • SOP-LAR provides for stakeholder engagement in respect of land acquisition and involuntary resettlement. The SOP-LAR provides for disclosure of the LARPF to the stakeholders and public before the approval of the project. Similarly, the DRPs are also disclosed to stakeholders and	Carry out meaningful consultations with persons to be displaced by the Project, host communities and non-governmental organizations, and facilitate their informed participation in the consultations, consult with all persons to be displaced on their rights within the resettlement process, entitlements and resettlement options, and further participation process. Ensure their involvement in planning. Implementation, monitoring and evaluation of the resettlement plan. Pay particular attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, indigenous peoples and those without	Ensure that resettlement activities are planned and implemented collaboratively with the meaningful participation of affected people.	Meaningful consultations, inclusive of all groups and gender including vulnerable persons, as per AIIB's ESS2 should be conducted, with particular attention to ensuring it is a two-way process, that allows for feedback from APs and they are informed how their feedback was incorporated.

Items for Clarification	RGC's SOP-LAR	AIIB's ESS2	IFAD's SECAP Standard 7	Clarifications
	public after approval by the GDR.	legal title to land and ensure their participation in consultations.		
Voluntary Donation (VD)	• The SOP deals with land acquisition and involuntary resettlement and therefore does not provide guidance on VDs.	AIIB's ESS2 prescribes that where affected people choose to voluntarily donate land or assets without payment of full compensation, based on conditions (a) the potential donor or donors have been appropriately informed and consulted about the project and the choices available choices regarding the land and their implications, including refusal to donate the land, and has confirmed in writing their willingness to proceed with the donation; (b) the amount of land being donated is minor and will not reduce the donor's remaining land area below that required to maintain the donor's livelihood at current levels; (c) no household relocation is involved; (d) the donor is expected to benefit directly from the project	There is no Standard applicable to resettlement resulting from voluntary transactions.	SOP-LAR does not prescribe VDs. However, this LARPF provides guidance on when VDs would be appropriate and the process of carrying out the donations, including documentation which will need to be followed by MoWRAM.

4. SCOPE AND APPLICATION, PRINCIPLES AND PROCESS

4.1 Scope and Application

43. This LARPF pertains to situations of permanent or temporary resettlement and economic displacement directly resulting from the CAISARP within the subproject area. These situations should align with the RGC's SOP-LAR and complied with the AIIB's ESS2.

44. It's important to note that this LARPF does not encompass impacts on incomes and livelihoods that are not directly influenced by CAISARP's land acquisition or land use restrictions. Such impacts will fall under AIIB's ESS1 on Environmental and Social Assessment and Management. They will also be addressed in accordance with CAISARP's Environmental Code of Practice (or, if deemed necessary, through the development of an Environmental and Social Management Plan specific to the respective subprojects.

45. In cases where a VD procedure is applied to households affected by the subproject, the MoWRAM must document the entire land donation process following the guidelines provided in this LARPF. It is important to emphasize that AHs have the right to refuse participation in this procedure.

46. Under exceptional circumstances that necessitate additional land acquisition, the GDR team will carry out a negotiated settlement, as outlined in this LARPF. This applies when there are no more than 20 AHs. However, the willingness of the AHs to engage in a negotiated settlement will be determined during the initial consultation meeting with the community and the AHs.

47. In the proposed CAISARP, efforts will be made to avoid any adverse impact on land collectively owned by Indigenous Peoples (IP) communities through alternative project designs. Meaningful consultation will be conducted with IPs, if applicable, and it should be noted that Free, Prior, and Informed Consultation and Free, Prior and Informed Consent are not required in this specific context.

4.2 Eligibility Criteria

48. People whose assets such as houses, structures, business, crops, etc. are in a subproject area before the COD for the subproject is announced will be eligible for compensation for their affected assets, loss of livelihoods, and livelihood restoration support – regardless of the legal status of the affected land[4]. People who occupy any land portion of the subproject area after the COD is publicly announced will not be eligible for any compensation or any other resettlement assistance. Ideally COD should be established at the DMS stage when the full census will be conducted.

4.2.1. Category of Project Affected Persons

49. All AHs who have assets in the COI before the COD will be eligible for compensation and resettlement assistance, regardless of their legal status – as follows:

a) Those who have formal legal rights to land, including customary and traditional rights recognized under the national laws, will be entitled to compensation for the land they lose, all assets affixed to the land, as well as livelihood restoration measures;
b) Those who do not have formal legal rights to land at the time the census begins but have a claim to such land or assets—provided that such claims are recognized under the national laws or become recognized through a process identified in the resettlement plan, will be will be entitled to compensation for the land they lose, all assets affixed to the land, as well as income restoration measures; and

[4] With formal legal rights to land or assets; without formal legal rights but with recognized or recognizable claim under national law; with no recognizable legal right or claim to land or assets they occupy and use.

c) Those who have no recognizable legal right or claim to the land they are occupying will be entitled to all assets affixed to the land, as well as income restoration measures.

50. Persons covered under a) and b) are provided compensation for the land they lose, and other assistance in accordance with paragraph 6. Persons covered under c) are provided financial assistance *in lieu of* compensation for the land they occupy, and other assistance, as necessary, to ensure they could restore that livelihoods to pre-project level – if they occupy the subproject area prior to a cut-off date established by the borrower and acceptable to the Bank.

4.2.2 Cut-Off-Date

51. The COD for this CAISARP is defined as the date that establishes for receiving the compensation and resettlement assistance by the project AHs. The COD for each subproject financed under the Project will be the date of the completion of the census undertakenduring the DMS stage. The COD will be announced in the consultation meeting prior to the DMS. Any persons who encroach upon the subproject's corridor of impact (COI) after the COD will not be eligible for any compensation or assistance. Persons not covered in the census result can be eligible for compensation if they can show proof that they have been inadvertently missed during the census survey.

4.3 Process for Land Acquisition

52. If the survey of the subproject or DED shows that there will be a need for land acquisition and resettlement, MoWRAM will inform GDR after the completion of the survey. In case where there are a small number of AHs or less than 20 AHs, the GDR will acquire the land through **negotiated settlement** outlined in this LARPF. Where there are more than 20 AHs, the GDR will prepare an abbreviated RP (ARP) or a DRP and submit to the AIIB for review and approval.

53. For **negotiated settlement**, the GDR will develop procedures in a transparent, consistent, and equitable manner if land acquisition or changes in land use rights are acquired through negotiated settlement for a subproject, to ensure that the AHs who enter into negotiated settlements maintain the same or better income and livelihood status. To achieve this, GDR will engage an independent external party to validate and document the negotiation and settlement process.

54. If the failure of negotiated settlement results in expropriation, then there is still a need for the preparation of a DRP. Under the provisions of the AIIB ESS2, where impacts on the entire displaced population are minor, or fewer than 200 people are displaced, the GDR may, with the prior approval of the Bank, prepare an ARP, covering such elements as the Bank may specify. Impacts are considered "minor" if the AHs are not physically displaced and less than 10 percent of their productive assets are lost.

4.3.1 Principles of Land Acquisition and Resettlement

55. Under CAISARP, the following specific principles will be applied to guide the whole process of land acquisition and resettlement.

- Avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives and prepare a timebound Resettlement Plan.
- Mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by: (a) providing timely compensation for loss of assets at replacement cost; and (b) assisting AHs in their efforts to improve, or at least restore, their livelihoods and living standards, in real terms, to pre-project levels.
- Improve living conditions of poor or vulnerable persons who are physically and economically displaced to at least the national minimum standards including access to social protection systems. Provide legal and affordable access to land and resources.Non-titled AHs will be provided livelihood allowance and will be fully compensated at replacement cost on assets other than land.
- Legalizable AHs will be legalized and fully compensated at replacement cost for land losses.

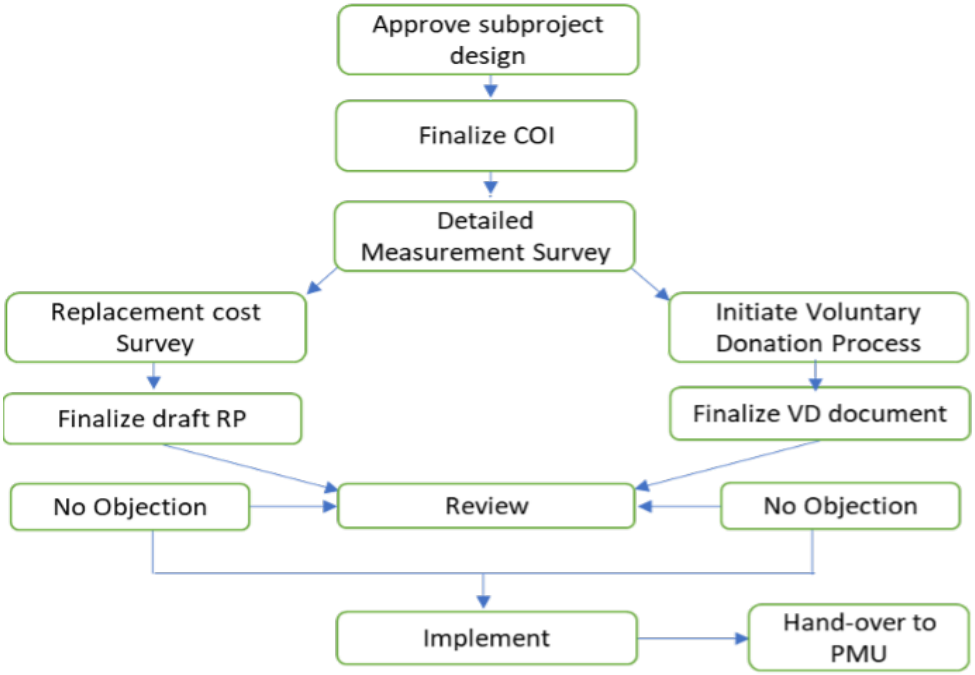
- Establish a transparent, fair, and equitable procedure of land acquisition through negotiated settlement. An independent external party shall be engaged to validate and document the negotiation and settlement process;
- Conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to AHs to benefit directly from the project, as the nature of the project may warrant;
- Ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.
- Ensure conduct of meaningful consultations with AHs on social impact assessment, entitlements, disclosure of resettlement information to AHs, and participation of AHs in planning and implementing subprojects. The social impact assessment and Resettlement Plan will be disclosed to the AHs in the local language; and
- Establish a grievance redress mechanism for AHs and stakeholders to address grievances and concerns.
- Pay full compensation to all the AHs who are physically displaced before their relocation.

4.3.2 Key Tasks during Resettlement Process

Once subprojects' detailed engineering designs (DED) are finalized/approved and the need for involuntary land acquisition is confirmed for the subproject, MoWRAM will inform the GDR of the need for land acquisition under the subproject and will share with the GDR the DED and information on the COI. However, before the finalization DED, MoWRAM will invite GDR for a joint site visit to inspect and assess the resettlement impacts and seek GDR's advice on avoidance and minimization of the impacts. MoWRAM will then finalize the DED and COI and submit it to GDR. Based on the DED and COI, GDR will conduct consultation meeting with the AHs, distribute the updated project information booklet (PIB), explain the DMS/SES processes and GRM procedures and then conduct the house-to-house DMS jointly with the AHs. The GRM will be functional prior to the DMS and the updated PIB will include the COD. If the analysis of DMS data shows that AHs have lost their livelihood source permanently, the IRC-WG and PRSC-WG will carry out consultations with the AHs and prepare the livelihood restoration program and include it in the draft DRP.

56. The key tasks in the resettlement process to be undertaken by MoWRAM/GDR are summarized in the flow chart in Figure 4.

Figure 4 – Summary of Key Task in the Resettlement Process



4.3.3.1 Corridor of Impact

Based on the final DED, a field trip will be conducted for land demarcation. The output of land demarcation process is the land areas that are identified as subproject's corridor of impact (COI) within which any assets such as land, houses, structures, crops, fruit and non-fruit trees etc. that are owned by the AH, private sector, or government, local community are considered as affected under the subproject.

57. Once the preliminary design of a subproject is defined, MoWRAM will prepare a PIB prior to feasibility study stage, to be endorsed by GDR. Thereafter MoWRAM with its feasibility study consultants and GDR will conduct the first round of consultations with potential AHs and local authorities to discuss project/subproject information, the benefits potential impacts, anticipated land requirements, compensation policy, entitlements and eligibility. The PIB will be distributed and explained during the consultations.

4.3.3.2 Detailed Measurement Survey

58. Based on the final DED and COI, GDR will make arrangements for establishing the Inter-ministerial Resettlement Committee (IRC) and its Working Group (IRC-WG) and Provincial Resettlement Sub-Committee (PRSC) and its Working Group (PRSC-WG) for conducting the DMS/SES and the replacement cost study (RCS) and liaise with the Commune and Village Offices to inform the AHs and commune/village authorities of this survey exercise before the survey is carried out. The PIB will be updated by GDR which will include the entitlements, GRM processes and procedures and GRM focal contact persons at Commune, District, GDR and PGRC levels A consultation meeting will be undertaken prior to DMS to explain the DMS process, GRM procedures and its operationalization, PPM and the updated PIB will be distributed and explained.

59. DMS will be undertaken as soon as the COI is demarcated. The measurement of the affected land, structures, and other productive assets of each AH or of public facilities to be acquired will be carried out during the DMS to record of the impact at household level, and to prepare corresponding compensation package for each household. The DMS shall be carried out with the full participation of the AHs to ensure agreement from affected people and avoid potential dispute over incorrect measurements or calculations of compensation payment package. In particular, the DMS team will install pegs/markers to demarcate the affected land and identify assets affected within the COI in the presence of the AHs. This demarcated area

will be measured the for calculation of the land area and other assets that will be lost. The affected land willl also be classified by type of land at this time based on actual land use.

60. The DMS will be conducted by the IRC-WG assisted by the PRSC-WG and relevant local authorities. The RCS will be conducted in parallel with the DMS by an independent agency hired by IRC[5]. Based on the results of DMS and RCS, GDR with the assistance of project consultants will jointly update the subproject Basic Resettlement Plans, if any, into draft DRPs or prepare the draft DRPs. The draft DRP will be submitted to AIIB for review and comments. GDR will finalize the draft DRP in liaison with AIIB project team for approval by IRC and will then submit it to AIIB for clearance and disclosure. After the disclosure of the approved DRP, GDR will calculate the compensation amount and subsequently request resettlement budget from RGC.

4.3.3.4 Replacement Cost Study (RCS) and Asset Valuation

61. The RCS will be conducted by a local independent consultant qualified and experienced in asset valuation. The RSC consultant will be hired by GDR. RCS results will be used as the basis for calculating compensation package. The rates will be valid for one year from the date of the approval the RCS Report by the IRC.[6] In case compensation payment to AHs is late and the compensation unit rates are no longer valid before commencing compensation, the RCS results will be updated by the RCS consultant to reflect the current market prices of the affected assets.

62. The RCS aims to assess the values of affected assets to propose compensation rates for various affected assets – at full replacement cost. Full replacement compensation includes affair market value that is sufficient to replace the affected assets (without depreciation), plus all necessary transaction costs, interest accrued, transitional and restoration costs, and administrative charges related to new land title, construction permits, reasonable moving (relocation) expenses and any similar additional costs potentially borne by AHs. The compensation payment for the lost assets is based on replacement cost for affected assets such as lands, houses, structures, crops and trees prevailing at the time of the DMS. Their proposed asset valuation methods and results will be subject to confirmation and approval of the GDR.

63. The compensation payment package proposed for each AH will be calculated based on the results of the DMS and RCS. The agreement of AHs as to the proposed compensation package for them is confirmed in an official and binding contract between the IRC-WG and the AH. Any errors that are found will be corrected during a one-to-one consultation process of the compensation package with each AH.

64. A binding legal instrument recording all affected assets of each AH which will be signed by the AH and IRC-WG, and witnessed by local authority (normally by the Commune or Village Chief). The compensation and support to be provided to the AHs will be based on the entitlement matrix, final DMS and RCS results as outlined in the ARP/DRP and agreed with AHs.

65. The following procedures will be applied to determine the replacement costs of affected assets:

a) For replacement costs of land, the RCS Consultant will directly interview households that have recently bought or sold land to collect the evidence of the rate of land transaction, and interview households who are looking for properties to sell or buy within and around the subproject area. The RCS Consultant will also find out from local residents, subject to confirmation/validation through official records of local authorities, the price of various types of land that have been the subject of transactions in the past six months to one year in the community or nearby areas and the prices of various types of land local residents are willing to buy or sell as well as collects data from government offices on recent land transactions and land market assessment.

[5] An independent local consulting firm qualified and experienced in asset valuation will be recruited by GDR to carry out the RCS. The resettlement budget will include the estimate costs of RCS consultancy services.

[6] Ministry of Economy and Finance. Land Acquisition and Involuntary Resettlement para.186 of the Standard Operating Procedure for Externally Funded Projects in Cambodia, 22 February 2018. Phnom Penh, Cambodia.

b) For structures, the RCS Consultant will interview owners of structures to determine the construction materials usually used in the locality for each type of building following existing government categories or standards; sources of construction materials used and the unit costs of said materials, including the costs of transporting the same to the locality; and the cost of labour for constructing each type of building found in the locality. In the survey, interviews will also be conducted with building contractors to determine the cost of construction materials for each type of structures in the subproject area following existing government categories; the cost of transporting construction materials to the subproject area (community); the cost of labour for constructing each type of building; and the unit cost per meter square of each type of building in the subproject area following existing government categories. The replacement cost will be based on the latest item rates for construction within the subproject area.

c) For the crops and trees, interviews will be conducted with owners, market vendors and seedling suppliers to determine the current selling farm gate price of fruits or crops in the area and compensated accordingly as described above. RCS will collect data from statistics offices on average yields per type of crop and/or tree identified during the DMS.

66. The inventory of loss (IOL) and the measurements will be recorded and signed by the IRC-WG and the AH and witnessed by the Commune/Village Official, normally the Chief.

4.3.3.5 Detailed Resettlement Plan

67. Table 2 summarizes the key tasks on the preparation of DRP as per the SOP-LAR and compliance with the AIIB's ESS2.

Table 2 – Key Tasks on the Preparation of Detailed Resettlement Plan

Tasks	Requirements
Institutional Arrangements	• Establishment of the IRC and IRC-WG. • Establish the Provincial Resettlement Sub-Committee and the Provincial Resettlement Sub-Committee Working Group.
Detailed Measurement Survey	• Conduct demarcation of land and DMS (100% survey, 100% Inventory of Losses, and full Census through DMS Questionnaire).
Gender	• Gather gender information.
Poor and Vulnerable Groups	• Update the database based on DMS. • Determine different categories of poor and vulnerable groups, and the eligibility of each to receive additional assistance package. • Finalize the additional assistance package
Replacement Cost Study	• Hire external expert to carry out RCS to determine prevailing market rates to replace lost assets. Methods of valuing affected assets and calculating compensation for each eligible AP or household will be at full replacement cost in line with ESS2 of the AIIB's ESF.
Compensation Package	• Update the LARPF Entitlement Matrix to show the full and complete compensation package that will be made available to the AHs.
Livelihood Support Plan *(if applicable)*	• Prepare plan for Livelihood Support Program for permanent loss of sources of livelihood, in consultation and active participation with the AHs and include in the DRP.
Grievance Redress Mechanism	• Operationalize GRM at the Provincial level[7] • Outline procedures for handling complaints in line with SOP-LAR, provide details to AHs during the consultation process and ensure it is readily accessible and useful to the AHs

[8] The MEF will facilitate the establishment of a Provincial Grievance Redress Committee (PGRC) which will be responsible for addressing grievances for all externally financed projects located in the respective province/city. The PGRC will be established by the Provincial Governor in consultation with the IRC.

Consultation	• Conduct meaningful consultation with AHs at the commune level based on AIIB ESS 2, to inform them of overall entitlements and the method of computation of compensations, as well as the GRM procedures. Seek their feedback of the resettlement process. • Meaningful consultation with AHs eligible for relocation on the Resettlement Sites (if applicable) at commune/village level as per guidelines above • House-to-house consultations to confirm measurement surveys during DMS. • Consultations with APs on compensation rates prior to signing of contracts.
Monitoring and Reporting	• Make arrangements, roles and responsibilities for monitoring and reporting of the implementation of the DRP, and the reporting requirements. • Determine scope of internal monitoring.
Formulation of Budget	• Prepare estimates of land acquisition costs by GDR.

Source: RGC's SOP-LAR, 2018

4.3.3 Approach for Negotiated Settlement

68. In case of negotiated settlement, the following will be adopted:

- The GDR will prepare an IOLs to pave the way for DMS and RCS which will be conducted to design compensation package for each AH;
- The RCS will help calculate the replacement value at current market price including transaction costs, interest accrued, transitional and restoration costs, and any other applicable payments, if any of affected land and assets such as houses, structures, and trees, etc. Where market rates for land are unavailable, the RCS unit rates will be developed in consultation with the AHs or land users to determine the compensation amounts for the land to be purchased and the assets attached to the land.[8];
- If there is loss of income, the RCS consultant will calculate the number of losses based on the project's Entitlement Matrix (Annex 3 of this LARPF);
- In case of loss of fruit trees, the RCS consultant will calculate the economic loss based on maturity and formula shown in the Entitlement Matrix;
- If there is physical displacement, transition allowances will be provided at the rates shown in the Entitlement Matrix;
- The total amount of compensation will be calculated and offered as a lump sum amount;
- Conduct consultation and negotiation with the landowner/land user, and negotiation to be conducted in good faith, and all relevant information has been provided to and understood by the landowner including project use of land, terms and conditions of the agreement. This will be adequately documented;
- A contract will be prepared, showing the total amount of compensation and the breakdown to facilitate negotiation with each AH. Once agreed, a Minutes will be prepared and signed by the AH, that both spouses or single heads of households will be required to sign and the IRC-WG with the witness of the Commune or Village official;
- If all AHs agree with their lump sum compensation package, the lump sum amount will be paid upon contract signing;
- A report on the process and results of the negotiated settlement will be prepared after completion of compensation payment and will be submitted to the AIIB;
- In case an AH does not agree on the proposed negotiated settlement option, the offer of negotiated settlement for all the AHs will be withdrawn and the GDR will prepare a DRP for submission to the AIIB for review and approval;

[8] The cost of compensation equivalent to replacement cost will look at information on recent transactions, quality and type of land, crop cycles and production, and land availability.

- A report on a negotiated settlement will be prepared after the process is completed and submitted to the AIIB.
- GDR will engage an independent external party to validate and document the negotiation and settlement process.

4.3.4 Approach for Voluntary Donation

69. Voluntary land donation will be the sole responsibility of MoWRAM. The GDR will not be involved in the voluntary land donation process.

70. The Voluntary Donation (VD) process should be initiated only when census survey/IOL, DSM, are completed (See Figure 3 above). When VD is the case, an AR) or a DRP will not be prepared. MoWRAM will ensure that only potential donors who meet pre-requisite are approached to tender VD as an option (See Eligibility Criteria at Section 4.3.4.2 below). The potential donors/AHs have the right to refuse to donate their affected assets if they don't wish to.

71. The VD process will be transparent. All potential donors will be informed of their choice for VD and will be consulted fully and appropriately. MoWRAM will be responsible for full and careful documentation of the entire VD process which will be subject to AIIB's prior review and approval.

4.3.4.1 Principles

72. Under CAISARP, the principles below will be adopted:

a) The donor will be fully informed about the subproject and available choices regarding the land and their implications, including refusal to donate the land, and need to confirm in writing their willingness to proceed with the donation;
b) The amount of donated land is minor and will not reduce the donor's remaining land area below that which is required to maintain the donor's livelihood at current levels;
c) No physical household relocation is involved;
d) The donor is expected to benefit directly from the subproject; and
e) Donations from collective land owned by IPs, if any, are not accepted.

4.3.4.2 Eligibility Criteria

73. **For households who are willing to donate,** all conditions below must be met:

- Donating household must not be from any vulnerable households – as defined by the Project and must be direct beneficairy household of the planned subproject;
- Donated land must be minor in nature, and must not exceed 5% of the land plot to be donated;
- Affected assets (intended to be donated) should be lower than 400,000 Riels in value per household and donation of affected land or assets shall not reduce the donor's remaining area below that required to maintain the donor's livelihood at current level;
- No physical or economic displacement of AH is involved except for minor shift back at same location which will be financed under the subproject budget to restore to pre-existing condition;
- Donating person/people should have sole ownership to the land portion and is free from any legal land disputes;
- Donated household bear no fees related to the transfer of the ownership of the donated plot of land. Any fees or taxes owed for processing or registration of the land transfer, if applicable, are paid in full by the Project; and
- All AHs will be informed of project's grievance redress procedures.

For households who do not wish to donate.

- Technical design will be adjusted, if technically feasible, to avoid the land impact.
- If avoidance of land impact is not possible, compensation payment will be made to the affected people in accordance with the Entitlement Matrix of this LARPF.
- Eminent domain or other powers of the state shall not be used for those who refuse donating affected land or assets.

4.3.4.3 Key Steps in Conducting Voluntary Donation

Step 1. Conduct Initial Screening for VD Eligibility

For each subproject, based on the final COI, MoWRAM will:

- Collect key demographic data[9] about affected individuals/households within the subproject COI;
- Collect information on the magnitude of land and/asset impacts based on the IOL;
- Screen to identify individuals/households who are potentially qualified for VD, using the Eligibility Criteria in Section 4.3.4.2 (above);
- Summarize this step using the form in **Annex 2**.

Step 2. Consult with Potential Donors

- In collaboration with Commune and village Council, convene meetings with potential donors qualified from Step 1;
- Explain to potential donors all the details of VD procedures (Section 4.3.4.3), highlighting the affected peoples' right to compensation. Donor could donate portion of affected land and/or other non-land assets if they wish;
- Provide potential donors with sufficient time to consider his or her disposition of the property and has knowingly rejected the right to renege on his or her decision.
- Identify if there are anyone who are using the part of land intended for donation; if there is, consult with them to obtain their consent related to planned donation;
- Finalize the list of donors who wish to donate affected assets;
- Establish a formal statement of donation which will be signed by each owner and user involved, if any, including obtaining donor's informed consent and confirmation there is no dispute associated with part of land that is being considered for donation. There are also no claims by renters, users, squatters, or encroachers (use Form in Annex 2);
- Submit VD documents to the AIIB for review and approval.

Step 3. Start Donation Process

- Proceed the formal procedures for donating the part of land/asset following the government's procedures;
- Hand over/transfer of land title of the donated land to the Project;
- MoWRAM will maintain all records of asset donations and ensure supporting documents are available for review in case where grievance arises;
- MoWRAM will document fully and carefully the entire VD process and compile a report which includes the followings:
- Subproject name, location, geographical area (including timing of the report and disclosure information);
- Description of the subproject's construction work site/section, the COI and the extent of impacts on assets (attach Annex 1);
- Description of consultation activities and procedures that have been undertaken to ensure donors are appropriately informed of the project's VD procedures and requirements, including their rights to choosing compensation payment or opting for VD;

[9] Demographic data may include information about household members such as names, age, education, ethnicity, sex, etc.

- A detailed list of assets voluntarily donated and corresponding donors, disaggregated by gender (attach Annex 2);
- Minutes of consultation, including consultation process and consultation outcomes as to asset donation, and grievance redress mechanism;
- Ensure that VD process is regularly monitored as part of MoWRAM's internal monitoring arrangement.

4.3.4.4 Responsibilities

74. In collaboration with Commune Council, MoWRAM will:

- Develop fair and transparent procedures for VDs in consultation with affected households (AHs) and the communities;
- Provide guidance to and ensure that the Chief of the involved Commune prepares a Voluntary Land Donation Report, following the guidelines outlined in the Commune/Sangkat Fund Project Implementation Manual. This report should confirm that all affected households have been fully informed about the subproject and their right to refuse donating their land and/or other assets;
- Ensure the detailed design avoids impacts on land, houses, structures and other fixed assets. When avoidance is not possible, effort shall be made to minimize such impacts;
- Screen for eligible donating household(s) who meet the donation prerequisite (See Section 4.3.4.1 – Principles) to explore they wish to make voluntary contribution based on the VD principle;
- Ensure eligible potential donating household(s) are appropriately informed[10] that by donating their affected land and/or asset for the subproject purpose, they are reneging on their right to compensation;
- Ensure donating households are those who receive direct benefit from the planned subproject (e.g., access to irrigation, flood protection, etc.)
- Ensure that donated assets are owned and used by the owner, and that if others are using the asset, land or asset users are fully consulted on the potential donation by the asset owner[11];
- Ensure that the person donating land/asset pays no fee associated with their donation. Any fees or taxes incurred to land donation and any update of land ownership documents are covered by MoWRAM;
- Obtain the consent of the community involved, including individuals who are using or occupying the land in case where community or collective land is proposed for donation;
- Keep AHs informed timely and appropriately about the VD process, including their rights and project's grievance redress procedure (See Section 6 of this document);
- Inform potential donors of their right in deciding the extent of their VD (out of the total impact that the project may cause to them);
- Attention shall be paid to vulnerable/ disadvantaged group, such as Indigenous Peoples, women, the elderlies, where relevant;
- Resolve any grievances that may occur in relation to VD process; and
- Ensure that the entire VD process and its outcome is fully and timely documented by MoWRAM and submitted to the AIIB for review.

[10] "Appropriately informed" means that the potential donor has all available information regarding the proposed project activity and its impacts, its land requirements, and its alternative activity sites, as well as the potential donors' rights to compensation as per this LARPF. The potential donor has also been provided with sufficient time to consider his or her disposition of the affected assets and has knowingly rejected the right to renege on his or her decision.

[11] For instance, if part of a business stall is leased and is being donated by the owner, the person leasing the stall should also be consulted.

4.4 Project's Compensation, Livelihood Restoration Program and Relocation

4.4.1 Compensation and other Resettlement Assistance

75. This section applies in cases of LAR activities only. All persons with assets in the COI before COD will be eligible for compensation for lost assets regardless of their legal status. Given that irrigation infrastructure rehabilitation is expected to be conducted in the Riparian Land, which is state-owned land, there would be no compensation for land but loss of income from loss of use of land, land improvements, businesses affected by land, employment, and other income sources; transportation allowances; subsistence allowances during the transition period; and income/livelihood restoration programs. For the vulnerable group, in addition to the above, a special assistance package is provided thereby cash grant for subsistence allowances and livelihood restoration program are doubled.

76. Fruit and vegetable crops, rice, other economic trees and standing crops will be compensated according to the principles of replacement cost in the RGC's SOP-LAR and the AIIB's ESS2. Where possible, AHs will be allowed to harvest crops before acquisition or temporary use of the land.

77. Cash compensation based on the principles of replacement cost will be paid to AHs who lose structures or parts of structures, such as kiosks, roofs, concrete pavements, fences, shops, house-cum-shops and houses. Transport allowances will be provided where relevant.

78. For AH losing income during the transition period, allowances will be provided. If applicable, livelihood restoration programs will be provided for AHs who permanently lose their source of livelihoods.

79. AHs whose land is used temporarily during construction will be compensated for loss of income from crops or other assets during the period of construction.

80. A tenant of the immovable property who is operating a business shall be entitled to compensation for the impact on their business operation and to additional assistance at fair and just compensation to the capital value actually invested for the business operation activities as of the date of the issuance of the declaration on the expropriation project (Article 29 of the Expropriation Law, 2010).

81. Regarding the RGC's SOP-LAR, all AHs who lose their business from fixed structures whose businesses are relocated to a new site will be compensated with the projected loss of net income for 60 days. For those whose business is relocated on-site (move back or within the same area), compensation will be projected loss of net income for 30 days. The businesses may be registered or non-registered. The employees of those with loss of business will be provided with a transitional allowance as per the entitlement matrix.

82. The following types of displaced persons shall be eligible to compensation, but compensation would vary depending on their situation:

- Legal owners and holders of title or rights to land, including customary rights;
- Tenants and leaseholders, including employees, workers and hawkers;
- Those who have no formal title or rights to the land (illegal occupiers) who are engaged in farming or businesses, and
- Poor and vulnerable groups.

However, if the business is engaged in illegal activities like gambling, prostitution, drugs or similar nature, no compensation will be paid.

4.4.2 Vulnerable Groups

83. Poor and Vulnerable Persons/Groups, those who are perceived to be more vulnerable than others such as (i) households living below the poverty line, identified by the Ministry of Planning[12]; (ii) elderly people headed households with no means of support; (iii) female headed households with dependents living below the poverty rate; (iv) disabled headed households, , (v) landless poor living below the national poverty rate; and (vi) indigenous peoples (who often have traditional land rights but no formal titles).

84. To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure, the poor or vulnerable persons who are classified as poor and vulnerable under the above criteria (para. 83) and hold ID Poor Cards lose any **livelihood source permanently** will participate in any one of the three programs and the corresponding skills training program. In addition, these AHs will be entitled to the following: (a) Double the financial support rate offered in the three different livelihood programs. (b) Priority access to employment opportunities under the Project.

85. In cases where Land Acquisition is required from vulnerable groups, the needs of the vulnerable groups need to be assessed and included in DRPs. Special attention should be paid to gender aspects. In cases where vulnerable groups are Indigenous Peoples, DRPs should be done concurrently and in coordination with the Indigenous Peoples Plans, which will be prepared by MoWRAM.

4.4.3 Livelihood Restoration Program

- Eligibility for Participation

86. The purpose of the Livelihood Restoration Program (LRP) is to assist households who lose their livelihood source permanently due to physical relocation to restore their livelihoods and income to the pre-project level, or better. To this end, households who lose their livelihood source permanently are eligible to receive benefit from the CAISARP's LRP. This may be either in the form of cash grants for them to seek new or upgrade their skills or through a LRP (land based, employment base, or business based) depending on the choice of the DPs. Eligible members of affected households, determined through the DMS and detailed in DRP, will have access to skill training tailored to their preferences and economic opportunities in the area at designated vocational centers. This initiative, to be facilitated by the Provincial Department of Labor and Vocational Training, aiming to enhance employability and match participants with potential employment or livelihood opportunities, ensuring a holistic approach to livelihood restoration. Details of the LRP such as types of vocational/skill training, number of APs eligible for LRP, institutional arrangements, enrolment procedure, etc. as well as the budget will be described in the DRP. Those APs who are classified as poor and vulnerable as per the category stipulated in the definition of Vulnerable Groups and will substantiate with ID Poor Cards will also be provided additional assistance to improve their living status.

87. Under the CAISARP, it is anticipated that part of the affected population would be affected significantly. The LRP will be prepared in close consultation and active participation with the AHs and simultaneously implemented in parallel with the DRP to assist AHs in restoring their livelihoods and income levels.

88. Depending upon their existing livelihood, eligible AHs would be entitled to participate in one of the support options as outlined in SOP-LAR: (i) Land-based Livelihood Restoration; (ii) Employment-based Livelihood Restoration; and (iii) Business-based Livelihood Restoration.

Option 1 – Land-based Livelihood Restoration:

[12] RGC, Sub-decree on Identification of Poor Households, No: 291 ANKr. BK (2011), Article 17: Relevant government ministries/institutions, non-governmental organizations and local communities which intend to provide services or assistance to poor households or individuals, including any appropriate emergency interventions, must primarily use valid national poor household data.

AHs who depend on and permanently lose land-based sources of livelihood such as agricultural and livestock will be provided with:

- Access to other land-based sources of income, like vegetable gardening, fruit trees and livestock, if alternate land is not available.
- Soft skill training will be provided such as introductory training on crops of higher value, or training that adds value to existing crops, and other related agricultural job skills that AHs may need. The content of training will be based on a training need assessment to be conducted for AHs.
- Financial support - as a lump sum grant of $200, to assist AHs in re-establishing their livelihood.

If no alternative agricultural land is available, or if the AHs prefer to undertake an alternate type of livelihood, they will be offered the option to participate in either an employment-based or business-based livelihood restoration program.

Option 2 – Employment-based Livelihood Restoration

89. For AHs who rely primarily on employment for their livelihood and have permanently lost that employment as a result of LAR, or for AHs with land-based livelihood who opt for new livelihood, an employment-based livelihood restoration support will be offered to provide them with:

- Employment skills training, based on employment opportunities in the community. A survey of the employment opportunities in the proximity of the relocation sites would be carried out as part of the preparation of the DRP which would be analyzed to determine the types of jobs available, and the skills set requirements. The training program would be developed to help build these skills set for the AHs.
- Financial support as a form of cash grant equivalent to 3 months income based on the official poverty rate prescribed by the RGC to support to the affected family members of the AHs during the training period. The amount will be the monthly poverty rate x number of members in the AH x 3.
- The subproject may also provide temporary job opportunities at the construction site, at the office or other places. For jobs in offices or those requiring higher levels of skills, skill training will be provided to the APs to access those jobs.

Option 3 – Business-based Livelihood Restoration

90. For households (AHs) whose livelihoods are based on business activities and have suffered permanent loss of their businesses, or for those AHs who choose to participate in this program, a business-oriented livelihood program will be available. This program will include the following support:

- Business Skills Training: AHs will receive training in essential business skills, with a specific focus on small or home-based businesses. The training will be tailored to the business opportunities that may exist within their local community.
- Financial Assistance: Given that a limited number of AHs may require this training, a cash grant will be provided to enable them to pursue skills training of their choice.
- Financial support as a lump sum cash grant of $200, to assist them and their families in re-establishing their micro or home-based businesses.

4.4.4 Contracts with AHs and Compensation Payments

91. The agreement on the compensation package is confirmed under a formal and binding contract between IRC-WG and each of the AH. In the case of negotiated settlement, a meeting is held at the commune or village office or community hall where the contracts are offered and explained to the AHs on an individual basis before negotiation and signing. Upon signing, compensation will be paid to AH as a lump sum. If errors are identified during the meeting, they will be corrected on the spot.

92. In the case of the DRP, a meeting will be held with the AHs and the contracts are offered and explained to the AHs on a one-to-one basis. The AH can sign the Contract at that time or within the next three (3) days. The compensation payments are not made at this stage and a separate meeting is scheduled for

making the compensation payments at a later date. The AHs will be informed in advance of the date of the meeting for the compensation payments through the Commune and/or Village Offices.

93. Payment of compensation and rehabilitation assistance to the AHs is central to the implementation of SOP-LAR. The GDR must ensure transparency and integrity of the budget disbursement and compensation payments process which will be governed by the following principles:

- Full payment of the compensation shall be offered and made to all AHs prior to land acquisition;
- Payments for all allowances must be completed prior to relocation to the new sites or self-relocation. In case of AHs who dispute or refuse to accept the offer or payment, the payment will deem to have been made at the same time as payments are made to the other AHs;
- Payments will be made in the joint names of both spouses or the single head of the AH, where applicable or a designated adult member of the AH in case where both spouses are unable to receive the payments;
- Payments should preferably be made by cheque. However, where access to banking facilities is not available or difficult, cash payments can be made with the necessary safeguard protection for the AHs to verify that payments have been actually received by the AHs;
- All payments should be made in a public place as far as possible and witnessed by a representative of the local authorities; and
- On completion of the payments, a proper and due notice shall be issued to AHs to vacate the land/occupation within one month from date of issuance of the notice.

4.4.5 Relocation

94. Relocation of displaced persons to a new site resulting from involuntary resettlement is not envisaged under the CAISARP. However, in the event of relocation of persons displaced by the CAISARP to another new site, all physical relocation will be verified during the DMS and included in the DRP. For the physically relocated AHs, the DRP will include option for self-relocation. Under this option, the displaced persons will be provided cash assistance towards purchase of an affordable land, including site development and transitional allowances, to their preferred choice of self-relocation. The displaced persons can do this for economic reasons, including employment opportunities and availability of employment, or due to social consideration such as proximity of kin. The RCS will determine the costs for self-relocation which will be included in the budget estimates in the DRP.

95. The physically relocated AHs are also entitled to transportation allowance to cover both relocation of AHs from their place of residence, material transport for relocating businesses and temporary relocation or rental allowance. The physical relocation will not commence until full compensation has been paid to the AHs. Monitoring will follow up that the physically relocated AHs have a permanent residence after relocation. Subprojects having a large number of AHs for relocation to another site will not be financed under the CAISARP.

5. INSTITUTIONAL AND IMPLEMENTATION ARRANGEMENTS

5.1 Ministry of Water Resource and Meteorology

96. The Ministry of Water Resources and Meteorology (MoWRAM) is a lead project implementation agency, responsible for public irrigation infrastructure, through its Project Management Project (PMU) and Project Implement Unit (PIU) of PDWRAM. If there is any involuntary resettlement impacts and LAR activities the MoWRAM will request GDR to address them in accordance with the policies and procedures in this LARPF.

5.2 Inter-Ministerial Resettlement Committee

97. The Inter-Ministerial Resettlement Committee (IRC) is the decision making and oversight body for LAR activities. The IRC has the mandate to review and evaluate resettlement impacts and land acquisition for public physical infrastructure projects in the Kingdom of Cambodia. The IRC is a collective entity, permanently chaired and led by the Ministry of Economy and Finance (MEF), with members of other line Ministries. The IRC carries out its responsibilities through a Working Group (IRC-WG) which is established by the MEF for each public investment project. The powers of the IRC are delegated to its permanent Chairman. The key responsibilities of IRC include:

- Provide effective oversight and ensure LAR complies with the laws and implementing rules and regulations.
- Ensure effective coordination between line ministries, provincial/local authorities and GDR in carrying out LAR.
- Provide overall guidance on implementing rules and regulations for LAR and propose updates; as necessary;
- Initiate the establishment of PGRC; and
- Approve of LARPF, RPFs, RFs, BRPs, ARPs, DRPs and any updated ARPs/DRPs.

5.3 General Department of Resettlement

98. The General Department of Resettlement (GDR) is the permanent Secretariat of the IRC and is the lead agency for LAR activities for public investment projects. It is directly responsible for the preparation, implementation, and monitoring and reporting of DRPs in accordance with the laws and implementing rules and regulations related to LAR and the mandatory requirements of the safeguard policies of the development partners. The GDR carries out these activities through its Resettlement Departments (RD). For this project, the Resettlement Department 2 (RD2) of GDR will be the first point of contact and interface with MoWRAM for the entire project and resettlement cycle. Key responsibilities of GDR include:

- Coordinate and collaborate with line ministries and other agencies involved in LAR activities;
- Conduct public consultations and focus group discussions with the affected peoples and vulnerable groups (if any);
- Prepare the ARP/DRP for the subprojects and submit to the AIIB for review and concurrence;
- Develop terms of reference and recruit the replacement cost appraiser;
- Prepare and secure the necessary budget for the implementation of the ARP/DRP;
- Calculate, prepare contracts, and make payments for compensation for each AH based on the entitlement matrix in the ARP/DRP;
- Implement all LAR activities in compliance with the ARP/DRP;
- Ensure proper functioning of the GRM, including training/refresher training for GRC members, adequate record keeping, etc.;
- Supervise, monitor, and report on implementation progress of the ARP/DRP;
- Prepare and submit to MoWRAM and copy to the AIIB a handover letter for AIIB's no objection to commencement of civil works;
- Prepare and submit to AIIB semi-annual monitoring reports;
- Prepare, agree with AIIB and implement corrective action plan, if any, during implementation; and submit the corrective action plan implementation report to AIIB for concurrence and disclosure;

- Conduct awareness workshops for MoWRAM, line ministries, local authorities, and construction contractor on the implementing rules and regulations as specified in the ARP/DRP;
- Acquire the land and provide land handover letter to MoWRAM with a copy to AIIB; and
- Serve as the focal knowledge center for resettlement of the project.

99. The Department of Internal Monitoring and Data Management (DIMDM) of GDR is responsible for carrying out the internal monitoring of the implementation of the ARP/DRP. Its role extends to internal verification of all LAR activities for compliance with the provisions under the agreed ARP/DRP and reports directly to the Director General of GDR. In addition, it records and reviews all complaints and grievances submitted by affected people; investigates them and makes recommendations on compliance to the Director General of GDR.

5.4 Inter-Ministerial Resettlement Committee Working Group

100. The Inter-Ministerial Resettlement Committee Working Group (IRC-WG) is established by the GDR and will carry out the day-to-day land acquisition activities under the project/subproject, led by the Deputy Director/Chief of the Resettlement Department 2 (RD2) of GDR. The IRC-WG comprises technical staff of MoWARM, staff of GDR and staff of the Ministry of Land Management, Urban Planning and Construction. The IRC-WG will be responsible for all the fieldwork under the supervision of the Director of the RD2 and overall guidance and direction of the Director General of the GDR.

5.5 Provincial Resettlement Sub-Committee

101. The Provincial Resettlement Sub-Committee (PRSC) is established by the Provincial Governor at the request of the IRC for each project/subproject and comprises (i) the Provincial Governor or the Deputy Provincial Governor as the Head, (ii) Provincial Department Directors of the Line Ministries represented in the IRC, and (iii) the respective chiefs of the Districts and Communes of the locations affected by the project/subproject as Members.

The role of the PRSC is as follows:

- Provide the coordination and supporting role to the GDR, IRC and IRC-WG for land acquisition activities at the local level;
- Ensure all relevant provincial and local government authorities provide the necessary support for land acquisition;
- Manage the public consultation meetings at Provincial Level;
- Oversee and monitor the work of the PRSC-Work Group;
- Responsible and accountable for the disbursements of the compensation payments at the provincial level; and
- Assist the IRC-WG in developing measures to assist vulnerable households by the project.

5.6 Provincial Resettlement Sub-Committee Working Group

102. The Provincial Resettlement Sub-Committee Working Group (PRSC-WG) is established by the Provincial Governor and is mainly responsible for technical functions of the PRSC and works with the IRC-WG in carrying out the LAR activities at the provincial level. In addition to supporting the PRSC, the PRSC-WG has the following specific functions:

- Facilitate all public consultation and information disclosure meetings and maintain records;
- Cooperate with IRC-WG in carrying out DMS and IOLs and in the implementation of the approved DRP;
- Lead the payments of compensation; and
- Prepare monthly progress reports on all land acquisition activities at the provincial level and submit them to PRSC and GDR.

5.7 Cadastral Administration Office

103. The Cadastral Administration Offices under the Ministry of Land Management, Urban Planning and Construction is responsible for issuing titling documents, including the certificate of land use rights, hard titles, and social land concession as part of securing tenure for landless and issuing title documents for the land plots acquired in favor of MoWRAM.

5.8 The concerned local administrative authorities (district, commune and village)

104. The districts, communes, and villages where the Subproject is located will coordinate and work closely with the PRSC-WG and IRC-WG on the DRP preparation and implementation. Their roles and responsibilities include:

(i) Identify and coordinate the venue for the public consultation meetings and invite AHs to participate in the consultation activities, such as DMS, SES, RCS and other resettlement related activities;
(ii) Assist in the resolving of grievances/complaints lodged by the AHs; and
(iii) Assist the IRC-WG, PRSC-WG, and GDR in developing suitable measures to assist the vulnerable AHs by the Subproject.

6. GRIEVANCE REDRESS MECHANISM

6.1 Overview of Grievance Redress Mechanism

105. The Grievance Redress Mechanism (GRM) seeks to resolve concerns promptly, using an understandable process that is culturally appropriate and readily accessible at no cost. Grievances can be submitted if an AH or any person believes the Project/Subproject is having a direct detrimental impact on them as a result of land acquisition impacts.

106. In provinces where the CAISARP requires acquisition of land or loss of other livelihood assets, a GRM will be set up or activated to handle complaints and concerns of local people on all land acquisition and involuntary resettlement aspects of the project/subproject. The MEF will facilitate the establishment of the Provincial Grievance Redress Committee (PGRC) for addressing grievances of the project/subproject. The PGRC will be established by the Provincial Governors in consultation with the IRC. The Expropriation Law of the RGC provides for a GRC to handle complaints with the additional provision for the AHs to seek judicial redress in case they dispute the decision of the grievance redress committee.

6.1.1 Provincial Grievance Redress Committee

107. The PGRC will consist of representatives from relevant provincial authorities and the MEF as follows:

- Chair: Provincial Governor, or person appointed by the Provincial Governor
- Vice Chair: Director of Provincial Department of Land Management, Urban Planning and Construction or representative
- Member: Director of Provincial Department of Economy and Finance or representative
- Member: Director of Provincial Department of Water Resource and Meteorology or representative
- Member: Chief of Provincial Office of Law and Public Security or representative
- Member: District Governor or representative
- Member: One Representative of a Local-Based Civil Society Organization.

108. The GRC functions at three levels or tiers to handle LAR grievances:

1. The first level will be at the district level by the concerned District Head;
2. The second level will be at the GDR level by the Director General of GDR; and
3. The third level will be at PGRC level by PGRC before going to the judicial system.

6.2 Grievance Redress Procedure

6.2.1 Types of Complaints

109. Complaints can be categorized as either an individual or an anonymous or a group or complaints:

1. **Individual Complaint**: Lodged by a single affected person (AP) facing a grievance. The complainant has access to all three steps in the process.
2. Anonymous Complaint: Complaint lodged in written or oral, received by the GDR, in which the identity of the complainant is not revealed.
3. **Group Complaint:** Filed by a group of APs with the same grievance(s) based on the same facts. If the group consists of fewer than five APs, they can follow the same procedures as individual complaints. However, if the complaint contains different grievances that don't apply to all group members, separate complaints are requested. Group complaints skip Step 1 and proceed directly to Steps 2, 3, and 4, similar to individual complaints.

110. GRM requires that complaints (or comments/suggestions) should be made in writing. As such, the head of aggrieved affected households must lodge a complaint in writing to the Head of the District Office. In case the aggrieved person has difficulties writing, the Administration Officer at the District Office will assist the aggrieved person to fill in the Individual Complaint Form based on the verbal complaint of aggrieved person. While anonymous complaints are accepted, potential APs will be advised that anonymous complaints related to specific entitlements, for example, may take longer time to resolve, if necessary, details are not provided in anonymous grievance letter to allow appropriate investigation and resolution. As such, response to anonymous grievance cannot be provided. However, where sufficient information is provided (in anonymous grievance letter), anonymous complaints will be resolved. Anonymous complaints will be addressed directly by the GDR, and if the grievance cannot be resolved, it will be forwarded to the PGRC (the third step of the GRM) for resolution. The grievance will be handled thorough a 3-step formal approach as outlined in the SOP-LAR and detailed below.

111. However, prior to the First Step, the AH may informally seek the assistance of the commune chief or a community elder to discuss and find an amicable solution to his/her complaint or grievance with the leader of the PRSC-WG. This is done verbally and informally and moreover; its aim is to resolve the matter to avoid lodging formal written complaints. If this verbal process of problem solving does not resolve the complaint to the satisfaction of the AH, s/he can seek the formal route for lodging the grievance. Formal lodging can be done verbally (to community elder or representative who will record the complaint) or in writing. The GRM process is detailed below:

- **Step 1 – District level**. AH can lodge a written complaint to the Head of the District Office (where the subproject is located). The AH can bring a community elderly or their representative to discuss their grievance at the District Office. A conciliation meeting shall be held, and a decision be made within **15 working days** from the date of complaint is received by the District Office. If the complaint is resolved to the satisfaction of the AH, the IRC-WG will inform GDR's Department of Internal Monitoring and Data Management (DIMDM) who will review and seek the approval of the Director General of GDR for appropriate remedial action. GDR will inform the AP of the decision/ remedial action within **15 working days** from the receipt of the grievance by the District Office. If the complaint is rejected at this step, District Office will inform the AH of the rejection in writing. If the complainant is not satisfied with the decision/resolution result, s/he can proceed to step 2 (below).

- **Step 2 – GDR level.** The complainant who is not satisfied with proposed resolution from Step 1 shall lodge a written complaint to the GDR for resolution. GDR, through its DIMDM, will carry out a holistic review of the complaint and submit a report on its findings with the relevant recommendations, if any, to the Director General of GDR for review and decision. GDR may conduct a field visit to meet the complaint and the IRC-WG to gather relevant information. The final report must be completed within **30 working days** from the date of receipt of the complaint by GDR for submission to the Director General of GDR who will make a final decision within **5 working days** of receipt of the final report. In the event that the subject matter requires a policy level intervention, it will be referred to the IRC for a decision which may require that an additional **10 working days** be extended from the original deadline for final decision.
- **Step 3 – Provincial level.** AH will submit a written complaint to the PGRC through the Provincial Governor's Office. The complainant or a representative will be given an opportunity to present its case during a meeting and the PGRC may consider any compelling and special circumstances of the AH to inform their decision. The GDR will send a representative, as a non-voting member, to provide an explanation to the rejection of the complaint at Step 3 with the GDR. The decision of the PGRC must be made on a consensus basis and will be final and binding except when the matter relates to government's policy. Decisions related to government's policy matters on land acquisition and resettlement are decided by the IRC. The PGRC will have **40 working days** from the date of receipt of the complaint to reach a final decision. The decision of the PGRC will be sent to the IRC (through the GDR) for endorsement before any remedial action is taken.

112. The handling of the complaint at the administrative stage ends at the Third Step. There are no fees or charges levied on the AH for their lodgment of complaint and for complaint resolution for the above 3 steps. However, as provided for in the Expropriation Law, the aggrieved AH at any step can file a suit at the Provincial/Municipal Courts, as applicable, to seek a resolution. At this stage, there is no involvement of the GDR, PRSC or IRC-WG unless there is a judicial order from the competent court.

113. However, if the aggrieved person prefers filing a lawsuit at the Provincial/Municipal Courts, as applicable, to seek a resolution, AH can do so but will bear cost related to the lawsuit as per the Expropriation Law. When the case is brought to a Court of Law, there is no involvement of the GDR, PRSC or IRC-WG unless there is a judicial order from the competent courts.

114. **Project Affected People's Mechanism (PPM)**. People who believe they have been or are likely to be adversely affected by a failure of the Bank (Asia Infrastructure Investment Bank) to implement the Bank's Environment and Social Policy may submit complaints to the Bank's PPM in accordance with the Policy on the PPM, when their Project-related concerns cannot be addressed satisfactorily through the above Project-level GRMs or the Bank's management processes.

115. Information on the availability of the PPM will be provided in the Khmer language and in English and disclosed in the PIB and the Project's Website.

116. The GRM details and guidelines on LAR will be circulated and explained in detail to the AHs during consultations during the ARP/DRP preparation and implementation. These guidelines outline each of the above Steps and include the administrative procedures for receiving and addressing complaints during the consultative meetings. The GRM procedures, focal person and their contact details will be included the updated PIB and will be distributed and explained in detail to all AHs during the preparation and implementation of the DRP.

6.3 Recording and Documentation of Grievances

117. The RGC's SOP-LAR details the GRM process, registers, records, and documentation. The forms for individual complaint form, register of complaint and Letter from Head of District-Khan to be used for grievance documentation will be included in the updated PIB and distributed and explained to the AHs.

7. FUNDING AND IMPLEMENTATION ARRANGEMENTS

7.1 Budget and Financing

118. The budget for land acquisition and resettlement is prepared after the DMS and RCS are completed and is included in the DRP. In the case of negotiated settlement, it is included in a separate report on negotiated settlement. The budget is financed by the counterpart funds allocated from the national budget by the RGC and no CAISARP loan funds from AIIB and IFAD will be required. The budget will include the estimate costs of all the affected/items such as land, buildings, structures, crops and trees, relocation, vulnerable, transitional and transport allowances, income and livelihood support etc. for compensation payments that are due to any AHs that will be in the DRP. The field surveys, consultation meetings, GRM, etc. will be financed from GDR's and Provincial Administration's budget.

119. The GDR will be responsible and accountable for all financial management functions relating to the use of the budgeted funds. The funds for land acquisition are provided to the GDR from the Counterpart Funds Account. Once the budget is approved by the MEF, the funds are released by the General Department of Treasury and deposited into a project designated account established by the GDR for the Project/Subproject in the National Bank of Cambodia. Following an internal process, the funds are released from the project/subproject designated account, as and when necessary, and provided to the PRSC which is responsible for making payments to the AHs.

7.2 Implementation Plan

120. The Project is expected to be implemented from 2024 to 2031. Land acquisition for six schemes is expected to take place from 2024-2026.

7.2.1 Voluntary Donations

121. It is expected that priority irrigation infrastructure will be identified in Year 1 and screened for involuntary resettlement impacts as detailed in this LARPF. In cases of VDs, the implementation process will consist of iterative consultation to ensure affected people are adequately informed of options available for their choices and of the donation process, COI, COD, and time when the civil works is scheduled to start. The donation of assets will be fully and carefully documented by MoWRAM, as described in this LARPF.

122. The MOWRAM-PMU's ESOs will work closely with the DED team to identify any potential land acquisition and will lead the consultation process on VDs, including COD, as detailed in this LARPF. The process for documenting VDs shall be completed before the civil works contractor commences works on that construction work site/section. During civil works, the contractor will work with Commune and PDWRAM-PIU to remove donated assets at contractors' costs. The removed assets will be provided to donating households if they wish. The contractors will restore the affected area and the area next to the affected area to a good condition, if needed, to the satisfaction of the donating person. For instance, if part of a concrete driveway is donated, the contractor will assist to ensure the rest of the driveway is in good condition.

7.2.2 Land Acquisition

123. In the case of Land Acquisition, the procurement of civil works will commence after the DEDs have been finalized, the demarcation of land is completed jointly by MoWRAM and GDR, and the COD has been announced and relevant project/subproject information is disseminated as described in this LARPF. It is expected that the census survey, IOL and DMS will commence after the DEDs for a construction component is submitted to GDR. The preparation of the DRP/ARP and its approval by the IRC and the AIIB is expected within 90 days thereafter if the number of AHs is minimal (less than 100). After the approval of the budget and release of funds, the payment of the compensation will take about 30 days to 45 days depending on the number of AHs.

124. Civil works can commence only in sections where the payment of compensation and other entitlements have been paid in full to the AHs in that section and a comprehensive income restoration program, where applicable, is in place and supported by an adequate budget. In case AH refuses the compensation payment, or where complaints have been lodged for resolution under the GRM, these cannot prevent the commencement of civil works and funds should be put in a separate special account on hold for the AH. In the event if any assets outside the COI are damaged during construction by the civil works contractor, the contractor will be required to restore/repair them to the original or better standard.

8. INFORMATION DISCLOSURE AND STAKEHOLDER CONSULTATION

8.1 Information Disclosure

125. For public consultation, the draft LARPF (in English) and its Executive Summary (in Khmer) was disclosed on MoWRAM's website on http://www.mowram.gov.kh/. The Executive Summary (in Khmer) was also disclosed in hard copy at MoWRAM's public library in Phnom Penh, and in the offices of PDWRAM in the commune offices of the all-subproject provinces. Once the LARPF is finalized and approved, it will be again disclosed through the above channels. The final approved LARPF will be disclosed in English on the AIIB's website.

126. Once the subprojects are identified and selected, the proposed subproject information will be explained in detail to the subproject stakeholders in Khmer language with translation into the language spoken by IPs for those locations where IPs are identified in the subproject areas, and the PIB will be distributed to them. The proposed project/subproject information in the PIB covers the following:

(i) The purpose, nature, and the scale of the proposed project/subproject.
(ii) The location of the proposed project/subproject, project/subproject components and activities.
(iii) The duration of proposed project/subproject activities.
(iv) The COIs, timing of census, IOL, DMS/SES, eligibility criteria, compensation policy, RCS, the timing of the establishment of the GRM, and contact details for the GRM focal persons.
(v) The options for voluntary land contribution and relevant procedures.
(vi) Potential risks and impacts of the proposed project/subproject on local communities, and proposed mitigation measures, highlighting potential risks and impacts that might disproportionately affect vulnerable and disadvantaged groups and describes the differentiated measures taken to avoid or minimize them; and
(vii) Names and contact details of key persons on LAR technical matters on the project/subproject.

8.2.1 Voluntary Donation

127. In addition to the PIB explained and distributed to the stakeholders, in cases of VDs, affected people with assets in the riparian corridor will be informed about the subproject and their options for them to receive compensation or to voluntarily donate their affected assets. The GRM will be explained in detail and donors will be appropriately informed and consulted about the sub-project and choices available to them. The contact information of MoWRAM's SEOs will also be disclosed during the consultation process. As described, when people choose to voluntarily donate, the process of land VD will be adequately recorded and documented in English and Khmer. In the case IPs are identified to be present in the subproject area by MoWRAM, documentation will be translated into the language used by IPs. Documentation will be publicly disclosed at the local level (such as commune/Sangkat halls) and at national level (MoWRAM's website). Personal details and sensitive information of donating people will be removed to protect their privacy.

8.2.2 Land Acquisition

128. In cases of Land Acquisition, the relevant information will be disclosed timely in Khmer language and translated in the language used by IPs in the case IPs are identified to be in the sub-project area, and in places easily accessible to AHs and the communities. Information disclosed to AHs relevant to land acquisition will be done through PIB at the first consultation stage during Basic Resettlement Plan (BRP) preparation, and through updated PIBs at a second consultation stage prior to DMS and at third consultation stage upon

contract offer. The BRPs and ARPs/DRPs, without sensitive personal information, will also be disclosed at MoWRAM's and the AIIB's website.

8.2 Stakeholder Consultation

8.1.1 Consultation and Stakeholder Engagement for Voluntary Donation

129. Once project implementation begins, in cases of VDs, potentially AHs will be invited to consultation sessions to understand the project compensation pprocesses as well as the availability of the VD option that affected people may consider. Special attention will be given to disadvantaged/vulnerable individuals/groups, Indigenous Peoples, if any, and women. Local authorities will also be invited to participate in these consultations.

130. As outlined in this LARPF, consultations will begin as early as subproject's design and location are identified and will be facilitated by the SEO at MoWRAM. The consultation will be an iterative process in which all AHs will be informed of their right to compensation and the option for a VD of assets, including VD procedures, and the subproject's benefits.

8.1.2 Consultation and Stakeholder Engagement for Land Acquisition and Involuntary Resettlement

131. In cases of Land Acquisition, key stakeholders participating in the consultation process will include:

- AHs, with special attention to women, Indigenous Peoples include their representative (if any), and disadvantaged/vulnerable people;
- MoWRAM and PDWRAM-PIU; its Provincial Departments;
- Provincial Department of Land Management, Urban Planning and Construction;
- Provincial Department of Agriculture, Forestry and Fisheries;
- Provincial River Basin Management Committee;
- IRC and GDR, including IRC-WG and PRSC-WG;
- Provincial and Local authorities (District/Khan, Commune Councils and Village Offices), including representatives of women's groups; and
- Civil Society Organizations, if relevant.

132. Consultations on land acquisition and involuntary resettlement will be an iterative process and will consist of various rounds taking place in various subproject locations, as described in the SOP-LAR. Consultations will start when subproject's construction work sites are identified. In addition to information disclosed as in in this Section above, concerns, questions and comments raised by AHs will be recorded and considered for incorporation into subproject planning, design and implementation.

133. The first consultation will aim to introduce the project/subproject, its goal, benefits, risks and impacts, including land acquisition and VD procedures. The option of a negotiated settlement will be explained in detail. The consultation will target both potential affected people and interested parties. The PIB prepared by MoWRAM and endorsed by GDR will be shared and made available at the commune/village council offices located in the subproject area. The GRM procedures and processes will be introduced to AHs and their views sought. If the subproject spans across a few provinces or multiple communes, then multiple consultative meetings will be held to cover all the affected communes. The major concerns and suggestions raised by the AHs will be recorded in the Minutes of the Meeting in summary form. If AHs agree on a negotiated settlement, this will also be recorded in the Minutes.

134. The second round of consultations will be at DMS stage and will focus on DMS process, the DMS Questionnaire and the IOL which will be explained to the AHs. This consultation will be undertaken jointly by IRC-WG and PRSC-WG assisted by local authorities. The updated PIB by GDR reflecting the entitlements for AHs, including GRM procedures and GRM focal persons and their contact details at commune, district, GDR and provincial levels will be shared and explained in detail. The consultation will be conducted with

participation of AHs and relevant authorities before DMS starts. Thereafter the DMS team will meet AHs on one-on-one basis and explain the purpose of the DMS process before proceeding to filling out the DMS Questionnaire and carrying out the measurements of the affected assets. The measurements will be taken in the presence of the AH and the AH will confirm the loss of the affected assets and measurements. This is to ensure AHs fully understand the basis on which the compensation will be paid for their lost assets, and other relevant entitlements. The DMS Questionnaire, which also includes the SES Questionnaire will also be shared and discussed so that the AHs know what information and data will be gathered during house-to-house DMS. The AH will sign the completed DMS Questionnaire and the IOL and witnessed by a community elder or official or commune chief. This process is also followed for a negotiated settlement.

135. The third public consultative meeting will be held prior to the signing of the agreement/contract for the compensation package and will be undertaken jointly by the IRC-WG and PRSC-WG. At this stage, the DMS and the RCS are completed, the compensation package for each AH is known and draft contracts will be prepared. The consultative meeting explains the compensation package, compensation schedule, procedures, entitlements and GRM, among others. The AHs will be provided with the option to sign the contract during this consultation stage or given 3 working days to submit the signed contract to the IRC-WG through the commune council office. For AHs who are unable to participate in the meeting, best efforts will be made to visit them at their home or seek the assistance of the village office to contact them. During the DMS the IRC-WG and PRSC-WG will obtain the mobile phone contact details from all AHs, and they will be outreached through mobile phones, when required.

136. Additional formal consultative meetings will be conducted when the compensation payment is ready to be disbursed. Details on consultation entitlements, schedule and process will be provided as well as the GRM. This consultation will be undertaken jointly by the IRC-WG and PRSC-WG. The schedule for compensation payments will be informed to AHs at least one week in advance through the commune and village offices.

137. The disclosure of relevant project/subproject information helps the AHs and other stakeholders to understand the risks, impacts and opportunities of the project/subproject. Meanwhile meaningful dialogue in consultations can avoid the potential for conflicts, address the concerns of APs to the extent possible, avoid bottlenecks to minimize project/subproject delays and contribute towards mitigating adverse impacts.

138. The consultation and disclosure activities associated with IFAD and AIIB-funded projects in Cambodia adhere to the principles of meaningful consultation, transparency, and alignment with local procedures, including the Royal Government of Cambodia's SOP-LAR, as well as any applicable Social and Environmental Plans or requirements. This ensures that projects funded in Cambodia prioritize community engagement and adhere to established standards for environmental and social risk management. The consultation and disclosure activities that are specified in the RGC's SOP-LAR and are consistent with that of AIIB's ESF (stakeholder engagement, para. 18) including requirements for meaningful consultation that begins early and is ongoing throughout the project/subproject.

9. MONTORING AND REPORTING

139. While the MoWRAM will be responsible for monitoring the overall implementation of the CAISARP, its process and outcomes of activities set forth in this LARPF, the DIMDM of GDR will be directly responsible for the monitoring and reporting of the implementation of the DRP. MoWRAM will engage the Detailed Design Implementation and Supervision consultants under CAISARP to assist MoWRAM in the management, implementation and monitoring of CAISARP. The DIMDM of GDR remains responsible for the monitoring and reporting of the implementation of the land acquisition activities under the ARPs/DRPs.

9.1 Internal Monitoring

140. The role of internal monitoring of the LAR activities are to ensure that resettlement activities are implemented in accordance with the implementation schedule outlined in the subprojects' ARP/DRP. In this

way, the protection of AHs' interests and the schedule for civil works can be assured. Primary responsibility for internal monitoring lies with MoWRAM as the project implementing agency and will be coordinated by its PMU. PMU will be responsible for overseeing the formation, function, and activities of each of the implementing agencies, and through quarterly monitoring reports, summarizing this progress. All monitoring data will be collected to ensure gender and ethnicity disaggregation.

9.1.1 Voluntary Donations

141. MoWRAM-PMU will be responsible for keeping adequate records of VD process and outcomes in accordance with the provisions outlined in this LARPF. As part of internal monitoring, the Project Manager (PM) will be responsible for reviewing the reports submitted by the SEO on VDs and grievances, if any. The files of record should be kept in the PMU office for at least five years after the project/subproject is completed.

142. It is expected that SEO will conduct due diligence on the voluntary land donations. The due diligence report provided by MoWRAM will cover the followings:

- Validation that donating assets is within the COI and the donors (individuals/households) are direct project beneficiaries;
- Validation and documentation that assets required for the subproject (within COI) were donated voluntarily and are free from any dispute on ownership or any other encumbrances;
- Validation that donated asset is minor and have not reduced the donor's remaining area below that required to maintain the donor's livelihood at current levels;
- Validation that no physical relocation or displacement of person is involved;
- Validation that meaningful consultation has been conducted in good faith with all potential donors, including that donors were aware that they were entitled to compensation. Separate discussions to be held with women as required to facilitate meaningful participation;
- Validation that a GRM is in place and a review and documentation of grievances, if relevant;
- In cases of community donation, that there is a consent of individuals using/occupying the land; and
- PMU will report will prepare a special report detailing the VDs when these are completed for subprojects for each contract package and submit to AIIB with all the relevant supporting documents. In addition, it will report on all aspects of VDs in the quarterly progress reports and submit them to AIIB.

9.1.2 Land Acquisition and Involuntary Resettlement

143. In case of Land Acquisition and Involuntary resettlement, the objective of internal monitoring is to (i) measure and report to keep MoWRAM informed on the progress in the preparation and implementation of the ARP/DRP; (ii) identify problems and risks, if any, and measures to mitigate them; and (iii) assess if the compensation and rehabilitation assistance are in accordance with the provisions under the ARP/DRP.

1. The GDR's DIMDM will be responsible for carrying out the internal monitoring which will review quarterly DRP progress reports provided by the RD2 including fielding its own missions to the fields to verify the progress made and the validity of the data and information, where necessary. The DIMDM will validate that the (i) entitlements and the corresponding compensation are paid to AHs in accordance with the EM in the DRP; and (ii) GRM is functioning as per the guidelines. The GDR's DIMDM will prepare and submit a semi-annual monitoring report on the implementation of the DRP. A single monitoring report will be prepared covering all subprojects under DRP per province. An indicative list of internal monitoring indicators is provided in **Annex 4**.

2. The internal monitoring reports will include the followings:
   (i) Set up of Institutional Arrangements;

(ii) Compensation Payments for Entitlements;
(iii) Relocation, if any;
(iv) Livelihood Restoration Program, where applicable;
(v) GRM;
(vi) Public Consultations;
(vii) Budget Expenditures;
(viii) Overall RP Implementation Progress against agreed Implementation Schedule in the DRP;
(ix) Problems and issues; and
(x) Proposed remedial actions.

144. In case of a negotiated settlement, when this is completed for the subprojects under each contract package, the GDR will submit a report detailing the negotiated settlement process together with the relevant supporting documents to the AIIB.

9.2 External Monitoring

145. In addition to internal monitoring, GDR will engage an Independent Monitoring Consultant (IMC) to conduct periodically independent monitoring on implementation of DRP where there is significant impact. The purpose of IMC is to monitor the implementation of the approved DRP to ensure the implementation complies with regulations and policies stipulated in the DRP. The IMC will prepare a completion report within 6 months of the completion of the resettlement activities under the DRP. The final report should include all findings from monitoring and evaluation and corrective action plan (if needed) and will be submitted to GDR. GDR will submit the final completion report to AIIB.

ANNEXES

Annex 1 – Screening Form for Land Acquisition and Resettlement

Initial Screening on Land Acquisition

Initial Screening is to be done during the feasibility study and confirmed during DED.

Province:		**District:**				**Commune:**	
Name of Subproject:		**Name of contractor:**				**Name/number of irrigation infrastructure:**	
Section of Construction Work (m/Kms)	**Villages/ Communes / Districts located/ crossed**	**Describe what is within COI (i.e. possible asset impacted such as trees, parts of structure, concrete driveway, livelihoods etc.)**				**Number of AHs impacted**	**Would voluntary donations be appropriate? (small impacts, no major impact on livelihood, no relocation etc. see Section 3.1 of this LARPF)**
		Western Side (W)	**Eastern Side (E)**	**Northern Side (N)**	**Southern Side (S)**		

Annex 2 – Voluntary Asset/Land Donation Form

Province:	District:	Commune:	Villages:
Subproject ID:	Name of contractor:		
Names of Persons Donating:	Name of Husband:		ID Number:
	Name of Wife:		ID Number:
Address:			
Beneficiary of the project: Y/N			
Living/Operating/with land, structure or tree/crop on COI: Y/N			
How does the persons donating **directly benefit** from the project? Please detail:			
Is the asset being donated used by anyone other than the owners? Please detail:			

Description of land that will be taken for the subproject:	Area affected:	Total landholding area:	Ratio of land affected to total land held (%):	Map code, if available:
Description of annual crops growing on the land now and subproject impact:				

	Details (number, etc.)	What the donating person is left with?
Trees/crops that will be donated		
Fruit trees/crops		
Mature non-fruit trees		
Trees/crops used for other economic or household purposes		
Describe any other assets that will be lost or must be moved to implement the subproject:		
Assets that will be donated (including parts of structures, wells, fences, etc.)		

Total value of donated assets:	Land*	Structures	Trees/crops
Other:			
If the asset being donated is used by someone other than the owner, a description of the remaining assets of that person, and/or description of why their livelihoods are not made worse by the donation.			

* *VLD will be accepted when the land area does not exceed 5% of the total land area*

By signing or providing thumbprint on this form the owner and/or user agrees to contribute assets for CAISAR's subprojects. The contribution is voluntary, and the person affected understands they could refuse or have the option to seek compensation, but they choose to donate. If the owner or user does not want to contribute his/her assets to the subproject, s/he should refuse to sign or provide thumbprint and ask for compensation instead.

Date:	Date:
District MoWRAM representative's signature	Donating person's signature (both husband and wife if applicable)

Witnessed by village/commune authority:

Annex 3 – Entitlement Matrix

Category	Type of Loss	Application	Category of AH	Entitlements	Clarification
1. LOSS OF LAND					
1a	**Land**	Agricultural, residential and commercial land	Legal owners, including those covered by customary rights	• Cash compensation for land at full replacement cost or land swap of equal productive value. • Provision of all and full stamp duties, land registration fees and other similar taxes, if applicable by the time of compensation, for acquiring legal rights in case of replacement land (land for land swap). • Includes option of compensation at same replacement cost for affected land that remains after acquisition if remaining land becomes unviable or unusable. • For customary ownership, replacement land to sustain livelihood and way of life. Land registration, stamp duty and other fees to register land ownership or right to use will be reimbursed at cost	• If land for land is offered, title will go to both husband and wife. • Applies only to partial loss of land.
1b	**Land**		Tenants and Leaseholders	• No compensation for loss of land as not legal owners of land (compensation made to landowner)	
1c	**Land**		Illegal occupiers/squatters without legal titles or rights to land	• No compensation made for land loss as not legal owners of land.	
2. LOSS OF USE OF LAND					
2a	**Crops, Perennial trees, fruit trees, timber**	Agricultural land	All AHs who are engaged in farming, irrespective of titled and non-titled	• **For rice/crop farming:** **Net annual income X 1year.** In addition, AHs can harvest and retain income from standing crops. • **For fruit trees,** replacement cost of loss based on following formula: **[Quantity Harvested per Year) X (Market Price) X (Number of years it will bear fruit)] + Cost of Seedling.**	• RCS will determine the amounts. • Market Price is based on Farm-Gate Price
				• **Perennial trees** that have a growth period of more than 5 years are classified as follows: + ***Sapling trees*** *under 1 year*: not compensated as it can be replanted. Cost of seedling will be provided. + ***Young trees*** (1 to 3 years): Valued at 1/3 of its full cost as it can be replanted plus cost of seedlings. • ***Young trees*** (More than 3 to 5 years) bearing some fruits: valued at 2/3 of its full cost plus cost of seedlings.	• RCS will determine the value. • Full compensation price is the amount to be calculated from the formula shown in [ ] without cost of seedling.

Category	Type of Loss	Application	Category of AH	Entitlements	Clarification
				• ***Mature trees*** (more than 5 years): full bearing fruits valued at full cost plus cost of seedling. • ***Wood and other Productive Trees***: based on age and wood value.	
2b	**Businesses**	Commercial use and business use	All AHs who are engaged in businesses, irrespective of titled and non-titled	• For businesses which need to be relocated to a new site, an amount equal to loss of projected net income for **two months**. • For businesses relocated on-site (move back or same area), an amount equal to loss of projected net income for **one month.** • For illegal businesses such as gambling, prostitution, drugs and similar types, no compensation is paid.	• RCS will determine the amounts. • Both registered and unregistered businesses are compensated except businesses that are not legal.
3. LOSS OF HOUSES AND STRUCTURES					
3a	**Houses and Structures**	Residential, commercial structures and other assets	Owners of houses, buildings and structures	• Cash compensation equivalent to full replacement cost of lost portion of the house/ building/ structure (without depreciation) • If the owner rents or leases, compensation for any improvements/ construction carried out by the renter/leaseholder will be deducted from the compensation payment to the owners. • In case houses/ buildings are rented/leased, any improvements/construction added by renters and leaseholders will be compensated at replacement cost and paid to renter or leaseholder. Owners will not get compensation for such improvements or construction. • In case of loss of only part of the houses/ buildings/ structure and the remaining portion is not usable, compensation will be paid for complete structure at full replacement cost.	• RCS will determine the replacement cost. • When loss is 75 % or more of the floor space
3b	**Houses and Structures**	Residential, commercial structures and other assets	Tenants and Leaseholders	• Cash compensation at full replacement cost for any improvements or construction by the tenants or leaseholders • In the case of no improvements or construction, no compensation is paid. • Transfer/ Disturbance Allowance equivalent to **1 month** of rental or lease amount	• RCS will determine replacement cost. • Documentary evidence is required.
3c	**Houses and Structures**	Residential, commercial structures and other assets	Illegal occupiers/squatters	• Cash compensation at full replacement value of affected structures, including also cost of labor involved in rebuilding such structure)	• RCS will determine replacement value.
3d	**Transport Allowance**	Transport allowance for household and personal goods	AHs (legal owners, tenants and Illegal occupiers/ squatters)	• Fixed Lump Sum allowance per AH based on average cost of transportation to new relocation place for: o Up to 5 km o More than 5 km	• RCS will determine the lump sum amount for 2 cases.

Category	Type of Loss	Application	Category of AH	Entitlements	Clarification
3e	**Tombs/ graveyard**	Relocation of affected tombs	AHs	• Compensation payment for affected tombs includes full replacement costs associated with a) buying of land (if needed) for re-burial, b) excavation, c) relocation, d) reburial, e) construction of new tombs, and f) other reasonable costs for conducting rituals in accordance with local customs. • If affected people are from EM community, consultation with affected EM households and local EM leaders will be held to ensure the impact is addressed in a manner that is culturally appropriate to the affected EM households/community.	• The relocation of tombs shall be carried out based on full consultation with affected households to meet local customs of affected households. • In case the owner of the affected tombs could not be identified, public announcement has to be made (through popular local media) to look for the tomb owners. Within a reasonable time, if the tomb owners could not be identified, relocation of tombs could be done by a specialized unit in consultation with local authorities and local people. Prior to relocation, photos of unknown tomb(s) shall be taken, and procedures of tomb relocation, and the new location of the tombs shall be documented carefully. • If affected households are from EM group, local EM leaders and community shall be consulted to ensure tomb relocation rituals are fully observed and proceeded in accordance with local EM tradition/practice
4. LOSS OF INCOME AND LIVELIHOOD					
4a	**Loss of Income during transition Period (Subsistence Allowance)**	Loss of Income	AHs who lose income during the transition period including employees of businesses	• Lump sum amount equivalent to **3 months** of income based on the official monthly poverty rate established by RGC. **Monthly Poverty Rate X Number of Members in AH X 3** • In case affected person is classified as poor and vulnerable group, the **above lump sum amount is doubled**.	• Monthly Poverty Rate as established by the RGC

Category	Type of Loss	Application	Category of AH	Entitlements	Clarification
4b	**Permanent Loss of Livelihood Source**	Income Restoration	AHs who lose their source of livelihood permanently	AHs can choose to participate in one of the following Livelihood Restoration options: **+ Land–Based Livelihood Restoration** for AHs engaged in land-based livelihood (i) facilitate access to replacement land (land-for-land if land is available) to enable AHs to continue their farming activities (rice cultivation, gardening, growing fruit trees, livestock, and other similar land-based farming activities; (ii) access to trainings on farming or livestock; and (iii) lump sum cash of **USD 200** to assisted affected households to start new income generation activity. OR **+ Business–Based Livelihood Restoration** for AHs who opt for alternative non-farm business, including: (i) access to training on new business skills; (ii) a lump sum cash of **USD 200** to assist in starting a new non-farm business. OR **+ Employment–Based Livelihood Restoration** for members of AHs who lose land-based employment permanently, and prefer to learn new job skills, including: (i) access to employment skills training; (ii) lump sum cash equivalent to **3 months** of income based on official poverty rate to supplement income support during the training period. **Affected household who are "Poor" and "Vulnerable" by project's definition will receive doubled lump sum cash** (as mentioned above) and have priority in accessing suitable employment opportunity under the Project.	AHs will be eligible for any one of the three options based on their preferred choice.
4c	**Relocation**	Self-relocation	AHs who will be permanently displaced and relocated	Cash compensation for self-relocation of the AHs to their preferred choice of site.	RCS will determine the cost of self-relocation.
5. TEMPORARY IMPACTS DURING CONSTRUCTION					
5.a	Damages to private and public assets, structures, properties		Local people, private sector and government	• Damage to properties that are caused by civil works contractors during construction will be compensated for property owners by involved contractors. Compensation shall be at full replacement costs. • Where public structures such as schools, health centers, recreational parks, public roads, water transmission pipelines, and electricity transmission lines (including electricity poles) are	

Category	Type of Loss	Application	Category of AH	Entitlements	Clarification
				affected, such affected works will be restored, and repaired, or compensated at full replacement cost to ensure normal operation is timely resumed at no cost to the local community, or private entitles who own and operate such public facilities. • The principles adopted for this LARPF apply for calculation of compensation.	
5.b	Unanticipated Impacts			• Any unforeseen impacts or damage due to the Project will be properly assessed and compensated in accordance with the LARPF and AIIB's ESF. The Borrower will inform AIIB of the occurrence of the unanticipated impacts and actions to be undertaken to mitigate these. These shall also be included in the monitoring report to AIIB.	

Source: Appendix 6 of SOP-LAR

Annex 4 – Indicative Internal Monitoring Indicators for Land Acquisition

Indicative Internal Monitoring Indicators for Land Acquisition

Purpose	Activities	Monitoring Indicators
Identification of compensation recipients	Verify list of compensation recipients against eligibility criteria for compensation	Number of persons in list of compensation recipients who do not meet eligibility criteria (included in error)
	Identification of persons who may claim eligibility for compensation but are not included in list of compensation recipients. Separate verification should be performed for each claim.	Number of persons who meet eligibility criteria but not included in list of compensation recipients (excluded in error)
Verification of affected area and assets	Confirmation of area of affected assets, but with legal ownership and without, against the RP / A-RP	Area of land subject to acquisition, for which compensation has been paid
		Area of other assets subject to acquisition, for which compensation has been paid
Verification of compensation amount, processing and payment	Examination of financial documents	Number of persons who received compensation in time and in full amount, disaggregated by compensation type
	Identification and analysis of reasons for compensation not being paid in full and in time	Number of persons who did not receive compensation in time and in full, disaggregated by compensation type
		Amount of funding allocated for payment of compensations
	Identification of reasons for which funds for compensation have been under- or overspent	Rate of spending of funds actually allocated for compensation, as % of amount envisioned in the RP/A-RP
Verification of compensation timeline	Identification of reasons payment of compensation is delayed (i.e., inheritance issues, court case)	Number of persons who received delayed compensation, disaggregated by compensation type and reason for delay; and any changes in amount of compensation (if any)
Verification of consultation and participation	Determine level of involvement and reasons for inadequate participation	Number of compensation recipients participating in consultations and coordination meetings at each stage of land acquisition / resettlement process, disaggregated by vulnerability status and IPs
		Number of IPs consulted in their own language through verbal translation
	Examination of grievance cases; analysis of disputes and complaints content and the resolution of conflicts	Number of complaints received disaggregated by grievance type and project activity
		Number of complaints resolved disaggregated by grievance type and project activity

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Cambodia

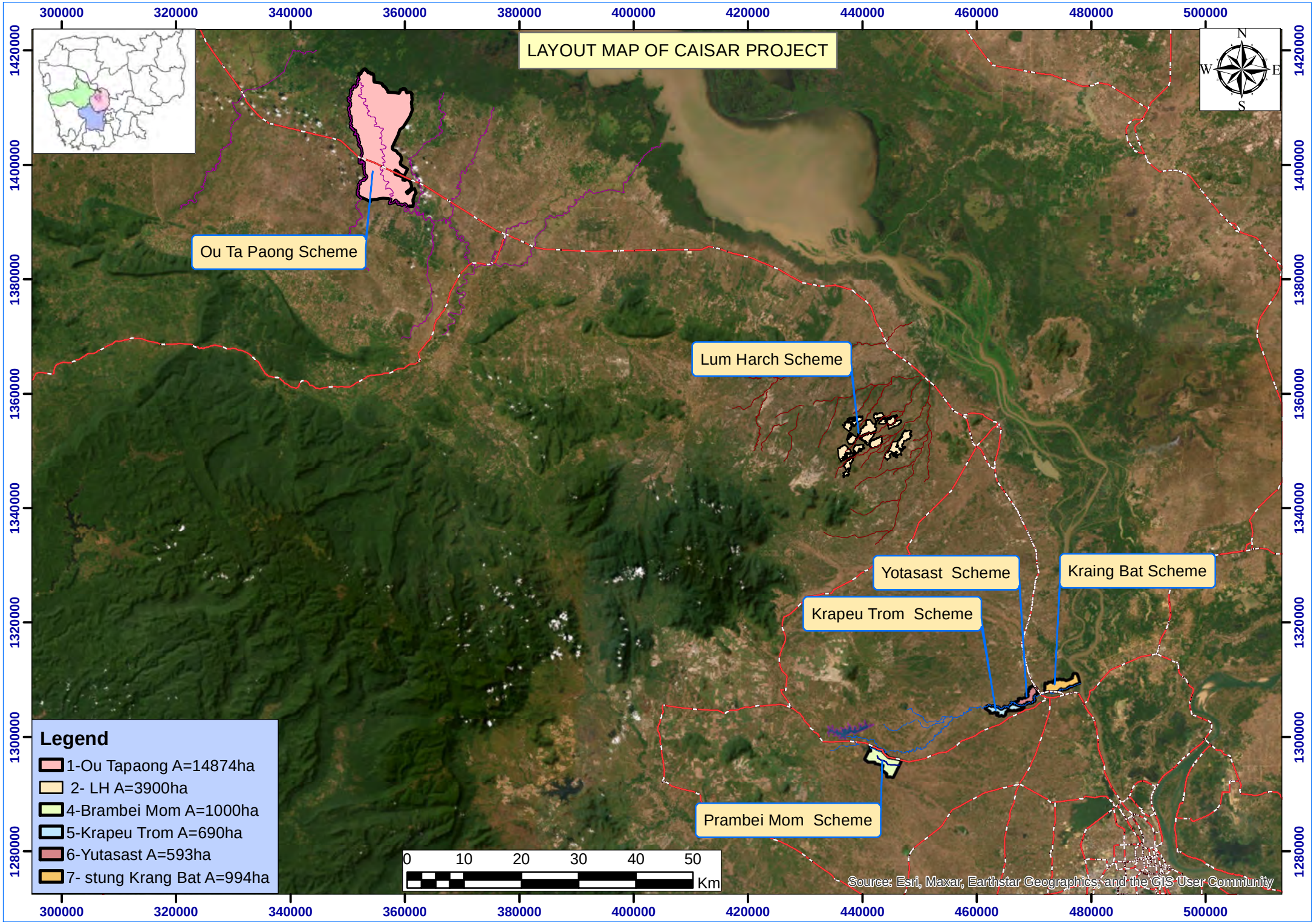
Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

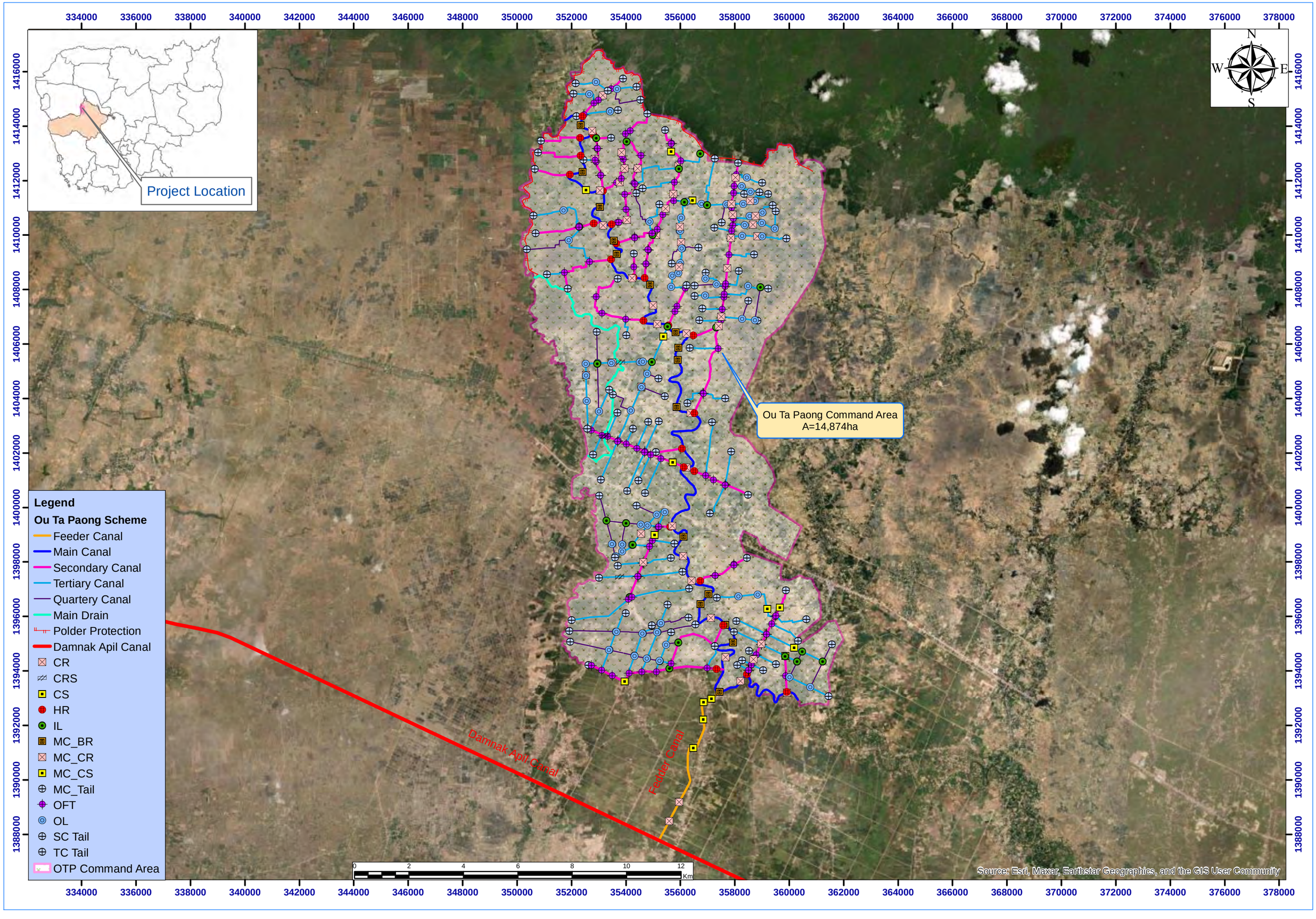
Annex: 16 Annex 16 Caisar Maps Indicating The Location Of Proposed Interventions

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Project No.	2000003926
Report No.	7034-KH

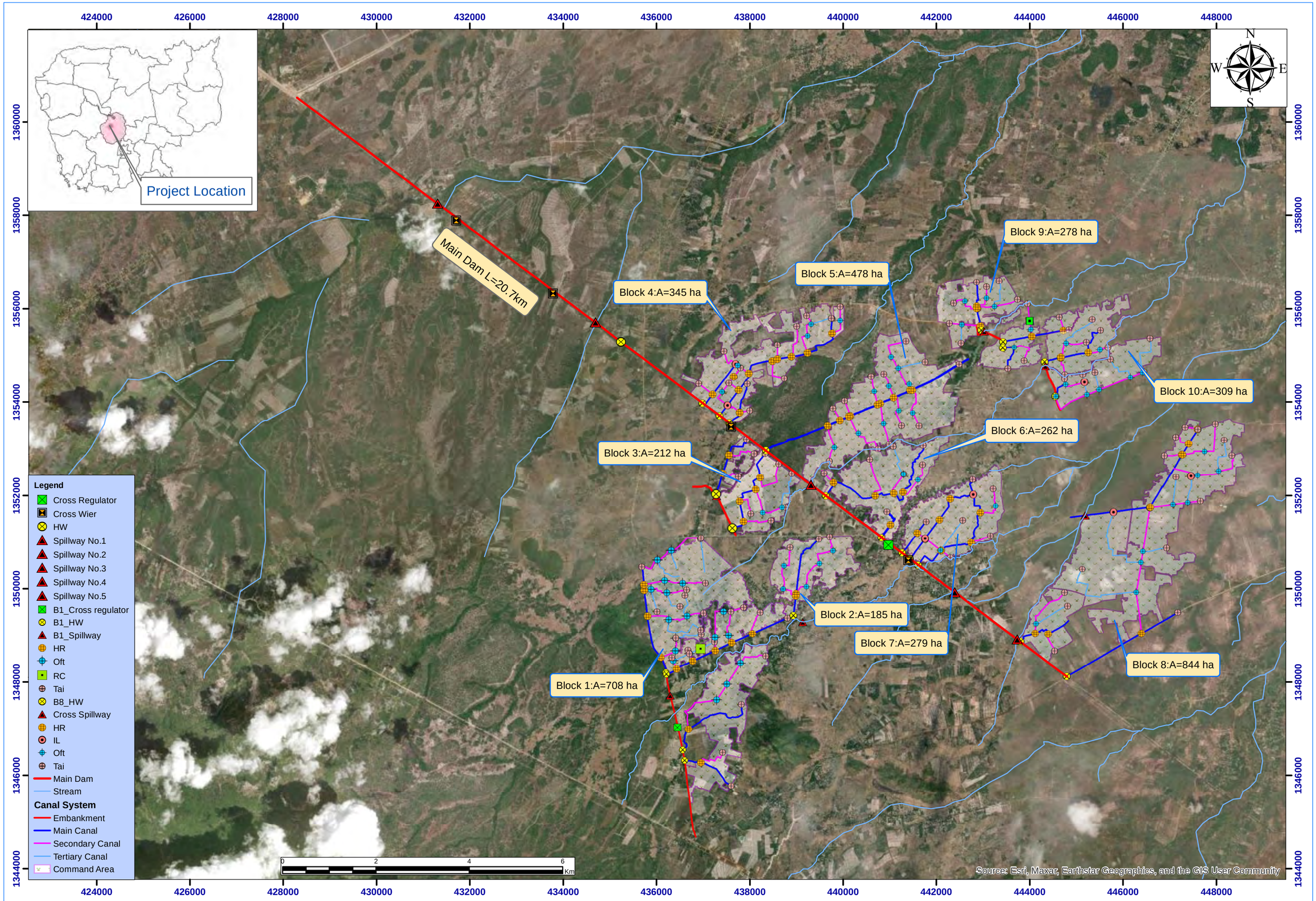
Asia and the Pacific Division
Programme Management Department


LAYOUT MAP OF CAISAR PROJECT
Ou Ta Paong Scheme
Lum Harch Scheme
Yotasast Scheme
Kraing Bat Scheme
Krapeu Trom Scheme
Prambei Mom Scheme
Legend
1-Ou Tapaong A=14874ha
2- LH A=3900ha
4-Brambei Mom A=1000ha
5-Krapeu Trom A=690ha
6-Yutasast A=593ha
7- stung Krang Bat A=994ha
0 10 20 30 40 50
Km
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
300000 320000 340000 360000 380000 400000 420000 440000 460000 480000 500000
1420000 1400000 1380000 1360000 1340000 1320000 1300000 1280000
N
W
E
S

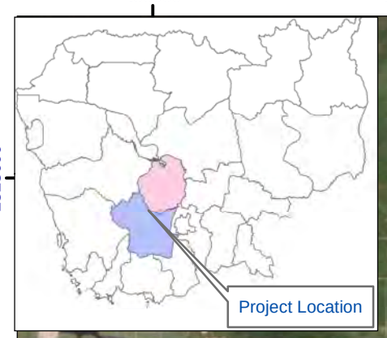
LAYOUT MAP OF OU TA PAONG IRRIGATION SCHEME



LAYOUT MAP OF LUM HARCH IRRIGATION SCHEME



LAYOUT MAP OF KRANG PONLEY SCHEME



Stung Krang Bat Irrigation Schem
Command Area A=994ha

Yotosast Irrigation Schem
Command Area A=593ha

Anlong Chrey Reservoir

Krapeu Trom Irrigation Schem
Command Area A=690ha

Prambei Mom Irrigation Schem
Command Area A=1000ha

N
W
E
S

435000 440000 445000 450000 455000 460000 465000 470000 475000

1315000 1310000 1305000 1300000 1295000 1290000

Legend

- Main_Road
- Anlong Chrey Reservoir
- Stung Krang Ponley
- Prambei Mom Canal
- Krapeu Trom Canal
- Pram Bei Mom Sub-re
- Yotosast Canal
- Pram Bei Mom Re
- Stung Krang Bat Canal

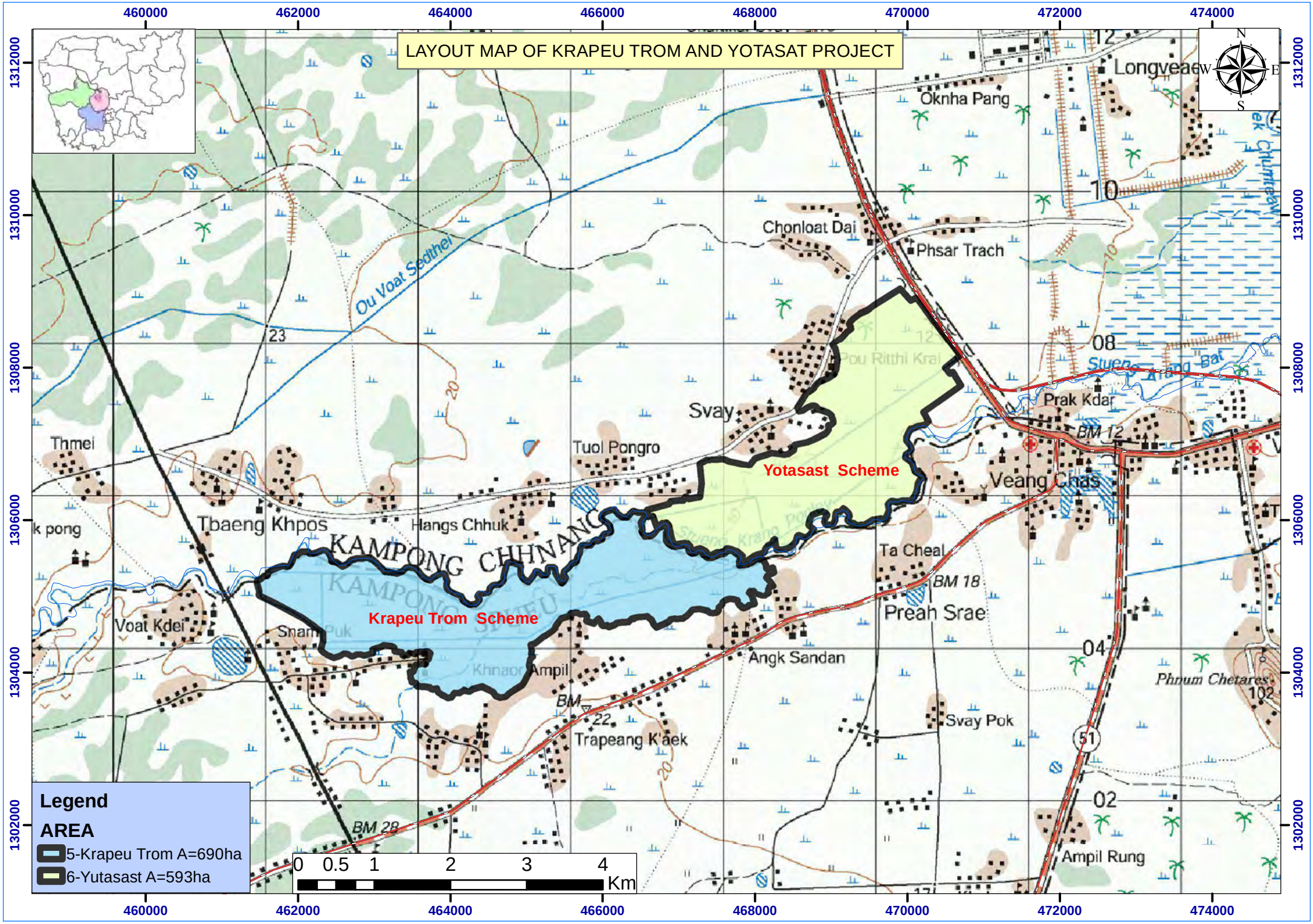
Irrigation Scheme Area

- Brambei Mom
- Krapeu Trom
- Stoeung Krang Bat
- Yotosast

0 2 4 6 8 10 Km

1:120,000

Maxar, Earthstar Geographics,

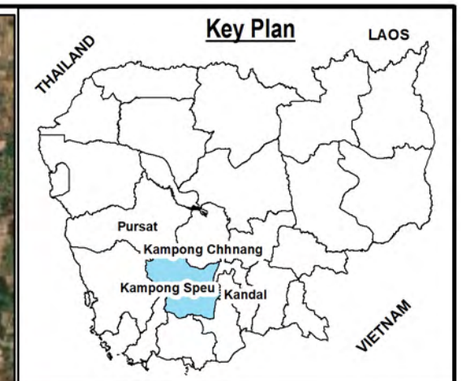

LAYOUT MAP OF KRAPEU TROM AND YOTASAT PROJECT
460000
462000
464000
466000
468000
470000
472000
474000
1312000
1310000
1308000
1306000
1304000
1302000
N
S
W
E
Longveaew
Oknha Pang
Chonloat Dai
Phsar Trach
Ou Voat Seithei
Svay
Thmei
Tuol Pongro
Yotasast Scheme
Prak Kdar
BM 12
Veang Chas
Tbaeng Khpos
Hangs Chhuk
KAMPONG CHHNANG
Krapeu Trom Scheme
Ta Cheal
BM 18
Preah Srae
Voat Kdei
Angk Sandan
Khnaor Ampil
BM 22
Trapeang K'aek
Svay Pok
Phnum Chetares
Ampil Rung
BM 28
Legend
AREA
5-Krapeu Trom A=690ha
6-Yutasast A=593ha
0 0.5 1 2 3 4
Km

LOCATION MAP OF BRAMBEI MOM IRRIGATION SCHEME

Kampong Chhnang

Kampong Speu

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Legend

- Rural_Road
- Provincial Boundary
- Water Body

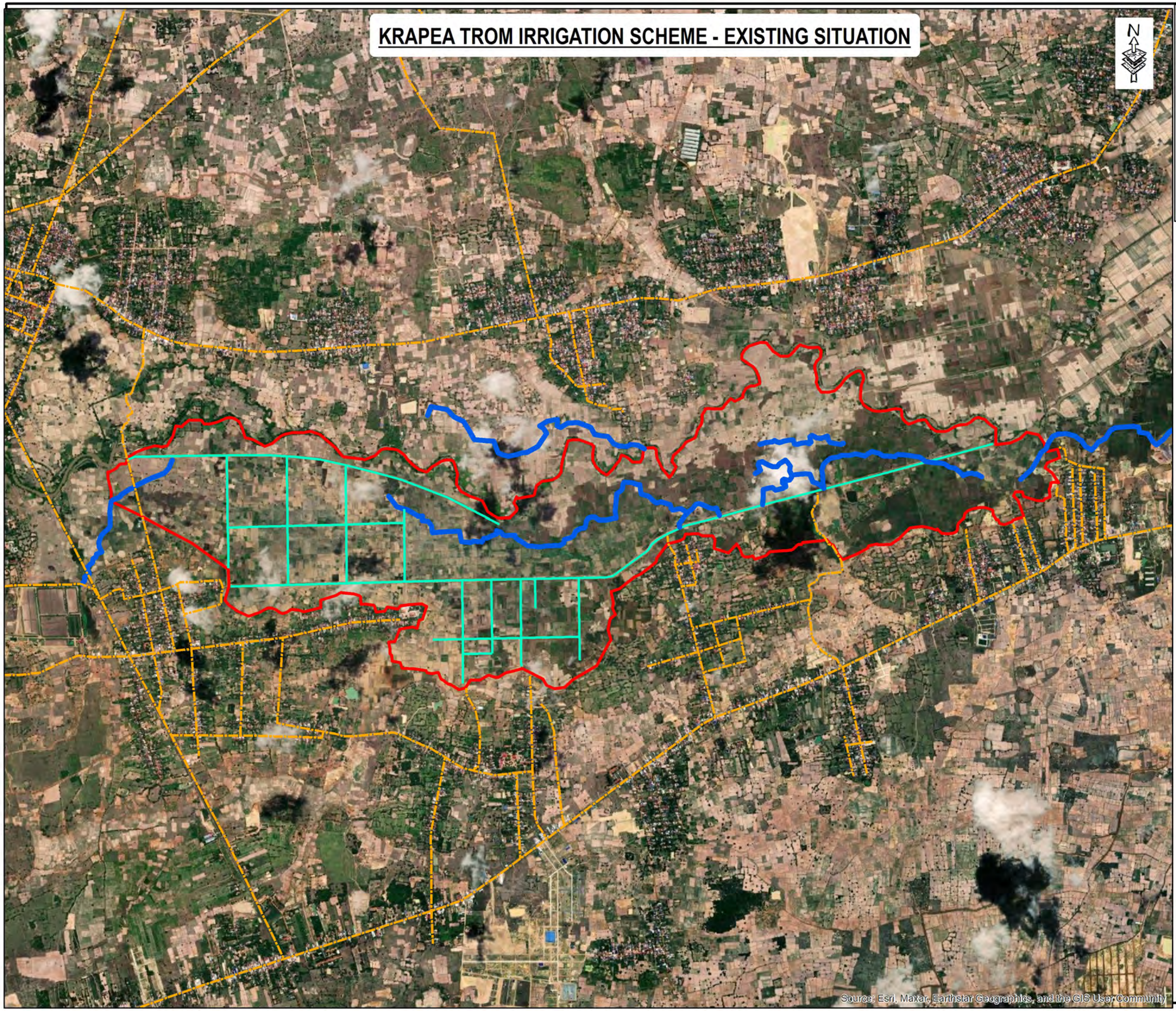
Irrigation Scheme

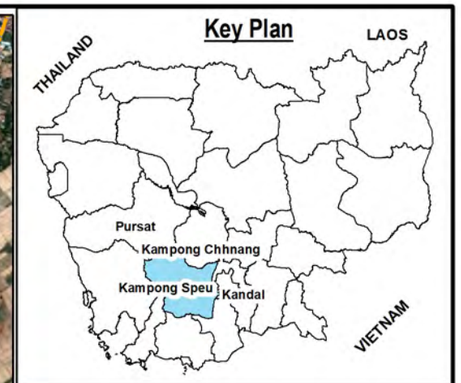
- Brambei Mom

1:30,000

0 0.25 0.5 1 1.5 Km

KRAPEA TROM IRRIGATION SCHEME - EXISTING SITUATION





Legend

- Existing Road
- Existing Canal
- Stream

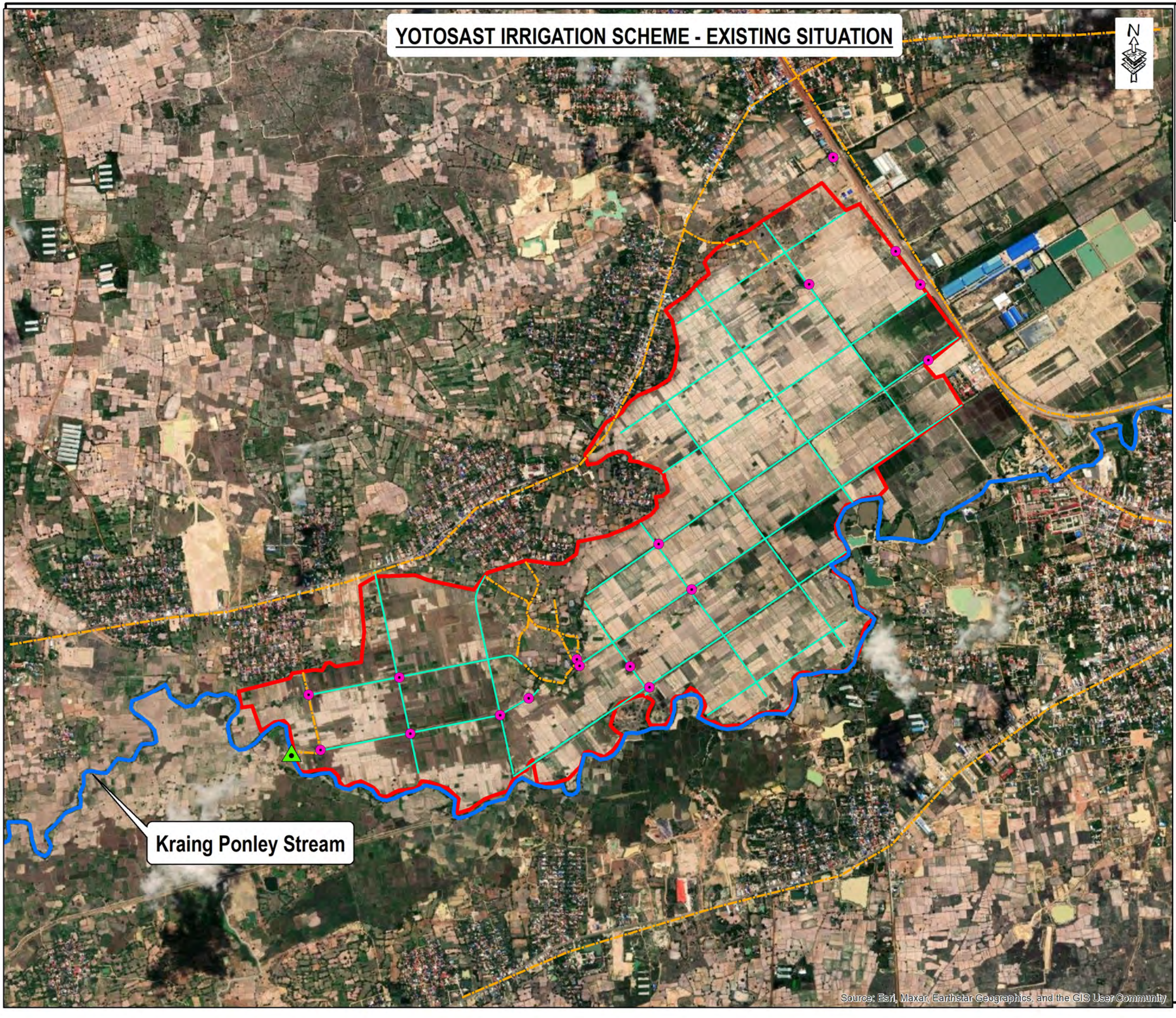
Irrigation Scheme

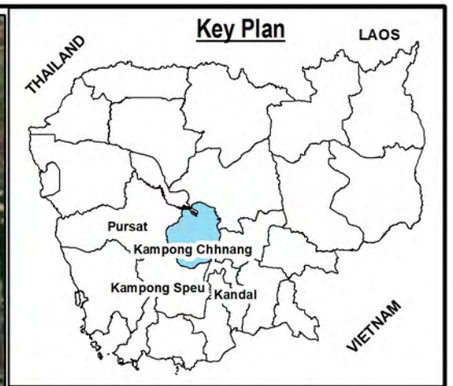
- Krapeu Trom

1:25,000

0 0.2 0.4 0.8 1.2 Km

YOTOSAST IRRIGATION SCHEME - EXISTING SITUATION





Legend

- Existing Structures
- Existing Weir
- Stream
- Existing Road
- Existing Canal

Irrigation Scheme

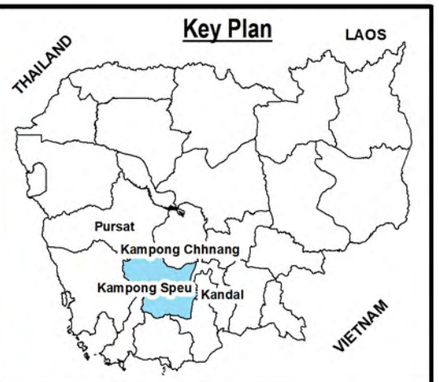
- Yotosast

1:20,000

0 0.150.3 0.6 0.9 Km

EXISTING HYDRAULIC LAYOUT MAP OF STOEUNG KRANG BAT IRRIGATION SCHEME





Legend

- Existing_Structures
- Bank
- Feeder
- MC
- MD
- SC
- SD
- TC
- TD
- National Road No.5
- Proposed Road
- Existing Road
- Polder
- Krang Ponley Stream
- Stream
- Water Body

Irrigation Scheme

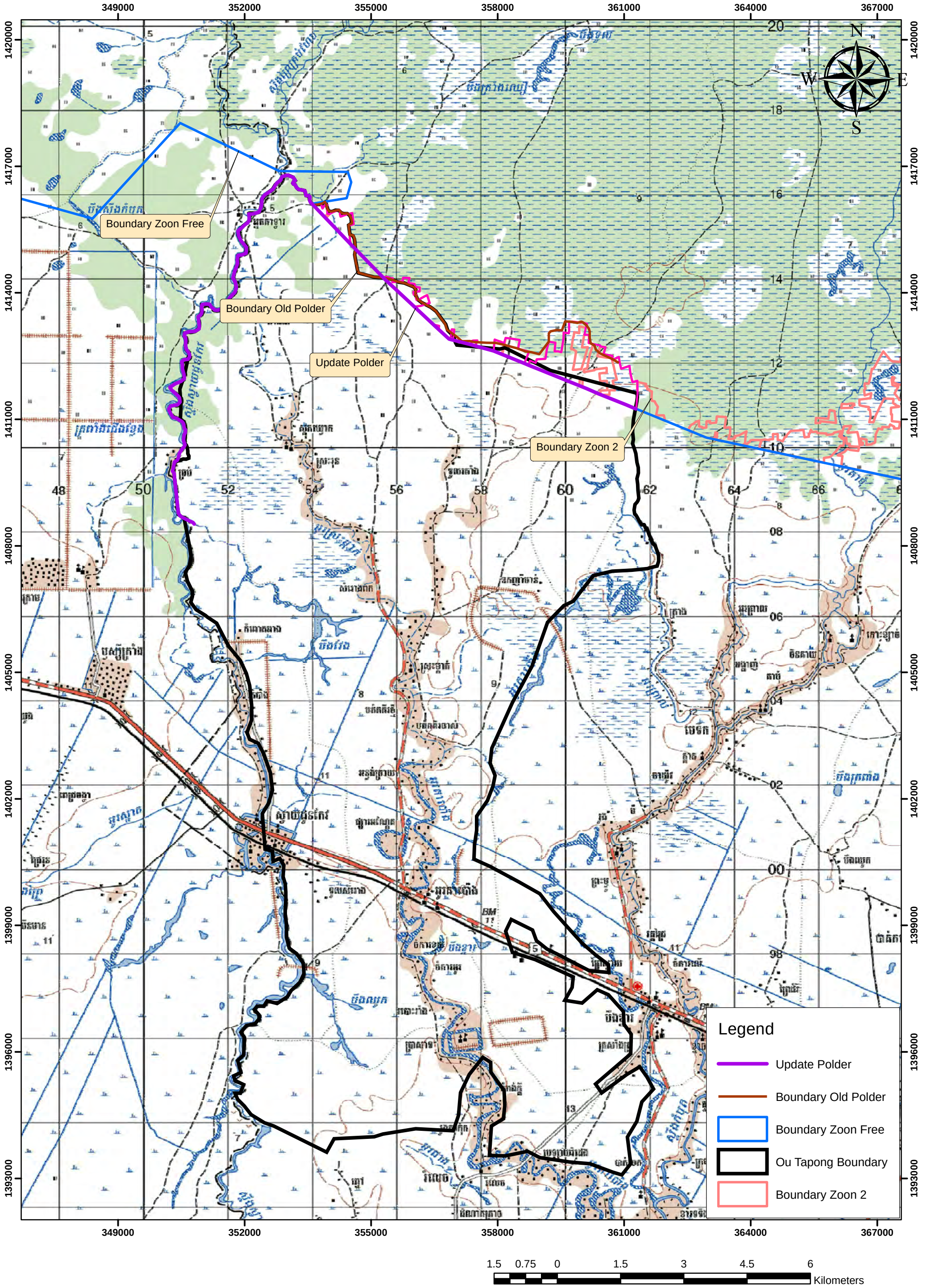
- Stoeung Krang Bat

1:30,000

0 0.25 0.5 1 1.5 Km

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Polder of Ou Tapong



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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 25. Annex 23 B Caisar Beneficiary Estimates 27032025

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

Irrigation Scheme	Component 1		Component 2						Households in Project Areas	Irrigation Scheme	Command Area (Ha)	Flood Protection (Ha)	Commune HHS	HHs in the district	HHs in the whole province	% of farmers (average)	# farming HHs, commune level Direct targets	# farming HHs, district level Spillover	# farming HHs, province level CIEWS targets	Provincial poverty rate (2023)
			Component 2.1		Component 2.2		Component 2.3		Province											
	Area (Ha)	Ratio %	Area (Ha)	Ratio %	Area (Ha)	Ratio %	Area (Ha)	Ratio %												
Ou Ta Paong	17 079	53%	14 874	67%	2 205	22%	80 000	100%	Pursat	Ou Ta Paong	14 874	2 205	14 437	24 952	103 862	74%	10683	18464	76858	19.16%
Lum Harch	6 350	20%	3 900	18%	2 450	24%			Kampong Chhnang	Lum Harch	3 900	2 450	22 513	55 193	126 299	81%	18236	44706	102302	12.27%
Kropeu Trom	1 140	4%	690	3%	450	4%			Kampong Speu	Kropeu Trom	690	450	3 393	31 834	195 882	58%	1968	18464	113612	14.18%
Yotasast	2 693	8%	593	3%	2 100	21%			Kampong Speu	Yotasast	593	2 100	7 870	36 664		58%	4565	21265	0	14.18%
Stoeung Krang Bat	1 394	4%	994	5%	400	4%			Kandal	Stoeung Krang	994	400	4 735	23 616	265 803	31%	1468	7321	82399	12.61%
Brambei Mom	3 400	11%	1 000	5%	2 400	24%			Kampong Speu	Brambei Mom	1 000	2 400	23 779	86 670		58%	13792	50269	0	14.18%
TOTAL	**32 056**	**100%**	**22 051**	**100%**	**10 005**	**100%**	**80 000**	**100%**												
									TOTAL HHs		**22 051**	**10 005**	**76 727**	**258 929**	**691 846**		**50 711**	**160 489**	**375 171**	
									TOTAL HH MEMBERS				**322 253**	**1 087 502**	**2 905 753**		**212 987**	**674 055**	**1 575 716**	

Total Farming HHs in Cambodia	1 735 000
Total people of farming HHs in Cambodia	7 391 100
Total population in Cambodia	17 409 127
Total households in Project Area (4 provinces)	691 846
Total farming households in Project Area (4 provinces)	375 171
Total farming households in Target Communes	50 711
Area in Project area (ha)	60 027
Average Landholding (ha)	1.18

	Footnote	Unit	Quantity	Direct Beneficiaries				Footnote	Indirect Beneficiaries				
Component and Output				**Men**	**Women**	**Total**			**Men**	**Women**	**Total**		Remarks
Component 1 - Farm Level Climate Adaptation and Resilience													
Output 1.1Increased farmer capacity in climate smart agriculture.		Master Trainer		120	80	200							
	a1	People		24 000	16 000	40 000		a1	96 000	104 000	200 000		**Please note:** This is an output indicator and reflects the number of farmers directly participating in FSS and trained (male or female, each representing a unique household). a1: Direct beneficiaries: It is assumed that each FFS (1600 in total) will have 25 participants of whom 40% will be women. Each FFS participant represents one unique household. [40,000 FFS participant households hence represent 78.9% of the targeted commune farming households]. a2: Indirect beneficiaries: Each FFS participant will benefit the spouse in their own household, and influence two (2) additional households (with one male and one female farmer who co-manage their agricultural plot or fish/poultry) beyond the commune, at the district level.
	b	Mechanization services	20										These are service providers for LLLs (Laser Land Levelling) and direct rice seeder (mDSR)
Output 1.2 Climate adaptive value chains developed by 4Ps and increased access to finance.													
Number of MSMEs involved	c	MSMEs	120	72	48	120							c: 120 MSMEs benefit from 4PF: Allocated budget for 4PF is US$ 3million. Grant for each enterprise (fully or partially – see the PIM) is in the range from US$15,000 (maximum 200 MSMEs) to USD 50,000 (Maximum 60 MSMEs). In discussions with four provinces, it was agreed that each province (four) will attract at least 25 MSMEs - i.e., will be highly local in nature. Other MSMEs (additional 20) might be regional or provincial in nature. MSME grants be delivered on a competitive basis in between provinces.
Number of households per MSME	d	people		3 600	2 400	6 000							d1: Examples from other IFAD project in the regions showed that an effective contract farming (between MSME and farmers) should be around 50 households.
Access to Finance through linkages	e	people		-	-	-			16 800	11 200	28 000		e: Access to Finance: It is assumed that 70% of FFS farming households will have improved access to finance and will be able to invest it in their adoption of more sustainable agriculture practices. https://www.khmertimeskh.com/501052053/70-percent-of-cambodians-have-access-to-financial-services/
Access to grants	f	MSMEs		72	48	120							f: Access to grants under the 4PF
Access to BDS	g	MSMEs		72	48	120							g: Access to Business Development Services under the 4PF
Output 1.3. Increased access to and use of climate information and advisory services for climate responsive water-use and crop planning	h1	people		337 654	225 103	562 757		h2	112 551	75 034	187 586		h1: Direct beneficiaries: Based on the assumption that 75% of farming households in the target provinces will benefit from climate information and early warning services (CIEWS) delivered through a mobile app. Direct CIEWS beneficiaries comprise male and female farmers from the household within the irrigation command areas (1.1) who will participate in FFS, adopt climate-resilient agricultural practices (rice, fish, poultry) and benefit from access to markets. Direct CIEWS beneficiaries also includes farmers from adjoining communes and districts who benefit from access to advisories and early warnings via mobileapp. h2: Indirect beneficiaries: Are the remaining 25% of farming households in the target provinces. **n.b.** Unit corrected from "provinces, commune, mobile" to "people"
Output 1.4: Increased resilience of farm road infrastructure to climate change	i1	people		5 341	5 341	10 683		i2	575 809	575 809	1 151 618		i1: Direct beneficiaries 9,417,017 rural population over 14,545 villages - gives the average number of households in a Cambodian village. 66% of population in each village is farming households. Assuming that 3 members (male and female farmer + youth or another adult farmer) from each household directly benefit from roads. 90 kms of road was mapped to 35 villages, based on Preliminary Report on Road Survey. i2: Indirect beneficiaries Since these are climate-resilient roads, in addition to farmers within 35 villages, indirect beneficiaries are farming and non-farming households across the communes, districts and provinces who benefit from improved connectivity. 40% of the population is assumed to indirectly benefit.
Component 2. Irrigation Infrastructure for increased resilience													
Output 2.1 Irrigation schemes and ponds modernized	j	Ha	22 051										Worksheet "Schemes" Component 2.1, Cells D4-D9 references to command area per scheme.
Output 2.2 Flood-proofed and improved drainage.	k	Ha	10 005										Worksheet "Schemes" Component 2.1, Cells F4-F9 references to flooded area per scheme.
Output 2.3 Farmers Water User Communities (FWUC) established and trained	m	FWUC	11										A total of 11 FWUCs are planned, 4 of which are partially functioning.
Output 2.4 Water information system (CIEWS and SCADA)	n1	people		10 683	10 683	21 366		n2	66 175	66 175	132 350		n1: Direct beneficiaries SCADA (a system for measurement of flows and influencing operation of irrigation/drainage gates) covers only the Ou Ta Pong scheme within the project, and is meant to ensure sufficient water availability for this scheme, which is located downstream in the water basin. The project communes of OTP have 10,683 households. Both male and female adult farmers from each household, co-managing agriculture, will directly benefit. n2: Indirect beneficiaries Farming households in non-project schemes (still in Pursat province) that rely on the same water resources (Pursat water basin), and allow for rotational distribution of water. OTP province has 76,858 households, and both male and female adult farmers from each household, co-managing agriculture, will indirectly benefit.
Component 3. Institutional Strengthening													
Output 3.1 MOWRAM Capacity Support		people		150	100	250							These are staff from MOWRAM who will benefit from upgraded technical capacity in various aspects of climate resilient irrigation design and management, river basin management and
Output 3.3 Strengthening of NCDD		people		210	140	350							These are staff from NCDD, an Accredited Entity to GCF will improve capacity to implement climate finance projects (project management, financing management, MEL, gender and social

Beneficiary Type	Benefit Description	Units	Direct	Indirect
Smallholder farmers in the four target provinces	Improved access to climate information and early warning services, specifically tailored advisories for crop cultivation	people	562 757	187 586
Smallholder farmers, and people with farming and non-farming households who benefit from improved and climate-resilient rural roads acros the four target provinces **(a-direct, b-indirect)**	Improved access to markets and services for climate-resilient livelihoods	people	10 683	1 151 618
Smallholder farmers living in the communes associated with schemes **(c)**	Improved access to information on climate-resilient agriculture, improved market access, and support for adoption of climate-resilient, low-emission practices and technologies for crops, fish and poultry	people	40 000	200 000
Local MSMEs and mechanization services	Service providers who provide mechanization services, local MSMEs who receive business development support and grants	MSMEs	140	-
MOWRAM, NDA / DOE, NCDD staff	Capacity development, improved access and awareness of tools, improved capacity to implement and manage climate finance projects	people	600	-

	TOTAL ADAPTATION BENEFICIARIES (Unique, no. of people)	**1 714 375**	562 757	1 151 618

0

NOTES

(a) Direct beneficiaries are part of the 562,757 direct beneficiaries

(b) 187,586 indirect beneficiaries who are male/female farmers within 375,171 farming households in four provinces are cautiously assumed to be a part of the 1.15M people who benefit from improved rural roads

(c) They are a part of the 562,757 beneficiaries

Integrated Results Management Framework										
	Unit	Number (Total)	Number (Women)	Assumption	Reference	people	people	women	women	**Assumptions related to women beneficiaries and CoI G-H, if any**
Core Indicator 1: Greenhouse gas (GHG) emissions reduced, avoided or removed/sequestered	tonnes of carbon dioxide equivalent	Reduction of 213,501.58 tCO2eq by end of implementation period (year 7) Reduction of 1,006,507 tCO2eq by the end of Implementation and capitalization phase (year 20)	Not Applicable	Please refer to EX-ACT annex and associated Excel worksheets	Annex 22 EX-ACT	-	-	-	-	
Supplementary 1.4: Renewable energy generated (MWh)	MWh	3123	Not Applicable	15,000 hectares (ha) of cultivated area will switch to (off-grid) solar irrigation, from diesel powered irrigation systems. The size of solar irrigation pumping units to be installed will vary from one FWUC / farmer to another. If a relatively large system is installed with 135 solar panels (each 340W) that can power a 30kW motor pump this can irrigate about 300 ha of land and will cost US$ 66,000. The 300 ha of land corresponds to 250 farmers (assuming ~1.2 ha per farming household) and each smallholder farmer will need to contribute US$ 264. 50 such systems will be needed to cover 15,000 ha. 135 panels X 340W X 50 = 2,295,000 watts (W) or 2.295 MW. If each MW is assumed to generate 1,361 MWh annually (IWMI reference for solar irrigation system: https://solar.iwmi.org/wp-content/uploads/sites/43/2023/11/Issue-brief-06-1.pdf), the total capacity is 3,123.75 MWh (in theory). This assumes that all solar irrigation pumps are operational and there is no wasted energy.						
Core indicator 2: Direct and indirect beneficiaries reached					Annex 23B (Beneficiary Estimates)					
Supplementary 2.1: Beneficiaries (female/male) adopting improved and/or new climate-resilient livelihood options.	number of individuals	192 000	96 000	Based on the assumption that 80% of the 40,000 participants (each representing a unique household) in the FFS adopt climate-resilient and/or improved livelihoods (direct beneficiaries). Each of those 40,000 FFS participants will influence one member in their household (typically, their spouse with whom they manage their plots and livestock), and an additional two (2) households with two (2) adult farmers. 80% adoption rate assumption is retained (indirect beneficiaries) 40% of the direct FFS participants are assumed to be women. Overall, 50% of the farmers who benefit directly and indirectly (through diffusion) are assumed to be women (women farmers and women-headed households). Finally,420% of the beneficiaries (non-farming, MSMEs) are assumed to be women. **N.b.** There are 50,711 households in the project communes. However, spillover effects are likely go beyond project commune and involve farmers in the wider district through FFS replication as well as informal market interactions (learning from one another).		32 000	160 000	12 800	83 200	40% of the farmer-participants in FFS are assumed to be women.
Supplementary indicator 2.2: Beneficiaries (female/male) with improved food security	number of individuals	282 240	141 120	This is now linked to total number of beneficiary households (Supplementary 2.1): 40,000 households that participate in FFS and an additional 2 households per FFS participant. 80% adoption rate is retained. Household size is 4.20 members for the four provinces. Assuming that 70% of households will improve their food security. 50% of household members with improved food security are women. **[All household members are counted into the indicator since targeted support will be provided at the household level.]**		134 400	268 800	67 200	134 400	Cell G7-H7 compute number of members in each household, only 70% of who are assumed to benefit from improved food security. 50% of household members are women / girls.
Supplementary indicator 2.4: Beneficiaries (female/male) covered by new or improved early warning systems	number of individuals	750 342	375 171	Based on the assumption that only farming households in all four provinces (computed as 375,171) will benefit from CIEWS, even though the early warnings on floods and droughts from the CIEWS app will benefit all households (691,846 households in the four provinces). Further, assume that information will be shared between male and female farmers within the household co-managing the agriculture activity (crop, fish, livestock), doubling the number of beneficiaries per farm household. **[Beneficiaries "covered" means those individuals residing within an area covered by the early warning system supported by GCF-funded interventions and can receive or have received early warning information.]**		562 757	187 586	281 378	93 793	50% of farmers in each household assumed to be women (either male-headed or female-headed households)
Core Indicator 3: Value of physical assets made more resilient to the effects of climate change and/or more able to reduce GHG emissions	value of physical assets in USD	-	-							None
Core Indicator 4: Hectares of natural resource areas brought under improved low-emission and/or climate-resilient management practices	hectares	32 056	-	This includes areas that were fallow owing to flooding and can now be cultivated, and area of land that was uncultivable and now will have irrigation access. The number has been corrected and adjusted downwards to reflect FFP wherein Chhean Laeung is dropped (from 36,909 ha to 32,056 ha). 22,051 hectares of the command area, and an additional 10,001 hectares of the flood-protection area. This calculation does not multiply cultivated area by seasons. E.g., if out of 20,008 ha of rice area cultivated in May under Ou Ta Pong scheme, 11,156 hectares is cultivated again in Oct.		-	-	-	-	None
Supplementary indicator 4.1: Hectares of terrestrial forest, terrestrial non-forest, freshwater and coastal marine areas brought under restoration and/or improved ecosystems	hectares	32 056	-	Through FWUCs, lands will be brought under improved water management. Through FFS, lands will benefit from improved soil (and irrigation) management. Both actions will contribute to better ecosystem services on production landscapes.		-	-	-	-	None
Core indicator 5: Degree to which GCF investments contribute to strengthening institutional and regulatory frameworks for low-emission climate-resilient development pathways in a country-driven manner	high	-	-	None		-	-	-	-	None
Core indicator 6: Degree to which GCF investments contribute to technology deployment, dissemination, development or transfer and innovation;	Medium	-	-	None		-	-	-	-	None

The following indicator is dropped after a careful review of GCF IRMF. The definition of innovations *"refer to a resilience-building model, technology, tool, practice, service or product that was demonstrated (i.e. successfully tested) for the first time in a country by the project. Innovations that had already been demonstrated elsewhere but never in the country or countries where the project is implemented can be counted under this indicator"*

The crop management practices, fish and poultry value chains, and CIEWS promoted through the project are present in Cambodia (though not adopted at scale, and not underpinned by flood and drought management infrastructure in these targeted regions)

Supplementary indicator 2.5: Beneficiaries	number of individuals	30 000	12 000	Based on the assumption that 75% of the 40,000 participants of the FFS adopt climate		30 000		12 000		

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 14 a. ESCIA

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Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

CLIMATE ADAPTIVE IRRIGATION AND SUSTAINABLE AGRICULTURE FOR RESILIENCE (CAISAR) AIIB PPSF GRANT S0452A, CODE 00-452-PPSF-DTA

ENVIRONMENTAL, SOCIAL, AND CLIMATE IMPACT ASSESSMENT REPORT

Submitted To:

Project Management Unit
Ministry of Water Resources and Meteorology,
AIIB and IFAD

Submitted By:

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24TH FEBRUARY 2025

EXECUTIVE SUMMARY

This summary provides a detailed overview of the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project in Cambodia, drawing on information from the provided sources. The project, designed to improve irrigation systems and enhance agricultural productivity, spans four (4) provinces and six (6) sub-schemes. The project has undergone thorough environmental and social impact assessments to mitigate potential adverse effects, and it prioritizes community engagement and information disclosure.

Project Origins and Goals

The CAISAR project emerged from the Royal Government of Cambodia's (RGC) strategic framework for the irrigation sector, aiming to achieve the goals outlined in their National Water Resources Management and Sustainable Irrigation Road Map and Investment Program (2019-2023). The project aims to enhance climate adaptation and mitigate the negative impacts of extreme climate events on smallholder farmers and vulnerable communities, particularly in the Mekong River and Tonle Sap region.

Project Scope and Coverage

The project focuses on six (6) sub-schemes: Ou Ta Paong, Lum Hach, Brambei Mom, Krapeu Troum, Yutasas, and Steung Krang Bat, covering a total command area of 25,604 hectares and benefiting approximately 22,500 farmers. The project will conduct a comprehensive Environmental, Social, and Climate Impact Assessment (ESCIA) covering all six (6) sub-schemes and formulate Environmental, Social, and Climate Management Plans (ESCMP) for three (3) selected sub-schemes: Ou Ta Paong, Krapeu Truom, and Yutasas.

Legal and Policy Framework

The project's impact assessment adheres to international standards, including the Asian Infrastructure Investment Bank's (AIIB) Environmental and Social Framework (ESF), the International Fund for Agricultural Development's (IFAD) Social, Environmental, and Climate Assessment Procedures (SECAP), and the Green Climate Fund's (GCF) environmental and social standards. The assessment also considers the RGC's legal framework, including provisions for environmental protection, land acquisition, and involuntary resettlement. The project proposes measures to address any gaps between international standards and the RGC's legal framework.

Defining the Area of Influence

The project recognizes three (3) categories of influence: areas affected by project activities, areas affected by cumulative impacts from past and planned projects, and areas impacted by associated facilities. During the construction phase, air quality, noise, and vibration impacts are anticipated, primarily affecting areas within approximately 100 meters of construction sites, including rehabilitated rivers and canals, upgraded structures, and transportation routes. Water quality is also a concern during both construction and operation phases, with potential impacts arising from sedimentation, chemical contamination, and agricultural runoff. These

impacts could extend downstream along various rivers and ultimately affect the Tonle Sap Lake, impacting water availability for agriculture and domestic use.

Soil quality is anticipated to be affected by erosion, compaction, and contamination during construction, while operational impacts include salinization, nutrient imbalance, and waterlogging. The project acknowledges the potential impacts on biodiversity, particularly on wildlife movement patterns and habitats. Specific areas of concern have been identified for each of the six (6) sub-schemes, including the Boeng Kanseang Lake, Toul Samraong, Phnom Banon, and Chan Trak Community Forests, the Stoeung Krang Ponley River, and the Tonle Sap River.

Social impacts are expected to extend beyond the immediate project sites and will be influenced by changes in land use, water availability, and employment opportunities. The project recognizes the potential for shifts in livelihoods, migration patterns, and community dynamics, and aims to address potential negative impacts through community engagement and consultation, particularly with vulnerable groups. The report emphasizes the importance of mitigation measures to minimize these impacts, such as environmental monitoring, sustainable farming practices, and social safeguards to protect workers and communities.

Baseline Environmental and Social Conditions

This assessment covers a range of environmental and social factors, including geological, hydrological, climatic, and socio-economic conditions, and identifies key considerations for sustainable project implementation.

Geological and Topographical Features: The project area exhibits diverse geological formations, including deltaic deposits, organic deposits, and alluvial plains. Elevations range from less than 40 meters in Ou Ta Paong to 40-145 meters in Prambei Mom, indicating variations in terrain and land use potential. Soil types also vary across sub-schemes, with red-yellow podzols being the most common in Brambei Mom.

Hydrological Resources and Water Availability: Cambodia, particularly the CAISAR project area, possesses abundant water resources, primarily from the Mekong River and Tonle Sap Lake. However, water availability fluctuates seasonally, leading to challenges in the dry season. The project relies on several rivers and reservoirs, including the Pursat River, Ou Ta Paong River, and Svay Don Keo River. Existing irrigation infrastructure varies in condition and capacity, with some systems facing limitations due to damage, neglect, or inadequate design.

Climatic Conditions and Climate Change: Cambodia's climate is characterized by distinct wet and dry seasons, with precipitation ranging from 1,300 to 1,500 mm in the project areas. Historical climate data reveals rising temperatures, particularly during the dry season, and projections indicate a continued warming trend in the future. Flooding is a significant concern, with the project area highly susceptible to both riverine and flash floods.

Air and Water Quality: Air quality in the project area is generally good, though dust and smoke from agricultural activities can periodically affect local conditions. Noise and vibration levels vary across sub-schemes, with locations near major roads experiencing higher noise levels. Water quality assessments reveal concerns regarding nutrient pollution and microbial contamination in certain areas, particularly elevated levels of nitrogen, phosphorus, and total coliform.

Biodiversity and Species Distribution: The project area supports diverse ecosystems and a range of endangered and critically endangered species. Assessments have identified key species in various sub-schemes, including turtles, fish, birds, mammals, and plants. However, some species face population declines due to habitat loss, overfishing, and limited flooding events, highlighting the need for conservation efforts.

Socio-economic Conditions: The project area is predominantly rural, with agriculture as the primary occupation. The population is generally young, but educational levels vary across sub-schemes. Access to energy and sanitation facilities is high, but water supply reliability remains a concern. Rice production is the dominant agricultural activity, with varying yields and challenges across sub-schemes. Vegetable production is also prevalent, with farmers facing limitations related to market access, pest management, and water availability.

Cultural Heritage: The project area contains important cultural sites, including the Longvek Capital and Bardez Stupa, which require protection during project implementation.

Institutional Capacity and Needs: The report highlights capacity gaps in water resources and irrigation management at various levels, including within the Ministry of Water Resources and Meteorology (MOWRAM), Provincial Departments of Water Resources and Meteorology (PDOWRAM), and Farmer Water User Communities (FWUCs). Recommendations for capacity building include training programs on technical and administrative aspects of water management, environmental awareness, and social safeguards.

Climate Change Adaptation: The project recognizes the need to address climate change risks, including projected temperature increases, changes in rainfall patterns, and increased flood frequency and intensity. Mitigation measures, such as promoting drought-resistant crops, improving water storage and distribution systems, and strengthening early warning systems, are crucial for enhancing resilience.

Identifying and Assessing Potential Impacts

The project's environmental and social impact assessment meticulously identifies and analyzes potential risks and impacts associated with project activities, such as the construction and rehabilitation of irrigation canals, river dredging, and intensified crop production. These potential impacts are categorized as direct, indirect, and cumulative.

Direct Impacts: These are immediate and localized consequences of project activities. Examples include noise and dust pollution from construction, soil erosion from earthworks, and habitat disturbance during the construction of irrigation canals.

Indirect Impacts: These are secondary effects extending beyond the immediate project area. They may include water pollution from agricultural chemical runoff, increased demand for wildlife products due to labor influx, and changes in local economic activities due to project-related employment opportunities.

Cumulative Impacts: These arise from the combined effects of the project and other past, present, and reasonably foreseeable future projects in the area. Examples include the cumulative impact on water resources from multiple irrigation projects, the combined effects of agricultural intensification on biodiversity, and the overall impact of development projects on the socio-economic landscape.

Mitigating Environmental and Social Impacts

To minimize potential environmental and social impacts, the project proposes several management measures. The report highlights the potential environmental and social risks and impacts associated with the project, particularly during the construction and operation phases, and proposes mitigation measures to address these concerns.

The construction phase involves activities such as dredging, excavation, and the establishment of worker camps, which can lead to environmental pollution, habitat loss, and increased greenhouse gas emissions. The operation phase, characterized by intensified farming practices, poses risks related to water and soil pollution from agricultural chemicals and potential social inequalities.

To mitigate these risks, the report proposes several measures. These include implementing strict environmental monitoring programs to track air and water quality, conducting biodiversity assessments, and promoting sustainable farming practices. Social mitigation strategies focus on preventing child and forced labor, addressing potential sexual exploitation and abuse, and ensuring community health and safety through awareness campaigns and training programs. The report emphasizes the importance of community engagement and consultation, particularly with vulnerable groups, to ensure equitable access to resources and benefits from the project. Clear roles and responsibilities are outlined for various stakeholders, including government agencies, the Project Management Unit (PMU), contractors, and local communities, to ensure effective implementation and monitoring of these measures. The report also establishes an environmental and social compliance framework with detailed reporting procedures to ensure transparency and accountability throughout the project lifecycle.

Public Consultation and Information Disclosure

The project emphasizes public consultation and information disclosure throughout its lifecycle. Consultations were held with local communities, relevant authorities, and other stakeholders to inform them about the project's objectives, gather feedback, and address concerns. Concerns raised during consultations included potential pollution from construction, impacts on biodiversity, labor and working conditions, and community health and safety. The project is committed to disclosing the Environmental and Social Climate Impact Assessment (ESCIA) report and the Environmental and Social Climate Management (ESCM) Plan to the public in both English and Khmer. This includes a Non-Technical Summary (NTS) in Khmer, which provides a simplified explanation of the project.

Grievance Redress Mechanism (GRM)

The project establishes a comprehensive Grievance Redress Mechanism (GRM) to address concerns and complaints from affected communities and individuals. The GRM provides multiple channels for submitting grievances, a system for logging and tracking complaints, and procedures for resolving issues in a timely and transparent manner. The GRM aims to ensure accountability and responsiveness to community concerns throughout the project lifecycle.

Cost and Budget

The project's ESCIA includes detailed cost and budget analysis for mitigating potential environmental and social impacts. The budget outlines financial requirements for implementing mitigation measures, monitoring environmental and social indicators, capacity-building initiatives, and community engagement programs. The estimated cost for implementing the Environmental and Social Climate Management Plan (ESCMP) is $3,324,064, covering additional costs not originally factored into the project's budget. The ESCMP budget allocates funds to various stakeholders, including the Ministry of Water Resources and Meteorology (MOWRAM). A significant portion of the budget is dedicated to the Biodiversity Plan, supporting protected areas and biodiversity actions in specific locations like Ou Ta Paong, Lum Hach, and Stung Krang Ponley. The budget also covers UXO clearance, consultation outreach, awareness-raising campaigns, and a comprehensive Environmental and Social Monitoring Program. This monitoring program involves regular assessments of soil quality, air quality, noise and vibration levels, and water quality at designated locations within the project area.

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii
TABLE OF CONTENTS vii
LIST OF TABLES xii
LIST OF FIGURES xv
ABBREVIATIONS xix
CHAPTER 1 – INTRODUCTION 1
1.1 RATIONALE 1
1.2 PREPARING THE ESCIA 2
1.2.1 Objectives of the ESCIA 2
1.2.2 Project Location 2
1.2.3 Scope and Coverage 3
CHAPTER 2 – PROJECT DESCRIPTION 6
2.1 INTRODUCTION 6
2.2 PROJECT DESCRIPTION 6
2.2.1 Background 6
2.2.2 Project Area and Beneficiaries 9
2.2.3 Description of the Sub-Schemes 10
2.3 PROPOSED INFRASTRUCTURE 21
2.3.1 Ou Ta Paong 21
2.3.2 Lum Hach 28
2.3.3 Stung Krang Ponley 31
2.3.4 Project Activities 37
2.3.5 Construction Equipment 41
2.4 ASSOCIATED FACILITIES 42
2.5 IMPLEMENTATION RESOURCES REQUIREMENT 46
2.5.1 Labour and Workforce 46
2.5.2 Power Usage 47
2.5.3 Supporting Facilities 48
2.5.4 Water Consumption 48
2.5.5 Expected GHG Emission and Discharge 49
2.5.6 Land Acquisition for Material Storage 50
CHAPTER 3 – PROJECT ALTERNATIVES ANALYSIS 51
3.1 INTRODUCTION 51
3.2 ALTERNATIVE ANALYSIS 51
3.2.1 Ou Ta Pong 51

3.2.2 Lum Hach 60
3.2.3 Stung Krang Ponley 63
CHAPTER 4 − LEGAL AND POLICY FRAMEWORK 68
4.1 INTRODUCTION 68
4.2 RELEVANT LAW AND REGULATIONS OF THE ROYAL GOVERNMENT OF CAMBODIA 68
4.2.1 The Constitution of the Kingdom of Cambodia (1993) 68
4.2.2 Legal Framework on the Management and Conservation of Natural Resources and Biodiversity 68
4.2.3 Legal Framework on Labour, Public Well-Being, and Safety 71
4.2.4 Legal Framework on Governance and Social Inclusion 72
4.2.5 EIA Classification 73
4.2.6 Applicable Ambient Quality Standards 73
4.3 AIIB'S ENVIRONMENTAL AND SOCIAL FRAMEWORK (ESF) 75
4.4 IFADs' SECAP 76
4.5 GEF'S ENVIRONMENTAL AND SOCIAL SAFEGUARDS POLICIES 77
4.5.1 International Conventions and Treaties 78
4.6 Good International Industry Practices (GIIP) 79
4.6.1 WBG General EHS Guidelines (2007) 79
4.6.2 WBG EHS Guidelines for Annual Crop Production (2016) 79
4.7 GAP ANALYSIS OF NATIONAL LEGAL FRAMEWORK AND POLICIES OF AIIB, IFAD AND GCF 80
CHAPTER 5 − PROJECT AREA OF INFLUENCE 86
5.1 INTRODUCTION 86
5.2 DETERMINING PROJECT AREAS OF INFLUENCE 86
5.3 DESCRIPTION OF KEY COMPONENTS THAT POTENTIALLY CAUSE THE INFLUENCIAL IMPACT 87
5.3.1 Air, Noise and Vibration 87
5.3.2 Water Quality 89
5.3.3 Soil Quality 90
5.3.4 Biodiversity 91
5.4 SUMMARY OF THE PROJECT AREAS OF INFLUENCE 95
CHAPTER 6 − BASELINE CONDITIONS 96
6.1 INTRODUCTION 96
6.2 METHODOLOGY 96
6.2.1 Environmental and Natural Resources 96
6.2.2 Socio-Economic Resources 107
6.3 PHYSICAL AND ENVIRONMENTAL CONDITIONS 110

6.3.1 Geological Conditions 110
6.3.2 Topography 111
6.3.3 Land Cover and Water Use 113
6.3.4 Soil Types 114
6.3.5 Hydrological Resources 117
6.3.6 Climatic Conditions 122
6.4 BASELINE ENVIRONMENTAL QUALITY 130
6.4.1 Unexploded Ordnances (UXO) 130
6.4.2 Ambient Air quality, Noise and Vibration 133
6.4.3 Soil Quality 138
6.4.4 Surface Water Quality 139
6.4.5 Groundwater Quality 143
6.5 BIODIVERSITY 144
6.5.1 Ou Ta Paong 144
6.5.2 Lum Hach 168
6.5.3 Brambei Mom 173
6.5.4 Krapeu Trom 175
6.5.5 Yutasas 178
6.5.6 Stueng Krang Bat 184
6.6 SOCIO-ECONOMIC AND CULTURAL CONDITIONS 192
6.6.1 Administrative and Social Structure 192
6.6.2 Social Conditions 194
6.6.3 Demographic and Facilities 196
6.6.4 Socio–economic Conditions of the Beneficiaries 198
6.6.5 Cultural Sites 201
6.6.6 Agricultural Production 203
6.6.7 Profiles of the Beneficiaries 210
6.6.8 Profiles of the Potentially Affected Households 215
6.7 CLIMATE CHANGE SCENARIOS 222
6.7.1 Current Impacts of Climate Change 222
6.7.2 Climate Change Projections 224
6.7.3 Greenhouse Gas Emissions and Agriculture Sector in NDCs 227
6.8 CAPACITY, EXPERIENCE OF THE IMPLEMENTING AGENCIES AND NEEDS 228
6.8.1 MOWRAM/ PMU and PDWRAM 228
6.8.2 FWUC/FWUG/FWUSG 229
6.8.3 Training and Technical Assistance 230

6.8.4 Technical Assistance on E&S Capacity Building 230
6.8.5 Review Of MOWRAM/PMUS Capacity in Prevention of SEA/SH Risks 231
CHAPTER 7 − ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT 232
7.1 INTRODUCTION 232
7.2 APPROACH TO ASSESMENT OF RISK AND IMPACTS 232
7.2.1 Identification and Assessment of Risks and Impacts 232
7.2.2 Project Activities 233
7.3 ASSESSMENT OF ENVIRONMENTAL AND CLIMATE RISKS AND IMPACTS 236
7.3.1 Risks and Impacts at Preparation and Construction Stage 237
7.3.2 Risks and Impacts at Operation Stage 251
7.4 ASSESSMENT OF SOCIAL RISKS AND IMPACTS 261
7.4.1 Risks and Impacts at Preparation Stage 262
7.4.2 Risks and Impacts at Construction Stage 270
7.4.3 Risks and Impacts at Operation Stage 282
CHAPTER 8 – RAPID CUMULATIVE IMPACT ASSESSMENT 286
8.1 INTRODUCTION 286
8.2 STEPS FOR CONDUCTING RCIA (PROJECT LEVEL) 286
8.3 SOURCES OF INFORMATION AND LIMITATIONS OF RCIA 288
8.4 RESULTS OF THE RAPID CIA 289
8.4.1 Identification of Valued Environmental and Social Components (VECs) (Step 1) 289
8.4.2 Identification of other Projects, Activities and External Stressors (Step 2) 291
8.4.3 Baseline Conditions of VECs (Step 3) 293
8.4.4 Assessment of the Cumulative Impacts of VECs (Step 4) 294
8.4.5 Assessing the Impacts Significance (Step 5) and Management Measures (Step 6) 297
8.5 CONCLUSION 299
CHAPTER 9 − ENVIRONMENTAL & SOCIAL MANAGEMENT 300
9.1 INTRODUCTION 300
9.2 ENVIRONMENTAL, SOCIAL AND CLIMATE 300
9.2.1 Mitigation Measures for the Environmental and Climate Risks and Impacts 300
9.2.2 Mitigation Measures for the Social Risks and Impacts 311
9.2.3 Environmental Monitoring Program 323
9.2.4 Social Monitoring Program 333
9.2.5 E&S Auditing 341

9.3 ROLES AND RESPONSIBILITIES FOR IMPLEMENTATION OF SUB-SCHEME ESCMP 341
9.4 ENVIRONMENTAL AND SOCIAL COMPLIANCE FRAMEWORK 341
9.4.1 Institutional Arrangement and Capacity Development 341
9.4.2 Environmental and Social Duties of the PMU/Detail Design Consultants 343
9.4.3 Environmental and Social Duties of the Contractor 345
9.4.4 Contractor's Environmental and Social Management Plan (C-ESCMP) ... 345
9.4.5 Safety, Social and Environmental Officer (SSEO) 346
9.4.6 Reporting Arrangements 347
CHAPTER 10 − PUBLIC CONSULTATION AND INFORMATION DISCLOSURE 350
10.1 INTRODUCTION 350
10.2 SUMMARY OF PUBLIC CONSULTATION PROCESS & RESULTS 350
10.2.1 The Consultation 350
10.2.2 Results of the Consultations 352
10.3 INFORMATION DISCLOSURE 373
10.4 GRIEVANCE REDRESS MECHANISM (GRM) 373
10.4.1 Objectives of the Project GRMs 374
10.4.2 Summary of National Legislation Related to Grievance and Complaint .. 374
10.4.3 Principles of the Project GRMs 375
10.4.4 Project's Redress Procedures 376
10.4.5 Registration of Project Grievance 381
CHAPTER 11 – COSTS AND BUDGET 382
11.1 INTRODUCTION 382
11.2 ESTIMATED COSTS FOR ESCMP IMPLEMENTATION 382
ANNEX 385
ANNEX 1: BIODIVESITY ASSESSMENT REPORT 385
ANNEX 2: SUMMARY OF HOUSEHOLD SURVEY RESULTS 492
ANNEX 3: SUMMARY OF SURVEY DATA WITH VILLAGE CHIEFS 495
ANNEX 4: SUMMARY OF SUB-SCHEME COMMUNE DATA 497
ANNEX 5: LABORATORY TESTING RESULT 501
ANNEX 6: CHANCE FIND PROCEDURE 517
ANNEX 7: LIST OF ARCHEOLOGICAL AND CULTURAL SITES 518
ANNEX 8.1: RESULTS OF THE CONSULTATIONS IN PURSAT PROVINCE 530
ANNEX 8.2: RESULTS OF THE CONSULTATIONS WITH COMMUNE COUNCILS IN PURSAT PROVINCE 548
ANNEX 8.3: RESULTS OF THE CONSULTATIONS WITH VILLAGE CHEFS IN PURSAT PROVINCE 555
ANNEX 9.1: RESULT OF CONSULTATION: KAMPONG CHHNANG PROVINCE 561

ANNEX 9.2: RESULTS OF THE CONSULTATIONS WITH COMMUNE COUNCILS IN KAMPONG CHHNANG PROVINCE 582

ANNEX 9.3: RESULTS OF THE CONSULTATIONS WITH VILLAGE CHEFS IN KAMPONG CHHNANG PROVINCE 594

ANNEX 10.1: RESULTS OF THE CONSULTATIONS IN KAMPONG SPEU PROVINCE 605

ANNEX 10.2: RESULTS OF THE CONSULTATIONS WITH COMMUNE COUNCILS IN KAMPONG SPEU PROVINCE 619

ANNEX 10.3: RESULTS OF THE CONSULTATIONS WITH VILLAGE CHEFS IN KAMPONG SPEU PROVINCE 625

ANNEX 11: RESULTS OF THE CONSULTATIONS WITH RICE FARMERS 632

ANNEX 12: RESULTS OF THE CONSULTATIONS WITH VEGETABLE FARMERS 647

ANNEX 13: RESULTS OF THE CONSULTATIONS WITH CHICKEN FARMERS 658

ANNEX 14: RESULTS OF THE CONSULTATIONS WITH DUCK FARMERS 667

ANNEX 15: STANDARD OPERATION PROCEDURE (SOP) FOR LAND CLEARING AND REHABILITATION 676

LIST OF TABLES

Table 1.1: List of six (6) sub-schemes under CAISAR 2
Table 2.1: Summary of the CAISAR project targeted area 9
Table 2.2: List of six (6) sub-schemes under CAISAR 10
Table 2.3: Administrative coverage of Ou Ta Paong sub-scheme 10
Table 2.4: The Water Resources by Region of Ou Ta Paong sub-scheme 12
Table 2.5: Key Characteristics of the Ou Ta Pong Irrigation Scheme 12
Table 2.6: Administrative coverage of Lum Hach sub-scheme 14
Table 2.7: Irrigation Resources and Development Potential for Lum Hach sub-scheme 15
Table 2.8: Administrative coverage of the Krang Ponley Sub-scheme 15
Table 2.9: Main Water Resources for the Krang Ponley sub-scheme 17
Table 2.10: Water sources for the four (4) sub-schemes in Krang Ponley area 18
Table 2.11: Water sources for the Krapeu Truom sub-schemes 19
Table 2.12: Main water Resources for the Krapeu Truom sub-schemes 20
Table 2.13: Frequency and seriousness of natural disasters in Krapeu Truom sub-scheme 21
Table 2.14: Tentative implementation schedule of Ou Ta Paong irrigation scheme. 21
Table 2.15: Ou Ta Paong Sub-Project Key Characteristics 24
Table 2.16: Tentative implementation schedule of Lum Harch irrigation scheme. 29
Table 2.17: Summary of design options in Lum Hach 30
Table 2.18: Tentative implementation schedule of Krang Ponley irrigation scheme 31
Table 2.19: Key Features of the Krang Ponley Sub-Project 32
Table 2.20: Summary of the Project Activities in relation to the infrastructure investment ... 40
Table 2.21: Screening of potential Associated Facilities under CAISAR* 44
Table 2.22: Assessment of Project Associated Facilities 45
Table 2.23: The estimated influx labor within the sub-schemes 46
Table 2.24: The estimated quantity of water for domestic use of the project 49
Table 3.1: Irrigation System Design and Options 51

Table 3.2: River Training Design Options 54
Table 3.3: Slope Design Options Comparison 56
Table 3.4: Slope Design Option Comparison 57
Table 3.5: Irrigation System Options 58
Table 3.6: Irrigation System Options in Lum Hach 61
Table 3.7: Options for pond construction 61
Table 3.8: Irrigation System Options in Stung Krang Ponley 63
Table 4.1: ESIA Classification for Development Projects relevant 73
Table 4.2: Water quality standards in public water areas for bio-diversity conservation 74
Table 4.3: Groundwater and Drinking Water Quality Standards. 74
Table 4.4: Ambient Air Quality Standards 75
Table 4.5: Maximum permitted noise levels in public and residential areas (dB (A)) 75
Table 4.6: Summary of the RGC's legal framework corresponding to the policies of AIIB, IFAD and GCF 80
Table 5.1: Summary of the project area of influence 95
Table 6.1: The identification of risks for determining the locations of water and soil quality testing in all sub-schemes 97
Table 6.2: The selected locations for surface water sample collection 97
Table 6.3: Locations of surface water quality sampling 98
Table 6.4: Groundwater sampling locations 99
Table 6.5: Locations of air quality, noise and vibration 100
Table 6.6: Quantitative thresholds for criteria 1-3 relating to tier 1 and tier 2 critical habitat 107
Table 6.7: The selected communes and villages for consultation in the six (6) sub-schemes 108
Table 6.8: List of identified KIIs at local level 108
Table 6.9: List of FGDs to be consulted for agricultural production 109
Table 6.10: Sample sizes for socio-economic data collection at household level 109
Table 6.11: Soil types and area in Cambodia 114
Table 6.12: Soil types and area in Cambodia 132
Table 6.13: Air quality testing result of Damnak Chheu Krom project 133
Table 6.14: Air quality testing result 134
Table 6.15: Air quality testing result 135
Table 6.16: Soil analysis results in an agricultural context 138
Table 6.17: Result of surface water quality 142
Table 6.18: Result of groundwater quality 143
Table 6.19: Confirmed List of endangered and critically endangered species for the Ou Ta Paong sub-scheme 145
Table 6.20: List of international and national key expert was consulted to check and verify each all target EN and CR species 161
Table 6.21: Confirmed List of endangered and critically endangered species for the Lum Hach sub-scheme 169
Table 6.22: Confirmed List of endangered and critically endangered species for the Yutasas sub-scheme 179
Table 6.23: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Yutassas sub-scheme of the Project Area 182
Table 6.24: List of endangered and critically endangered species based on the IBAT Screening result vs. key informant interview at Stueng Krang Bat Sub-scheme 184

Table 6.25: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Stueng Krang Bat sub-scheme of the Project Area 190
Table 6.26: Status of relevant CBOs within the project area..... 193
Table 6.27: Administrative and population coverage of Ou Ta Paong sub-scheme 194
Table 6.28: Administrative and population coverage of Lum Hach sub-scheme 195
Table 6.29: Administrative and population coverage of Lum Hach sub-scheme 195
Table 6.30: Demographic information of the HH living within and the vicinity of the command areas..... 196
Table 6.31: Access to energy and water and sanitation facilities..... 197
Table 6.32: Occupation of the HHs living within and the vicinity of the command areas 198
Table 6.33: Migration and vulnerability of the people within the sub-schemes..... 199
Table 6.34: Houses and Assets of the HHs within the Sub-Schemes..... 200
Table 6.35: Issues in the project communities..... 201
Table 6.36: Demographic Information of the beneficiaries HHs (n=272)..... 210
Table 6.37: Occupation of the beneficiaries HHs (n=272) 210
Table 6.38: Occupation of the members of the potentially affected beneficiaries HHs..... 211
Table 6.39: Houses of the beneficiaries HHs (n=272) 212
Table 6.40: Lands of the surveyed HHs (n=270) 212
Table 6.41: Average annual income per household of the survey households (n=272) 215
Table 6.42: Demographic Information of the potentially affected HHs (n=85) 215
Table 6.43: Occupation of the potentially affected HHs head (n=85) 216
Table 6.44: Occupation of the members of the potentially affected HHs..... 217
Table 6.45: Houses of the potentially affected HHs (n=85)..... 217
Table 6.46: Lands of the potentially affected HHs (n=85) 218
Table 6.47: Socio-economic and safety challenges affecting different segments of the population in the sub-scheme 220
Table 6.48: Average annual income per household of the affected HHs (n=85) 222
Table 6.49: Projected anomaly (changes °C) for average monthly temperatures, using median values of CCKP multi-model ensembles and showing 10-90th percentile in brackets 224
Table 6.50: GHG emissions and scenarios (BAU, NDC) 228
Table 7.1: Key project activities potentially causing environmental & social risks & impacts – during project implementation & operations 234
Table 7.2: Indicative figure of canal expansion at all sub-schemes 263
Table 7.3: Indicative estimates of the cost for the land acquisition and land resettlement at all sub-schemes 264
Table 7.4: Indicative figure of canal expansion at Ou Ta Paong..... 265
Table 7.5: Land Acquisition and Asset Impacts in the Ou Ta Paong sub-scheme 266
Table 7.6: Indicative figure of canal expansion at Lum Hach..... 266
Table 7.7: Indicative figure of canal expansion at Krang Ponley..... 267
Table 7.8: Affected and Vulnerable Households in Ou Ta Paong Sub-scheme 269
Table 7.9: Affected and Vulnerable Households in Lum Hach Sub-scheme 269
Table 7.10: Affected and Vulnerable Households in Krang Ponley Sub-scheme 270
Table 7.11: The estimated influx labor within the sub-schemes..... 272
Table 8.1: Identification of valued environmental and social components (VECs) under the RCIA 289
Table 8.2: Baseline conditions of the identified valued environmental and social components (VECs) under the RCIA..... 294

Table 8.3: Analysis result of the identified valued environmental and social components under the RCIA 295
Table 8.4: Analysis of the Identified VECs Baseline Condition, Impacts Significance and Management Measures, and Responsible Stakeholders 297
Table 9.1: Preconstruction, Construction, and Operation Phase Environmental Mitigation Measures 301
Table 9.2: Social Risks, Impacts and Mitigation Measures 311
Table 9.3: Environmental monitoring plan 323
Table 9.4: Social monitoring plan during preconstruction, construction, and operational phase 333
Table 9.5: Report procedure 348
Table 10.1: Number of participants being consulted for the ESCIA 351
Table 10.2: Types of stakeholders, and topics of the consultations is shown below: 351
Table 11.1: Estimated Additional Costs for Environmental Social and Climate Change Monitoring Plan (ESCMP) Implementation 382

LIST OF FIGURES

Figure 1.1: Map of the CAISAR Schemes 3
Figure 1.2: Illustration of key assessment conceptual coverage 4
Figure 2.1: Map of Ou Ta Paong Sub-Scheme 11
Figure 2.2: Map of Lum Hach Sub-Scheme 13
Figure 2.3: Map of Sub-Scheme in Krang Ponley Basin 16
Figure 2.4: Schematic Supply Map of Krang Ponley 17
Figure 2.5: Length from Sub-Scheme to Another of Krang Ponley 18
Figure 2.5: Length from Sub-Scheme to Another of Krang Ponley 19
Figure 2.6: Three (3) blocks (sub-scheme) of Ou Ta Pong sub-project 22
Figure 2.7: Concept design of Block A of Ou Ta Pa Ong Scheme 22
Figure 2.8: The Selected 3 Options 24
Figure 2.9: Typical canal section in full cutting 25
Figure 2.10: Pictures and design layout of a typical regulator or off-take structure at a canal section 26
Figure 2.11: Principles of river rehabilitation for Lum Hach scheme 29
Figure 2.12: Concept design Layout of Brambei Mom irrigation scheme 33
Figure 2.13: Canal section on full cutting section 33
Figure 2.14: Concept design of Kropeu Trom irrigation scheme. 34
Figure 2.15: Conceptual design layout of Yotasas irrigation scheme 36
Figure 2.16: Concept design layout of Stoeung Krang Bat irrigation scheme 37
Figure 3.1: Ou Ta Paong Sub-project Options Map 52
Figure 5.1: Locations of irrigation structures in Ou Ta Paong 88
Figure 5.2: Locations of irrigation structures in Lum Hach 88
Figure 5.3: Locations of irrigation structures in Prambei Mom 88
Figure 5.4: Locations of irrigation structures in Kropeau Truom, Yutasas, and Stoeng Krang Bat 89
Figure 5.5: Map of Residential Area and protected areas in Ou Ta Paong 92
Figure 5.6: Map of Construction Sites and Residential Area in Lum Hach 92

Figure 5.7: Map of Construction Sites and Residential Area in Stung Krang Ponley 94
Figure 6.1: Map showing the locations of selected surface water samples..... 97
Figure 6.2: Map showing the locations of selected groundwater samples 99
Figure 6.3: Map showing the locations of selected air quality, noise and vibration 101
Figure 6.4: Map with illustration of locations of soil quality samples 101
Figure 6.5: Geological Map of the sub-schemes 111
Figure 6.6: Topographical map of the project area..... 112
Figure 6.7: Map of soil types within the sub-schemes 115
Figure 6.8: River Basin Groups in Cambodia 117
Figure 6.9: Map with Illustration of Dam No. 2..... 120
Figure 6.10: Observed Annual Mean-Temperature, 1901 - 2021 122
Figure 6.11: Temperature change factor in °C between ’95-’21 and ’26-‘50 123
Figure 6.12: The maximum average and minimum monthly temperature for the last 10 years (°C) 125
Figure 6.13: The maximum, average, and minimum monthly precipitation for the last 10 years (mm)..... 125
Figure 6.14: The maximum, average, and minimum monthly humidity for the last 10 years (%)..... 126
Figure 6.15: The maximum, average, and minimum monthly wind speed for the last 10 years (m/s) 126
Figure 6.16: The maximum, average, and minimum monthly temperature for the last 10 years (°C)..... 127
Figure 6.17: The maximum, average, and minimum monthly precipitation for the last 10 years (mm)..... 127
Figure 6.18: The maximum, average, and minimum monthly humidity for the last 10 years (%)..... 127
Figure 6.19: The maximum, average, and minimum monthly wind speed for the last 10 years (m/s) 128
Figure 6.20: The maximum, average, and minimum monthly temperature for the last 10 years (°C)..... 128
Figure 6.21: The maximum, average, and minimum monthly precipitation for the last 10 years (mm)..... 129
Figure 6.22: The maximum, average, and minimum monthly humidity for the last 10 years (%)..... 129
Figure 6.23: The maximum, average, and minimum monthly wind speed for the last 10 years (m/s) 130
Figure 6.24: The landmine contamination map in Cambodia..... 131
Figure 6.25: Map of USA Bombing in Cambodia..... 132
Figure 6.26: Ou Ta Paong Water River Body..... 133
Figure 6.27: Kbal Hong Main Canal 133
Figure 6.28: Lum Hach Main Dam..... 134
Figure 6.29: Lum Hach Main Canal..... 134
Figure 6.30: Brambei Mom sub-scheme..... 135
Figure 6.31: Krapeu Troum sub-scheme..... 135
Figure 6.32: Yutasas sub-scheme..... 136
Figure 6.33: Stung Krang Bat sub-scheme..... 136
Figure 6.34: 24-hour Average Noise level results..... 136
Figure 6.35: 24-hour Average Noise level results in Location 2..... 137

Figure 6.36: Results of noise analysis at location 1 138
Figure 6.37: Ou Ta Paong Water River Body 140
Figure 6.38: Kbal Hong Main Canal 140
Figure 6.39: Lum Hach Main Canal 141
Figure 6.40: Lum Hach Main Dam 141
Figure 6.41: Brambei Mom sub-scheme 143
Figure 6.42: Krapeu Troum sub-scheme 143
Figure 6.43: Yutasas sub-scheme 143
Figure 6.44: Stung Krang Bat sub-scheme 143
Figure 6.45: Map showing the observed distribution of identified EN and CR species (with the potential movement of 1-2 km within and around suitable habitats (2020 to 2024) 147
Figure 6.46: Distribution of identified turtle and tortoise species in and outside the OTP Command Area 149
Figure 6.47: A spatial distribution map was generated for three bird species—the Bengal Florican, Greater Adjutant, and Milky Stork—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 151
Figure 6.48: Photograph of a Milky Stork foraging alongside a flock of Painted Storks (credit: Sang Mony, Sam Veasna Conservation Tour), and a map illustrating the distribution of Milky Stork sightings in Cambodia from 2020 to 2024, extracted from eBird data. 153
Figure 6.49: Photo of Yellow-breasted Bunting (Emberiza aureola) and its distribution map from eBird data (2020-2024) recorded by birdwatcher and wildlife overserves. 154
Figure 6.50: A spatial distribution map was generated for two primate species—the Indochinese Silvered Langur and Long-tailed Macaque—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 156
Figure 6.51: A spatial distribution map was generated for two fish species—the Siamese Tiger Perch, and Striped Catfish (old record-7 years ago)—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 158
Figure 6.52: Map of Ou Tapong Command Area and other existing protected areas under administered of the Ministry of Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministries of Water Resources and Meteorology 160
Figure 6.53: Land use and land cover map based on the satellite image from Sentinel-2 with 10m resolution. 164
Figure 6.54: Map of Ou Ta Paong command area and other existing protected area within the Tonle Sap Basin 164
Figure 6.55: Boeung Kansaeng located in Ou Tampaong's upper reaches, offers sighted records of Siamese Tiger Parch. The area's upper part in this photo is a settlement along the Svay Daunkav River 167
Figure 6.56: Overview of Boeung Kansaeng, located upstream of Ou Tapaong Command Area. A canal connects to Stueng Svay Daunkav River (left) and Ou Tapaong (right), a potential fish migration route during floods. 167
Figure 6.57: Aerial photograph depicting the Ou Tapaong Stream/canal fragmented by earth dams, roads, and ponds, illustrating its diversion for non-intended purposes. 167
Figure 6.58: Aerial photograph of intake flooded forest habitat within Tonle Sap Zone 3 and the continuous land encroachment, converting forest land for rice cultivation. 167

Figure 6.59: Green Peafowl distribution in Toul Samraong, Phnom Banon, and Chan Trak Community Forests, as confirmed by local sources from 2020 to 204. 170
Figure 6.60: The upperpart of Hum Hack next to Boribou river catchment area 172
Figure 6.61: Overview from the above of the general condition of Toul Samroang and Phnom Banon Community Forests..... 172
Figure 6.62: Overview from the above of the general condition of Chan Trak Community Forest 172
Figure 6.63: An expert consulted with the Toul Samraong CF management committee to verify the identification of a canine species, ensuring it was correctly identified as either a dhole or a jackal. 172
Figure 6.64: Interviewing and verifying Mekong Giant Barb with similar look of other fish species and their ecological niches 174
Figure 6.65: Local fishermen in Brabei Mom mistakenly identified their catch of Rohu (Labeo rohita) as Mekong Giant Barb. 174
Figure 6.66: A spatial distribution map was generated for four fish species at Krapeu Trom and Yotasas Command Area. 1 km buffer zones were included to approximate their minimum movement range around suitable habitats. 177
Figure 6.67: Map showing the distribution of endangered (EN) and critically endangered (CR) species, with 1-2 km buffers indicating their potential movement ran ge within and around suitable habitats as identified by key informants sighted from 2020 to 2024. 187
Figure 6.68: Maps of archaeological and cultural sites in and near Ou Ta Paong Sub-scheme 202
Figure 6.69: Maps of archaeological and cultural sites in and near Lum Hach Sub-scheme 202
Figure 6.70: Maps of archeological and cultural sites in Stung Krang Ponley Sub-scheme 203
Figure 6.71: Division of Roles in Household Chores of the Beneficiaries HHs (n=270) 213
Figure 6.72: Share of Roles in Crop Cultivation of the Beneficiaries HHs (n=272)..... 213
Figure 6.73: Share of roles in Animal Husbandry of the Beneficiaries (n=272) 214
Figure 6.74: Division of Roles in Household Chores of Affected HHs (n=85)..... 218
Figure 6.75: Share of Roles in Crop Cultivation of the Affected HHs (n=85)..... 219
Figure 6.76: Share of roles in animal husbandry of the affected HHs (n=85)..... 220
Figure 6.77: Temperature maximum deviation from historical baseline period (1980-2005) under RCP 4.5 (top row) for the period 2011-2040 (left), 2040-2070 (middle) and 2070-2100 (right) and RCP8.5 (bottom row) for the same time periods. The deviation highlights the projected changes into the future in degree Celsius based on projections from bias corrected regional CORDEX data (FAO analysis, CAVA tool). 224
Figure 6.78: Cumulative precipitation per year deviation from historical baseline period (1980-2005) under RCP 4.5 (top row) for the period 2011-2040 (left), 2040-2070 (middle) and 2070-2100 (right) and RCP8.5 (bottom row) for the same time periods. The deviation highlights the projected change into the future in millimeter/year based on projections from bias corrected regional CORDEX data (FAO analysis)..... 226
Figure 6.79: Deviation in cumulative precipitation in rainy season (May-October) from historical baseline period (1980-2005) under RCP 4.5 (top row) for the period 2011-2040 (left), 2040-2070 (middle) and 2070-2100 (right) and RCP8.5 (bottom row) for the same time periods. The deviation highlights the projected change into the future in millimeters based on projections from bias corrected regional CORDEX data (FAO analysis)..... 226
Figure 7.1: Consultation with Toul Samroang community forestry 247
Figure 7.2: Visiting the forestry area and drone taking photo..... 247

Figure 7.3: The process of risk assessment Risk assessment process (shaded) within the overall risk management process 261
Figure 7.4: Locations of the potentially affected households in Ou Ta Paong sub-scheme 265
Figure 7.5: Locations of the potentially affected households in Lum Hach sub-scheme 266
Figure 8.1: Location of Water resources development in the Pursat river (JICA, 2013) 292
Figure 8.2: Cumulative impact in Stung Krang Ponley 293
Figure 9.1: CAISAR Project (Component 1) Structure Chart 342
Figure 9.2: CAISAR Project PMU structure chart 343
Figure 9.3: Stakeholder and flow in reporting of CAISAR project 348
Figure 10.1: Redress Procedure for Complaints related to Land Acquisition 377
Figure 10.2: Redress Procedure for Complaints Related to Labor and Working Conditions 378
Figure 10.3: Redress Procedure for Complaints Related to SEA/SH/GBV 380

ABBREVIATIONS

4PF	Public Private Producer Partnership Facility
4Ps	Public Private Producer Partnerships
AC	Agriculture Communities
ACs	Agricultural Cooperatives
ADB	Asian Development Bank
ADRA	Adventist Development Relief Agency
AF	Associated Facilties
AH	Affected Household
AIIB	Asian Infrastructure Investment Bank
ANV	Air, Noise and Vibration
AoI	Areas of Influence
AP	Action Plans
API	Advocacy Policy Institute
AWD	Alternate Wetting and Drying
BAU	Business-as-usual
BM/BBM	Brambei Mom
CAISAR	Climate Adaptive Irrigation and Sustainable Agriculture for Resilience
CBME	Community-based monitoring and evaluation
CBOs	Community-based organizations

CDWQS	Cambodia Drinking Water Quality Standard
CEMP	Construction Environmental Management Plan
C-ESMP	Contractor’s Environmental and Social Management Plan
CF	Community Forestry
CFi	Community Fisheries
CL	Chrey Loeu
C-LMP	Contractor’s Labour Management Plan
CoC	Code of Conduct
COD	Cut-Off-Date
COI	Corridor of Impact
COVID-19	Severe Acute Respiratory Syndrome Coronavirus 2
CPMU	Central Project Management Unit
CR	Climate Resilient
CR	Critically Endangered
CSC	Construction Supervision Consultant
CSOs	Civil Society Organizations
CVA	Climate Vulnerability Analysis
DAHW	Damnak Ampil Headwater
DAMC	Damnak Ampil Main Canal
DAP	Di-Ammonium Phosphate
DDFs	Dry Deciduous Forests
DDIS	Detailed Design Implementation and Supervision
DED	Detailed Engineering Design
DHRW	Department of Hydrology and River Works
DIMDM	Department of Internal Monitoring and Data Management
DRPs	Detailed Resettlement Plans
DS	Dry Season
E&S	Environmental and Social
EA	Executing Agency
EHS	Environmental, Health, and Safety

EHSO	Environmental Health and Safety Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered
EPC	Environmental Protection Contract
ES	Environmental and Social
ESC	Environmental, Social, and Climate
ESCIA	Environmental, Social, and Climate Impact Assessment
ESCM	Environmental, Social, Climate Management
ESCMF	Environment, Social, Climate Management Framework
ESCMP	Environmental, Social, and Climate Management Plans
ESF	Environmental and Social Framework
ESHS	Environmental Social Health and Safety
ESIAs	Environmental and Social Impact Assessments
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESO	Environmental and Social Office
ESS	Environmental and Social Standards
FAO	Food and Agriculture Organization
FFS	Farmer Field School
FGDs	Focus Group Discussions
FOLU	Forestry and Other Land Uses
FPIC	Free, Prior, And Informed Consent
FWUC	Farmers Water User Communities
FWUG	Farmer Water User Group
GAP	Good Agricultural Practices
GBV	Gender-Based Violence
GCF	Green Climate Fund
GDR	General Department of Resettlement
GEF	Global Environment Facility

GHG	Green House Gas
GIIP	Good International Industry Practices
GIS	Geographic Information System
GN	Guidance Note
GRM	Grievance Redress Mechanism
GW	Groundwater
HH	Household
HIV/AIDS	Human immunodeficiency virus/Acquired immunodeficiency syndrome
IBA	Important Bird Area
IBAT	Integrated Biodiversity Assessment Tool
ICT	Information Communication Technologies
IEC	Information, Education and Communication
IEIA	Initial Environmental Impact Assessment
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
ILO	International Labour Organization
IMA	Independent Monitoring Agency
IP	Indigenous Peoples
IPM	Integrated Pest Management
IPP	Indigenous Peoples Plans
IPPF	Indigenous People Planning Framework
IPPU	Industrial Processes and Product Use
IRC	Inter-Ministerial Resettlement Committee
IRC-WG	Inter-Ministerial Resettlement Committee Working Group
ISF	Irrigation Service Fees
IUCN	International Union for the Conservation of Nature
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
JP	Judicial Police
KHHW	Kbal Hong Head Water

KHMC	Kbal Hong Main Canal
KIIs	Key Informant Interviews
KPT	Krang Ponley Teuk
KT	Krapeu Truom
L	Left
LH	Lum Hach
LMP	Labour Management Plan
M&E	Monitoring and Evaluation
MAFF	Ministry of Agriculture, Forestry and Fisheries
MC2	Main Canal 2
MCM	Million Cubic Metres
MEF	Ministry of Economy and Finance
Mm^3	Million Cubic Meters
MOE	Ministry of Environment
MOI	Ministry of Interior
MOWRAM	Ministry of Water Resources and Meteorology
MSPs	Multi-Stakeholder Platforms
MU	Management Unit
NCDD	National Committee for Sub-National Democratic Development
NCDDS	National Committee for sub National Democratic Development Secretariat
NDA	National Designated Agencies
NDC	Nationally Determined Contribution
NGOs	Non-governmental Organizations
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OTP	Ou Ta Paong
PDAFF	Provincial Department of Agriculture Forestry and Fisheries
PDoLMUPC	Provincial Department of Land Management, Urban Planning and Construction
PDWRAM	Provincial Department of Water Resources and Meteorology

PGL	Project Grievance Logbook
PGRC	Provincial Grievance Redress Committee
PIN	People In Need
PIU	Project Implementation Units
PM	Particulate Matter
PMC	Project Management Consultants
PMIC	Project Management Implementation Consulting
PMU	Project Management Unit
PPE	Personal Protective Equipment
PPIC	Phnom Penh International Consultant Co. Ltd.
PPMUs	Provincial Project Management Unit
PRA	Participatory Rural Appraisal
PRSC	Provincial Resettlement Subcommittee
PRSC-WG	Provincial Resettlement Subcommittee Working Group
PS	Performance Standards
PSC	Project Steering Committee
PWD	People With Disability
Q&A	Questions and Answers
R	Right
RCIA	Rapid Cumulative Impact Assessments
RCP	Representative Concentration Pathways
RGC	Royal Government of Cambodia
RPF	Resettlement and Policy Framework
RUPP	Royal University of Phnom Penh
S	Standard
SCADA	Supervisory Control and Data Acquisition
SEA	Sexual Exploitation and Abuse
SECAP	Social, Environmental and Climate Assessment Procedures
SEO	Social and Environmental Officer
SEP	Stakeholder Engagement Plan

SH	Sexual Harassment
SIA	Social Impact Assessment
SKB	Stung Krang Bat
SOP-LAR	Standard Operating Procedures for Land Acquisition and Involuntary Resettlement
SS	Soil Samples
SSEO	Safety, Social and Environmental Officer
STDs	Sexually transmitted diseases
SW	Surface water
TBC	To Be Confirmed
ToR	Terms of Reference
TOT	Training of Trainers
TSL	Tonle Sap Lake
TVET	Technical and Vocational Education and Training
UN	United Nations
UTM	Universal Transverse Mercator
UV	Ultraviolet
UXO	Unexploded Ordnance
VAC	Violence Against Children
VECs	Valued Environmental and Social Components
WASAC	Water Supply and Sanitation Acceleration Project
WBG	World Bank Group
WCS	Wildlife Conservation Society
WRMSDP	Water Resources Management Sector Development Program
WS	Wet Season
YT	Yutasas

CHAPTER 1 – INTRODUCTION

1.1 RATIONALE

The Project originated from the Royal Government of Cambodia (RGC)'s National Water Resources Management and Sustainable Irrigation Road Map and Investment Program (2019 -2023), which provides a Strategic Framework for the Irrigation Sector. It is designed to assist the Ministry of Water Resources and Meteorology (MOWRAM) with plans to make the irrigation sector climate resilient, The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project will be focusing on climate change adaptation with cross-cutting benefits through the reduction of Green House Gas (GHG) emissions linked to the use of high-efficiency smart irrigation systems use of renewable energy for pumping, and cover techniques to reduce evapotranspiration and enhance GHG reduction. Cambodia's Irrigated agriculture faces increasing challenges from adverse impacts of climate change, especially the changes in rainfall patterns, duration and timing of the rainy season, and climate induced water disasters such as floods and droughts. Climate Resilient (CR) and low emission practices and investments in agriculture and water management are therefore crucial to protect and enhance Cambodia's agricultural production and productivity which will in turn contribute to poverty reduction and increased food security.

CAISAR's Theory of Change is premised on the experience that addressing the complex impacts of climate change on rain fed and irrigated agriculture requires action at three (3) levels; farm level; irrigation scheme level and at the national level for creating a strong institutional base and an enabling environment. The theory of change of the project has therefore premised its investments on an understanding of the pathways that can help to reduce GHG emissions and help smallholder farmers adapt to climate change by applying climate resilient agricultural technologies. The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project will adopt a three-pronged strategy to bring about a paradigm shift in the farming systems and the water management governance in Cambodia. The integrated actions combining the various elements of the strategy can have a transformative impact on reducing vulnerability of water and agriculture systems to climate change impacts while also reducing GHG emissions and enhancing the livelihood of rural populations who primarily depend on agriculture.

The Theory of Change of the project assumes if the irrigation system is upgraded and modernized, farmers are made aware of improved energy efficient and water use technologies, and value chains of key agricultural commodities are strengthened. The country will then be able to transform agriculture to become more climate resilient and sustainable because through the positive changes in cropping pattern and production techniques that reduce GHG emissions, farmers communities are able to better adapt to climate change and increase and productivity and their incomes from agriculture, irrigation, and infrastructure is made more resilient and able to withstand extreme climate events, and institutional and regulatory capacity strengthened for low-emission climate-resilient development pathway. Some of the co-benefits that will emerge includes reduction in GHG emissions due to change in cropping pattern, switching to solar pumps and reduction in use of diesel pumps, improved

health, and well-being due to increased incomes from increased crop, poultry and aquaculture production, enhanced community collaboration and participation of women in managing water systems and much more active participation of the private sector in the water economy.

The CAISAR project will be parallel-financed by the Asian Infrastructure Investment Bank (AIIB), International Fund for Agricultural Development (IFAD), and Green Climate Fund (GCF) along with in kind contribution of the Royal Government of Cambodia.

1.2 PREPARING THE ESCIA

1.2.1 Objectives of the ESCIA

The overall objective of the study is to conduct a comprehensive assessment on the Environmental, Social, and Climate Impact Assessment (ESCIA) that covers the entire scope of the project, inclusive of its six (6) sub-schemes, as one (1) sub-scheme was removed from the project, which will lead to the formulation of the Environmental, Social, and Climate Management Plans (ESCMP) for three (3) selected sub-schemes.

The specific objectives of the assessment involve two (2) key tasks:

- To conduct and develop a comprehensive Environmental, Social, and Climate Impact Assessment (ESCIA) report that covers the entire scope of the project, inclusive of its six (6) sub-schemes.
- To formulate Environmental, Social, and Climate Management Plans (ESCMP) for selected sub-schemes, specifically focusing on:
    - ESCMP for the Ou Ta Paong sub-scheme in Pursat Province.
    - ESCMP for the Krapeu Truom sub-scheme in Kampong Speu Province.
    - ESCMP for the Yotassas sub-scheme, also in Kampong Chhnang Province.

1.2.2 Project Location

The assessment covers the CAISAR project's areas situated in Pursat, Kampong Chhnang, Kampong Speu and Kandal provinces in six (6) sub-schemes, namely Out Ta Paong, Lum Hach, Krapeu Truom, Yutasas, Soeung Krang Bat, and Brambei Mom. The size and proportional area of the sub-schemes are provided in Table 1.1:

Table 1.1: List of six (6) sub-schemes under CAISAR

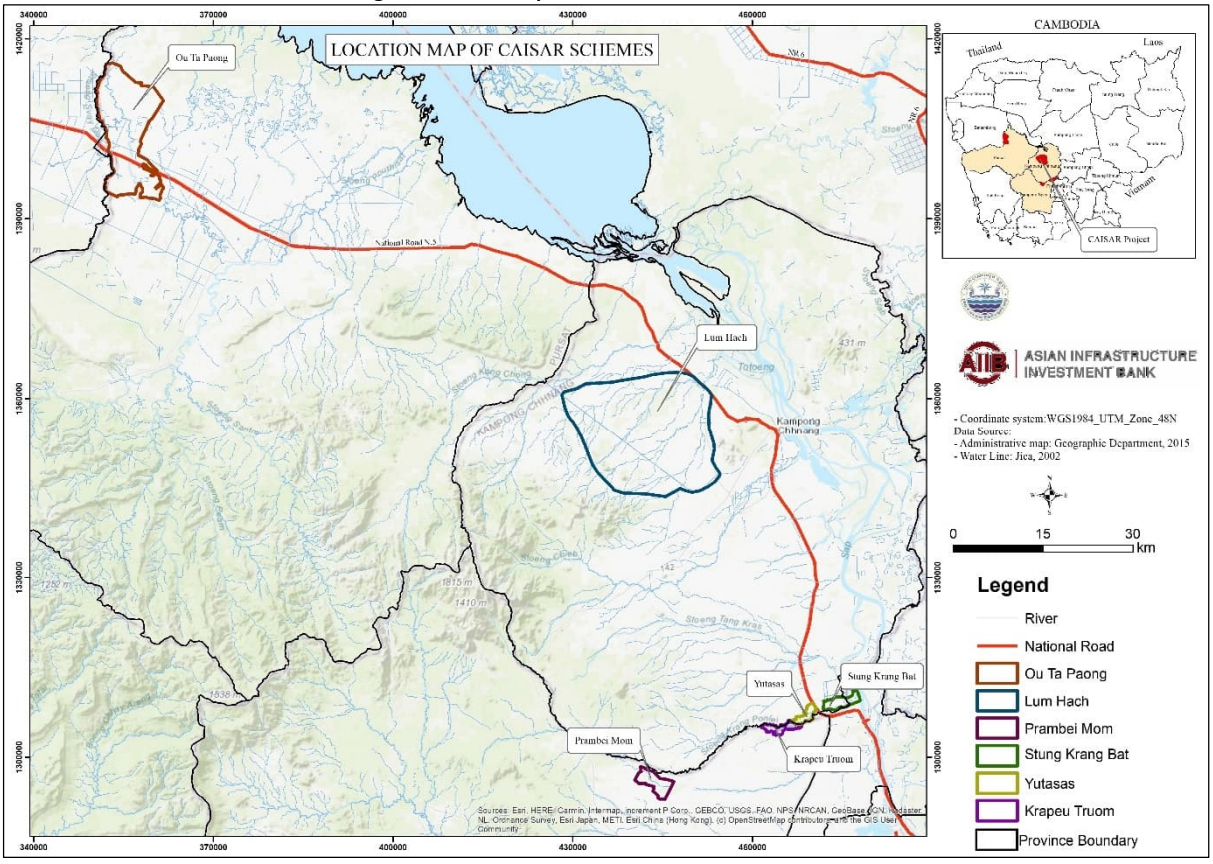
No.	Scheme Name	Component 2				Total	
		Irrigation		Rainfed area			
		Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)
1	Ou Ta Paong	14,874	67%	1,200	16%	16,074	55
2	Lum Hach	3,900	18%	2,400	32%	6,300	21
3	Brambei Mom	1,000	5%	2,400	32%	3,400	12
4	Krapeu Truom	690	3%	400	5%	1,090	4
5	Yutasas	593	3%	600	8%	1,193	4
6	Stoeung Krang Bat	994	5%	400	5%	1,394	5
Total		**22,051**	**100%**	**8,600**	**100%**	**34,204**	**100**

1.2.3 Scope and Coverage

1.2.3.1 Geographical Scope

As stated in the objectives of the assessment, the ESCIA will cover the entire project areas while the ESCMPs will be prepared for three (3) sub-schemes: Out Ta Paong, Krapeu Truom and Yutasas.

Figure 1.1: Map of the CAISAR Schemes



(Source: CAISAR Project, 2024)

1.2.3.2 Conceptual Framework Coverage

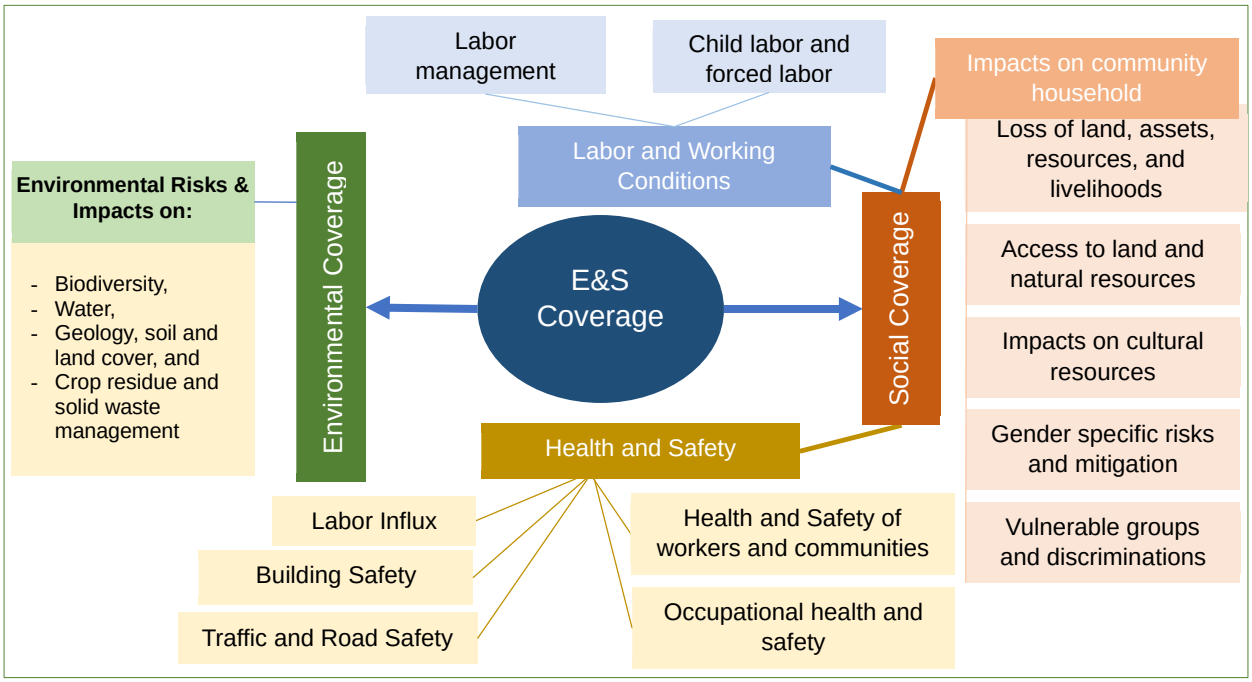
According to the Terms of Reference (ToR), the E&S study addresses two (2) key dimensions: social and environmental, both of which potentially affect the living conditions and/or income generation activities of the affected households - directly or indirectly

Firstly, the social dimension covers the impacts on community people either individual or collectively as a community due to the causes of the construction, which may lead to loss of their assets, income, access to their land and natural resources, etc. due to land acquisition for the purpose of construction. Moreover, some of these locations might be sacred, representing their cultural and religious worship. The presence of the infrastructure systems may also lead to conflicts or foster positive recognition among genders and vulnerable groups. In addition to the long-term impacts of the infrastructure after its completion, there are also immediate effects during the construction phase, including health and safety concerns. These may involve an influx of labour, traffic and road safety issues, building safety, and the health and safety of workers and the surrounding community. The influx of labour could be caused by the labour forces required during the construction and the ongoing operations of the

infrastructure, which may lead to migration to the areas, causing conflicts over land and water, or migration of local people due to increasingly competitive living conditions. This situation may lead to increased or decreased utilization of child labour during both the construction phase and after the completion of the project.

A diagram illustration of the project conceptual coverage is provided below:

Figure 1.2: Illustration of key assessment conceptual coverage



E&S = Environmental and Social.

Secondly, the environmental dimension also includes the potential effects of climate change, which the project intervention might mitigate positively, thereby potentially enhancing agricultural resilience. However, the project could also lead to degradation of ecosystem services and biodiversity, especially endangering certain species mainly the endangered species and the critically endangered species, either directly or indirectly because of the infrastructure projects, whether individually or collectively. The water quality for both surface and groundwater and hydrology are also required to be studied while geology, soil and land cover are part of the ESCIA. Lastly, crop residue and solid waste management are required to ensure that hazardous and non-hazardous waste will be properly considered.

The environmental and social impact assessment will incorporate the characteristics of the impacts, their nature and duration, significance/magnitude, likelihood, spatial scale, measures to mitigate or enhance, and significance/magnitude of residual impacts where relevant receptor sensitivity/vulnerability.

1.2.3.3 Legal Coverage

It is expected that the formulation of the reports will encompass relevant national policies, laws, regulations, as well as international guidelines and standards specified by the Asian Infrastructure Investment Bank (AIIB), International Fund for Agricultural Development (IFAD), Green Climate Fund (GCF), and the regulatory of the country. The list of the standard is provided here:

- **AIIB's Environmental and Social Framework (ESF) (2022):**
  - Environmental and Social Standard 1: Environmental and Social Assessment and Management
  - Environmental and Social Standard 2: Land Acquisition and Involuntary Resettlement
  - Environmental and Social Standard 3: Indigenous Peoples
- **IFAD's Social, Environmental and Climate Assessment Procedures (SECAP, 2021 edition)**
  - Standard 1: Biodiversity conservation
  - Standard 2: Resource efficiency and pollution prevention
  - Standard 3: Cultural heritage
  - Standard 4: Indigenous peoples
  - Standard 5: Labor and working conditions
  - Standard 6: Community health and safety
  - Standard 7: Physical and economic resettlement
  - Standard 9: Climate change
- **GCF's Environmental and Social Policy**
  - All International Labour Organization (ILO) conventions signed and ratified by the country, all ILO conventions covering core labor standards and all ILO conventions covering the basic terms and conditions of employment.
  - Other relevant international treaties and conventions to which Cambodia is a signatory; and
  - Other relevant good international industry practices (GIIP)
- **National Legal Framework:** In addition to the provided legal framework, PPIC will also undertake the Environmental Impact Assessment (EIA) for the Project, examining the law and key regulatory requirements related to environment of the Kingdom, in which is also relevant to the project on infrastructure.

CHAPTER 2 – PROJECT DESCRIPTION

2.1 INTRODUCTION

This chapter provides a comprehensive overview of the project, detailing the specific conditions and characteristics of each sub-scheme, along with the proposed structures and planned investments. It also includes a brief analysis of the various alternatives that were considered during the planning and design stages of the project. The analysis explores the potential impacts of each alternative, assessing both positive and negative outcomes, and evaluating their respective benefits. This chapter aims to provide a thorough understanding of the rationale behind the chosen design, ensuring that the proposed project aligns with the overall goals while minimizing potential risks and maximizing benefits for all stakeholders.

2.2 PROJECT DESCRIPTION

2.2.1 Background

The projects' intention is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve the livelihoods of smallholder farmers and vulnerable rural communities in four (4) provinces of Cambodia, including Pursat, Kampong Chhnang, Kampong Speu, and Kandal. The Mekong River and its tributaries dominate the hydrology of the Tonle Sap region in Cambodia, making it especially vulnerable to floods, storms and droughts. Agriculture is the primary source of livelihood for the people in most provinces of Cambodia and it accounts for 22.5% of the country's Gross Domestic Product and employs over 3 million people. Rice is the primary food crop grown on an estimated 2.3 million hectares or nearly 85% of the country's total cultivated area.

This objective will be achieved through implementing three (3) project components that aim at addressing climate change vulnerabilities, increasing agricultural productivity, and strengthening institutional capacities. The components include:

The project will be implemented through various activities organized under the following three (3) components:

Component 1. Improving farm-level climate adaptation, resilience, and water use efficiency

The objective of this component is to build climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. This component is designed to address the lack of knowledge and skills to deploy technologies and practices at farm level by farmers and the lack of appropriate extension services to propagate them. It will introduce farmers with various climate resilient technologies and practices for both rice and non-rice activities such as vegetable production, poultry and aquaculture.

Sub-component 1.1 Deployment of farm-level climate adaptation and water use efficiency measures

Output 1.1: Increased capacity of farmers to deploy climate resilient (CR) practices at farm level. This output will focus on developing farmer's capacity in deploying CR technologies and practices to transform the agricultural production system to adapt to the changing climate context. Farmer's will be trained to first develop Action Plans (AP) to re-orient farmer behaviour and assist them in transforming the agriculture production system in a manner that is better adapted to factoring in the agro-ecological context and expected climate change impacts.

- Activity 1.1.1 Preparation of community-based action plans (AP) to transform agriculture with CR practices.
- Activity 1.1.2 Preparation of training materials to support implementation of the AP.
- Activity 1.1.3 Conduct trainings to create a pool of expertise to demonstrate and propagate the CR technologies and practices.
- Activity 1.1.4 Train farmers on applying CR technologies using the Farmer Field School (FFS) approach.
- Activity 1.1.5 Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery.
- Activity 1.1.6 Community-based monitoring and evaluation (CBME) of implementation

Sub-Component 1.2 Climate adapted, value added, and market led agricultural investments

Output 1.2 CR value added, and market led agriculture investments secured. This output involves improving and enhancing some value chains that are key for the project area and include rice, vegetable, chicken and aquaculture value chains, through the use of Public Private Producer Partnerships (4Ps) and increased access to finance, which will improve market access, climate adaptability, and ensure increased income for smallholders in the value chains.

- Activity 1.2.1 Value chain study and planning
- Activity 1.2.2 Establish District Multi-Stakeholder Platforms (MSPs)
- Activity 1.2.3 Public Private Producer Partnership Facility (4PF)

Sub-component 1.3 Improve enabling conditions, capacities and disaster risk management strategies

Output 1.3. Increased access to and use of climate information and advisory services for climate responsive agriculture planning. This sub-component will strengthen the production and dissemination of tailored agro-meteorological information to inform climate responsive management and planning of agriculture in the project target areas through Information Communication Technologies (ICT). The aim is to ensure that agro-meteorological services are accessible and useful to farmers to manage climate risks, access to and use of water and efficient cropping systems.

- Activity 1.3.1 Establish ICT based multi-disciplinary platform at provincial level.
- Activity 1.3.2 Building the capacities of the platform to deliver services.
- Activity 1.3.3. Establish the agromet information systems and the outreach mechanisms.
- Activity 1.3.4 Awareness raising and capacity building of farmers and stakeholders in applying the services.

Sub-component 1.4 Rural roads

Output 1.4: Increased resilience of farm road infrastructure to climate change

- Activity 1.4.1 Initial planning and identification
- Activity 1.4.2 Technical survey and design considerations, preparation of cost estimation
- Activity 1.4.3 Improve 50 Kilometers of farm roads.
- Activity 1.4.4 Handing over of the completed works.

Component 2: Irrigation Infrastructure for increased resilience

Component 2 is linked with Component 1 such that it facilitates the implementation of CR on farm crop and water management practices through improved field level water supply delivery and drainage. It will focus on rehabilitating and modernizing of irrigation and flood protection/drainage infrastructure in the six (6) sub-projects, including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions.

Sub-

Component 2.1: Modernization of irrigation scheme and ponds

- Activity 2.1.1 Technical analysis, field surveys and preparation of plans for system upgrading.
- Activity 2.1.2 Implementation of infrastructure upgrading.
- Activity 2.1.3 Preparation of canal operation and maintenance (O&M) plans including application of ICT and SCADA for operation

Sub-Component 2.2: Flood-proofing and Drainage improvements

- Activity 2.2.1 Establish flood monitoring, information, and early warning systems.
- Activity 2.2.2 Strengthening and construction of flood control and drainage infrastructures.

Sub-Component 2.3: Establishments and training of Farmers Water User Communities (FWUC)

- Activity 2.3.1 Formation of institutional strengthening of the FWUC
- Activity 2.3.2 Build technical capacities of FWUC for canal structure O&M

- Activity 2.3.3 Prepare long term financing plan for O&M of the systems including the Water User Associations.

Sub-Component 2.4: Water information and Management - The Supervisory Control and Data Acquisition (SCADA)

Component 3. Institutional Strengthening

Sub-Component 3.1 MOWRAM capacity Support.

Output 3.1 Strengthened MOWRAM Capacity

- Activity 3.1.1 Preparation of climate resilient design manuals for irrigation and train staff
- Activity 3.1.2 Building capacities on application of ICT and RS technologies, data management
- Activity 3.1.3 Capacity building in water Accounting and Auditing

Sub-Component 3.2 Strengthening of National Designated Agencies (NDA) and National Committee for Sub-National Democratic Development (NCDD).

Output 3.2 Improved capacities for climate action monitoring

- Activity 3.2.1 Preparation of Loss and Damage Strategy
- Activity 3.2.2 Strengthen national Monitoring and Evaluation (M&E) process for climate action
- Activity 3.2.3 Enhancing Capacity of NDA and other stakeholders.

2.2.2 Project Area and Beneficiaries

The CAISAR project covers a total command area of 25,604 ha and is composed of six (6) sub-schems – Ou Ta Paong (Pursat Province), Lum Hach (Kampong Chhnang Province).

Brambei Mom (Kampong Speu province), Krapeu Troum (Kampong Speu and Kampong Chhnang), Yutasas (Kampong Chhnang), and Steung Krang Bat Kampong Speu and Kampong Chhnang.

Table 2.1 (below) provides a summary of project communes (by district and province) that each sub-scheme covers.

Table 2.1: Summary of the CAISAR project targeted area

No.	Sub-Schemes	Provinces	Districts	Communes
1	Ou Ta Pong	Pursat	Bakan	1. Beung Khnar 2. Ou Ta Paong 3. Rumlech 4. Svay Doun Keo 5. Me Teok 6. Khnar Torteung
2	Lum Hach	Kampong Chhnang	Toek Phus	1. Krang Skear

			Rolea B'ear	1. Banteay Preal 2. Krang Leav 3. Prasneob
			Boribour	1. Anchanh Rung
3	Brambei Mom	Kampong Speu	Thpong	1. Brambei Mom 2. Rung Reung
4	Krapeu Troum	Kampong Speu	Odoung Maechey	1. Veal Pong
		Kampong Chhnang	Sameakki Meanchey	1. Thbeng Khpos 2. Svay
5	Yotasas	Kampong Chhnang	Sameakki Meanchey	1. Svay
6	Steung Krang Bat	Kampong Chhnang	Kampong Tralach	1. Longvek
		Kandal	Ponnhea Leu	2. Kampon Leung

With a coverage of 25,604 ha, CAISAR is expected to provide support to an estimated 22,500 people who do farming in the six (6) sub-scheme area (See table below).

Table 2.2: List of six (6) sub-schemes under CAISAR

No.	Scheme Name	Component 2						Beneficiaries	
		Irrigation		Rainfed area		Total			
		Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	HH*	Ratio
1	Ou Ta Paong	14,874	67%	1,200	16%	16,074	55	15,000	67%
2	Lum Hach	3,900	18%	2,400	32%	6,300	21	3,900	18%
3	Krapeu Truom	690	3%	400	5%	1,090	4	1,100	3%
4	Yutasas	593	3%	600	8%	1,193	4	700	3%
5	Stoeung Krang Bat	994	5%	400	5%	1,394	5	650	5%
6	Brambei Mom	1,000	5%	2,400	32%	3,400	12	1,050	5%
Total		**22,051**	**100%**	**8,600**	**100%**	**34,204**	**100**	**22,500**	**100%**

*HH = Household

2.2.3 Description of the Sub-Schemes

2.2.3.1 Ou Ta Paong

2.2.3.1.1 Location and Coverage

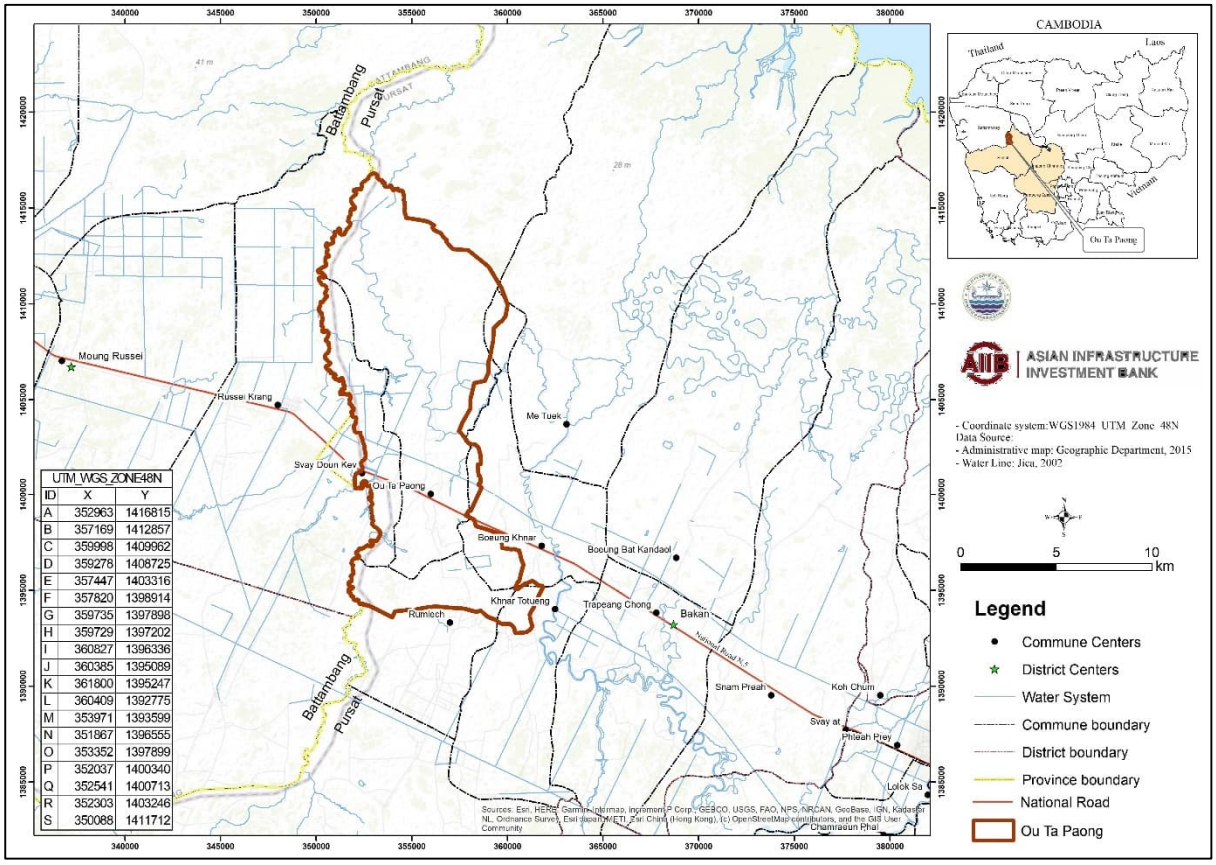
The OTP command area, located in Bakan District, Pursat Province, spans approximately 16,074 hectares and is a crucial rice-producing region. The Ou Ta Paong scheme encompasses five (5) communes within Bakan district, Pursat province: Ou Ta Paong, Boeung Khnar, Svay Duon Kev, Khnar Totueng, and Rulech. Additionally, three (3) surrounding communes affect the scheme: Me Tuek commune in Bakan district, Pursat province, Russei Krang Moung in Russei district, and Prey Tralach in Rokkiri district, Battambang province. For detailed information, please refer to Table 2.3.

Table 2.3: Administrative coverage of Ou Ta Paong sub-scheme

Category	Commune Name	District	Province
Within the Scheme	Ou Ta Paong	Bakan	Pursat
	Boeung Khnar	Bakan	Pursat
	Svay Duon Kev	Bakan	Pursat

	Khnar Totueng	Bakan	Pursat
	Rulech	Bakan	Pursat
Surrounding the scheme	Me Tuek	Bakan	Pursat
	Russei Krang Moung	Russei	Battambang
	Prey Tralach	Rokkiri	Battambang

Figure 2.1: Map of Ou Ta Paong Sub-Scheme



(Source: CAISAR Project, 2024)

2.2.3.1.2 Agro- and Hydrological Characteristics

The command area utilizes water from multiple sources, including the Pursat River, Svay Donkeo River, and Ou Ta Paong River. These rivers create distinct hydraulic zones within the scheme, influencing water availability and agricultural productivity. The upper part of the scheme, south of National Road 5, primarily relies on the Pursat River, which feeds the Damnak Apil Canal and its irrigation network. Due to the area's natural slope from south to north, gravity-fed irrigation is possible, but the existing infrastructure is inadequate. To improve water distribution, it is necessary to enhance the canal networks and build additional regulating structures.

The eastern part of the scheme lies between the Ou Ta Paong River to the west, Wat Chre scheme to the east, and National Road 5 to the north. Water in this region comes from a combination of southern infrastructure, including the Damnak Apil and Kbal Hong hydraulic systems, the Wat Loung canal, and parts of the Svay Donkeo and Ou Ta Paong rivers.

However, the area's low hydraulic gradient prevents gravity irrigation, necessitating one-stage pumping and the development of more efficient distribution networks. Similarly, the western section of the scheme, between the Svay Donkeo River on the west and the Ou Ta Paong River on the east, also requires pumping due to the low gradient, with Svay Donkeo serving as the primary water source. As shown in table 2.4.

Table 2.4: The Water Resources by Region of Ou Ta Paong sub-scheme

Region	**Water Resources**
Upper Part	Pursat River, Damnak Apil Canal
Eastern Part	Damnak Apil, Kbal Hong, Wat Loung, Svay Donkeo River, Ou Ta Paong River
Western Part	Svay Donkeo River, Ou Ta Paong River

In all these blocks there are ample opportunities to develop two (2) wet season rice crops by developing proper canal system. This blocks proper canal bed slope of the canal, tertiary canals, regulating structures and most importantly the canal management. As per study there is also an opportunity to develop dry season in 10% command area.

Several key facilities potentially impact the water availability for the Ou Ta Pong (OTP) command area, including Dam 1, Dam 2, Dam 3, Dam 5, the Damnak Cheukrom barrage, and the Damnak Apil Headwork. Each of these structures' influences water flow and availability in various ways within the OTP sub-scheme.

Dam 1, currently under construction and expected to be operational by 2026, is the largest contributor to the Pursat River, which serves as the primary water source for the OTP area. With a catchment area of 3,499 km², Dam 1 is projected to provide a substantial water supply of 1,014 MCM, far exceeding the contributions of Dams 3 and 5 but the purpose of the dam is for hydropower generation. Meanwhile, Dam 2, approved for construction in June 2024, will add significant water capacity to the region with its reservoir covering 4,016 hectares and a storage capacity of 861.75 MCM. Its completion in 2026 is expected to ensure that the province's water needs are fully met, particularly when combined with the existing water supplies from Dams 1, 3, and 5 (Please see table 2.5).

The water distribution system for Ou Ta Pong is managed by the Farmer Water User Community (FWUC), which coordinates with the Provincial Department of Water Resources and Meteorology (PDWRAM) in Pursat. The FWUC handles requests from local farmers and oversees the allocation of water to the various villages within the command area. Water from the Damnak Apil Headwork is diverted into the OTP scheme based on these requests. Additionally, the Damnak Cheukrom barrage, which manages a 16,100-hectare command area, will receive priority water supply from Dam 1 once it becomes operational, potentially affecting the water availability downstream to the OTP area.

Table 2.5: Key Characteristics of the Ou Ta Pong Irrigation Scheme

Aspects	**Description**
Water Sources	Pursat River, Svay Donkeo River, Ou Ta Paong River
Hydraulic Zones	Upper, Eastern, and Western Zones
Irrigation Methods	Gravity-fed irrigation (upper zone), Pumped irrigation (eastern and western zones)

Infrastructure Needs	Canal network improvement, regulating structures, pumping stations
Cropping Potential	Two (2) wet season rice crops, potential for dry season cropping in 10% of the command area

Annual flooding, particularly in the downstream areas near Tonle Sap, impacts farming activities. Farmers in these flood-prone areas typically cultivate two (2) crops: one (1) rain-fed crop before the flood and another after the floodwaters recede. Despite the challenges, the existing canal system provides ample opportunity to develop two (2) wet-season rice crops across the scheme, and there is potential for dry-season cultivation in about 10% of the command area, provided that proper canal management and infrastructure improvements are implemented.

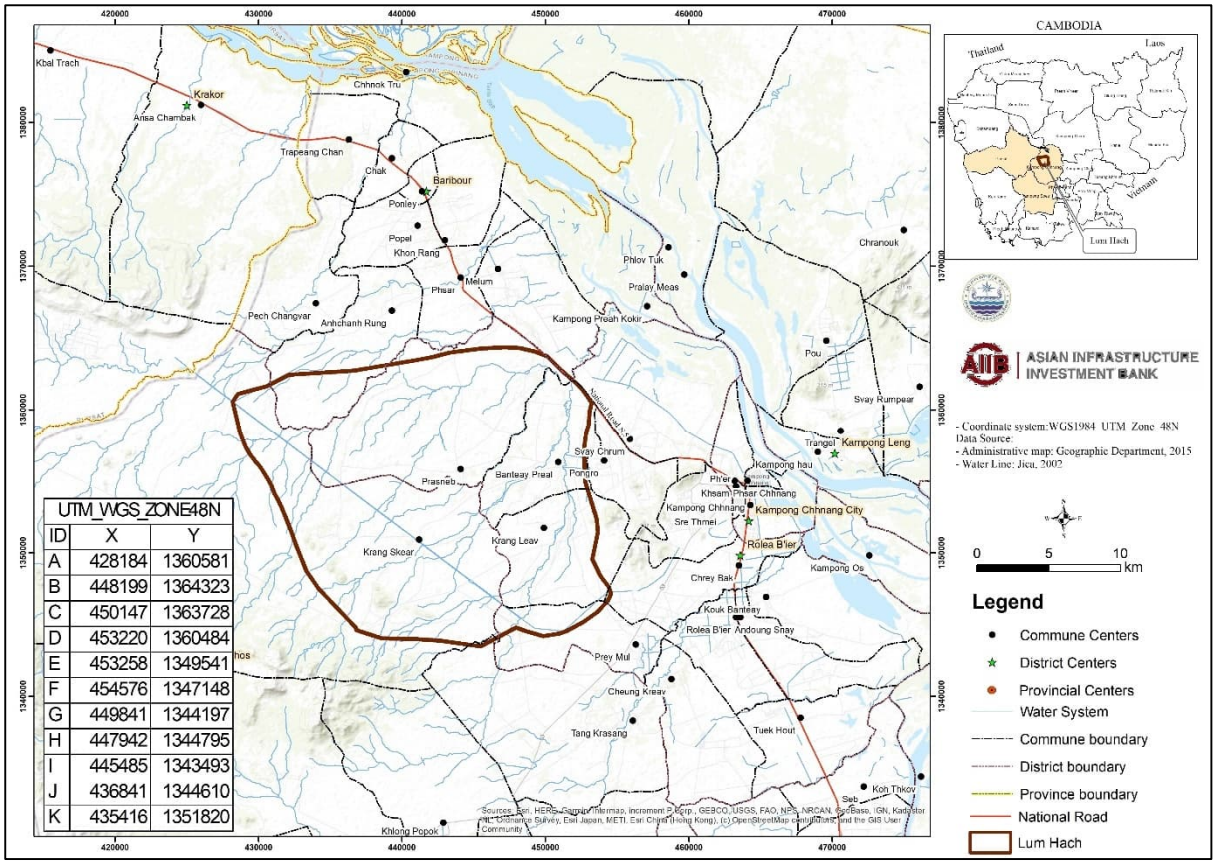
2.2.3.2 Lum Harch Scheme

2.2.3.2.1 Location and Coverage

The Lum Harch Irrigation scheme encompasses a command area situated downstream the old Lum Harch canal built during Pol Pot period (1975-1977), drawing its water supply from various streams crossing the canal. These sources comprise several other rivers that traverse the scheme and have very limited catchment area and flow.

The sub-scheme is situated across three (3) districts in Kampong Chhnang province: Baribour, Rolea B'ier, and Tuek Phos. Within its command area, six (6) communes' benefit from its water supply: Prasneb, Banteay Preal, Krang Leav, Prey Mul, Anhchanh Rung, and Krang Skear. Additionally, several communes surrounding the scheme also utilize its water resources, including Phsar, Melum, Svay Chrum, Chrey Bak, Tang Krasang, Pech Changvar, and Khlong Popok (Please see table 2.6).

Figure 2.2: Map of Lum Hach Sub-Scheme



(Source: CAISAR Project, 2024)

Table 2.6: Administrative coverage of Lum Hach sub-scheme

District	Communes within the scheme	Communes surrounding the scheme
Baribour	Anhchanh Rung	Phsar, Melum, Pech Changvar
Rolea B'ier	Prey Mul, Prasneb, Banteay Preal, Krang Leav	Svay Chrum, Chrey Bak
Tuek Phos	Krang Skear	Tang Krasang, Khlong Popok

2.2.3.2.2 Agro- and Hydrological Characteristics

The Lum Hach area spans 25,142 hectares, but only 30% of this land is currently used for agriculture, while the rest consists of shrubland and grassland, some of which is intermittently farmed. Most farmers cultivate a single paddy crop annually, relying on medium or late-maturity rice varieties, with multiple cropping being rare. Planting typically begins around May or June, depending on rainfall patterns. The primary irrigation infrastructure, known as the 1st of January Canal, was built in the mid-1970s, including a headworks on the Boribo River and a 30-kilometer main canal. However, shortly after its completion, severe flooding caused the collapse of the headworks, leaving the canal in a state of disrepair.

This water supply system results in the creation of distinct hydraulic zones within the scheme, each characterized by specific water availability levels, which in turn have a direct impact on agricultural output.

The area presents a general slope in the direction from south-west to north-East. This explains that the area is mainly supplied by the super streams and makes it challenging to divert water

from other sources. The gradient hydraulic is low and due to the existing infrastructure design (Existing Lum Harch irrigation), the area cannot be irrigated by the existing infrastructure. Gravity irrigation will not be possible and will require one (1) stage pumping. In all the schemes there is an opportunity to improve the river training and develop two (2) wet season rice crops by developing proper irrigation system adapted to the local context: limited of water resource, soils conditions, lack of road access, low agricultural activities. Some upper land could also diversify crops all through the year.

In response to these challenges, the Japan International Cooperation Agency (JICA)-)-)-led Lum Hach 1 Scheme was initiated in 2005-2006, identifying a 3,100-hectare potential irrigation area. The project, completed in 2020, involved constructing a new barrage and modifying the main canal's first section. However, the lowered headworks require exploring alternative water supply options, such as utilizing natural streams and water storage solutions, as much of the irrigation infrastructure remains underdeveloped. Additionally, in 2016, the Achang Irrigation Scheme, supported by China, was built downstream, covering 10,300 hectares. Despite its larger water demand, Lum Hach's upstream location allows it to divert its share of the Boribo River's flow which may affect the Achang scheme. However, significant improvements are still needed to fully realize Lum Hach's irrigation potential (please see Table 2.7).

Table 2.7: Irrigation Resources and Development Potential for Lum Hach sub-scheme

Aspects	Description
Water Sources	Boribo River, Canals, Ponds
Nearby Irrigation Schemes	JICA-led Lum Hach 1 Scheme, Achang Irrigation Scheme (Downstream)
Irrigation Methods	Rainfed, Gravity-fed irrigation, Pumped irrigation
Infrastructure Needs	Canal network improvement, regulating structures, pumping stations
Cropping Potential	Paddy rice expansion, vegetable and perennial crops as the alternatives

2.2.3.3 Krang Ponley Sub-scheme

2.2.3.3.1 Location and Coverage

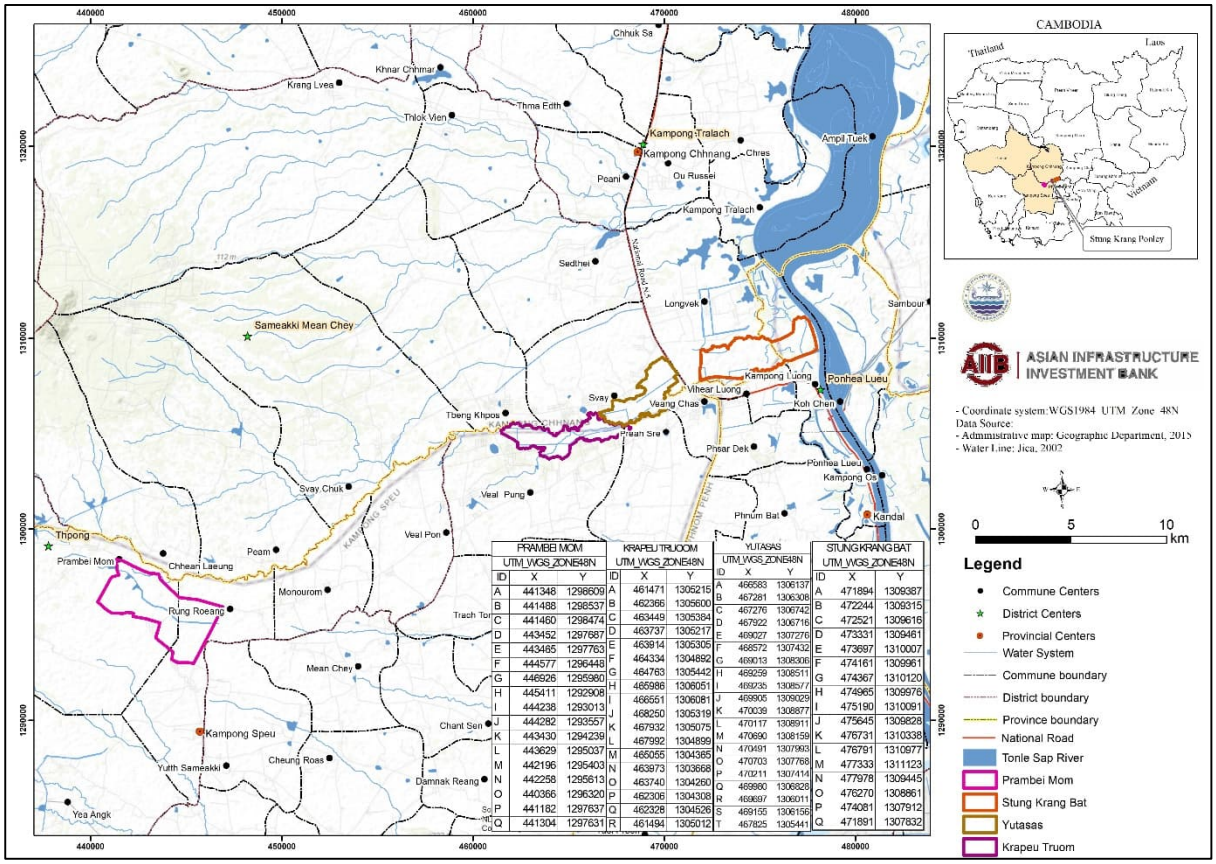
The Krang Ponley Sub-project encompasses four (4) distinct irrigation schemes—Brambei Mom, Krapeu Troum, Yutasast, and Stung Krang Bat—spanning across Kampong Speu, Kampong Chhnang, and Kandal provinces (Figure 2.3). The four (4) schemes of the Krang Ponley sub-project, Brambei Mom, Krapeu Troum, Yutasast, and Stung Krang Bat, are situated across Kampong Speu, Kampong Chhnang, and Kandal provinces. Each scheme encompasses specific communes within its designated district. Additionally, surrounding communes from neighboring districts contribute to the overall regional context, as shown in Table 2.8.

Table 2.8: Administrative coverage of the Krang Ponley Sub-scheme

Sub-Scheme	Location	Communes Within	Communes Surrounding
Brambei Mom	Brambei Mom and Rung Roeang commune, Phpong district, Kampong Speu	Brambei Mom, Rung Roeang	Yuth Sameakki, Monourom, Peam, Chhean Laeung

Krapeu Troum	Preah Sre and Veal Pung commune, Odongk district, Kampong Speu	Preah Sre, Veal Pung	Svay, Tbeng Khpos
Yutasast	Svay commune, Sameakki Mean Chey district, Kampong Chhnang	Svay	Veang Chas, Preah Sre, Veal Pung, Longvek
Stung Krang Bat	Longvek, Kampong Tralach district, Kampong Chhnang and Kampong Luong, Ponhea Lueu district, Kandal	Longvek, Kampong Luong	Vihear Luong

Figure 2.3: Map of Sub-Scheme in Krang Ponley Basin



(Source: CAISAR Project, 2024)

The floodplain of Krang Ponley, located at an elevation of approximately 10 meters above sea level, is characterized by low permeability due to its fine soil particles, making it highly susceptible to frequent flooding. Although river-based flooding is minimal, the project areas in Krang Ponley face severe flooding during the wet season and periods of heavy rainfall. Floodwater from the Bassac and Mekong rivers regularly inundate the floodplain, eventually draining into the Tonle Sap, with the lower sections experiencing the most persistent flooding.

The Krang Ponley River serves as the main water source for these irrigation schemes, except for the Brambei Mom scheme, which is situated along the Ou Khley River. Brambei Mom has a small reservoir but can receive supplementary water from the Anlong Chrey Reservoir via an outlet, ensuring a more reliable water supply for irrigation.

2.2.3.3.2 Agro- and Hydrological Characteristics

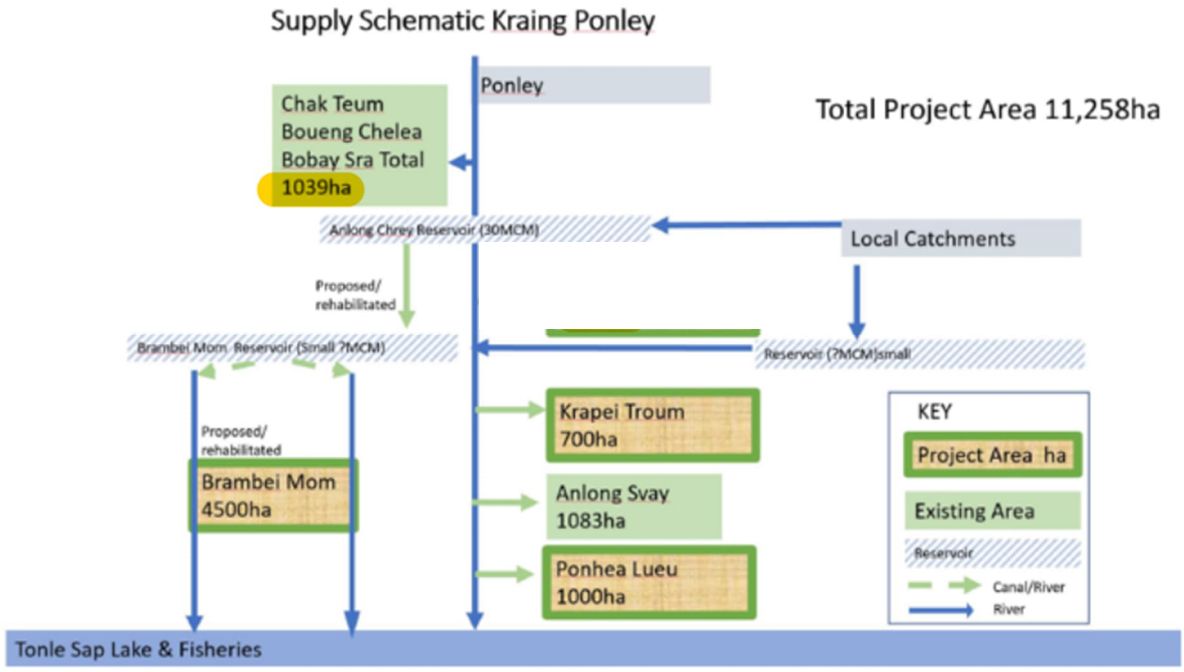
The Krang Ponley scheme is a unique irrigation system comprising four (4) interconnected areas, drawing water primarily from the Anlong Chrey reservoir and secondarily from the Kdol Dam. This integrated approach ensures a reliable water supply for the scheme's agricultural needs (Table 2.9).

Table 2.9: Main Water Resources for the Krang Ponley sub-scheme

Resource	Description
Anlong Chrey Reservoir	Primary water source for the Krang Ponley scheme
Kdol Dam	Secondary water source, providing additional water supply
Ponley River	Connects the four (4) separate scheme areas, facilitating water transfer

The Krang Ponley River Basin serves as the primary water source for the Krang Ponley subproject and its irrigation schemes. The basin includes several key reservoirs and irrigation infrastructures, developed over time to support agricultural needs and water management in the region. The river itself is extensive, and irrigation infrastructure exists across various subproject areas (Figure 2.4). Much of this infrastructure dates to the Khmer Rouge era (1975–1979) but has fallen into disrepair due to a lack of maintenance. Despite efforts by local farmers to maintain some main and branch canals, sediment buildup, embankment erosion, and damaged concrete structures have resulted in an inefficient irrigation system.

Figure 2.4: Schematic Supply Map of Krang Ponley

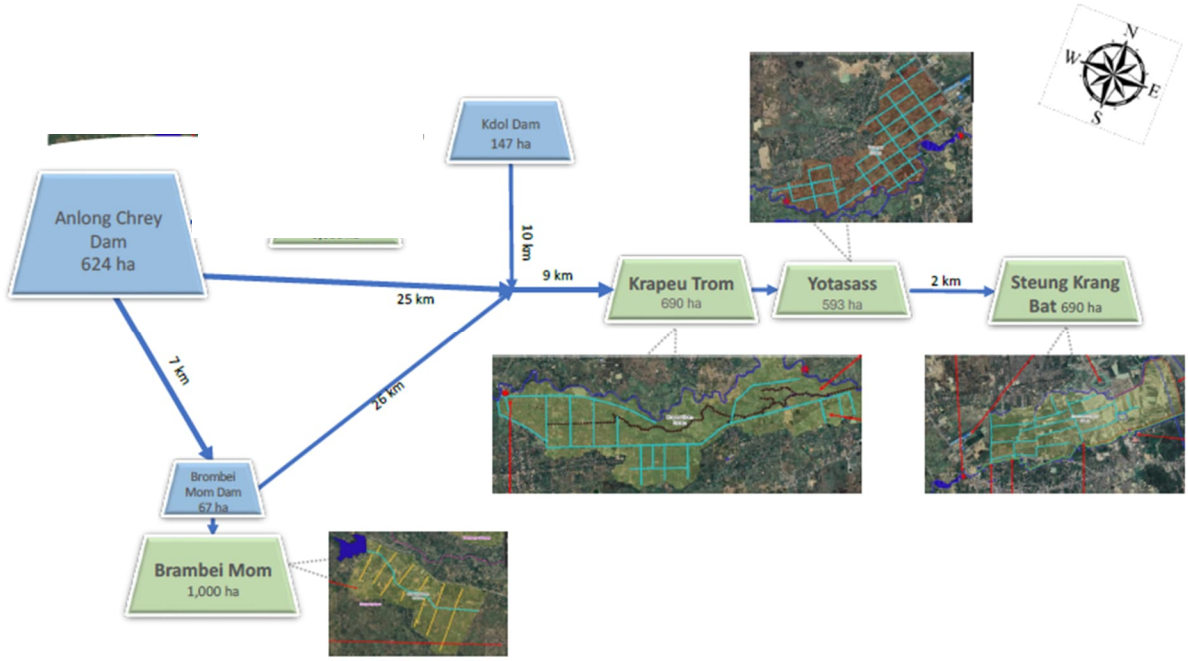


Three (3) main reservoirs—Anlong Chrey, Brambei Mom, and Kdol—were constructed under the Krang Ponley Water Resources Development Project in 2012. These reservoirs have improved water availability for downstream irrigation and play a significant role in flood protection. However, the Anlong Chrey reservoir (Figure 2.5), with a capacity of only 30 million cubic meters (Mm^3), is small compared to the estimated annual inflow of 123 Mm^3 and the

irrigation demands of the area. A small hydropower station was installed at the site, but it remains unused due to insufficient water supply.

One (1) of the irrigation schemes, Stung Krang Bat, is in the lower basin and partially within the active floodplain of the Tonle Sap River. During the rainy season, floodwaters from the Mekong cause the Tonle Sap River to rise, submerging agricultural land for up to three (3) months, with water depths reaching 3 meters. This seasonal flooding shapes local agricultural practices. Additionally, local rivers cause flash floods that can last 5 to 7 days, damaging rice crops. This flooding is further aggravated by vegetation growth, silt buildup in drainage channels, and encroachment on these channels by residents, leading to inadequate drainage and extended flood durations.

Figure 2.5: Length from Sub-Scheme to Another of Krang Ponley



The subproject's five (5) proposed irrigation schemes aim to irrigate nearly 3,000 hectares, largely dependent on the Anlong Chrey reservoir (Table 2.10). However, the reservoir's capacity is insufficient to meet full irrigation demands during the dry season. The primary management goal is to release water early in the wet season (May and June) to allow for the timely planting of Early Wet Season crops, followed by a Late Wet Season paddy crop. Nevertheless, challenges remain, including potential conflicts between hydropower generation and irrigation needs, a lack of clarity in reservoir operating rules, and inconsistent runoff that may prevent the reservoir from reaching full capacity in some years.

Table 2.10: Water sources for the four (4) sub-schemes in Krang Ponley area

No	Irrigation scheme	Proposed target command area (ha)	Main Water source	Secondary water source
1	Brambei Mom	1,000	Brambei Mom dam (2 MCM) from Ou Khley Ou Rumlich Meun Ram rivers)	Anlong Chrey Dam

2	Kropeau Truom	690	Anlong Chrey Dam (30 MCM)	Kdol dam (4.7 MCM), Kdol river
3	Yutasas	593	Anlong Chrey Dam (30 MCM)	Kdol dam (4.7 MCM), Kdol river
4	Steung Krang Bat	690	Anlong Chrey Dam (30 MCM)	Kdol dam (4.7 MCM), Kdol river

MCM = Million Cubic Metres

2.2.3.3.3 Krapeu Troum

Water Availability

The Krapeu Truom sub-scheme, located within the Krang Ponley River Basin, relies primarily on the Anlong Chrey Reservoir as its principal water source. The Kdol Dam and River serve as secondary sources, supplementing water supply when needed. This integrated system is crucial for ensuring reliable irrigation for the sub-scheme's target command area of 690 hectares.

The Anlong Chrey Reservoir, while essential for the Krang Ponley sub-project's water needs, has a relatively small capacity of 30 million cubic meters (Mm^3). This poses a challenge as the estimated annual inflow into the reservoir is 123 Mm^3, significantly exceeding its storage capacity. This discrepancy highlights the need for efficient water management strategies to balance irrigation demands with the reservoir's limitations (please see in Table 2.11).

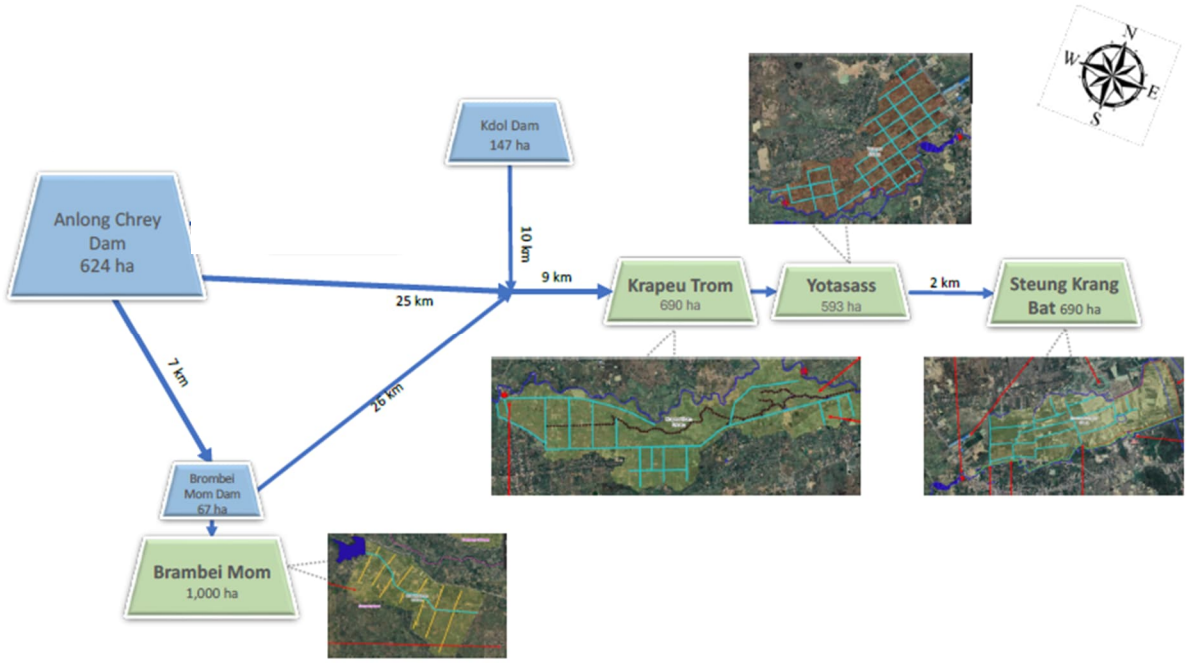
Despite efforts to manage water release for optimal crop planting during both early and late wet seasons, the reservoir's limited capacity may struggle to meet full irrigation demands, particularly during the dry season. Factors like inconsistent runoff, which could prevent the reservoir from reaching full capacity, further complicate water availability.

Table 2.11: Water sources for the Krapeu Truom sub-schemes

No	Irrigation scheme	Proposed target command area (ha)	Main Water source	Secondary water source
2	Kropeau Truom	690	Anlong Chrey Dam (30 MCM)	Kdol dam (4.7 MCM), Kdol river

MCM = Million Cubic Metres.

Figure 2.5: Length from Sub-Scheme to Another of Krang Ponley



Anlong Chrey and Kdol Dam are the main water sources for Krapeu Truom sub-scheme. Given its close location to the two (2) dams, the sub-scheme is at an advantageous position compared to the other sub-scheme downstream of Krang Ponley River basin (Please see Table 2.12).

Table 2.12: Main water Resources for the Krapeu Truom sub-schemes

Resource	Description
Anlong Chrey Reservoir	Primary water source for the Krang Ponley scheme
Kdol Dam	Secondary water source, providing additional water supply
Ponley River	Connects the four (4) separate scheme areas, facilitating water transfer

Irrigation Management

The Kropeau Troum Irrigation Project was constructed by PDWRAM with Korean Support. By operating gates on the main canal, water can be raised and brought onto some of the fields by gravity; other fields need to pump water from the canals. The FWUC was established in 2016 and is referred to by PDWRAM as a very successful one. The main management strategy focuses on releasing water early in the wet season (May and June) to support the timely planting of Early Wet Season crops, followed by a Late Wet Season rice crop. Despite these efforts, challenges persist, including potential conflicts between hydropower and irrigation needs, unclear reservoir operating rules, and inconsistent runoff that may prevent the reservoir from reaching full capacity in some years.

Natural challenges

Over the past 10 years, the Krapeu Truom irrigation sub-scheme has encountered several natural challenges. Drought was the most frequently reported, affecting 58% of respondents, with an average of three (3) occurrences over the decade. However, two (2) of these

occurrences were considered serious. Floods were the second most reported issue, noted by 36% of respondents, with an average of three (3) events, of which one (1) was deemed serious. Storms were the third most common natural disaster, reported by 31% of respondents and occurring three (3) times, with one (1) of these events considered serious. Insect outbreaks were experienced by 27% of respondents, with an average of two (2) occurrences over the last decade, but only one (1) event was considered serious (shown in Table 2.13).

Table 2.13: Frequency and seriousness of natural disasters in Krapeu Truom sub-scheme

Types	Figures	Percent	Times	Number of Seriousness
Drought	39	58%	3	2
Flood	24	36%	3	1
Storms	21	31%	3	1
Insect outbreak	18	27%	2	1

2.3 PROPOSED INFRASTRUCTURE

2.3.1 Ou Ta Paong

2.3.1.1 Activities and Timeline

Should the feasibility study for the Ou Ta Paing subproject proceed to detailed design, then allowing for the design process, procurement process and approvals, it has been assumed the following planning as displayed in Table 2.14.

The following assumptions have been made:

- The detailed design will start in January 2025; it will take two (2) years to get a better understanding of the upstream hydraulic infrastructure, conduct additional survey and propose the best solution for a sustainable water supply of the scheme.
- The procurement process will not take more than three (3) quarters.
- The work construction will start after the rainy season in Cambodia with a mobilization period (last quarter of the year).
- The work construction duration will not last more three (3) dry seasons.

Hence the construction would be able to commence at the last quarter 2027, with completion by mid-2030

Table 2.14: Tentative implementation schedule of Ou Ta Paong irrigation scheme.

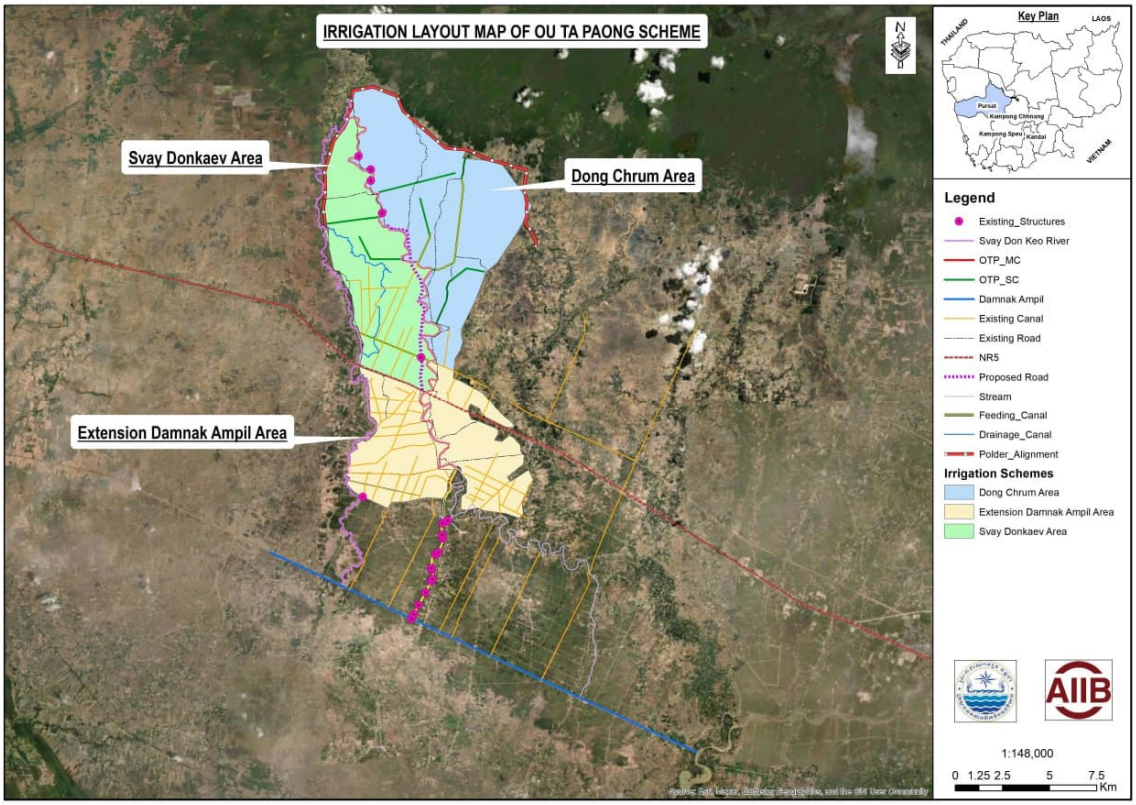
COMPONENTS, SUB-COMPONENTS, OUTPUTS AND ACTIVITIES	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
2.1.1 - Ou Ta Paong	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
Activity 2.1.1.1 - Pursat West Hydraulic system masterplan	●	●	●																					
Activity 2.1.1.2 - Detailed design			●	●	●	●	●	●																
Activity 2.1.1.3 - Procurement									●	●	●													
Activity 2.1.1.4 - Work construction and supervision												●	●	●	●	●	●	●	●	●	●	●		

2.3.1.2 Design Concepts and Options

The Ou Ta Paong River system is divided into three (3) distinct blocks for irrigation purposes as per the block colour in Figure below. Block A, located south of National Road shaded in light yellow colour, is supplied by the Pursat River through the Dam Ampil Canal and upstream

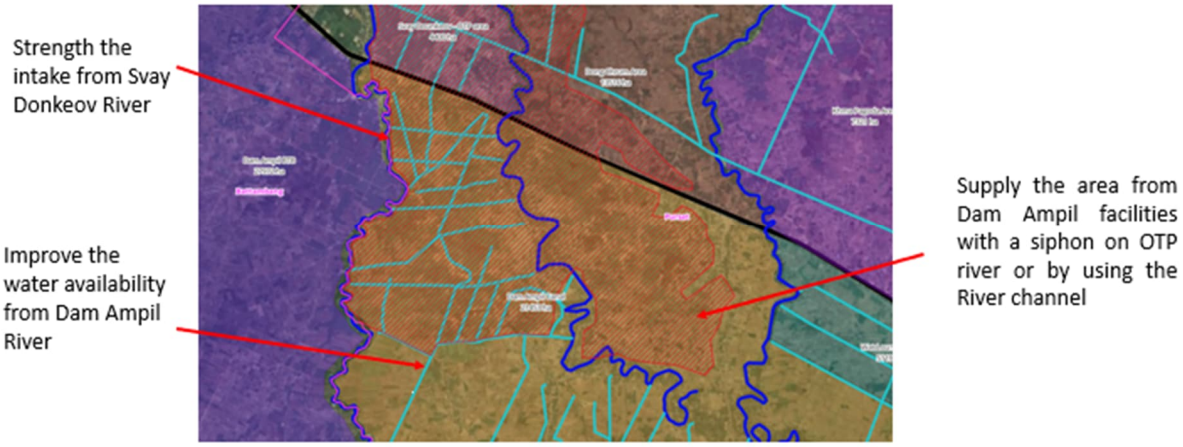
infrastructure, covering an area of 4,198 hectares. Some of the upstream infrastructure may require rehabilitation to increase its hydraulic capacity and fully irrigate the area. Block B, situated in the northwest and covering approximately 4,400 hectares shaded in light green colour, is currently supplied by the Svay Donkeov River. It relies on existing canals, which require upgrades to improve water delivery, with additional overflow from Block A and drainage from National Road 5 also contributing to water supply. Block C, in the northeast, covers around 6,276 hectares shaded in light blue colour and is the most challenging area to irrigate, as it depends on multiple sources of water, including the Svay Donkeov River, Kbal Canal, and Dam Ampil Canal, all of which require rehabilitation and upgrades to meet irrigation needs.

Figure 2.6: Three (3) blocks (sub-scheme) of Ou Ta Pong sub-project



(Source: CAISAR Project, 2024)

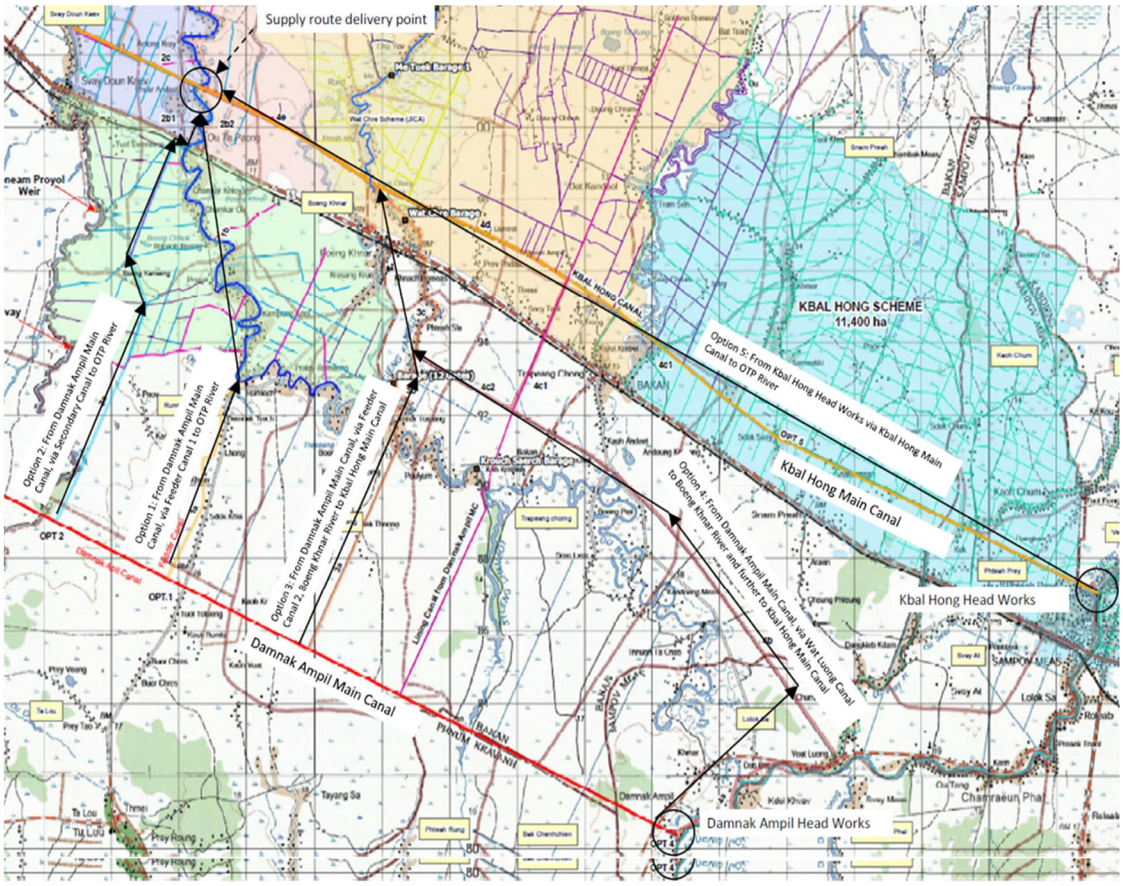
Figure 2.7: Concept design of Block A of Ou Ta Pa Ong Scheme



In addition, existing infrastructure along the Svay Donkeov river should be investigated at the design study to see if the western side can still be irrigated partially from the stream or directly from Dam Ampil Canal which intercept the river upstream. The eastern part is more difficult to be irrigated by Dam Ampil existing infrastructures as the Ou Ta Paong River creates a natural upstream barrier. Five options were proposed and considered (described bellow). But only three options were finally selected to proceed with detailed design: including Option 1, Option 3 and Option 5 (See Figure 2.8):

- **Option 1**: The option will release part of the required water of the Damnak Ampil secondary canal to the Ou Ta Paong River and create necessary work rehabilitation/ construction to divert the extra flow to the eastern area (river rehabilitation under component 2.2 and river diversion). The canal is routed from Damnak Ampil Headwater (DAHW),),), via Damnak Ampil Main Canal (DAMC) (18.7 km), via the Secondary Canal ('Feeder Canal 1', 8.8 km), into OTP River, and via OTP River's section (13.8 km) South of the National Road to the supply point. The totaltotaltotal length of this route is 41.3 km.
- **Option 3**: Parallel to Option 1, the canal will additionally release water from Damnak Ampil but extended further reaching Kbal Hong Canal, then continues to Ou Ta Paong River. **Route description:** From DAHW, via DAMC (16.7 km), via the Secondary Canal at km 16.7 ('Feeder Canal 2', 6.1 km), into Boeng Khnar River's section (9.9 km) South of the National Road to Wat Chrey Head Works, and via link canal (0.5 km) into KHMC, and via KHMC (7.2 km) to the supply point. Total length of this route is 40.4 km.
- **Option 5:** The option begins at Kbal Hong barrage at Pursat provincial town involving the enhancement of the Watergate height and the distance of carrying water will be approximately like Option 4. However, the increase in the height of the Watergate will cause inundation of the upper area of the Pursat River which may cause flooding in the town. This may bring in huge discontentment of the people in the city as height water level may cause in delay of storm water flow during raining period. The route is from Kbal Hong Head Water (KHHW), via Integrated Water Resources Management (IWRM) Kbal Hong Main Canal (KHMC) (17.0 km) into KHMC Extension (17.0 km) to the supply point on OTP River. The total length of this route is 34.0 km.

Figure 2.8: The Selected 3 Options



(Source: CAISAR Project, 2024)

2.3.1.3 Types of Infrastructure and Design

The Ou Ta Paong sub-project utilize water from the Pursat River and Svay Don Keo. It integrates nature-based solutions such as the restoration of the Ou Ta Paong River, fish passages on Don Keo and OTP, and natural management of Tonle Sap floods. The project includes 35 solar pump installations. Canal infrastructure development comprises a main/feeder canal of 8 km with 29 structures, secondary canals totalling 65.8 km with 121 structures, and tertiary canals extending 198.5 km with 1,591 structures. Additionally, there are 36.3 km of drains and 21 km of flood embankments with five (5) structures. Storage solutions include local ponds, fish refuges, and two (2) existing reservoirs within the Pursat catchment, with the Pursat Dam 1 hydropower project under construction and Dam 2 water storage. Please see also Table 2.15.

Table 2.15: Ou Ta Paong Sub-Project Key Characteristics

Sub Project	Ou Ta Paong
Area Cultivated (ha)	13,000
Water Source	Pursat River and Svay Don Keo
Nature Based Solution[1]	Restoration of Ou Ta Paong River, fish passage on Donkeo and OTP,

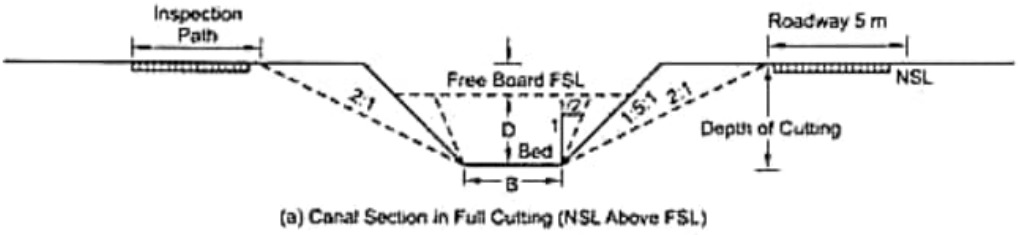
[1] Nature-Based Solution, in this case is the restoration of the river system through dredging, is applied to contribute to the recovery of the natural condition of the Ou Ta Paong as the system has already

	Natural Management of TS floods.
Solar Pump Installations	35 (Not suitable in flood areas)
Main/Feeder Canals C/L(km)/N	1_8.0km_29
Secondary Canal C/L (km)/N (Existing)	8_30.0km_ 13_35.8km_108
Tertiary Canal C/L (km)/N Exist	34_47.5km 139_151.0km_1452
Main/Secondary Drains (C/L km/N)	7_36.3km_15
Storages	Local Ponds and fish refuge. Storage within OTP river. 2 Existing reservoirs in Pursat catchment, Pursat 1 hydropower under construction
Land Area of Canals (Existing proposed Ha)	299_575
Cost Estimate (USD/m)	70.8
Cost/ha $	5,450

The latest decision on the infrastructure in OTP confirmed that the polder system is no longer needed, and the focus is given to the existing canal system only. The key components of OTP include a canal system with concrete linings, and water regulation structures. Two (2) tertiary canal options are proposed, one (1) using diesel pumps and another employing solar-powered pumps for improved sustainability. Expansion of existing feeder canals is also planned, though specifics remain subject to change. The following are the conceptual design for each of the design where the detail design is supposed to be considered:

Canal. The design of the canal system (Figure 2.9) aims to serve both irrigation and drainage functions, considering the topography, limited water resources, and potential land resettlement issues. Where possible, the canals will follow existing paths to minimize social impacts. The size of the canals will be adjusted based on the irrigated area and the local topography. To ensure long-term sustainability and reduce water loss through percolation, it is recommended to construct the main canals using concrete linings or suitable alternatives. This approach will help maintain water distribution efficiency and improve the durability of the infrastructure.

Figure 2.9: Typical canal section in full cutting



(a) Canal Section in Full Cutting (NSL Above FSL)

River Training and Drainage: A well-designed drainage system will be a critical component of the project, intended to manage excess runoff during the rainy season and prevent

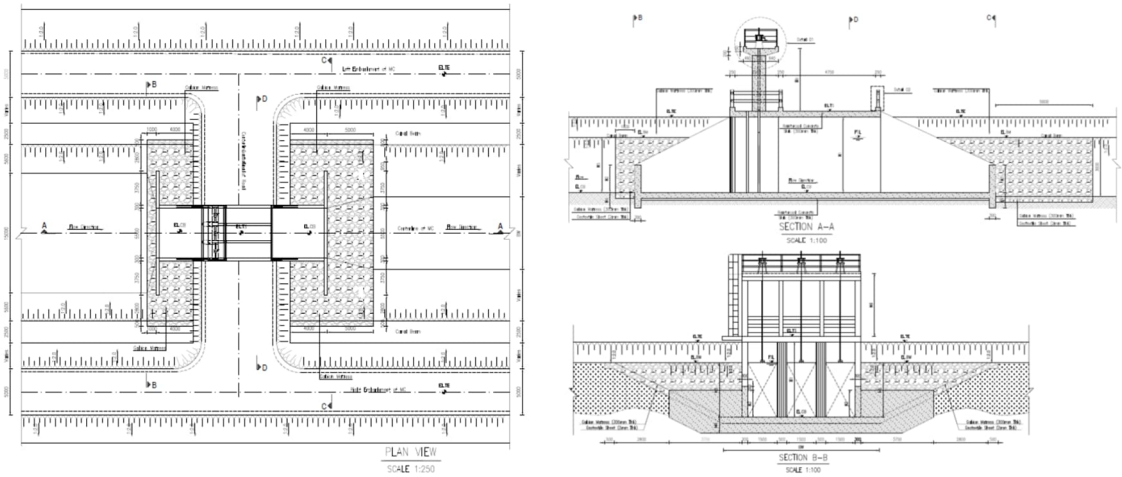
been deteriorated due to over water abstraction and blockage of the river system while the restoration of fish passage/sliding gate is going to be decided at the time of DED since no specific design being considered at this stage.

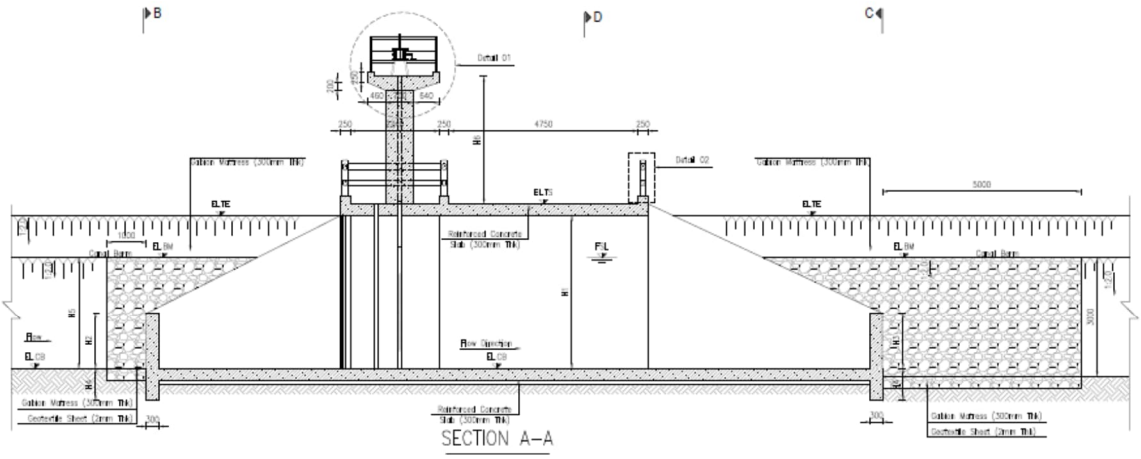
waterlogging in the command area. This system will also serve as the outlet for the on-farm drainage network, which is designed to control groundwater levels and drain surplus irrigation water. The layout of the drainage system will be based on the main natural drainage channels, upstream watersheds, rainfall over the command area, and changes in water levels in the Tonle Sap. It will also consider land use, crop types, and the planned irrigation systems to ensure efficient water management.

Water Regulation and Off-Take Structures: Water will be diverted from multiple sources into the main canals according to water availability and a demand schedule prepared by the FWUC and PDoWRAM, based on crop needs. Various cross structures (off-take structures) will be installed to maintain the full supply level in the main and secondary canals where necessary. The flow of water into each canal will be controlled by operating the gates of the head regulators, ensuring efficient delivery to the tertiary canals, which will distribute water to individual fields. Farmers will have the option to irrigate their plots either through plot-to-plot irrigation or by constructing field ditches through the diversion of water using these off-take structure (See also Figure 2.10).

Figure 2.10: Pictures and design layout of a typical regulator or off-take structure at a canal section

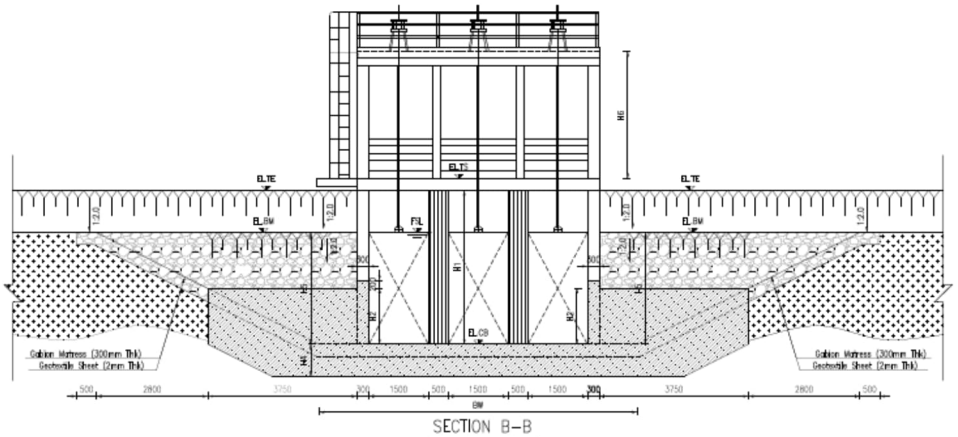






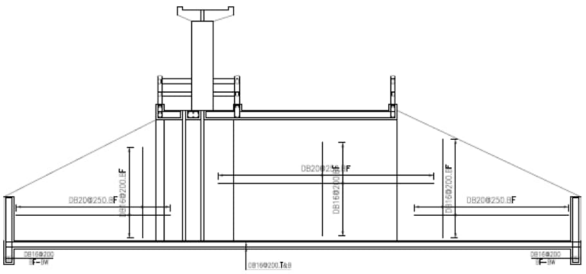
SECTION A–A

SCALE 1:100



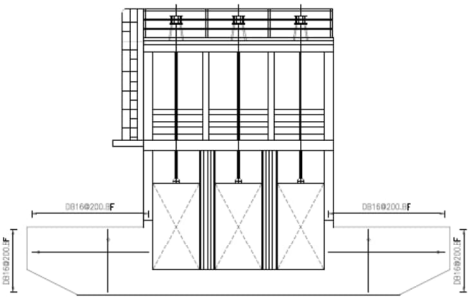
SECTION B–B

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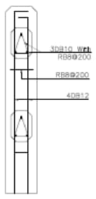
BAR DETAIL OF SECTION A–A

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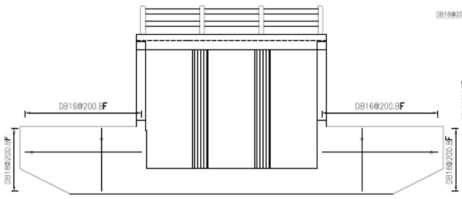
TYPICAL BAR DETAIL OF B–B

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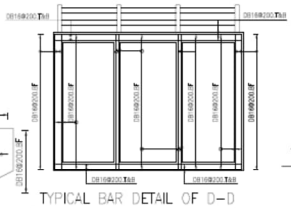
TYPICAL BAR DETAIL OF DETAIL 2

SCALE 1:15



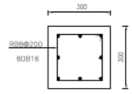
TYPICAL BAR DETAIL OF C–C

SCALE 1:100



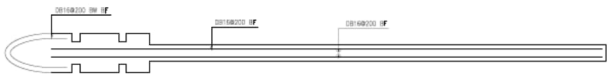
TYPICAL BAR DETAIL OF D–D

SCALE 1:100



TYPICAL BAR DETAIL OF COLUMN

SCALE 1:15



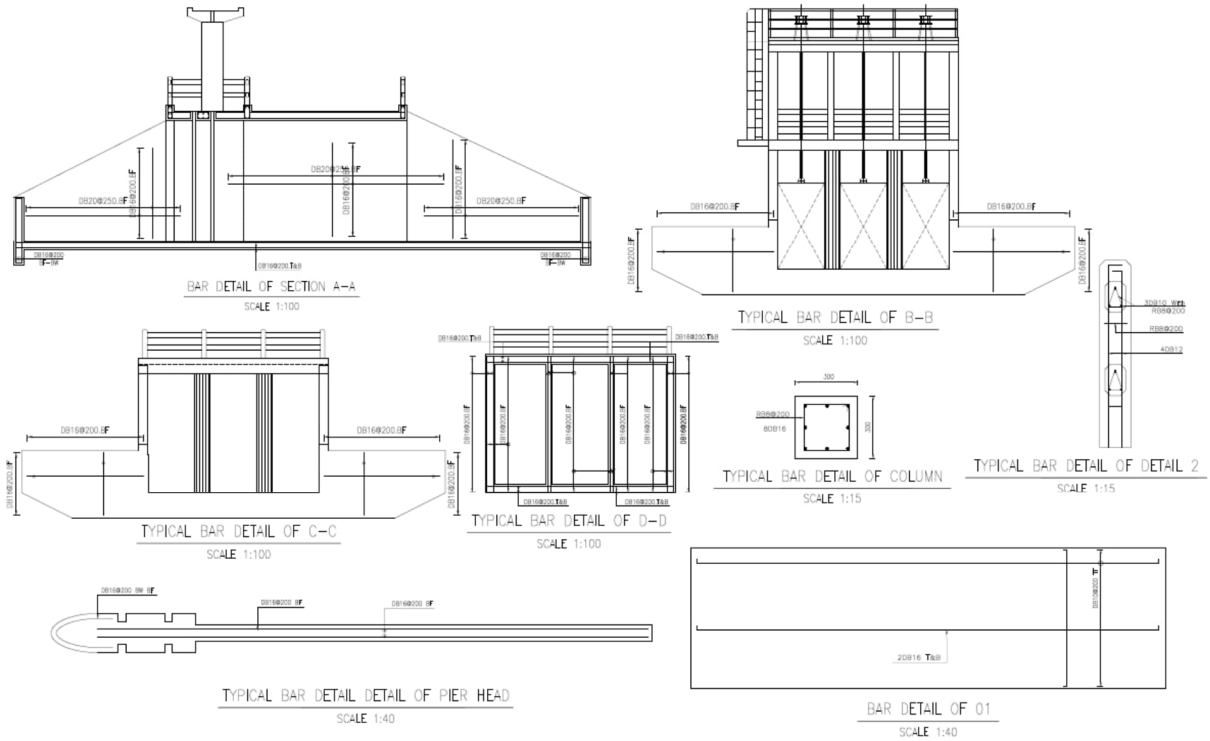
TYPICAL BAR DETAIL DETAIL OF PIER HEAD

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BAR DETAIL OF 01

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Tertiary System: The irrigation system design extends to the tertiary canal level, which is the final distribution point before water reaches individual plots. Two (2) options are considered for the tertiary canals. The first option involves creating traditional tertiary canals through excavation, where farmers will individually pump water using diesel pumps based on their needs. However, this requires significant cooperation from beneficiaries, as canal alignment must be accepted without land compensation. The second option is to install collective solar pumping stations, a more sustainable and cost-effective solution that eliminates the need for diesel pumps and reduces CO2 emissions.

Collective Solar Pumping System: The project aims to implement a solar-powered pumping system as a low-tech, sustainable alternative to diesel pumps, with a pilot test covering 30-50 hectares in each irrigation block. The solar pumping system requires minimal maintenance and has no fuel costs, making it an environmentally friendly and cost-effective solution for farmers. The southern part of Block A is particularly suitable for the implementation of this system due to its proximity to villages and protection from floods. The solar pumping system could cover 4,198 hectares with 80-90 units, improving water efficiency by 20% and reducing the risk of land conflicts along the canal alignment. This system would ensure reliable water delivery and support sustainable agricultural practices.

2.3.2 Lum Hach

2.3.2.1 Activities and Timeline

Should the feasibility study for the Lum Harch subproject proceed to detailed design, then allowing for the design process, procurement process and approvals, it has been assumed the following planning as displayed in the Table 2.16.

The following assumptions have been made:

- The detailed design will start in January 2025.
- The procurement process will not take more than three (3) quarters.
- The work construction will start after the rainy season in Cambodia with a mobilization period (last quarter of the year);
- The work construction duration will not last more three (3) dry seasons.

Hence the construction would be able to commence at the last quarter 2027, with completion by mid-2030.

Table 2.16: Tentative implementation schedule of Lum Harch irrigation scheme.

COMPONENTS, SUB-COMPONENTS, OUTPUTS AND ACTIVITIES	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
2.1.2 - Lum Harch	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
Activity 2.1.2.1 - Detailed design	●	●	●	●	●	●	●	●																
Activity 2.1.2.2 - Procurement									●	●	●													
Activity 2.1.2.3 - Work construction and supervision												●	●	●	●	●	●	●	●	●	●	●		

2.3.2.2 Design Concepts and Options

The Lum Harch Irrigation scheme serves an area downstream of the old Lum Harch canal, built during the Pol Pot era (1975-1977). The system pulls water from multiple streams that intersect the canal, but the catchment areas of these rivers are small, limiting water availability and creating distinct hydraulic zones that affect agricultural productivity. The region's slope, from southwest to northeast, primarily relies on upstream streams, making it difficult to divert water from other sources, such as the Bouribor River. An initial proposal to divert water from the Bouribor River with an impoundment option was removed due to environmental and social concerns. To address the issues of water availability, the system has focused more on pond system across the entire system. The design option of the system is provided in Table 2.17. In addition, the project has shifted to a “Nature-Based Solution” approach, focusing on rehabilitating existing streams and ponds to improve irrigation, diversify crops, and protect against flooding. The project includes:

- Rehabilitation of streams crossing the command area.
- Creation or rehabilitation of 50-80 ponds along the scheme for irrigation development.
- Rehabilitation of the old Lum Harch Canal to be used as a reservoir.

Figure 2.11: Principles of river rehabilitation for Lum Hach scheme

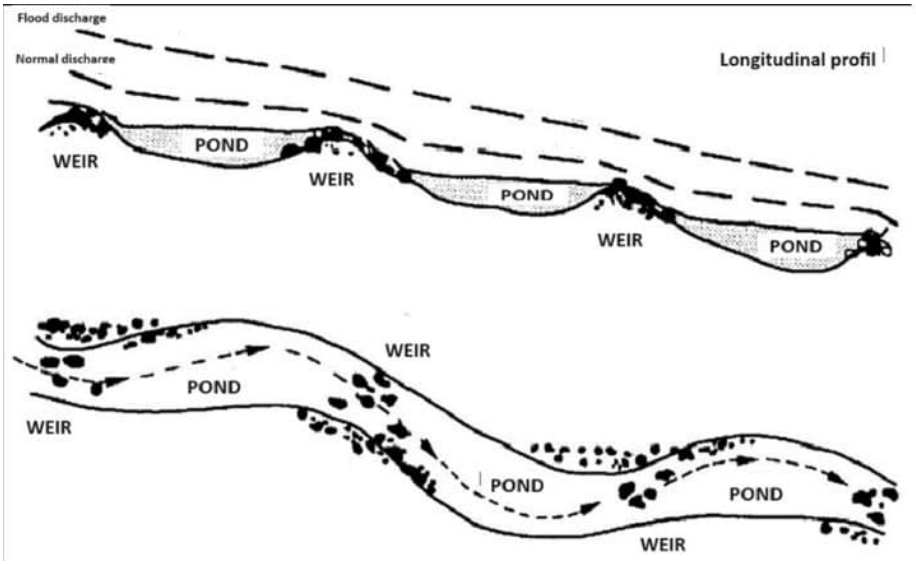


Table 2.17: Summary of design options in Lum Hach

Sub Project	Lum Hach
Area Cultivated (ha)	3,900
Water Source	Local Streams and diversion of Boribo tributary
Nature Based Solution [2]	Enhancement of Main Canal environmental features, local storages and riparian corridors along local rivers. 200 Ponds
Solar Pump Installations	179
Main/Feeder Canals C/L(km)/N	1_30.0_52
Secondary Canal C/L (km)/N (Existing)	12_12.2km_673
Tertiary Canal C/L (km)/N Existing	179_107km_1487
Main/Secondary Drains (C/L km/N)	12_107km_99
Flood Embankments /structures (Km/N)	Main Canal Bank included above
Storages	Development of upstream storage area, local ponds
Land Area of Canals (Existing proposed Ha)	65_532
Cost Estimate (USD/m)	85.4
Cost/ha $	5,400

Canals: No new canals are planned for this sub-project.

River Training and Drainage: The drainage system layout will focus on using the main natural drainage channels to manage excess runoff during the rainy season and prevent waterlogging. The system will also control groundwater levels and drain surplus irrigation water. The drainage system is designed with a 5-year return period (5% probability) for main rivers and a 5-year (20% probability) return period for all other drains. The layout will be based on natural drainage channels, upstream watersheds, rainfall over the command area, and Tonle Sap water level changes. It will also consider land use, crop types, field management, and planned irrigation systems. Additional drains will be built upstream and parallel to the main canal to divert floodwaters and protect the canal.

[2] Nature-Based Solution, in this case is the improvement of water storage capacity including canal enhancement and pond restoration, is applied to contribute to the recovery of the natural condition of the water system within the command area.

Water Sources: Lum Hach Will take advantage of Watershed protection in the Aural Mountain and a new regulator to provide storage of 40MCM at an existing site is proposed. This will be linked to the Lum Hach 2 area through a small link canal.

Flood Management: Flood issues in the area are limited to floodplain flows along the smaller streams and management of flood flows across the main canal. The proposed regulator may offer some flood control function to downstream communities on the Boribour. Improvement of drainage will help reduce flood damages.

Water Distribution:

(a) Restoration of main canal for 26.3km will improve control as a distribution between inflow from creeks and main supply and outflows at secondary canals and river channels. Improve eroded spills to operate during flood and enhance environmental functioning and bank on east side. The canal banks however maintain significant riparian vegetation and restoration as a functioning river and the spine of the conveyance system will have multiple benefits.
(b) Secondary Canals: 31 secondary canals with a length of 104km most of these canals will be newly built as the original Lum Hach scheme was not fully completed.
(c) Tertiary and Quaternary Canals

2.3.3 Stung Krang Ponley

2.3.3.1 Activities and Timeline

Should the feasibility study for the Krang Ponley subproject proceed to detailed design, then allowing for the design process, procurement process and approvals, it has been assumed the following planning as displayed in the Table 2.18.

The following assumptions have been made:

- The detailed design will start in January 2025.
- The procurement process will not take more than three (3) quarters.
- The work construction will start after the rainy season in Cambodia with a mobilization period (last quarter of the year);
- The work construction duration will not last more two (2) dry seasons.

Hence the construction would be able to commence at the last quarter 2026 for the four (4) first schemes (Chhean Laeung, Kropeu Trom, Yotosast, and Stoeung Krang Bat) with total completion by mid-2030 for Brambei Mom irrigation scheme.

Table 2.18: Tentative implementation schedule of Krang Ponley irrigation scheme.

COMPONENTS, SUB-COMPONENTS, OUTPUTS AND ACTIVITIES	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
2.1.4 - Kropeu Trom	●	●	●	●	●	●	●	●	●	●	●	●	●	●										
Activity 2.1.4.1 - Detailed design	●	●	●	●																				
Activity 2.1.4.2 - Procurement					●	●	●																	
Activity 2.1.4.3 - Work construction and supervision								●	●	●	●	●	●	●										
2.1.5 - Yotasast	●	●	●	●	●	●	●	●	●	●	●	●	●	●										
Activity 2.1.5.1 - Detailed design	●	●	●	●																				
Activity 2.1.5.2 - Procurement					●	●	●																	
Activity 2.1.5.3 - Work construction and supervision								●	●	●	●	●	●	●										
2.1.6 - Stoeung Krang Bat	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
Activity 2.1.6.1 - Detailed design	●	●	●	●																				
Activity 2.1.6.2 - Procurement					●	●	●																	
Activity 2.1.6.3 - Work construction and supervision								●	●	●	●	●	●	●	●	●	●	●						
2.1.7 - Brambei Mom				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
Activity 2.1.7.1 - Detailed design				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
Activity 2.1.7.2 - Procurement									●	●	●													
Activity 2.1.7.3 - Work construction and supervision												●	●	●	●	●	●	●	●	●	●	●		

2.3.3.2 Design Concept and Options

The current planning coverage area of Krang Ponley sub-project is around 3,000 hectares, drawing water from the Krang Ponley River, with existing storage at Anlong Chrey and Brambei Mom. Nature-based solutions include controlling the flood regime at Krang Bat for flood recession and fisheries, alongside the rehabilitation of 31 major ponds. Solar pump installations total 184 units distributed across Brambei Mom (110), Chrey Loeu (47), and Krang Ponley Teuk (27). Canal infrastructure includes 31.3 km of main/feeder canals, 29.2 km of secondary canals, and 63.5 km of tertiary canals. Drainage infrastructure comprises 42.8 km of main and secondary drains, while flood embankments and channels are planned for flood management, with raised canal banks in Krang Ponley Teuk. Storage facilities include the upgrade and safety improvement of the Anlong Chrey Reservoir, 31 rehabilitated ponds at Brambei Mom, and support for local storages and fish refuges. The land area for canals is 383 hectares, comprising 144 existing and 239 proposed hectares (Table 2.19).

Table 2.19: Key Features of the Krang Ponley Sub-Project

Sub-Project	**Krang Ponley**
Area Cultivated (ha)	3,000
Water Source	Krang Ponley River with existing storage at Anlong Chrey and Brambei Mom
Nature Based Solution[3]	Control of flood regime at Krang Bat for flood recession and fisheries. Rehabilitate 31 major ponds.
Solar Pump Installations	110 (BBM) + 47(CL) + 27(KPT)
Main/Feeder Canals C/L(km)/N	6_31.3km
Secondary Canal C/L (km)/N (Exist)	35_29.2km
Tertiary Canal C/L (km)/N Existing	77_ 63.5km
Main/Secondary Drains (C/L km/N)	17_42.8km
Flood Embankments /structures (Km/N)	Storage/Operation in AC reservoir for flood, Raised canal bank on KPT, flood channels in KPT and embankment on TS
Storages	Existing Anlong Chrey Reservoir to be upgraded and safety improvements. 31 major ponds on Barambei Mom. Support local storages and fish refuge.
Land Area of Canals (Existing proposed Ha)	144/239

BBM = Brambei Mom, CL= Chrey Loeu, KPT = Krang Ponley Teuk.

[3] Nature-Based Solution, in this case is the improvement of water storage capacity including canal enhancement and pond restoration, is applied to contribute to the recovery of the natural condition of the water system within the command area.

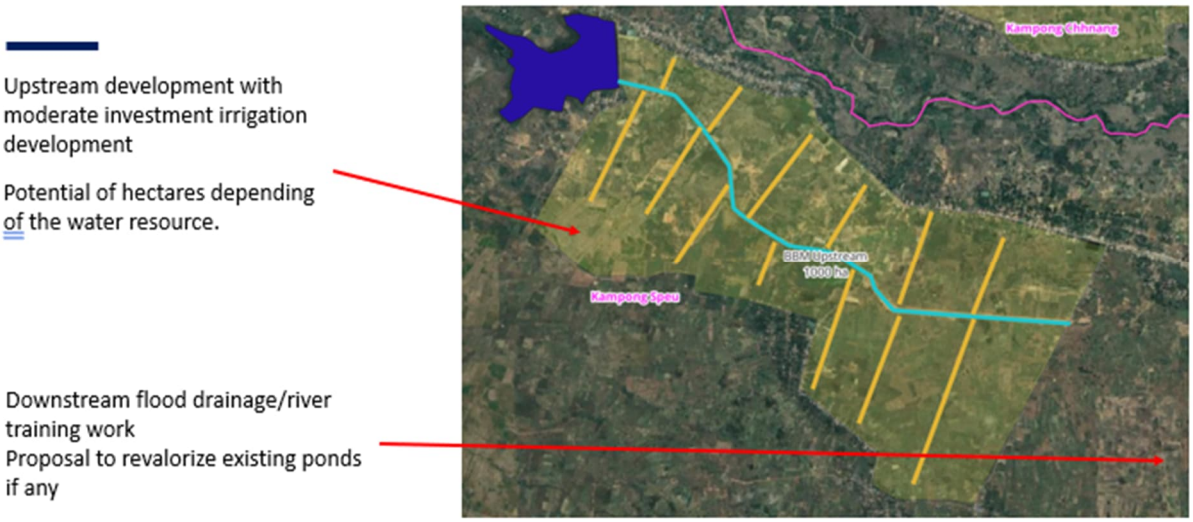
2.3.3.2.1 Brambei Mom

The Brambei Mom irrigation system (Figure 2.12) consists of:

- The creation of irrigation distributary canals to irrigate 1,000 ha. It is envisaged to investigate the possibility of collective solar pumping system at the tertiary level.
- The rehabilitation of the downstream river to prevent flooding and water disaster.

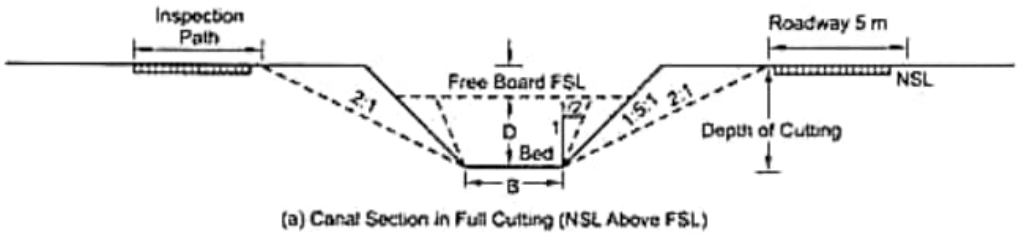
These concerted activities aim to enhance irrigation capabilities, optimize water distribution, and reduce potential water-related risks within the project area.

Figure 2.12: Concept design Layout of Brambei Mom irrigation scheme



Canal Design: The canal design (Figure 2.13) will serve both irrigation and drainage purposes, considering the topography, limited water resources, and potential land resettlement issues. Wherever possible, canal alignments will follow existing paths to minimize social impacts. Canals should be constructed with measures to reduce percolation and infiltration, using concrete linings or suitable alternatives to enhance long-term sustainability and water distribution efficiency. All canal characteristics will be finalized during the detailed design phase.

Figure 2.13: Canal section on full cutting section



River Training and Drainage

The drainage system layout for the project will focus on utilizing the main natural drainage channels to manage excess runoff during the rainy season and mitigate waterlogging in the

command area. This system will also serve as the outlet for the on-farm drainage system, which is designed to drain surplus irrigation water and control the groundwater table.

The primary goal of the drainage system is to support increased agricultural production in the area. To achieve this, the drainage system will be designed for a 5-year return period with a 5% probability for main rivers, and a 20% probability for all other drains.

The drainage layout will consider:

- Main natural drainage channels as the foundation.
- Incoming sources, such as upstream watersheds, direct rainfall over the command area, and water level changes in the Tonle Sap.
- Land use, including crop types, field layout, and management practices.
- Planned irrigation systems.

The main drains will be based on existing natural rivers, and the internal drainage system will be adapted to the layout of agricultural plots and irrigation systems. Additional drains will be constructed upstream and parallel to the main canal to act as diversion and interception drains, reducing crossings over the canal and protecting it from floodwater. These additional drains will divert floodwater according to the topography to effectively integrate into the overall drainage system.

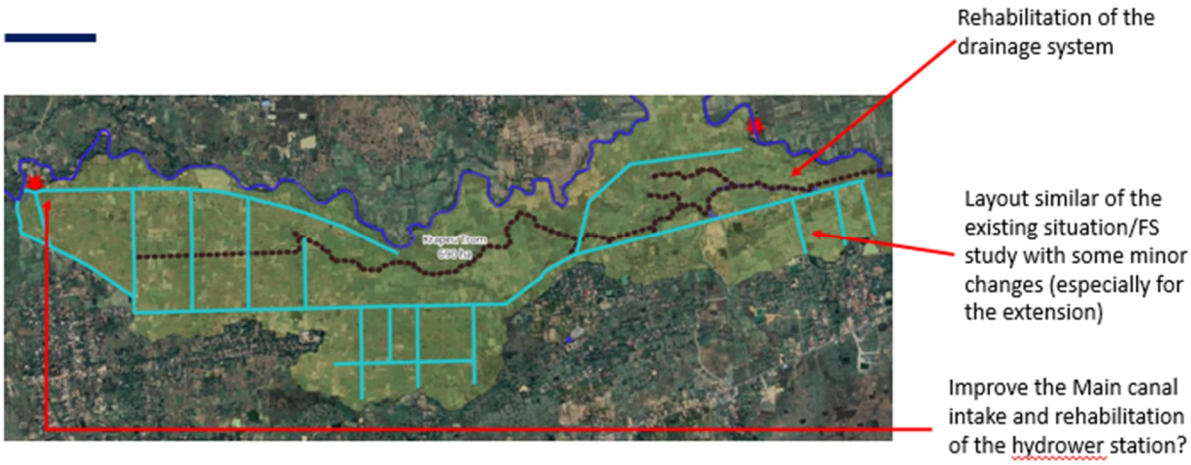
2.3.3.2.2 Kropeu Trom

The proposed Kropeu Trom project, as per the design layout in Figure 2.14, includes several key components aimed at enhancing irrigation capabilities and mitigating water-related hazards. These include:

- Rehabilitation of the Intake Structure on the Anlong Chrey stream.
- Rehabilitation of Irrigation Distributary Canals to irrigate 690 hectares, with the possibility of lining key canals.
- Development of Sub-distributary Canals (tertiary level), with investigations into implementing a collective solar pumping system.
- Rehabilitation of Drainage Systems, including the Anlong Chrey stream and main drainage systems to mitigate flooding.

These activities collectively aim to enhance irrigation capabilities, improve water distribution, and mitigate potential water-related hazards in the project area.

Figure 2.14: Concept design of Kropeu Trom irrigation scheme.



Preferred Technical Design Option

The rehabilitation, construction and activities of CAISAR project in Krapeu Truom sub-scheme consist of canals, river training and drainage, improvement of water regulation and structure and tertiary systems, and installation of solar power systems.

Canal. The design of the canal system aims to serve both irrigation and drainage functions, considering the topography, limited water resources, and potential land resettlement issues. Where possible, the canals will follow existing paths to minimize social impacts. The size of the canals will be adjusted based on the irrigated area and the local topography. To ensure long-term sustainability and reduce water loss through percolation, it is recommended to construct the main canals using concrete linings or suitable alternatives. This approach will help maintain water distribution efficiency and improve the durability of the infrastructure.

River Training and Drainage: A well-designed drainage system will be a critical component of the project, intended to manage excess runoff during the rainy season and prevent waterlogging in the command area. This system will also serve as the outlet for the on-farm drainage network, which is designed to control groundwater levels and drain surplus irrigation water. The layout of the drainage system will be based on the main natural drainage channels, upstream watersheds, rainfall over the command area, and changes in water levels in the Tonle Sap. It will also consider land use, crop types, and the planned irrigation systems to ensure efficient water management.

Water Regulation and Structures: Water will be diverted from multiple sources into the main canals according to water availability and a demand schedule prepared by the FWUC and PDoWRAM, based on crop needs. Various cross structures will be installed to maintain the full supply level in the main and secondary canals where necessary. The flow of water into each canal will be controlled by operating the gates of the head regulators, ensuring efficient delivery to the tertiary canals, which will distribute water to individual fields. Farmers will have the option to irrigate their plots either through plot-to-plot irrigation or by constructing field ditches. Once again, the off-take structures (Figure 2.14) will be installed for farmers to divert water into their field using plot-to-plot irrigation method or they can construct small canals as per agreement within their groups.

Tertiary System: The irrigation system design extends to the tertiary canal level, which is the final distribution point before water reaches individual plots. Two (2) options are considered

for the tertiary canals. The first option involves creating traditional tertiary canals through excavation, where farmers will individually pump water using diesel pumps based on their needs. However, this requires significant cooperation from beneficiaries, as canal alignment must be accepted without land compensation. The second option is to install collective solar pumping stations, a more sustainable and cost-effective solution that eliminates the need for diesel pumps and reduces CO_2 emissions.

Collective Solar Pumping System: The project aims to implement a solar-powered pumping system as a low-tech, sustainable alternative to diesel pumps, with a pilot test covering 30-50 hectares in each irrigation block. The solar pumping system requires minimal maintenance and has no fuel costs, making it an environmentally friendly and cost-effective solution for farmers. The southern part of Block A is particularly suitable for the implementation of this system due to its proximity to villages and protection from floods. The solar pumping system could cover 4,198 hectares with 80-90 units, improving water efficiency by 20% and reducing the risk of land conflicts along the canal alignment. This system would ensure reliable water delivery and support sustainable agricultural practices.

2.3.3.2.3 Yutasas

The Yutasas irrigation system as per the design layout in Figure 2.15 consists of:

- The rehabilitation of the intake structure on Anlong Chrey stream.
- The rehabilitation of the irrigation distributary canals to irrigate 593 ha. It is envisaged to have canal lining for the main infrastructures (main and secondary canal)
- The development of sub-distributary canals (tertiary). Investigation will be performed to envisage the possibility of collective solar pumping system at the tertiary level.
- The rehabilitation of the Anlong Chrey and existing main drainage system to prevent flooding and water disaster.

These combined efforts seek to elevate irrigation capabilities, refine water distribution, and alleviate potential water-related risks within the project area.

Figure 2.15: Conceptual design layout of Yotasas irrigation scheme



2.3.3.2.4 Stoeung Krang Bat

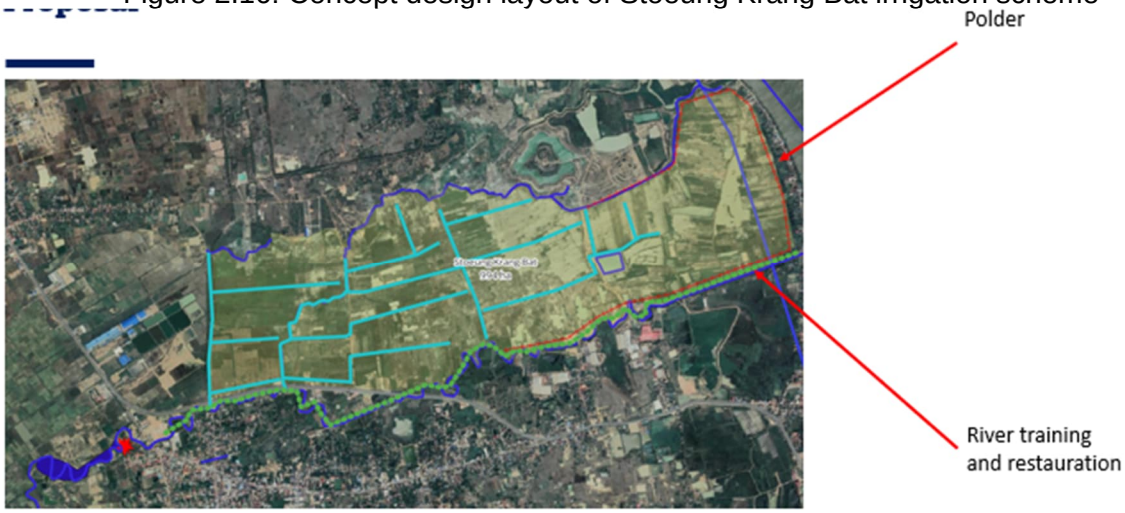
The Steung Krang Bat irrigation system as per the design layout in Figure 2.16 consists of:

- The rehabilitation of the intake structure on Anlong Chrey stream.
- The rehabilitation of the irrigation distributary canals to irrigate 994 ha. It is envisaged to have canal lining for the main infrastructures (main and secondary canal)
- The development of sub-distributary canals (tertiary). Investigation will be performed to envisage the possibility of collective solar pumping system at the tertiary level.
- The rehabilitation of the Anlong Chrey and existing main drainage system to prevent flooding and water disaster.
- The creation of a polder on the eastern side to protect the area from flooding of Tonle Sap.

These joined activities aim to enhance irrigation capabilities, optimize water distribution, and reduce potential water-related risks within the project area.

Polder System. This polder system will be added along the existing road of the system, allowing for the cultivation of wet-season paddy and providing protection for homes and property from floods. A typical polder includes an encircling embankment that keeps water out, drainage canals inside the polder to remove excess water, and a sluice gate that releases water during low tides. The sluice gate will also serve as an irrigation intake during water shortages, ensuring water availability even during dry spells within the rainy season (Please see Figure 2.16 for the location of the polder).

Figure 2.16: Concept design layout of Stoeung Krang Bat irrigation scheme



2.3.4 Project Activities

The infrastructure investment of the project, as outlined in the previous section, involves several key activities during the pre-construction phase. These activities set the foundation for the successful implementation of the project's construction work and ensure that resources and personnel are well-prepared for the task.

The project is divided into two (2) key components. Component 1 focuses on improving farm-level climate adaptation, resilience, and water use efficiency. This involves planning and

training activities to develop community-based action plans and build capacity among farmers. Additionally, mechanization efforts and farm road improvements will enhance agricultural productivity and accessibility. Component 2 aims to strengthen irrigation infrastructure for increased resilience. This includes a range of activities such as river dredging, canal rehabilitation, construction of small-scale structures, river training, polder system development, solar pumping system installation, feeder canal construction, and pond construction or rehabilitation. These interventions will improve water management, increase water storage capacity, and ensure efficient water distribution to agricultural fields.

2.3.4.1 Pre-construction Phase

At the pre-construction phase, there are several activities that need to be done where disturbance to local people as well as natural resources may occur. These activities are:

1. Land and Right of Way Negotiation: This initial step focuses on securing the necessary land and access rights for the construction. Negotiations with local authorities, landowners, and other stakeholders ensure that all legal and logistical requirements are met, minimizing potential delays or disputes that could arise during the project.
2. Contracting and Training of Staff: The project then engages in the recruitment and contracting of skilled personnel, including construction teams, engineers, and project management staff. This step is critical to ensure that the workforce has the necessary expertise and experience. Alongside recruitment, training programs are provided to align staff with the project's goals, safety standards, and technical requirements.
3. Mine and UXO Clearance: In areas with potential unexploded ordnance (UXO), safety is the highest priority. Before any construction begins, the project undertakes mine and UXO clearance to ensure that the site is free of hazardous materials, creating a safe environment for workers and preventing accidents.

These pre-construction activities are integral to establishing a strong foundation for the project, ensuring that the necessary infrastructure, workforce, and materials are in place to proceed smoothly with the subsequent phases of construction.

2.3.4.2 Construction Phase

The construction phase of the project involves a comprehensive set of activities aimed at establishing the required infrastructure while ensuring safety, environmental management, and efficient use of resources. Key construction activities include:

1. Mobilization of Construction Materials, Consumables, Machinery, Equipment, and Staff: Once the team is in place, the project moves into the mobilization phase, where all essential materials, machinery, and equipment are transported to the construction site. This also includes the deployment of consumables and other resources required for ongoing construction. Ensuring the timely arrival and organization of these assets is crucial for avoiding disruptions in the construction timeline. Similarly, staff are mobilized to ensure a coordinated start to the construction activities.
2. Installation and Operation of Temporary Infrastructure: Temporary facilities, such as worker camps, asphalt plants, concrete mixing stations, and ground material processing plants, are set up to support the construction process. These facilities are

critical for providing on-site accommodation for workers and ensuring the continuous supply of construction materials.

3. Site Clearing and Cleaning: This phase involves clearing the construction site of any obstructions such as vegetation, debris, and existing infrastructure. It ensures that the land is prepared and ready for subsequent construction activities.
4. Demolition and Removal of Existing Infrastructure: In areas where existing structures need to be replaced or upgraded, demolition and removal are necessary. This ensures that the site is clear for the installation of new infrastructure and allows for efficient use of the available land.
5. Land Movements (Excavations, Dredging, and Fills): Major land movements, including excavations and dredging, are conducted to reshape the land and prepare it for new infrastructure. These activities also involve filling areas to achieve the required ground levels for construction stability and support.
6. Construction of Hydraulic Works (Including Occupation of Waterways): Hydraulic works, such as dams, levees, or irrigation systems, are constructed to manage water resources effectively. This stage often requires temporary occupation of waterways, making careful planning and environmental considerations critical.
7. River Training: As part of managing water flow and preventing erosion, river training is conducted to stabilize riverbanks and direct water movement, which is essential for protecting both the construction site and surrounding ecosystems.
8. Dismantling of Temporary Facilities and Camps: Once the primary construction activities are completed, temporary infrastructure such as camps and material plants are dismantled. This marks the transition toward the final stages of the construction process.
9. Final Cleanup of Intervened Areas: A thorough cleanup of the construction site is conducted to remove debris, materials, and any temporary installations.
10. Site Retoration: To ensure the aesthetic and environmental sustainability of the project, landscaping efforts are undertaken, including replanting vegetation, managing drainage, and shaping the landscape to blend with the natural surroundings.

This series of construction activities ensures that the project is completed according to design specifications, with an emphasis on safety, environmental responsibility, and efficient resource management.

2.3.4.3 Operation and Maintenance

The post-construction phase of the project involves the transition from infrastructure development to its operational use, with a focus on agricultural intensification, resource management, and long-term maintenance. The key activities during this phase include:

1. Intensifying Agricultural Production: Following the completion of the infrastructure, there is a focus on enhancing agricultural productivity. The improved infrastructure allows for more efficient farming practices, increased crop yields, and the introduction of advanced agricultural techniques. This intensification contributes to greater food security and economic development in the region.

2. Increased Use of Energy and Fuel for Agriculture Production: With the intensification of agricultural activities, there is a corresponding rise in the use of energy and fuel to power farming machinery, irrigation systems, and other agricultural equipment. This increased demand for energy supports the scaling up of production but also requires careful management to ensure sustainability and minimize environmental impacts.
3. Operation and Maintenance: To ensure the long-term functionality and durability of the newly constructed infrastructure, regular operation and maintenance activities are critical. This includes monitoring the condition of the infrastructure, performing repairs, and ensuring that the systems in place continue to function as designed. Routine maintenance helps prevent deterioration and ensures that agricultural productivity remains high.
4. Water Management: Effective water management becomes a priority in this phase, especially with the new hydraulic infrastructure in place. This includes controlling irrigation systems, managing water levels in reservoirs, and ensuring that water resources are used efficiently to support agricultural activities. Sustainable water management is crucial for balancing agricultural demands with environmental conservation.

These post-construction activities ensure the long-term success of the project, contributing to sustainable agricultural growth, resource efficiency, and the ongoing maintenance of infrastructure to support continued productivity in the agricultural sector. Summary of the project activities is provided in Table 2.20.

Table 2.20: Summary of the Project Activities in relation to the infrastructure investment

No.	Stage	Activities
1	Pre-Construction	Land and right of way negotiation
		Contracting and training of staff
		Mobilization of construction materials, consumables, machinery, equipment and staff
2	Construction	Mine and UXO clearance
		Installation and operation of temporary infrastructure (camps, asphalt, concrete and ground material plants)
		Site clearing and cleaning
		Demolition and removal of existing infrastructure in areas to be intervened
		Land movements (excavations, dredging and fills)
		Construction of hydraulic works (includes occupation of waterways)
		River training
		Dismantling of temporary facilities and camps
		Final cleanup of intervened areas
		Landscaping management
	After Construction	Intensifying agricultural production
		Increased use of energy and fuel for agriculture production
		Operation and maintenance
		Water management

UXO = Unexploded Ordnance.

2.3.5 Construction Equipment

To support the construction activities, the project will require a variety of construction equipment and machinery. Below is the potentially used equipment for different stages of the project:

- Earthworks and Land Preparation
  - Excavators – For digging canals, ponds, and trenches.
  - Backhoe Loaders – For smaller excavation and loading tasks.
  - Bulldozers – For clearing and leveling land.
  - Motor Graders – For grading and leveling road and embankment surfaces.
  - Scrapers – For removing and transporting soil over short distances.
  - Soil Compactors/Rollers – For compacting soil before construction.
- Water Infrastructure Construction
  - Dredgers – For clearing and deepening irrigation canals and reservoirs.
  - Trenchers – For laying underground pipelines.
  - Pipe Layers – For positioning and installing large-diameter water pipes.
  - Concrete Pumps – For pumping concrete into irrigation structures.
  - Concrete Mixers (Stationary & Mobile) – For mixing and delivering concrete.
  - Cranes – For lifting heavy pipes, gates, and pre-cast structures.
  - Pile Driving Machines – For driving piles into the ground for dam or levee construction.
- Road and Pathway Construction
  - Asphalt Pavers – For paving roads within the project.
  - Dump Trucks – For transporting materials such as gravel, sand, and asphalt.
  - Bitumen Sprayers – For road surfacing.
  - Road Rollers – For compacting asphalt or gravel surfaces.
- Drainage and Irrigation System Development
  - Water Pumps (Diesel & Electric) – For water transfer and dewatering.
  - Drilling Rigs – For well construction and deep water extraction.
  - Channel Forming Machines – For shaping and lining irrigation channels.
  - Concrete Pipe Making Machines – For on-site production of irrigation pipes.
- Structural and Facility Construction
  - Tower Cranes – For lifting heavy materials in building sites.
  - Scaffolding Systems – For workers' access and safety.
  - Rebar Cutters and Benders – For reinforcing concrete structures.
  - Shotcrete Machines – For spraying concrete onto embankments.
- Environmental and Erosion Control
  - Hydroseeding Equipment – For erosion control and vegetation replanting.
  - Rock Crushers – For breaking stones for embankment protection.

- Geotextile Laying Machines – For soil stabilization in embankments and canal lining.

- Power and Electrical Systems
  - Generators – For power supply in remote project sites.
  - Transformers & Substations – For irrigation pumping stations.
  - Solar Panel Installation Equipment – If renewable energy is incorporated.

- Monitoring and Surveying Equipment
  - Total Stations & GPS Survey Equipment – For site mapping and project layout.
  - Drones – For aerial surveys and project monitoring.
  - Water Flow Meters – For irrigation system performance assessment.

2.4 ASSOCIATED FACILITIES

Under CAISAR, the screening for potential Associated Facilties (AF) was conducted by SECAP team. The definition for "Associated facilities" (AF) in the AIIB's Environmental and Social Framework (May 2021 version) are activities that are not included in the description of the Project set out in the Legal Agreements governing the Project, but they are qualified to the following criteria:

> (a) **directly** and **materially** related to the Project.
>
> (b) **carried** out, or **planned to be carried out**, **contemporaneously** with the Project; and
>
> **(c) necessary** for the Project to be **viable** and would **not be carried out if the Project did not exist**".

Below is the summary of a) methods that was used by the team to screen for AF, and b) the results of the AF screening.

Methods

Interpretation of AF definition in the context of CAISAR project

Under CAISAR project, the key terms used in the above definition are interpreted as follows:

- **Project**: refers to CAISAR project
- **Direct**, in the context of environmental and social risk and impact assessment, refers to the **impact, which is caused by the project**, and **occurs contemporaneously in the location of the project**. This is to differentiate with an indirect impact which is an impact which is caused by the project and is later in time or farther removed in distance than a direct impact, but is still reasonably foreseeable, and will not include induced impacts. "Direct", in the context of AIIB's ESF refers to the "direct" relationship between a potential associated facilities (e.g. dam, reservoir, barrage) and its impact on the achievement of the intended project development.
- **Material**: significant, important, substantive. In the context of CAISAR, "material" refers to the strength of the above "direct" relationship between the impact of a potential AF

on the intended outcome for each subproject which is indicative of **reliable and increased water access** for the target project groups – as per project plan, to achieve expected development outcome.

- **Contemporaneous**: at the same time, which is the relative overlap of time with regards to planning and actual implementation of potential AF and CAISAR project activities (defined by project planning period and project implementation life).
- **Viable**: for CAISAR sub–schemes to **achieve** mostly the **intended impacts** (expected outcome, i.e. increased irrigated area and/or number of crops per year/reliable irrigation access).
- **Not be carried out if the Project did not exist.** Indicates the functional interdependency between the AF and CAISAR project.

Findings

As per the consultation with the CAISAR PMU and SECAP team, the document regarding the AF had already been approved. Therefore, the result from the assessment were used in this report. Further assessment will be conducted on any emerging facilities after the consultation and agreement being provided by the PMU. Based on the screening by the SECAP team, five (5) existing works have been screened and assessed if they are associated facilities (See table next page). The screening results indicates that none of the five (5) water resources facilities met the definition of AIIB's Environmental and Social Framework on Associated Facilities. Therefore, no further actions are required in connection with these five (5) works (please see in table 2.21).

Table 2.21: Screening of potential Associated Facilities under CAISAR*

Assessment criteria	Anlong Chrey Dam	Kdol Dam	Brambei Mom Dam	Kropeau Truom diversion work	Yutasas barrage
a) **directly** and **materially** related to the Project; and	Directly and materially (substantially) related to Brambei Bom, Kropeau Truom, Yutasas, and Stoeng Krang Bat.	Directly and materially (moderately) related to Kropeau Truom, Yotasas, and Stoeung Krang Bat	Directly and materially (substantially) related to Brambei Mon sub–scheme	Directly and materially (substantially) related to Kropeau Truom sub–scheme	Directly and materially (substantially) related to Yutasas sub–scheme
b) **carried out**, or **planned to be carried out**, **contemporaneously** with the Project; and	The Anlong Chrey construction was completed in 2012 under Krang Ponley Water Resources Development Project. **Not carried out contemporaneously** with Brambei Bom, Kropeau Truom, Yotasas, and Stoeung Krang Bat sub–schemes.	Kdol Dam construction was completed in 2012 under Water Resources Development Project. **Not carried out contemporaneously** with Kropeau Truom, Yutasas, and Stoeung Krang Bat	The Brambei Mom Dam construction was completed in 2012 Krang Ponley Water Resources Development Project. Not carried out contemporaneously with Brambei Mom sub–scheme	The Kropeau Truom Dam construction was completed in 2015 **Not carried out contemporaneously** with Kropeau Truom sub–scheme	The Yutasas Dam construction was completed in 2015 **Not carried out contemporaneously** with Yutasas sub–scheme
c) **necessary** for the Project to be **viable** and **would not be carried out** if the Project did not exist.	**Necessary** for Brambei Mon, Kropeau Truom, Yutasas, and Stoeung Krang to be **viable** and **still carried out** even if these schemes did not exist	**Necessary** for Kropeau Truom, Yutasas, and Stoeung Krang to be **viable** and **still carried out** if even these schemes did not exist	**Necessary** for the Brambei Mom sub–scheme to be **viable** and **still carried out** even if Brambei Mom sub–scheme did not exist.	**Necessary** for the Kropeau Truom sub–scheme to be **viable** and **still carried out** even if Kropeau Truom sub–scheme did not exist.	**Necessary** for the Yutasas sub–scheme to be **viable** and **still carried out** even if Yutasas sub–scheme did not exist.
Initial screening	NOT AF	NOT AF	NOT AF	NOT AF	NOT AF

*. Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project

Source: *Report on Screening of potential Associated Facilties under CAISAR (prepared by SECAP team)*

Table 2.22: Assessment of Project Associated Facilities

Assessment criteria	**Dam 1**	**Dam 3**	**Dam 5**	**Damnak Cheukrom Headwork**	**Damnak Ampil Headwork**
a) **directly** and **materially** related to the Project; and	**Not directly related** to, but **materially (substantially)** related to OTP because water released from Dam 1 is mostly fed into the Damnak Cheukrom command area (16,100 ha) located upstream the OTP and various other commands areas	**Not directly related** to OTP but **materially (moderately) related to** OTP because water from Dam 3 contributes the total water volume in Pursat river which is the main source of water for OTP	**Not directly related** to OTP but **materially (moderately) related to** OTP because water from Dam 5 contribute water to Pursat river which is the main source of water for OTP	**Not directly and materially to** OTP because water from this dam is for Damnak Cheukrom command area only (upstream the OTP)	**Directly and materially related to** OTP sub–scheme because its function and operations affects water volume diverted into OTP and thus affect intended outcome of the OTP sub–scheme.
b) **carried out**, or **planned to be carried out**, **contemporaneously** with the Project; and	Carried contemporarily with OTP	Not carried out, or planned to be carried out with OTP (It was built and completed in 2013)	Not carried out, or planned to be carried out with OTP (It was built and completed in 2013)	Not carried out, or planned to be carried out with OTP	Not carried out, or planned to be carried out with OTP (it was built during Khmer rouge time and was built in 2006.
c) **necessary** for the Project to be **viable** and **would not be carried out** if the Project did not exist.	Necessary for OTP to be viable but still carried out if OTP did not exist	Not necessary. Still carried out if OTP did not exist	Not necessary. Still carried out if OTP did not exist	Not necessary. Still carried out if OTP did not exist	Necessary for OTP to be viable (TBC based on final engineering design) but has been built with no intention to serve water to the OTP sub–scheme.
Initial screening	NOT AF	NOT AF	NOT AF	NOT AF	NOT AF

Note: AF = Associated Facilities, OTP = Ou Ta Paong, TBC = To Be Confirmed.

2.5 IMPLEMENTATION RESOURCES REQUIREMENT

2.5.1 Labour and Workforce

Table 2.23 outlines the estimated labor requirements for the construction of the irrigation system under the CAISAR project. Four main groups of the labor forces include: Direct Workers, Contracted Workers, Primary Supply Workers, and Other Stakeholders. The Direct Workers include individual consultants and members of the Project Implementation Unit (PIU), who are essential from the project preparation phase through to completion. The Contracted Workers, engaged by the PIU and construction contractors, consist of national specialists such as Detailed Design Consultants and Construction Supervision Consultants, as well as skilled and unskilled laborers. This group is engaged on intermittent basis. The Primary Supply Workers are mostly local workers involved in providing services to the project at local level during construction, while Other Stakeholders include civil servants from various government ministries and departments, such as MoWRAM, NCDDS, and MEF are technical support. Ou Ta Paong has the highest number of workers in most categories as it is the largest sub-scheme, given 80 skilled workers and 150 unskilled workers while only 40 skilled and 60 unskilled workers in both Lum Hach and Krang Ponley.

The involvement of local workers and civil servants is a key feature of the labor requirements. Local workers are heavily engaged as unskilled laborers and primary supply workers, emphasizing the project's reliance on local resources and its potential to create employment opportunities in the region. Additionally, civil servants from ministries such as MoWRAM, NCDDS, and MEF play a significant role, particularly during the construction phase, ensuring compliance with safeguards and providing technical and administrative support. The total estimated labor requirement of 735 workers demonstrates the scale and complexity of the CAISAR project, requiring careful coordination among consultants, contractors, government agencies, and local communities to ensure successful implementation.

Table 2.23: The estimated influx labor within the sub-schemes

Type of project workers	Characteristics of project workers	Duration of Labor Requirements	Ou Ta Paong	Lum Hach	Krang Ponley	Total Workers
Direct Workers						
PIU's member MoWRAM & NCDDS	Individual consultants (e.g., E&S Specialists, Design Engineers, Construction Supervision Engineers, etc.	From project preparation till project completion				20
Contracted Worker						
Engaged by PIU						
Detailed Design Consultant	National specialists	From project preparation until project completion	15	10	10	35

Type of project workers	Characteristics of project workers	Duration of Labor Requirements	Ou Ta Paong	Lum Hach	Krang Ponley	Total Workers
Construction Supervision consultant	National specialists		15	5	5	25
Independent E&S Monitoring Consultant		One (1) month in very six (6) months	10	5	5	20
Technical Assistance			15	10	10	35
Engaged by construction contractors						
Skilled workers	National specialists	Durations vary, depending on construction stages & needs.	80	40	40	160
Unskilled workers	Local workers (around subproject location)		150	60	60	270
Primary Supply Workers						
Workers producing materials for core project activities	Mostly local workers	Construction stage	30	15	15	60
Other Stakeholders Working in Connection with Project						
Civil servants of MoWRAM, PDWRAM at provincial & district level	SEO safeguard team	The construction stage of the project.	18	8	8	34
Civil servants of NCDDS	Staff of NCDDS	From project preparation until project completion	15	8	8	31
Civil servants of MEF	Staff of GDR	From project preparation until project completion	10	5	5	20
Civil servants of relevant Ministries	Staff	The construction stage of the project.	15	5	5	25
Total						**735**

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, E&S = Environmental and Social, NCDDS = National Committee for sub-National Democratic Development Secretariat, PDWRAM = Provincial Department of Water Resources and Meteorology, SEO = Social and Environmental Officer, MEF = Ministry of Economy and Finance, GDR = General Department of Resettlement.

2.5.2 Power Usage

During the construction, the project requires a reliable and sufficient power supply to support various construction activities including equipment operation, worker facilities, and site management. A significant portion of power consumption will be allocated to heavy machinery and equipment, including concrete mixers, cranes, drilling rigs, welding machines, water

pumps, and earthmoving equipment such as excavators and bulldozers. These machines require high-power supply mainly from the self-propel engine using diesel or gasoline as the fuel whereas the power for lighting and security systems for general visibility on the construction site could be from the power grid as the location is accessible to power grid. Apart from machinery, electricity for worker facilities and site infrastructure can be the power grid or diesel generators. Worker camps will require power for lighting, cooking, air circulation, and mobile charging.

The overall power demand will vary based on the project's phase, the number of workers, and the type of equipment used. However, the estimate of the demand is far from actual since many information is lacking. The engineering team recommended to wait until the DED stage. A hybrid power system using a combination of grid electricity, and diesel generators. Efficient energy management strategies will help optimize power use, reduce costs, and minimize environmental impact.

2.5.3 Supporting Facilities

Several supporting facilities that are required for the construction activities include site offices and administrative facilities, worker accommodation and welfare facilities such as worker camps containing toilets, showers, handwashing stations, and kitchens to ensure proper hygiene and nutrition. A stable power supply is needed for machinery operation, lighting, and worker facilities, sourced from grid electricity, diesel generators, or solar panels can be the options. Additionally, wastewater treatment facilities are need to manage sewage and reduce environmental pollution for the camp sites.

Proper storage and material handling facilities is needed to protect construction materials such as cement, steel, and gravel. Transportation infrastructure and access roads is used to facilitate the movement of materials and personnel, with designated loading and unloading zones to streamline logistics. To ensure safety, security measures such as perimeter fencing, guard posts, and fire safety stations is needed. Furthermore, environmental management facilities such as waste segregation units, drainage systems, and recycling bins are also needed to minimize environmental impact. The specific layout and location of the facilities can only be projected at after obtaining the final design layout plan of the engineering team during the construction stage after the contract award.

2.5.4 Water Consumption

Water is needed for construction activities and domestic uses of workers. Water is essential for various activities, including material preparation, earthworks, equipment operation, worker sanitation, and site maintenance. A significant portion of water use is allocated to concrete and material preparation, where it is needed for mixing concrete, mortar preparation, curing, and soaking bricks or blocks to prevent rapid water absorption. Additionally, earthworks and dust control require water for soil compaction, suppressing dust on unpaved roads, and softening the ground during grading and levelling. Water is also crucial for equipment and machinery operations, including cooling construction machinery, cleaning tools and formworks, and conducting hydraulic testing of pipelines to check for leaks and pressure integrity. In road construction and asphalt work, water is required for wetting base layers before compaction, mixing with bitumen, and cooling asphalt equipment. Estimate the quantity of water for such activities need the figure of the facilities. As per the consultation with the

engineering team, it is not feasible to make an estimate on the water need for such a work since the scope of work including volume of excavated soil, volume of concrete to be used, and so on are not available.

The estimate of water needs for domestic use of the project associated workforce use the 70 liters per day[4] as the basis for the calculation. As the duration of engagement of staff and officials, workers, civil servants over the project life time are varied from one to another. The PMU staff engagement at the field is estimated at 3 days per month over the period of 6 years. The DED Consultant is estimated at 100 days per year for one year, following by construction supervision consultant at 250 days per year for 2.5 year, independent E&S Monitoring Consultant at 25 days per year for 3 years, technical consultant at 50 days per year for 3 years, skilled and unskilled workers at 250 days per year for 2 years, primary supply workers at 50 days per year for 2 years, officials for MOWRAM and PDoWRAM at 50 days per year for 6 years, and other officials at 40 days per year for 6 years. The result of the estimate for water demand is provided below:

Table 2.24: The estimated quantity of water for domestic use of the project

No.	Type of Workers	Total Workers	Number of Days at Field	Total Water Demand (liters/day)	Total Water Demand (m3)
1	PIU member MoWRAM & NCDDS	20	4,320	1,400	6,048
2	Detailed Design Consultant	35	3,500	2,450	8,575
3	Construction Supervision consultant	25	15,625	1,750	27,344
4	Independent E&S Monitoring Consultant	20	1,500	1,400	2,100
5	Technical Assistance	35	5,250	2,450	12,863
6	Skilled workers	160	80,000	11,200	896,000
7	Unskilled workers	270	135,000	18,900	2,551,500
8	Primary Supply Workers	60	7,500	4,200	31,500
9	Civil servants of MoWRAM, PDWRAM	34	10,200	2,380	24,276
10	Civil servants of NCDDS	31	7,440	2,170	16,145
11	Civil servants of MEF	20	4,800	1,400	6,720
12	Civil servants of relevant Ministries	25	6,000	1,750	10,500
	Total				**3,593,570**

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, NCDDS = National Committee for sub National Democratic Development Secretariat, E&S = Environmental and Social, PDWRAM = Provincial Department of Water Resources and Meteorology, MEF = Ministry of Economy and Finance.

The estimated water demand is mainly for needed during the construction period, given less than 1% of the estimated water is required for pre-construction stage.

2.5.5 Expected GHG Emission and Discharge

[4] water-quantity.pmd

During construction, the construction activities will generate Greenhouse Gas (GHG) emissions from various activities, primarily due to the use of fossil fuels, electricity consumption, and material production. One of the major contributors to emissions is fuel combustion in heavy machinery and construction equipment, such as excavators, bulldozers, cranes, and trucks. These machines rely mainly on diesel fuel, which releases carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) into the atmosphere. Additionally, transportation of materials such as sand, gravel, cement, and steel to the construction site will also contribute to emissions through fuel consumption by trucks and other vehicles.

Another significant source of GHG emissions is the production and use of construction materials, particularly cement, steel, and asphalt. Cement manufacturing is known for high CO_2 emissions due to the chemical process of calcination, while steel production requires significant energy, leading to further emissions. The use of electricity for site operations, including lighting, worker accommodations, water pumping, and equipment, will also add to the overall carbon footprint, depending on the energy mix used. However, the exact amount of GHG emissions can only be determined after the detailed engineering design is completed, which will provide specific information on construction scope, number and size of equipment usage, and material requirements. Future calculations should take into account project-specific data to ensure a more accurate estimation of the environmental impact.

2.5.6 Land Acquisition for Material Storage

To support construction activities, contractors will need to rent land or engage local households to store materials and vehicles. This land will be used for essential contractor facilities, such as temporary storage areas, worker accommodations, and machinery stations. Securing this land is critical for ensuring efficient operational logistics and smooth construction management throughout the project. Ou Ta Paong, being the largest sub-scheme, is estimated to require the highest allocation. Overall, it is projected that a total of 35 households or land units will be needed across the six sub-schemes, including 10 units in Ou Ta Paong and 5 units each in Lum Hach, Brambei Mom, Krapeu Truom, Yutasas, and Stueng Krang Bat.

CHAPTER 3 – PROJECT ALTERNATIVES ANALYSIS

3.1 INTRODUCTION

Chapter 3 analyzes project alternatives, comparing the implications of implementing or not implementing the proposed interventions across various sub-schemes. It contrasts the "without-project" baseline scenario with the anticipated benefits of the "with-project" scenario, including improved irrigation, enhanced water management, and increased agricultural productivity. The chapter also examines design options and their technical, environmental, social, and economic impacts. By focusing on each sub-scheme, it highlights the potential for the project to boost farmer incomes, enhance resilience to climate and market risks, and promote sustainability through better water management and community participation.

3.2 ALTERNATIVE ANALYSIS

3.2.1 Ou Ta Pong

3.2.1.1 Site Selection

The number of hectares of Ou Ta Paong is approximately 14,000 hectares. This command area will be the same regardless of any options being proposed.

3.2.1.2 Project Layout and Design

The design layout of the irrigation system in OTP remains the same as per the project description (please see in table 3.1). However, a number of design options have been finalized and removed from the design options. The (i) Polder improvements (20.1 Km); (ii) “new” secondary canal (8.78 Km), (iii) “new” tertiary canal (19.3 Km); and (iv) “new” quaternary canal (4.2 km) in the previous design of PPTA Team had been agreed to remove to minimize the impacts from land acquisition and resettlement. To supplement the removals, off-take structures will be installed leaving farmers to abstract water as per their internal agreement on the conveyor type to be built within their block command area. The off-take structures that will be installed and locations to install will be identified during the DED.

Table 3.1: Irrigation System Design and Options

No	Structures	Design Length (km)	Existing Width (Average) (m)	Expansion (L) (m)	Expansion (R) (m)	Total Width (m)
1	Feeder 1	8.80	16.00	7.00	7.00	**30.00**
2	Feeder 2	6.10	29.10	1.50	1.50	**32.10**
3	Main Canals	37.50	37.10	5.00	5.00	**47.10**
5	Creek Re-shape	27.60	61.00	0.00	0.00	**42.00**
6	Main Drainage	11.70	52.00	Reshape	Reshape	**42.00**
7	Secondary Canals	60.12	16.10	2.50	2.50	**21.10**

L = Left, R = Right.

Feeder Canals. The feasibility study of Ou Ta Paong indicated no other design layout except the construction of the feeder canals to abstract water to feed the irrigation system. All options have its own specific strengths and shortage as describe below:

Option 1: Water is extracted from Pursat River through Damnak Ampil Main canal with a length of 6.5 km extended from the main canal feeding into Ou Ta Paong River. The option is one (1) of the best choices, given its shortest length from the main canal to reach command area. However, expanding only the feeder canal reaching a width that can carry adequate water to the sub-scheme will acquire a huge land area along the canal for canal expansion, and side road.

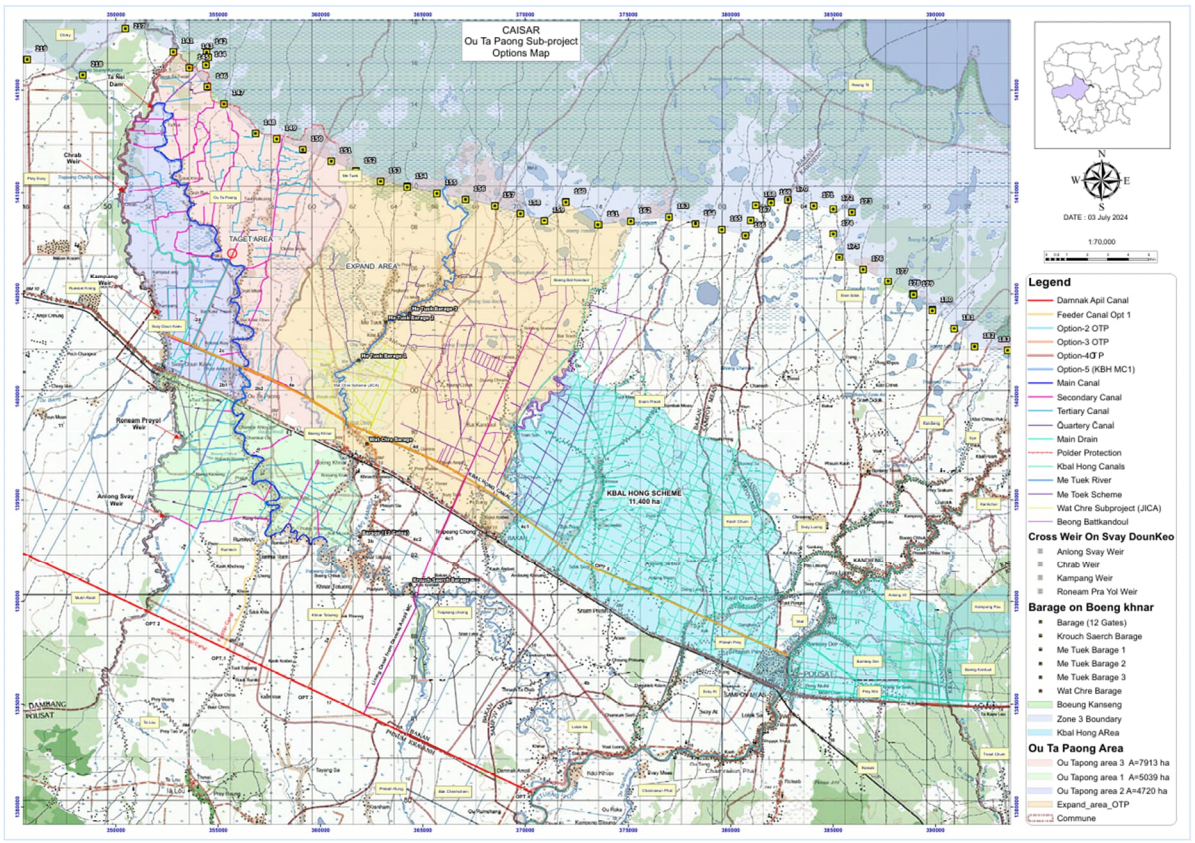
Option 2: The feeder canal is parallel to Option 1 but it extends further down. Prior to releasing water into Ou Ta Paong River, the canal releases water into Boeng Kanseng, flowing across the block allowing the irrigation to take place at this area. With the extension, the canal is about 12 km in length. Once again, the issue of land acquisition along the canal will be encountered due to the expansion.

Option 3: Similar to Option 1, the feeder canal extends further, allowing the water to flow into Kbal Hong main canal prior to the connection to Ou Ta Paong River at further downstream at the middle part of the catchment, making the total length of the canal at about 14 km from Damnak Ampil to Kbal Hong. This option may cause the water availability at the upper part of the sub-scheme being concerned while water will be fed into another area prior to Ou Ta Paong. The option, therefore, requires the budget for excavation to be around twice as much as Option 1.

Option 4: The option carries water from Wat Loang canal, flowing through the barrage at Damnak Ampil. The option will require the expansion of the canal to ensure that an adequate volume of water can be carried to Ou Ta Paong. The canal length to reach Ou Ta Paong is approximately 30 km. The expansion of the canal would result in huge acquisitions of land areas along the main canal.

Option 5: The option begins at Kbal Hong barrage at Pursat provincial town involving the enhancement of the Watergate height and the distance of carrying water will be approximately like Option 4. However, the increase in the height of the Watergate will cause inundation of the upper area of the Pursat River which may cause flooding in the town. This may bring in huge discontentment of the people in the city as height water level may cause in delay of storm water flow during raining period.

Figure 3.1: Ou Ta Paong Sub-project Options Map



(Source: CAISAR Project, 2024)

Evaluation of Options:

Evaluating the OTP Options is not easy as there are many factors that need to be considered, which makes the matter complex. So, the approach below are proposed for adoption:

- Reduce the number of cross regulators on OTP River
- Focus on improving the existing distribution system
- No new canals (in principle)
- No lining of canals
- No construction of the tertiary canals
- No pump stations, and
- No canals in fill

With the above approach, which aims to maximize water distribution (to support prefered crop patterns) while minimizing investment costs (including potential social and environmental impacts, three options (Option 1, Option 3 and Option 5) were extensively discussed, agreed, and finally selected by MOWRAM and AIIB. The combination of these three options does not only complement each other (minimizing costs related to construction and land acquisition) but also water use efficiency is enahnced through improved water distribution across thre three blocks within the command area.

Polder System. The polder system is expected to play a role as an embankment for protecting flood and invasive species from the Tonle Sap during early raining season. The discussion on the system agreed to remove the system as the operation of the system may face challenges. Firstly, the land areas for the construction are needed since it is the new

system which may cause a lot of land impact. Secondary, managing challenge may lead to delay in draining function during flooding period for the command area while flooding protection function would affect a lot of biodiversity exchange between the command area and zone 3 fauna and flora. Lastly, the meeting with engineering team decided not to include the system within the project design.

Secondary Canals. The construction of new secondary canal is expected to acquire huge land areas of farmers which may result in disruption of household economy. To avoid the negative impact, the construction of the canal was agreed to remove the newly plan secondary canal while off-take structure (culverts) will be used to allow farmers to abstract water from the system as per their block command areas. Farmers who own the land within the block need to discuss and agree whether they are going to build their own water canal or use plot by plot irrigation. The risk as per this option is when farmers could come up with the agreement on the construction of a small canal on their own, they have to continue irrigating their farm through deploying plot-to-plot irrigation or using long range pumping which involve with high cost and limited water use efficiency. Since the design is trying to avoid land acquisition, this will be the option for the system which is also applied to the quaternary and fourth-level canal as well.

River Training. River training methods are designed to regulate and stabilize river flows for various purposes, including irrigation, flood control, and erosion prevention. Below are three common types of river training, along with their respective advantages and disadvantages adopted from online source to provide general overview regarding the design and possible options which should be considered for the actual practices. However, it is up to the DED team to decide as per the consultation with Social Safeguard consultant (Table 3.2).

Table 3.2: River Training Design Options

River Training	**Description**
Embankments (Levees)	Embankments are artificially raised banks made of earth, concrete, or stone along the sides of a river to prevent water from overflowing into adjacent lands.
Advantages:	• **Flood Control:** Protects agricultural lands and infrastructure from river flooding. • **Irrigation Water Regulation:** Helps direct water flow into irrigation channels efficiently. • **Erosion Prevention:** Reduces bank erosion, safeguarding nearby farmlands and structures. • **Cost-Effective:** Generally, less expensive compared to more complex river training structures.
Disadvantages:	• **Sediment Deposition Issues:** Can lead to sediment buildup within the riverbed, raising water levels and increasing flood risks over time. • **Breaching Risk:** If poorly maintained, embankments can break during extreme floods, leading to catastrophic damage.

	• **Ecological Impact:** Alters natural river dynamics, affecting aquatic ecosystems and wetlands.
Spurs (Groynes)	Spurs (also called groynes) are structures extending perpendicularly from the riverbank into the river. They help deflect and slow down water flow to prevent erosion and sediment deposition in key areas.
Advantages:	• **Bank Protection:** Reduces erosion by redirecting strong currents away from vulnerable banks. • **Sediment Control:** Helps accumulate sediments in specific areas, aiding in land reclamation or creating stable riverbanks. • **Improves Water Availability:** Can be strategically placed to direct water flow into irrigation systems.
Disadvantages:	• **Local Scouring:** Can cause deep erosion near the structure, affecting nearby irrigation headworks or riverbanks. • **Periodic Maintenance Required:** Sediment accumulation may require periodic dredging to maintain functionality. • **High Initial Cost:** Construction and material costs can be relatively high compared to natural erosion control measures.
Weirs and Barrages	Weirs are low dams built across a river to regulate water flow, while barrages are adjustable structures with gates that control water levels for irrigation and flood management.
Advantages:	• **Water Level Control:** Maintains steady water levels in irrigation channels, ensuring consistent supply to farmlands. • **Hydropower Potential:** Some barrages can integrate small-scale hydroelectric generation. • **Prevents Saltwater Intrusion:** Useful in coastal areas where tidal effects can introduce salinity into freshwater irrigation systems.
Disadvantages:	• **Disrupts Natural River Flow:** Can impact fish migration and aquatic ecosystems if fish passages are not incorporated. • **Expensive to Build and Maintain:** High initial investment and ongoing maintenance are required for long-term functionality. • **Flooding Risk Upstream:** Can cause water accumulation upstream, leading to potential flooding in extreme weather conditions.

Design Slope. As per the confirmation of the Engineering Team, canal slopes will either be protected or left as earthen slopes based on their condition and the available budget, which will be determined during the detailed design phase. For weak slopes, concrete lining and geosynthetic materials will be recommended for reinforcement. The feasibility of bio-

engineering solutions will be assessed based on the specific site conditions of the project. The following is the comparison between the vegetated and concretized design slope:

Table 3.3: Slope Design Options Comparison

Concretized Canal Slopes	• Erosion Control: Concretized canal slopes provide strong erosion resistance, reducing sedimentation in water bodies downstream. This helps maintain water quality and prevents sediment-related ecological degradation. • Maintenance Needs: Concretized slopes generally require less maintenance compared to vegetated banks. They are easier to inspect and repair, reducing ongoing operational costs. • Habitat Impact: Concretized slopes typically offer limited habitat for aquatic organisms and vegetation compared to natural or vegetated banks. This can reduce biodiversity and ecological resilience in the waterway. • Heat Absorption: Concrete can absorb and retain heat, leading to higher water temperatures in the canal. This can affect aquatic life, especially sensitive species, and alter ecosystem dynamics. • Aesthetics: Concretized slopes may be perceived as less visually appealing compared to natural or vegetated banks. This could impact recreational use and community engagement with the water resource.
Vegetated Banks	• Erosion Control: Vegetated banks provide natural stabilization, reducing erosion by absorbing water, slowing runoff, and binding soil with root systems. They contribute to maintaining soil structure and preventing sedimentation downstream. • Biodiversity: Vegetated banks offer diverse habitats for aquatic and terrestrial species, promoting biodiversity and supporting ecological balance. They can serve as wildlife corridors and provide nesting sites for birds. • Water Quality: Vegetated banks act as buffers, filtering pollutants, and absorbing excess nutrients from runoff. This improves water quality and supports healthier aquatic ecosystems. • Temperature Regulation: Vegetation provides shade, helping to regulate water temperature and mitigate thermal pollution. This is particularly important for species sensitive to temperature fluctuations. • Community Benefits: Vegetated banks enhance the aesthetic value of the waterway, offering green spaces for recreation, relaxation, and cultural activities. They can also contribute to community engagement and ownership of the water resource.

Cross-Regulator/Off-Take Structure. The structure is required for all sub-schemes and specific size, number, and locations need to be assessed during DED stage. The calculation

regarding the design specification need to consider the water requirement in each block of the sub-command areas.

Fish Passes/Sliding Gate. There is practice using fish passage in barrage or headworks across the river where environmental flow is available. The engineering team indicated that the option is not practical at the field level canal because the water flow at the hydraulic structures along the canal system need to be fully closed for some time for farmers to irrigate their system. However, the fish passage may be practical for OTP river and Svay Doun Keo river which needs to be assessed at the DED stage. Two fish passes are provided below:

Table 3.4: Slope Design Option Comparison

Vertical Slot Fish Passway:	• Biodiversity Risks: o Habitat Fragmentation: Vertical slot fish passways can contribute to habitat fragmentation by interrupting the natural flow of rivers. This interruption can create barriers to fish migration, leading to isolated populations and reduced gene flow between different sections of the river. o Species-Specific Challenges: Some fish species may face difficulties navigating through the narrow, vertical slots of the passway. Species with limited jumping abilities or specific habitat preferences may struggle to ascend or descend through the structure, limiting their access to essential spawning or feeding areas. • Environmental Risks: o Sedimentation: Improperly designed vertical slot fish passways can alter flow patterns, leading to increased sedimentation downstream. Changes in flow velocity and direction can cause erosion of riverbanks and streambeds, resulting in sediment accumulation in downstream habitats. Excessive sedimentation can degrade water quality, smother benthic habitats, and reduce oxygen levels, harming aquatic life. o Hydraulic Impacts: Vertical slot fish passways may create hydraulic conditions that are unsuitable for fish passage. High velocities and turbulent flows within the passway can impede fish movement and cause physical stress or injury. Additionally, rapid changes in water level or flow rate can disorient fish and hinder their ability to navigate through the structure.
Cone Fishway	• Biodiversity Risks o Selective Passage: Cone fishways may not provide equal passage opportunities for all fish species. Some species may have difficulty navigating through the structure due to factors such as water depth, flow velocity, or hydraulic complexity. This selective passage can create barriers to migration for certain

	species, leading to reduced genetic exchange and population fragmentation. o Altered Hydrology: Cone fishways can modify natural flow patterns within river systems, potentially altering habitat availability and quality for aquatic organisms. Changes in flow velocity, turbulence, and water depth can influence the distribution and abundance of fish and other aquatic species, impacting ecosystem dynamics and biodiversity. • Environmental Risks o Habitat Modification: Construction of cone fishways may require alterations to river channels and banks to accommodate the structure. Channel dredging, bank stabilization, and other habitat modifications can disrupt natural riverine habitats and alter ecosystem processes. Changes in habitat structure and composition can affect the distribution of aquatic flora and fauna, leading to shifts in community composition and trophic interactions. o Sediment Transport: Cone fishways can affect sediment transport dynamics within river systems, with potential implications for downstream habitats. Changes in flow velocity and turbulence induced by the structure can influence sediment deposition and erosion patterns, altering habitat availability and quality for benthic organisms and other aquatic life.

3.2.1.3 Project Technology

There are different technological options being proposed for the project activities. The key technological options are provided here:

Table 3.5: Irrigation System Options

Options	Component	Options	Description
Pumping	1	Diesel water pump	Traditional water pumping systems powered by diesel engines. These are commonly used in areas where electricity is unavailable but it has higher operational cost and environmental impacts. However, it can be used anywhere in the sub-scheme.
		Solar pumps	Sustainable and cost-effective water pumping systems that harness solar energy, suitable for remote areas with abundant sunlight. They offer lower long-term costs but may require higher initial investment.
		Electric pumps	Powered by electricity from the grid or other sources, these pumps are efficient but depend on the availability of consistent electrical supply which

			maybe inapplicable at farm level in most of the sub-scheme
IPM	1	Pesticide application	A conventional approach involving chemical pesticides to manage pests, often leading to quick results but with potential risks to health, environment, and biodiversity. The times of application without IPM will be up to 6 times as per the reported from the field survey.
		With IPM*	The application of pesticides will be reduced to only around 3 times, minimizing the impacts on the quality and health of water, environment, wildlife, fauna and flora, human and animal
Agromet	1	Without Agromet	Farming practices carried out without the use of weather and climate data, potentially leading to inefficiencies and higher vulnerability to climate risks.
		Agromet	Incorporates meteorological data and forecasts into agricultural decision-making, enhancing productivity, resource optimization, and resilience to climate variability. However, the major challenge is mainly the operational cost of the system.
SCADA**	2	Convention	Manual or semi-automated control systems for monitoring and managing operations, which may be labour-intensive and less efficient in handling complex systems.
		SCADA	Advanced digital systems that provide real-time monitoring, data analysis, and remote-control capabilities for improved efficiency and operational oversight.

*. IPM = Integrated Pest Management

**. SCADA = Supervisory Control and Data Acquisition

For pumping, there is a need to be case specific to each of the option. Applying these technological options are important since the technologies will facilitate the agricultural production and complimenting each other is needed. The promotion of only one (1) option would decrease the effective farming activities. Regarding the IPM, it is quite important to promote the technologies as it will reduce the negative impacts which will be caused by the farming activities. The application of agromet will require technical skill and management capacity

3.2.1.4 Project Scenario Analysis

In the without-project scenario, the net command area in OTB (14,874 ha), will continue to be cultivated with a cropping intensity of 155% (23,055 ha). This includes 14,131 ha of wet-season paddy and 8,924 ha of dry-season paddy. In addition, the land area for vegetable production within the sub-scheme is reported to be approximately 141 ha, approximately 1% of the total command area.[5] The without-project scenario suggests that continuation of

[5] MoP (2023). Commune Database 2023. Ministry of Planning.

ongoing agricultural practices in the project area, with suboptimal yields for rice cultivation and poor crop diversification resulting in low farmer income and high vulnerability to climate risk. With poor rice yield and agricultural productivity, there is the possibility that farmers will alternate their livelihood options to seeking for additional sources of income such as illegal fishing, hunting, and migrating to other areas for income making to feed their families. Without adequate water, their livelihood is highly depending on climate which tends to be highly variated over the past years with series of climate occurrence at a high level of severity and frequency, reported to be approximately occurred every two (2) years both drought and flood and 29% of migration rate. This would be likely to be accelerated when the level of climate impact continues to increase.

In the with-project scenario, it is anticipated that the net command area will be cultivated with greater intensity, increasing from one (1) cropping cycle to two (2) or three (3) cycles per year. This improvement is attributed to enhanced water availability, better water management, higher water transmission efficiency, and improved drainage as a result of the project's investments. The rehabilitation of existing irrigation canals and the construction of new ones will enable an increase in cropping intensity of up to 270%, covering 40,161 hectares. This will yield a net increase of up to 17,106 hectares with reliable irrigation access, including 26,776 hectares of wet-season paddy, 11,899 hectares of dry-season paddy, and 1,488 hectares of high-value crops, such as fruits and leafy vegetables.

The project is expected to deliver the following agricultural outcomes for the 8,130 farming households in the OTP scheme: i) improved yields for wet-season rice, ii) expanded cultivation area and increased yields for dry-season rice, and iii) the introduction of high-value crops like leafy and fruit vegetables for dry-season cultivation. These changes are projected to boost agricultural production, raise farmer incomes, and enhance farmer resilience to drought, pests, diseases, and market risks through crop diversification.

3.2.2 Lum Hach

3.2.2.1 Site Selection

The sub-project area was chosen as the area has the potential in terms of agricultural production while limited water availability for production. The command area is changing as per the available design options due to water availability. The feasibility aims at achieving up to 8,000 ha, if water being adequately stored for irrigation. However, with huge acquisition of land area for construction of water storage, the command area was reduced to approximately 3,900 ha.

3.2.2.2 Project Layout and Design

The Lum Hach Irrigation Scheme is being rehabilitated under the CAISAR project, with the aim of improving agricultural productivity in the area. The project feasibility study has identified two (2) design options for improving agricultural productivity. The first design option involves rehabilitating existing irrigation infrastructure, such as canal improvement, embankment, main and secondary canals, and improving water availability and irrigation management (please see in table 3.6). The project will also work with PDWRAM and MOWRAM to establish, train, and manage FWUCs, which will provide farmers with training specific to their land type,

improving their land management capabilities. Farmers will be encouraged to diversify their cropping patterns and include short term horticultural crops, such as watermelon, on their dry paddies. The benefits of crop rotation in terms of returns and improvements in soil quality have been identified as important, particularly given the poor soil quality in Lum Hach.

The second design option involves constructing impoundments upstream to provide a storage system that will improve water availability both now and in the future under climate change. Although this option comes with additional costs, the benefits and improvement in agricultural productivity are expected to far outweigh the costs. The command area is expected to increase from 8,000 ha to 14,000ha, benefiting a greater number of farmers in the area and enabling them to be more resilient to climatic changes.

With limited hydrological analysis of water availability and the high potential of land acquisition for the construction of water storage at the upstream, option 2 is not feasible, leaving the first option as the option for the construction of the irrigation within the command area. The option reduces the command area to be around 3,900 ha.

Table 3.6: Irrigation System Options in Lum Hach

No.	Structures	Designed Length (km)	Existing Width (Average) m	Expansion (L) m	Expansion (R) m	Total Width (m)
1	Channel Improvements	20.70	80.00	Design of 90 m width (excavation + slopes) with 5 m depth		**90.00**
2	Embankments	7.20	13.10	9.00	9.00	**31.10**
3	Main Canals	48.80	11.30	6.50	6.50	**24.30**

L = Left, R = Right.

Once again, the secondary and tertiary canals were removed from the earlier conceptual design to avoid the impact of land acquisition as the same reasons to that of the OTP system. The system will involve with the construction of the slope for the channel improvement, embankments and main canal rehabilitation. The options for these types of the designs were the same to that of the OTP.

Ponds. Pond is another option being included in the sub-theme. Type and options in the construction of the pond have not been decided. There are a number of options for pond construction can be considered. A few of them are provided here:

Table 3.7: Options for pond construction

Design	Description	Description	
Large-Scale Reservoir	- Reinforced embankments (compacted soil with grass cover for erosion control). - Inlet channel from main water sources (river, reservoir, or rain-fed catchment).	Advantages	- Ensures continuous irrigation supply during dry seasons. - Connected to large irrigation networks, benefiting multiple farming areas. - Gravity-fed system, reducing reliance on pumps. - Flood mitigation, preventing downstream overflows.

	- Outlet structure (sluice gate) to regulate water flow into secondary irrigation canals. - Sediment trap at the inlet to reduce siltation. - Safety spillway for overflow management.	Disadvantages	- High construction cost due to excavation and embankment reinforcement. - Requires significant land area, possibly affecting resettlement. - Siltation risk, requiring regular dredging. - Complex management, requiring government oversight and water governance policies.
Mid-Sized Regulating Pond (Distribution & Buffer Storage)	- Lined embankments (clay or compacted soil) to prevent erosion. - Connected to primary storage reservoirs via secondary irrigation canals. - Water regulation structures (gated outlets to control water release). - Canal branching system directing water towards drip or furrow irrigation fields. - Low-cost pump station (solar or diesel backup) if needed for controlled release.	Advantages	- Balances water supply between large reservoirs and farm irrigation plots. - Reduces water losses by controlling distribution. - Lower land requirement compared to primary reservoirs. - Supports modern irrigation techniques (drip, furrow, and sprinkler systems).
		Disadvantages	- Limited storage capacity, requiring consistent water flow from upstream. - Medium construction cost, higher than earthen ponds but cheaper than reservoirs. - Pump dependency in low-lying areas, increasing operational costs. - Moderate maintenance needs, including sediment removal and embankment repair.
Farm-Level Irrigation Pond	- Compact clay or HDPE lining to reduce seepage. - Water inlet from tertiary irrigation canals for refilling. - Overflow drainage system to prevent waterlogging. - Drip or furrow irrigation system connected to the pond. - Possible integration with fish farming for dual-purpose use.	Advantages	- Reduces dependence on seasonal irrigation, allowing flexible water use. - Prevents water shortages, storing backup supply during dry spells. - Cost-effective, as smaller-scale ponds require less excavation. - Supports climate resilience, reducing drought risks for farmers.
		Disadvantages	- Limited storage, requiring regular refilling from main irrigation canals. - High evaporation loss, especially in hot climates. - Land use challenges, as space is required for pond construction. - Regular maintenance needed, including lining repairs and sediment removal.

Impacts on Natural Habitats. In addition to the stated option above, one existing main canal traverses the Toul Samroang community forestry as the improvement of the canal would impact on biodiversity of the area. The total protected land area that will be acquired was estimated at 36,182 m^2, giving the length of the main canal across the protected area at 1.49 km and the width the canal at 24.3 meters. The construction of the canal cannot be avoided as there is no suitable location that can be used to construct the canal in alternate to this one.

3.2.2.3 Project Technology

Similar to Ou Ta Paong, the project will involve different technology options for irrigating and cultivating. All pumping technologies and sustainable agricultural practices are important to the command area. However, the application of SCADA would be inapplicable since the construction of ponds would not be connected.

3.2.2.4 Project Scenario Analysis

In the without-project scenario, the net command area of 3,900 ha will continue to be cultivated with a cropping intensity of 100% (3,900 ha). This includes 1,950 ha of late wet-season paddy, 1,560 ha of medium wet season paddy and 390 ha of early wet season paddy. According to the commune database, the sub-scheme contains approximately 156 ha of vegetable production, given the land area for horticulture of 4%. Farmers will continue to produce crop production with limited sources of water, which is high risk of failure, even during wet season.

In the with-project scenario, although the net command area will remain unchanged, improvements in water availability, management, transmission efficiency, and drainage will increase cropping intensity to 110% (covering 4,290 hectares). This includes 1,170 hectares of late wet-season paddy, 1,560 hectares of medium wet-season paddy, 1,170 hectares of early wet-season paddy, and 390 hectares allocated to high-value crops such as fruits and vegetables.

The project is expected to deliver the following agricultural benefits for the 7,958 farming households in the LH scheme: i) improved yields for wet-season rice, ii) expanded cultivation area and higher yields for dry-season rice, and iii) the introduction of high-value crops like leafy vegetables and fruit vegetables for dry-season cultivation. These changes are expected to increase agricultural productivity, boost farmer incomes, and enhance farmer resilience to drought, pests, diseases, and market risks through crop diversification.

In contrast, the without-project scenario would see the continuation of existing agricultural practices, leading to suboptimal rice yields, limited crop diversification, lower farmer incomes, and heightened vulnerability to climate risks.

3.2.3 Stung Krang Ponley

3.2.3.1 Site Selection

The Krang Ponley sub-project is located within the Krang Ponley catchment, made of four (4) sub-areas: Brambei Mom, Krapeu Troum, Yutasas and Krang Bat covering a total area of 3,277 hectares.

3.2.3.2 Project Layout and Design

Rehabilitation and enhancement of the existing irrigation system is the main design option under the project opting out from the feasibility design stage as huge land area acquisition found to be critical and generate high social impacts on community people (please see in table 3.8).

Table 3.8: Irrigation System Options in Stung Krang Ponley

No.	Structures	Designed Length (km)	Existing Width (Average) m	Expansion (L) m	Expansion (R) m	Total Width (m)
Brambei Mom						

1	Main Canals	6.3	51.5	0	0	51.50
Krapeu Troum						
1	Main Canal 1	2.82	30	0	0	30.00
2	Main Canal 2	6.8	30	0	0	30.00
3	Drainage Canal	6.8	5	1	1	7.00
4	Carrying Roads (MC2)	6.8	Only one (1) section of 1.5 Km canal's embankment requires expansion to be the rural road. The section of 5.3 km is already large enough to be the rural road.		1.5	
Yutasas						
1	Embankment	1	18.4	1.6	0.8	20.80
2	Main canal	6.6	21.3	2.2	1.1	24.60
3	Main Drain	7.4	59	0	0	59.00
4	Secondary Drain	2.2	21.3	0	0	21.30
Stung Krang Bat						
1	Feeder Canal	5.12	30	2.5	2.5	35.00
2	Folder	2.22	18.5	0	0	18.50
3	Main canal1	2	51.1	0	0	51.10
4	Main canal2	10.3	35	0	0	35.00
5	Main Drain	40.2	40	0	0	40.00
6	Secondary Drain	7.7	22	0	0	22.00

L = Left, R = Right, MC2 = Main Canal 2

Once again, the secondary and tertiary canals were removed from the earlier conceptual design to avoid the impact of land acquisition as the same reasons to that of the OTP system. The system will involve with the construction of the slope for the channel improvement, embankments and main canal rehabilitation. The options for these types of the designs were the same to that of the OTP. The application is also the same for the case of pond design.

3.2.3.3 Project Technology

The feasibility study has assessed the climate vulnerabilities of the Command Areas and their communities to design suitable, sustainable, and climate-resilient irrigation systems. The scheme will make use of nature-based, adaptive, and data-driven technologies to ensure its resilience to extreme floods and climate change. Smart SCADA technology will be installed to monitor the system for leaks and flood damages, while drainage systems will also be installed to reduce waterlogging, flood impacts, and crop failures.

Solar pumping will be employed in place of costly and high-carbon diesel alternatives to create a self-sustaining system. The lining of canals is an important feature of the system's climate resilience, and a range of investment options exist depending on the extent of lining in the new network. Concrete will be used for certain sections to reduce the carbon footprint.

3.2.3.4 Project Scenario Analysis

3.2.3.4.1 Brambei Mom

In the without-project scenario, the net command area of 1,000 ha will continue to be cultivated with a cropping intensity of 100% (1,000 ha). This includes 200 ha of late wet-season

paddy and 800 ha of medium wet season paddy. There are also proportion of vegetable production approximately 40 ha[6] continue to grow with limited water sources.

In the with-project scenario, while the net command area will remain unchanged, improvements in water availability, management, transmission efficiency, and drainage will result in a cropping intensity increase to 130% (covering 1,300 hectares). This will include 100 hectares of late wet-season paddy, 400 hectares of medium wet-season paddy, 500 hectares of early wet-season paddy, and 300 hectares dedicated to high-value crops, such as fruits and vegetables.

The project is expected to achieve the following agricultural outcomes for the 1,914 farming households in the Brambei Mom scheme: i) higher yields for wet-season rice cultivation, ii) expanded cultivation area and higher yields for dry-season rice, and iii) the introduction of high-value crops like leafy vegetables and fruit vegetables for dry-season farming. These improvements are projected to increase agricultural productivity, raise farmer incomes, and enhance farmer resilience to drought, pests, diseases, and market risks through crop diversification.

In contrast, the without-project scenario would maintain the current agricultural practices, leading to suboptimal rice yields, limited crop diversification, lower farmer incomes, and higher vulnerability to climate risks.

The proposed Brambei Mom scheme will install secondary and tertiary irrigation canals along with associated infrastructure in the existing Brambei Mom irrigation system, thereby improving dry-season water availability for 1,000 hectares of nearby farmland. Additionally, the project will establish and train Farmer Water User Communities (FWUCs) to operate and maintain the irrigation infrastructure, ensuring its long-term sustainability. Agricultural extension services will also be provided to local farmers, focusing on improved agricultural techniques, value chain optimization, the use of improved seed varieties, cover crop application, and the optimal use of fertilizers and pesticides.

3.2.3.4.2 Krapeau Truom

Without-project scenario, the net command area of 690 has will continue to be cultivated with a crop intensity of 100% whereas the 15% of command area (73 ha) will continue to produce vegetables with limited water sources, facing the risk of crop failure even during rainy season.

In the with-project scenario, although the net command area will remain unchanged, improvements in water availability, management, transmission efficiency, and drainage will increase cropping intensity to 115% (covering 793 hectares). This will consist of 69 hectares of late wet-season paddy, 276 hectares of medium wet-season paddy, 345 hectares of early wet-season paddy, and 103 hectares of high-value crops, including fruits and vegetables.

The project is expected to bring the following agricultural benefits for the 2,430 farming households in the Kropeau Truom scheme: i) improved yields for wet-season rice, ii) expanded cultivation area and higher yields for dry-season rice, and iii) the introduction of high-value crops like leafy vegetables and fruit vegetables for dry-season cultivation. These changes are

[6] MoP (2023). Commune Database 2023. Ministry of Planning.

expected to increase agricultural productivity, raise farmer incomes, and enhance farmer resilience to drought, pests, diseases, and market risks through crop diversification.

In contrast, the without-project scenario would maintain current agricultural practices, resulting in suboptimal rice yields, poor crop diversification, lower farmer incomes, and heightened vulnerability to climate risks.

The proposed Kropeau Truom sub-scheme aims to rehabilitate the existing canals only, enhancing dry-season water availability for 690 hectares of nearby farmland. Additionally, the project will establish and train Farmer Water User Communities (FWUCs) to manage and maintain the irrigation infrastructure, ensuring long-term sustainability. Further agricultural extension services will be provided to local farmers, focusing on improved agricultural techniques, value chain optimization, the use of improved seed varieties, cover crop application, and optimal fertilizer and pesticide use.

3.2.3.4.3 Yutasas

In the without-project scenario, the net command area of 593 ha will continue to be cultivated with a cropping intensity of 100% (593 ha). This includes 119 ha of late wet-season paddy and 474 ha of medium wet season paddy. This is the same to the land area of 1% (6 ha) continue to grow vegetable with the risk of crop failure due to limited water sources.

In the with-project scenario, while the net command area will remain unchanged, improvements in water availability, water management, transmission efficiency, and drainage will increase cropping intensity to 117% (covering 693 hectares). This will include 59 hectares of late wet-season paddy, 237 hectares of medium wet-season paddy, 297 hectares of early wet-season paddy, and 100 hectares dedicated to high-value crops such as fruits and vegetables.

The proposed Yutasas scheme aims to install secondary and tertiary irrigation canals along with related infrastructure within the existing scheme, enhancing water availability during the dry season for 593 hectares of nearby agricultural fields. The project will also establish and train Farmer Water User Communities (FWUCs) to manage and maintain the irrigation infrastructure, ensuring its long-term sustainability. Additional agricultural extension services will be offered to local farmers, focusing on improved agricultural practices and value chain development, the use of improved seed varieties, cover crop application, and optimal fertilizer and pesticide use.

The project is expected to deliver the following agricultural benefits for the 1,339 targeted farming households: i) higher yields for wet-season rice, ii) expanded cultivated areas and increased yields for dry-season rice, and iii) the introduction of high-value crops like leafy and fruit vegetables for dry-season farming. These improvements are projected to enhance agricultural productivity, increase farmer incomes, and boost farmer resilience against drought, pests, diseases, and market risks through crop diversification.

In the without-project scenario, ongoing agricultural practices would persist, leading to suboptimal rice yields, limited crop diversification, low farmer incomes, and increased vulnerability to climate risks.

3.2.3.4.4 Steung Krang Bat

In the without-project scenario, the net command area of 994 ha will continue to be cultivated with a cropping intensity of 100% (994 ha). This includes 199 ha of late wet-season paddy and 795 ha of medium wet season paddy. As it is reported that 10% of the land area within this location are using for growing vegetable, the 9 ha of vegetable production will also continue to grow with the water sources.

In the with-project scenario, although the net command area will remain the same, improvements in water availability, management, transmission efficiency, and drainage will result in a cropping intensity increase to 124% (covering 1,235 hectares). This will include 99 hectares of late wet-season paddy, 389 hectares of medium wet-season paddy, 497 hectares of early wet-season paddy, and 250 hectares of high-value crops, such as fruits and vegetables.

The proposed Stoeung Krang Bat scheme seeks to install secondary and tertiary irrigation canals and related structures in the existing Stoeung Krang Bat irrigation system, improving water availability during the dry season for 994 hectares of nearby agricultural fields. The project will also establish and train Farmer Water User Communities (FWUCs) to manage and maintain the irrigation infrastructure, ensuring its long-term sustainability. Additional agricultural extension services will be provided to farmers in the area, focusing on enhanced agricultural practices, value chain development, the use of improved seed varieties, cover crop application, and optimal fertilizer and pesticide use.

The project is expected to bring the following agricultural benefits to the 1,020 farming households targeted in the Stoeung Krang Bat scheme: i) increased yields for wet-season rice, ii) expanded cultivated areas and higher yields for dry-season rice, and iii) the introduction of high-value crops, such as leafy and fruit vegetables, for dry-season cultivation. These improvements are anticipated to boost agricultural productivity, raise farmer incomes, and strengthen resilience to drought, pests, diseases, and market risks through crop diversification.

However, the sub-scheme is located closest proximity to Phnom Penh. The land value was very high ranging from USD 100,000 to USD 250,000 per hectare and highly potential to be converted into residential area. If the area is converted, the residential area is not suitable for agriculture production anymore and the benefit from the investment would be turned into nothing.

CHAPTER 4 – LEGAL AND POLICY FRAMEWORK

4.1 INTRODUCTION

This chapter reviews environmental and social legal and policy frameworks that apply to the CAISAR project. Since CAISAR implementation is financed by the AIIB, IFAD, GEF, and the Royal Government of Cambodia (RGC), policies and stardards that are relevant to CAIRSAR are reviewed and key policy objectives and requirements are reviewed. Where policy gaps are identified, measures are proposed to address such policy gaps – in a manner that are in harmony with the policy objectives of the AIIB, IFAD, GEF, and the Royal Government of Cambodia and for improved regulatory alignment.

4.2 RELEVANT LAW AND REGULATIONS OF THE ROYAL GOVERNMENT OF CAMBODIA

Following a framework for effective project development as well as environmental sustainability, MOWRAM shall observe the national legal framework and protocols ratified by the Kingdom of Cambodia. For CAISAR Project, the following laws, regulations and guidelines are relevant:

4.2.1 The Constitution of the Kingdom of Cambodia (1993)

The Constitution is the highest legal authority in Cambodia and establishes the fundamental rights and duties of citizens and the state. It sets the groundwork for environmental protection, governance, social inclusion, and public well-being, ensuring that environmental and social rights are integrated into national laws.

4.2.2 Legal Framework on the Management and Conservation of Natural Resources and Biodiversity

This framework aims to ensure sustainable use and conservation of Cambodia's natural resources, including water, land, biodiversity, and ecosystems. Laws under this framework help guide ESCIA processes to minimize environmental degradation.

- **Royal Decree on Protected Areas (2008)** sets the standard for managing Cambodia's protected areas. It categorizes these areas into **National Parks**, **Wildlife Sanctuaries**, **Protected Landscapes**, and **Multiple-Use Areas** to conserve biodiversity, ecosystems, and cultural heritage while supporting sustainable development.

- **Law on Environmental Protection and Natural Resource Management (1996)**: Establishes principles for sustainable development and environmental protection, requiring environmental assessments for projects impacting natural resources.
- **Environmental and Natural Resources Code 2023**: Provides a comprehensive approach to natural resource governance, setting standards for the sustainable management of resources.
- **Law on Land Management, Urban Planning and Construction (1994)**: Governs land use, urban development, and construction to ensure that environmental and social impacts are mitigated.
- **Law on Water Resource Management (2007)**: Regulates water usage, conservation, and management, ensuring that development projects do not negatively impact water resources.
- **Law on Fisheries (2006)**: Focuses on sustainable fisheries management and biodiversity conservation in aquatic ecosystems, crucial for ESCIA in projects affecting water bodies.
- **Protected Areas Law (2008)**: Establishes protected areas to conserve biodiversity and natural resources, ensuring that development projects respect these protected regions.
- **Land Law (2001)**: Regulates land ownership and management to promote sustainable land use practices.
- **Forest Law (1994):** Regulating the management, use, protection, and restoration of Cambodia's forests, this law is crucial for balancing economic development with environmental conservation, particularly in biodiversity-rich ecosystems.
- **Biodiversity Law (2009):** This foundational law provides a comprehensive legal structure for the sustainable management of biodiversity resources. It addresses habitat protection, species conservation, genetic resource management, and the sustainable use of biodiversity, outlining the government's responsibilities and promoting public participation.
- **Sub-Decree on Water Pollution Control (1999)**: Sets standards for water quality and pollution control in development projects.
- **Sub-Decree on Water Quality Standard for Public Waters for the Purpose of Biodiversity Conservation (1999):** These standards aim to maintain conditions suitable for aquatic ecosystems by limiting pollutants, ensuring water remains safe for the survival and reproduction of aquatic life, and preventing ecological degradation.
- **Sub-Decree on Environmental Impact Assessment (1999)**: Requires EIA for development projects, ensuring environmental impacts are assessed and mitigated.
- **Sub-Decree on Air Pollution Control and Sound Disturbance (2000)**: Provides standards to control air pollution and noise disturbances from development projects.

- **Sub-Decree on Solid Waste Management (1999)**: Governs solid waste management in projects, preventing environmental harm from improper waste disposal.
- **Prakas on Environmental Impact Assessment Reports (1999)**: Offers guidelines for preparing EIA reports to ensure thorough assessment of environmental impacts.
- **Prakas on Hazardous Substances (2015)**: Sets limits on the disposal of toxic substances, preventing environmental contamination from hazardous materials.
- **Biodiversity Convention (1994)**: Focuses on conserving ecosystems, species, and genetic diversity. Promotes sustainable use of resources, establishment of protected areas, and fair benefit-sharing from genetic resources.
- **Nagoya Protocol (2010):** As a party to the Nagoya Protocol under the Convention on Biological Diversity (CBD), Cambodia commits to the fair and equitable sharing of benefits arising from the utilization of genetic resources. This protocol supports Cambodia's efforts to protect its biodiversity while ensuring that the benefits of its genetic resources are shared with local communities and stakeholders.
- **Ramsar Convention (1999)**: Aims to conserve wetlands of international importance for biodiversity, water management, and climate resilience. Encourages sustainable use and designation of Ramsar sites.
- **UNFCCC (1994)**: Provides a framework to combat climate change impacts on ecosystems. Supports sustainable land use, forest conservation, and integration of climate adaptation into conservation strategies.
- **Kyoto Protocol (1997, entered into force 2005, Cambodia accessed 2002)**: Strengthens the UNFCCC by setting legally binding targets for reducing greenhouse gas emissions, promoting sustainable development and renewable energy.
- **Vienna Convention for the Protection of the Ozone Layer (1988, Cambodia accessed 2001)**: Aims to protect the ozone layer through global cooperation, encouraging research, monitoring, and measures to phase out harmful substances.
- **Montreal Protocol on Substances that Deplete the Ozone Layer (1987, entered into force 1989, Cambodia accessed 2001)**: A legally binding treaty to phase out ozone-depleting substances. Contributes to environmental and climate protection.
- **Basel Convention (1992, Cambodia accessed 2001)**: Controls the transboundary movement of hazardous wastes and their disposal, emphasizing waste reduction and environmentally sound management.
- **United Nations Convention to Combat Desertification (1996, Cambodia ratified 1997)**: Addresses land degradation and desertification through sustainable land management, conservation of soil and water resources, and restoration of degraded land.
- **CITES (1975, Cambodia ratified 1997)**: Regulates trade in endangered species to ensure their survival, focusing on sustainable management and combatting illegal wildlife trade.

- **UNESCO Network of Biosphere Reserves (Cambodia joined in 1997)**: Promotes the sustainable management of biodiversity, ecosystems, and cultural heritage through conservation and sustainable development practices.
- **Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs)**: Cambodia committed to global goals for environmental sustainability, including biodiversity conservation, climate action, and ecosystem protection.
- **ASEAN Agreement on Transboundary Haze Pollution (2006)**: Focuses on preventing and mitigating air pollution caused by forest fires through regional cooperation and sustainable forest management.
- **ASEAN Agreement on Disaster Management and Emergency Response (2009)**: Strengthens disaster preparedness, risk reduction, and environmental resilience in the ASEAN region.
- **Mekong Agreement (1995)**: Promotes sustainable development, equitable water use, and conservation of the Mekong River Basin's ecosystems and resources.

4.2.3 Legal Framework on Labour, Public Well-Being, and Safety

This framework emphasizes the protection of workers' rights, public safety, and well-being in project development. It ensures that development projects comply with labor laws and safety standards.

- **Labor Law (1997)**: Protects workers' rights, ensuring safe and fair working conditions during project implementation.
- **Law on Roads (2014)**: Governs the construction and maintenance of roads, with provisions for minimizing environmental and social impacts.
- **Law on Road Traffic (2014)**: Addresses traffic management and safety measures to prevent accidents and disruptions during development.
- **Law on Suppression of Human Trafficking and Sexual Exploitation (2008)**: Protects vulnerable populations during project implementation from exploitation and trafficking.
- Government Occupational and Community Safety and Health (OHS) guidelines follow the OHS Program for Cambodia (2010-2013) developed by the International Labor Organization (ILO). The draft guidelines provide the framework for instituting OHS at the workplace and in the community.
- The Ministry of Labor and Vocational Training (MLVT) has the following guidelines which will be implemented during the construction phase of the Project:
    - MLVT Prakas on Sanitation at the Construction Site (March 2011). The Prakas sets to ensure that the sanitation and safety conditions are fulfilled for workers at construction sites by owners, directors, contractors or subcontractors of construction establishments or construction companies. Articles 3 and 4 ensure that workers are provided with shelter, sanitation facilities and safe potable water for drinking and washing.

- MLVT Prakas on The Protection of Risk Resulting from Climate Change at Construction Sites (March 2011). Articles of this Prakas require safety measures and break times for workers at the construction site during extreme weather events.
- MLVT Prakas on Providing of Information at the Construction Site (March 2011). This Prakas states requirements for owners or responsible persons of a construction site to provide information, i.e. name and address of the owner of enterprise, construction establishment, Construction Company, name and address of architect, nature of construction, date for the start of the construction, estimated time to finish the construction works, and estimated number of workers to be employed for construction activities.
- MLVT Prakas on Stock of Materials, Waste Disposal and Clearance at Construction Site (March 2011). This Prakas provides safety guidelines and requirements for the safe storage of construction of materials and waste.

4.2.4 Legal Framework on Governance and Social Inclusion

This framework ensures that development projects promote inclusive governance, respect cultural heritage, and safeguard social rights. It includes provisions for tax obligations, land acquisition, resettlement, and social protection schemes.

- **Law on Taxation (1997)**: Governs the taxation of development projects, ensuring they contribute to national revenue and economic sustainability.
- **Sub-Decree on Construction Permit (1993)**: Requires permits for construction activities, ensuring they comply with environmental standards and social safeguards.
- **Law on Protection of the Rights of Persons with Disabilities (2009)**: Ensures that development projects consider the needs and rights of persons with disabilities.
- **Law on Social Security Schemes (2002)**: Provides social protection for workers, ensuring their well-being during project execution.
- **Sub-Decree on Health Care Scheme (2016)**: Extends social security and health care protection to workers involved in development projects.
- **Law on the Protection of Cultural Heritage (1996)**: Safeguards cultural heritage sites, ensuring that development projects do not damage or destroy culturally significant areas.
- **Expropriation Law (2010)**: Regulates land acquisition for public purposes, ensuring fair compensation and minimizing the impact on affected populations.
- **Sub-Decree on Land Acquisition and Resettlement (2018)**: Provides procedures for land acquisition and involuntary resettlement, particularly for externally financed projects.
- **Sub-Decree on Social Land Concession (2003)**: Allows for the allocation of state land to landless citizens, particularly when development projects displace communities.

- **Sub-Decree on State Land Management (2005)**: Regulates the management of state land, ensuring its sustainable use in development.
- **Sub-Decree on River Basin Management (2015)**: Promotes sustainable management of river basins, ensuring that development projects do not harm water systems and dependent ecosystems.

4.2.5 EIA Classification

In order to provide guidelines on effective implementation of sub-decree No 72 ANRK.BK on environmental impact assessment Procedures for development projects, MoE promulgated sub-decree No. 21 on Environmental Impact Assessment Classification for Development Projects.

According to this sub-decree, environmental impact assessment for projects is classified into three categories.

- Appendix 1: Projects requiring full environmental impact assessment (full ESIA)
- Appendix 2: Projects that require initial environmental impact assessment (IEIA)
- Appendix 3: Projects requiring the Contract on Environmental Protection (EPC)

The sub-decree includes an annex listing projects under various sectors and their categorization on the basis of their nature, type and size. The sector and EIA classification for irrigation project is summarized in Table 4.1 below.

Table 4.1: ESIA Classification for Development Projects relevant

No	Project Type	ESIA (Equiv. to ADB's A)	ESIA (Equiv. to ADB's B)	Env. Protection Contract	Apply to CAISAR Project
1	Irrigation systems		≥5000ha	1000-5000ha	√
2	Water diversion systems		≥5000ha	1000-5000ha	√
3	All building construction	>45000m2	15000 – 45000m2	3000-15000m2	
4	Road construction (new)	>100km	≥ 30 – 100km	10-<30km	√
5	Railroad and road expansion	>100km	≥50 – 100km	10-<50km	√
6	Road in protected areas	>30km	≥ 10-30 Km	10km	
7	Road widens or rehabilitation in protected area	>50km	≥ 10-50 km	10km	

Source: Prakas No. 021 PRK.BST dated 03 February 2020.

4.2.6 Applicable Ambient Quality Standards

4.2.6.1 Water quality standards for public health protection

Water quality standards in public water areas for biodiversity conservation are shown in Table 4.2 below. These are applied as the national standards on surface water quality.

Table 4.2: Water quality standards in public water areas for bio-diversity conservation

No	Parameter	Unit	Surface water Standard	
			River	Lake etc
1	pH	mg/l	6.5-8.5	6.5-8.5
2	Total suspended solids (TSS)	mg/l	25-100	1-15
3	Dissolved oxygen (DO)	mg/l	7.5-2.0	7.5-2.0
4	Biochemical oxygen demand (BOD5)	mg/l	1-10	<30
5	Chemical oxygen demand (COD)	mg/l	<50	1-8
6	Total Nitrate (TN)	mg/l	0.1-0.6	0.1-0.6
7	Total phosphorous (TP)	mg/l	0.005-0.05	0.005-0.05
8	Arsenic (As)	mg/l	<0.01	<0.01
9	Iron (Fe)	mg/l	<1	<1
10	Total Coliform	MPN/100ml	<5,000	<1,000

Note: Standard* = Surface water quality standards for lake, reservoirs and river of the MoE's Prakas on the adoption of terms of references for infrastructure and tourism sectors (2018).

The Royal Government of Cambodia has established a comprehensive policy on National Water Supply and Sanitation for both urban and rural water supplies. Based on this policy, and to ensure access to safe drinking water to all people, quality standards for both drinking water and groundwater are developed by an inter-ministerial process initiated by the Ministry of Industry, the Mines and Energy, and other concerned ministries with support from the World Health Organization (please see in table 4.3).

Table 4.3: Groundwater and Drinking Water Quality Standards.

No.	Parameters	Unit	Standard		
			River	Lake and reservoir	CDWQS*
1	Depth				
2	pH	-	6.5-8.5	6.5-8.5	6.5-8.8
3	Electrode Conductivity (EC)	mg/l	500-1500	500-1500	-
4	Arsenic (AS)	mg/l	<0.01	<0.01	0.05
5	Cadmium (Cd)	mg/l	<0.003	<0.003	<0.003
6	Lead (Pb)	mg/l	<0.01	<0.01	0.01
7	Total Nitrogen (TN)	mg/l	<3	<2	-
8	Total Phosphorus (TP)	mg/l	<0.25	<0.15	-
9	Total Dissolved Solid (TDS)	mg/l	<1000	<1000	<800
10	Total Suspended Solid (TSS)	mg/l	<100	<100	-
11	Dissolved Oxygen (DO)	mg/l	>3	>4	-
12	Total Coliform	MPN/100ml	<1000	<1000	0

*. Cambodia Drinking Water Quality Standard

Ambient Air Quality Standards are presented in Table 4.4. Maximum permitted noise levels in public and residential areas are shown in Table 4.5.

Table 4.4: Ambient Air Quality Standards.

Parameters	Cambodia				WHO Air Quality Guideline 2021
	Period 1h Average mg/m³	**Period 8h Average mg/m³**	**Period 24h Average mg/m³**	**Period 1year Average mg/m³**	
Carbon monoxide (CO)	40	20	-	-	4mg/m³ (24h Average)
Nitrogen dioxide (NO2)	0.3	-	0.1	-	10 ug/m³(1 year average) 25 ug/ m³ (24h average)
Sulfur dioxide (SO2)	0.5	-	0.3	0.1	40 ug/ m³ (24 h average)
Ozone (O3)	0.2	-	-	-	100 ug/ m³ (8h average)
Lead (Pb)	-	-	0.005	-	-
Particulates	-	-	0.33	0.1	5 ug/m³ (PM2.5, 1year) 15 ug/m³ (PM2.5, 24h average)

Note: 1. Sub-decree N0 42 ANRK.BK on Air Pollution Control and Noise Disturbance. Source: https://www.who.int/news-room/feature-stories/detail/what-are-the-who-air-quality-guidelines.

Table 4.5: Maximum permitted noise levels in public and residential areas (dB (A))

Location	Cambodia Standard			IFC-EHS Guideline	
	06:00 to 18:00	**18:00 to 22:00**	**22 to 6:00**	**Day 7:00 to 22:00**	**22:00 to 7:00**
Silence Area Hospital; Library, School, Nursery	45	40	35	55	45
Resident Area Hotel; Administration place, House	60	50	45	-	-
Commercial, Services Areas and mix	70	65	50	70	70
Small Industrial factories intermingling in residential areas	75	70	50		

Note: This is permitted noise level of any source of activity at the public and residential areas. Source: Sub-Decree on Air Pollution Control and Noise Disturbance, 2000.

4.3 AIIB'S ENVIRONMENTAL AND SOCIAL FRAMEWORK (ESF)

The Environmental and Social Framework (ESF) of the AIIB outlines the principles and standards to ensure environmentally and socially sustainable development practices for projects it finances. The framework consists of several Environmental and Social Standards (ESS) that provide comprehensive guidance on managing potential impacts and risks associated with AIIB-financed projects. The following AIIB's Environmental and Social Framework (ESF) apply to CAISAR.

- **Environmental and Social Standard 1: Environmental and Social Assessment and Management**: This ESS guides the assessment and management of environmental and social risks, requiring projects to evaluate alternatives, mitigate impacts, and disclose information. It emphasizes protecting the natural environment, particularly biodiversity and critical habitats, while addressing pollution, resource efficiency, and climate change. Social risks, including impacts on vulnerable groups, gender, and access to resources, must be considered. The standard also covers labor conditions, community health and safety, child labor, and security, ensuring proper grievance mechanisms, monitoring, and implementation plans.
- **Environmental and Social Standard 2: Land Acquisition and Involuntary Resettlement.** The ESS provides guidance to avoid Involuntary Resettlement where possible. The requirements under the standard contain 18 points of action to which the executing agency needs to follow.
- **Environmental and Social Standard 3: Indigenous Peoples.** The ESS aims to design and carry out projects in a way that fully respects Indigenous Peoples' identity, dignity, human rights, economies, and cultures. This ensures that Indigenous Peoples: (a) receive social and economic benefits that are culturally appropriate; (b) do not experience negative impacts from the projects; and (c) can actively participate in projects that affect them. The standard contains 15 points to follow.

4.4 IFADs' SECAP

The International Fund for Agricultural Development's (IFAD) Social, Environmental, and Climate Assessment Procedures (SECAP) provide a framework to ensure that IFAD-financed projects are sustainable, socially inclusive, and environmentally sound. The following Standards apply to CAISAR:

- **Standard 1: Biodiversity Conservation**: This standard ensures the protection of biodiversity by requiring projects to assess and mitigate biodiversity risks, avoid critical habitats, and provide compensation for unavoidable damages. It promotes sustainable use of genetic resources, discourages invasive species, and emphasizes expert advice and adherence to protected area laws.
- **Standard 2: Resource Efficiency and Pollution Prevention**: Focuses on efficient use of resources and pollution control. It requires projects to reduce energy, water, and material use, manage hazardous materials safely, and prevent

pollution, with an emphasis on sustainable natural resource management, including water, soil, fisheries, and forests.

- **Standard 3: Cultural Heritage**: This standard ensures the protection of tangible and intangible cultural heritage by screening and managing impacts, consulting local communities, and preserving access to cultural sites. Projects must avoid, minimize, or mitigate damage and follow legal requirements in protected areas.
- **Standard 4: Indigenous Peoples**: Supports and empowers indigenous communities by requiring free, prior, and informed consent (FPIC), promoting equitable resource access, and protecting cultural heritage. Projects must involve indigenous peoples in decision-making, ensure fair benefits, and avoid involuntary resettlement.
- **Standard 5: Labor and Working Conditions**: Sets requirements for safe, non-discriminatory workplaces, prohibiting forced and child labor. It requires the establishment of grievance mechanisms, safety protocols, and equal opportunities, with contractors and suppliers adhering to these standards.
- **Standard 6: Community Health and Safety**: Requires projects to assess and manage health risks, prevent exposure to hazards, and ensure infrastructure safety. It includes emergency preparedness, traffic and security management, and protection against gender-based violence.
- **Standard 7: Physical and Economic Resettlement**: Ensures resettlement is conducted legally and fairly, avoiding forced evictions. It requires special consideration for vulnerable groups, economic displacement, and establishing grievance mechanisms for affected communities.
- **Standard 9: Climate Change**: Ensures projects address climate risks and reduce GHG emissions. It mandates climate risk screening, adoption of climate-smart practices, and GHG accounting to guide project design towards reducing environmental impacts.

4.5 GEF'S ENVIRONMENTAL AND SOCIAL SAFEGUARDS POLICIES

GEF adopts the interim environmental and social safeguards to identify, measure, and mitigate environmental and social risks based on IFC Performance Standards (PS). Under CAISAR, the following PSs are applied:

- Performance Standard 1 – Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2 – Labor and Working Conditions
- Performance Standard 3 – Resource Efficiency and Pollution Prevention
- Performance Standard 4 – Community Health, Safety, and Security
- Performance Standard 5 – Land Acquisition and Involuntary Resettlement

- Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7 – Indigenous Peoples
- Performance Standard 8 – Cultural Heritage

4.5.1 International Conventions and Treaties

Cambodia has ratified all eight (8) of the International Labor Organisation (ILO)'s conventions which cover core labour standards recognized as human rights. These conventions focus on issues such as freedom of association, elimination of forced labour, abolition of child labour, and elimination of discrimination in employment.

- **Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)**: Ratified by Cambodia in 1999, this convention protects workers' and employers' rights to freely form and join organizations without interference, ensuring autonomy and safeguarding against dissolution by authorities.
- **Right to Organise and Collective Bargaining Convention, 1949 (No. 98)**: Ratified in 1999, it protects workers' rights to organize, engage in collective bargaining, and prevents discrimination for union activities, promoting fair wage negotiations and just working conditions.
- **Forced Labour Convention, 1930 (No. 29)**: Ratified in 1969, this convention aims to eliminate all forms of forced labour, including coercive work for public works or political purposes, protecting workers' rights and dignity.
- **Abolition of Forced Labour Convention, 1957 (No. 105)**: Ratified in 1999, it strengthens the prohibition of forced labour for political coercion, discipline, or discrimination, ensuring freedom and justice in the workplace.
- **Minimum Age Convention, 1973 (No. 138)**: Ratified in 1999, it sets a minimum age for employment (usually 15) to prevent child labour, promoting access to education and protection from hazardous work.
- **Worst Forms of Child Labour Convention, 1999 (No. 182)**: Ratified in 2006, this convention seeks to eliminate extreme forms of child labour like slavery, trafficking, and hazardous work, prioritizing children's safety and rehabilitation.
- **Equal Remuneration Convention, 1951 (No. 100)**: Ratified in 1999, it promotes equal pay for men and women for work of equal value, combating gender-based wage discrimination and fostering economic justice.
- **Discrimination (Employment and Occupation) Convention, 1958 (No. 111)**: Ratified in 1999, this convention addresses workplace discrimination based on race, gender, religion, and other factors, promoting equal treatment and opportunities for all workers.
- **Employment Policy Convention, 1964 (No. 122)**: Ratified in 1971, it requires active employment policies to promote full, freely chosen employment, aiming to reduce unemployment and support economic and social development.

- **Weekly Rest (Industry) Convention, 1921 (No. 14)**: Ratified in 1969, this convention guarantees a weekly rest period of at least 24 consecutive hours for workers, helping protect their health and well-being.
- **Labour Inspection Convention, 1947 (No. 81)**: Ratified by Cambodia in 1974, this convention establishes labour inspections in industrial and commercial workplaces to ensure compliance with national labour laws, promoting safe, fair, and decent working conditions.
- **Labour Inspection (Agriculture) Convention, 1969 (No. 129)**: Ratified in 1999, it extends labour inspection to agriculture, ensuring workers in this sector, including migrant and seasonal labourers, are protected by labour laws and safe working conditions are maintained.
- **Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)**: Ratified by Cambodia in 2009, this convention promotes consultation between governments, employers, and workers on international labour standards. It ensures that all stakeholders are involved in the implementation of labour policies, enhancing social dialogue and cooperation for fair labour practices.

4.6 Good International Industry Practices (GIIP)

4.6.1 WBG General EHS Guidelines (2007)

The World Bank Group (WBG) General Environmental, Health, and Safety (EHS) Guidelines (2007) provide internationally recognized technical guidance on managing environmental, health, and safety risks. These guidelines are designed to support project developers and operators, particularly in emerging markets, by outlining best practices for environmental sustainability, worker health and safety, and community well-being.

Key sections include:

- **Environmental Guidelines:** Focus on pollution prevention and control, resource efficiency, and managing air, water, and soil impacts.
- **Occupational Health and Safety (OHS):** Address workplace hazards, accident prevention, and worker welfare.
- **Community Health and Safety:** Cover topics like traffic safety, emergency preparedness, and protecting communities from project-related risks.
- **Construction and Decommissioning:** Provide guidance on managing risks during the life cycle of a project.

The guidelines emphasize compliance with local regulations and international standards and are intended to be applied alongside sector-specific EHS guidelines.

4.6.2 WBG EHS Guidelines for Annual Crop Production (2016)

The World Bank Group (WBG) Environmental, Health, and Safety (EHS) Guidelines for Annual Crop Production (2016) provide technical guidance on sustainable practices for cultivating

annual crops, such as grains, legumes, and vegetables. These guidelines aim to minimize environmental impacts, ensure worker safety, and promote efficient resource use.

Key focus areas include:

- **Environmental Management:** Guidance on soil conservation, water use efficiency, pest management, and biodiversity preservation.
- **Occupational Health and Safety (OHS):** Measures to prevent injuries, promote safe pesticide handling, and protect workers from physical and chemical hazards.
- **Community Health and Safety:** Recommendations to prevent risks like pesticide drift, water contamination, and traffic safety concerns related to agricultural operations.
- **Sustainable Practices:** Emphasis on integrated pest management (IPM), crop rotation, and efficient irrigation techniques to maintain productivity and environmental health.

These guidelines align with international standards and are designed to support sustainable agricultural development.

4.7 GAP ANALYSIS OF NATIONAL LEGAL FRAMEWORK AND POLICIES OF AIIB, IFAD AND GCF

The study and analysis of the national legal framework against the requirements under the policies of AIIB, IFAD and GCF can be summarised as Table 4.6 below:

Table 4.6: Summary of the RGC's legal framework corresponding to the policies of AIIB, IFAD and GCF

No.	Standards/ Policies of AIIB and IFAD			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	**IFAD**	**GCF**				
1	ESS1		PS1	Environmental and Social Assessment and Management	• Environmental and Natural Resources Code (2023), • Law on Water Resource Management (2007), • Law on fisheries (2026), • Sub-Decree on Water Pollution Control (1999), • Sub-Decree on Environmental Impact Assessment (1999), • Sub-Decree on Air Pollution Control and Sound Disturbance (2000), • Sub-Decree on Solid Waste Management (1999), • Prakas on the General Guideline for Preparing the Initial and Full Environmental Impact Assessment Reports (1999), • Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed (2015)	The RGC has established a wide range of regulations especially in the recent Environmental and Natural Resources Code (2023) that aim to environmental protection and natural resource management are well aligned to the provisions of the AIIB ESS1.	This ESCIA covers both direct, indirect, and cumulative impacts and mitigation measures, taking a holistic approach to the project and looking at impacts in an integrated way.
2	ESS2	S7	PS5	Land Acquisition and Involuntary Resettlement	• Law on Land Management, Urban Planning and Construction (1994), • Land Law (2001), • The Expropriation Law (2010), • RGC's Sub-Decree No. 22 ANK/BK (2018) on the Promulgation of the Standard Operating Procedures for Land Acquisition and Involuntary Resettlement (SOP-LAR) for Externally Financed Projects in Cambodia, • Sub-Decree No.19 on Social Land Concession of March 2003,	The RGC has the SOP-LAR which is well aligned with the provisions in the AIIB ESS 2. The AIIB ESS 2 on land acquisition and involuntary resettlement recognizes that project related land acquisition and land use can have impacts on communities. The RGC's SOP-LAR is consistent with the specific requirements under the AIIB ESS 2 on consultation, grievance redress, social support, resettlement assistance, standard of living	According the RGC's SOP-LAR, an income restoration program would be provided in order to re-establish sources of livelihoods for those affected households who have permanently lost their sources of livelihood. In this CAISAR project, the DRPs will include provisions to ensure livelihood

No.	Standards/ Policies of AIIB and IFAD			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	**IFAD**	**GCF**				
					• RGC's Sub-Decree No.118 ANK/BK (2005) on State Land Management, • RGC's Sub-Decree No.98 ANK/BK (2015) on River Basin Management	of poor and vulnerable, entitlements for persons without title or legal rights except for land, information disclosure, payment of compensation and entitlements prior to physical displacement, and the supervision and monitoring of implementation of resettlement plans. However, there are gaps on negotiated settlement and livelihood restoration. The SOP-LAR does not describe procedures for negotiated settlement and lack of clear benchmark to assist monitoring and evaluation to confirm if the affected households restore their livelihood to the level prevailing prior to the beginning of the project implementation.	restoration program are robust and can accurately meet the aim of livelihood restoration in line the AIIB ESS2.
3	ESS3	S4	PS7	Indigenous Peoples	• The Constitution of Cambodia (1993) • Land Law (2001)	No detailed regulations on how to avoid impacts to Indigenous Peoples or how to include them in project benefits. Lack of requirement to consult IP(s) in a manner that is culturally appropriate and special disclosure and consultation requirements as described in the AIIB ESS3.	An IPPF has been prepared on the basis of the AIIB ESS3. The IPPF details procedures on the preparation of IPP(s) and how to conduct meaningful consultation and disclose that is culturally appropriate.
4	ESS1	S1	PS6	Biodiversity conservation	• Environmental and Natural Resources Code (2023),	The code requires a proper consideration of biodiversity resources and payment of ecosystem services which support the conservation process. There is limited	This ESCIA include the biodiversity assessment and management plan.

No.	Standards/ Policies of AIIB and IFAD			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
						guidance on how to compensate in the ecosystem services once its pristine condition is affected.	
5	ESS1	S2	PS3	Resource efficiency and pollution prevention	• Environmental and Natural Resources Code (2023), • Sub-Decree on Environmental Impact Assessment (1999), • Sub-Decree on Air Pollution Control and Sound Disturbance (2000), • Sub-Decree on Solid Waste Management (1999), • Prakas on the General Guideline for Preparing the Initial and Full Environmental Impact Assessment Reports (1999), • Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed (2015)	The RGC has in place a set of separate provision and requirements for pollution prevention and management that are well align with the AIIB ESS 1 that aims to promote the sustainable use of resources and avoid or minimize the pollution from sources/project activities.	This ESCIA has included all relevant national laws and regulation as well as the requirement for AIIB ESS1.
6	ESS1	S3	PS8	Cultural heritage	• Environmental and Natural Resources Code (2023), • Law on the Protection of Cultural Heritage (1996)	The RGC has in place the law on protection of cultural heritage aligns with the requirement of the AIIB ESS1. However, there is lack of detail procedures for protection of the intangible cultural heritage.	This ESCIA provided details procedures and requirement to protect both tangible and intangible cultural heritage through Chance Find Procedure (Annex 6).
7	ESS1	S5	PS2	Labor and working conditions	• Labor Law (1997), • Law on Taxation (1997), • Sub-Decree on Construction Permit (1993), • Law on Social Security Schemes for Persons defined by the Provision of the Labor Law (2002),	The RGC has in place a set of law and regulations on labour and working conditions which is consistent with the requirement of the AIIB ESS1. However, the enforcement of these law and regulation is still limited. For example,	The ESCIA provides provisions to monitor compliance by contractor and of their primary suppliers in bidding documents and supervision contracts in order

No.	Standards/ Policies of AIIB and IFAD			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	**IFAD**	**GCF**				
					• Sub-Decree on Establishment of Social Security Scheme "Health Care Scheme" for Persons Defined by the Provisions of the Labor Law (2016)	regulation against forced labor and using child labor are not strictly enforced.	to prohibit using forced labour and child labour.
8	ESS1	S6	PS4	Community health and safety	• Law on Road Traffic (2014), • The Law on Suppression of Human Trafficking and Sexual Exploitation 2008, • Law on the Protection and the Promotion of the Rights of Persons with Disabilities 2009,	The RGC has established Labor Law the protect the health and safety of the workers. However, the concern and mitigation are more on individual rather than community as a whole. The AIIB ESS1 aims on protection of both individual and community for health and safety.	The ESCIA provides provisions to monitor compliance by contractor on community and health safety in bidding documents and supervision contracts. The requirement on raising awareness to local community on health and safety are also included in the bidding documents.
9	ESS1	S9	PS1	Climate change	• Environmental Code and Natural Resource Management 2023	The newly adopted code requires all relevant sectors to integrate climate resilient concepts into their strategic action plan along with different measures to tackle the issues. No gap being identified.	

- Note: AIIB = Asian Infrastructure Investment Bank, IFAD = International Fund for Agricultural Development, GCF = Green Climate Fund, ESS = Environment and Social Standard, S = Standard, PS = Performance Standards, RGC = Royal Government of Cambodia, SOP-LAR =: Promulgation of the Standard Operating Procedures for Land Acquisition and Involuntary Resettlement, IPPF = Indigenous People Planning Framework, IP = Indigenous Peoples, IPP = Indigenous Peoples Plans, ESCIA = Environmental, Social, and Climate Impact Assessment, DRPs = Detailed Resettlement Plans.

Overall, the Royal Government of Cambodia (RGC) has established various legal documents ranging from royal decrees, sub-decrees, and circulars framing the management, and implementation of all types of development projects and activities within the country at the pre-construction, construction and implementation periods. The laws cover the management and protection of the natural resources, and biodiversity including underground, inland and water bodies. These legal frameworks also contain the standards that are applicable to the country context including water quality, soil quality, air, noise quality and vibration. Regarding human well-being including health, safety, labour and sexual exploitation, the country has made significant progress over the past years promoting the working environment of workers and labour forces embracing various laws and policies for ensuring the well-being of workers as well as the compliances that employers must comply. Laws to protect sexual exploitation, and social protection guarded the public, especially the vulnerable including the poor, and people with disability. Although the country's legal frameworks cover the requirements, there are still limited report in terms of actual enforcement which need to be taken care where a proper implementation plan and resources are needed.

CHAPTER 5 – PROJECT AREA OF INFLUENCE

5.1 INTRODUCTION

This chapter outlines the areas of influence where the project may have potential impacts. It examines the geographical regions, ecosystems, and communities likely to be affected, addressing both environmental and socio-economic considerations. The analysis aims to inform mitigation strategies and ensure project activities align with sustainability while minimizing adverse effects.

Under CAISAR project, term "Areas of Influence" (AoI) comprise, as appropriate, areas that are likely to be affected by the project activities, accumulating with the other projects as well as the associated facilitates of the project.

5.2 DETERMINING PROJECT AREAS OF INFLUENCE

Under CAISAR, since project design is still ongoing, area of influence (of each of the six (6) sub-schemes) is anticipated based on: a) target command area of each scheme (where most proposed project activities will take place during project construction, and later during project operation), and b) the environmental footprint that are likely caused by project activities during project construction (as direct and indirect impacts due to activities under Component 2), and by project activities (mainly cumulative impacts due to intenstified crop production activities under component 1).

These above anticipated areas of influence need to be updated when more information becomes available to allow a more reliable assessment, particularly when project detailed design is completed, and construction measures proposed by construction constractors are identified. Future update on area of influence (at respective sub-scheme) will be made on the basis of updated environmental and social assessments once a) locations of construction sites, auxiliary facilities (such as borrow pits), and logistics operations are confirmed, and b) the full scope of the project's impacts (direct, indirect, and cumulative) is firmed up based on detailed engineering design (for Component 2) and project implementation approach (for Component 1).

It is noted that while direct and indirect impacts could be reasonably anticipated based on currently proposed scope of works and prior experience for similar works, cumulative impacts, particularly their spatial extent and severity (over the time) require collection of supporting scientific evidence from data collected under project's environmental and social monitoring program (See also Chapter 9 - Environmental & Social Management).

5.3 DESCRIPTION OF KEY COMPONENTS THAT POTENTIALLY CAUSE THE INFLUENCIAL IMPACT

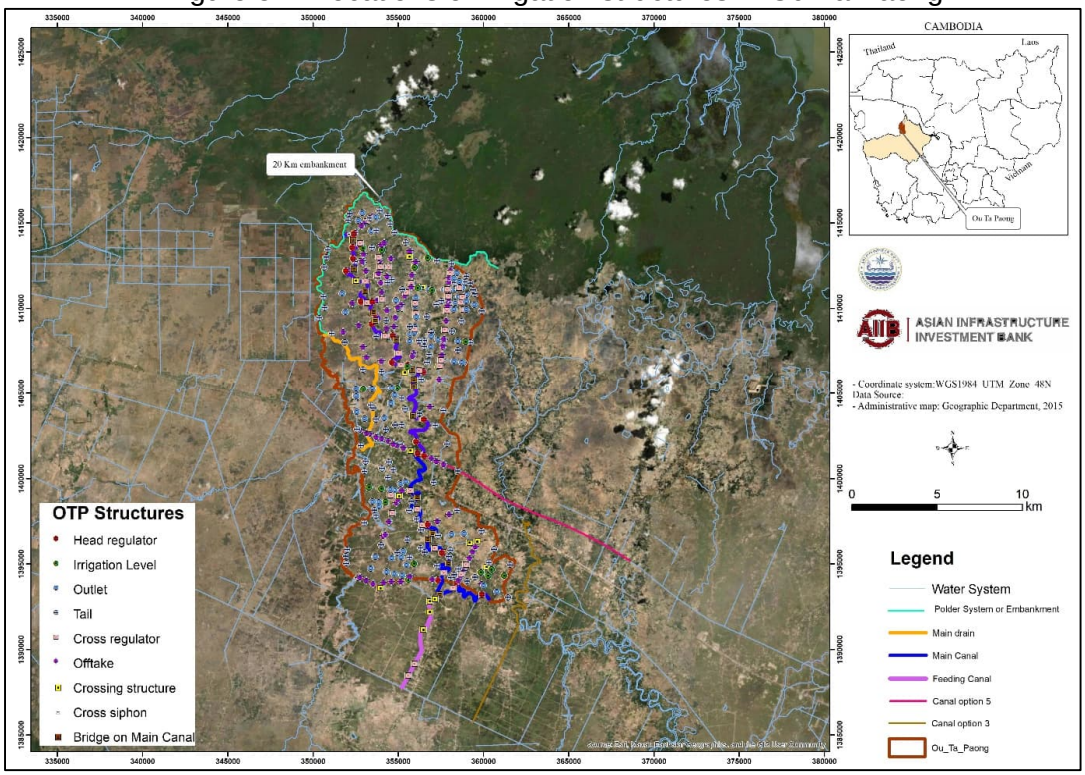
5.3.1 Air, Noise and Vibration

The area of influence for air quality, noise, and vibration during the construction and rehabilitation of irrigation systems extends beyond the construction site, affecting nearby communities and the environment. Dust, emissions from machinery, and material handling can temporarily increase particulate matter and pollutants in the air. Noise from heavy equipment may disturb residents and wildlife, while vibrations from activities like dredging and excavation can affect nearby structures, potentially causing discomfort or minor damage. These impacts, though short-term, typically extend up to 100 meters from the site, with heavier activities affecting a larger area. Post-construction, greenhouse gas emissions from farming activities could have minimal long-term impacts at a global scale. Each of the sub-scheme the area of influence include:

- Surrounding the sites of the rehabilitated/dredged rivers/stream
- Surrounding the rehabilitated main and tertiary canals, and
- Surrounding the rehabilitated/upgraded structure
- Along the road used for transporting materials by the construction activities

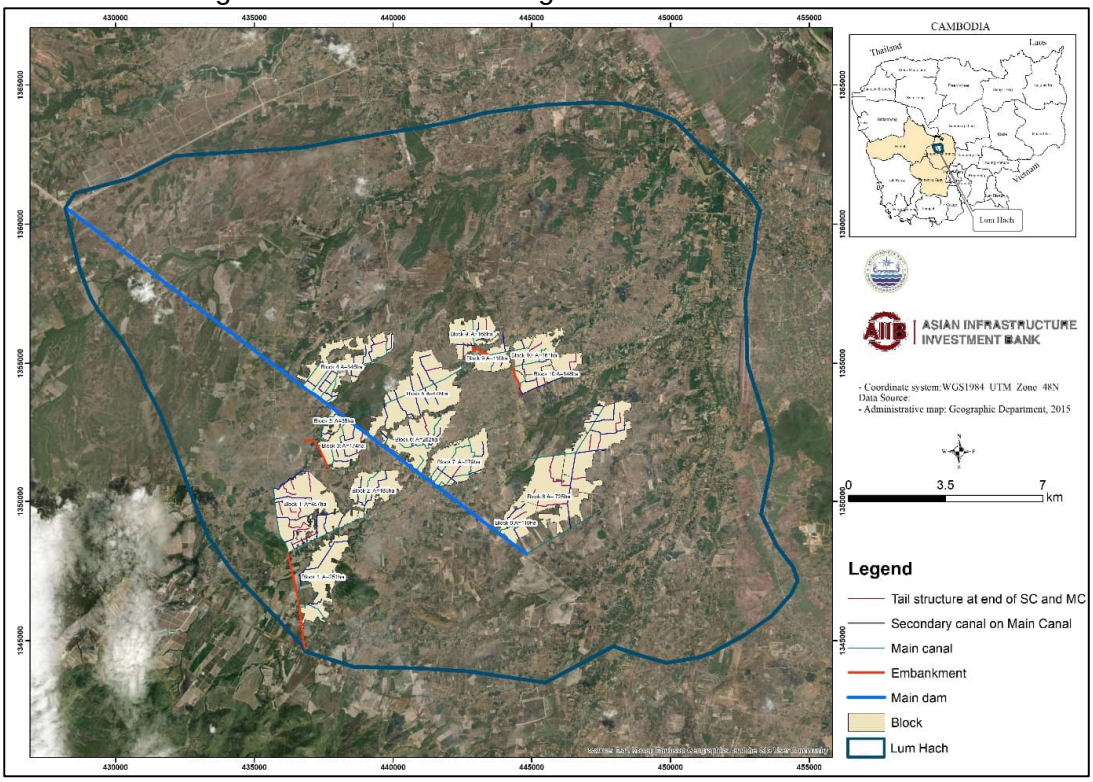
These effects occur only during the construction period while the emission of greenhouse gas emission from farming activities. The following are maps indicating the area of influence at each sub-scheme.

Figure 5.1: Locations of irrigation structures in Ou Ta Paong



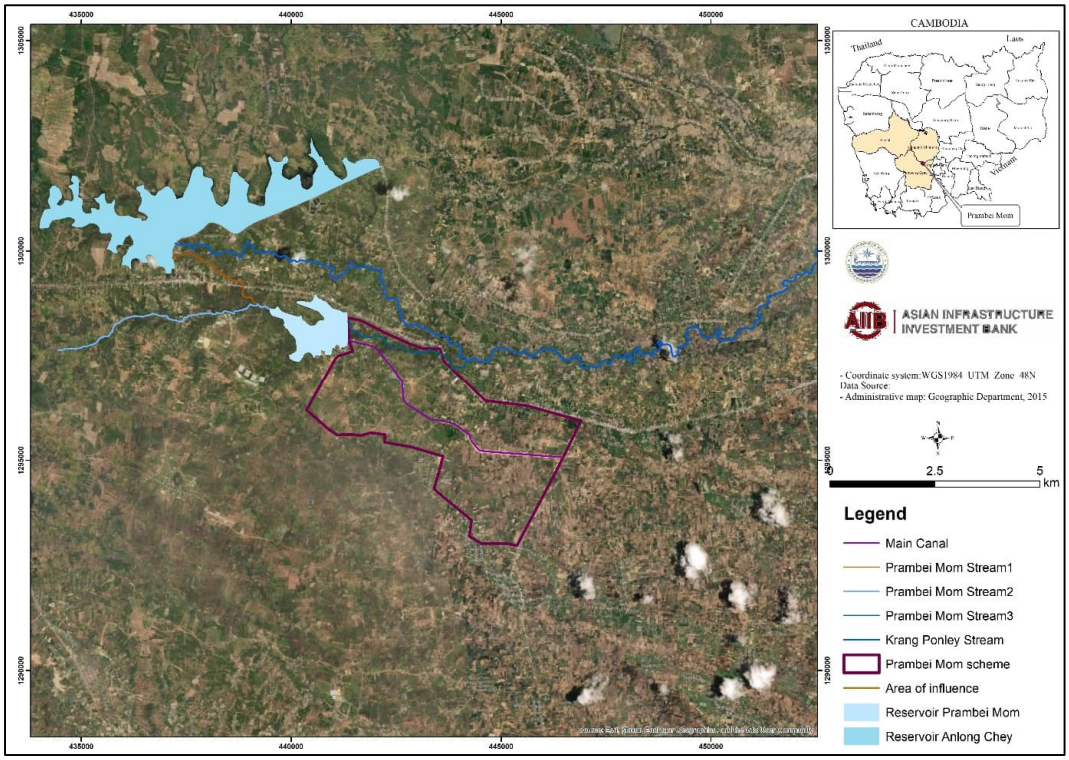
(Source: CAISAR Project, 2024)

Figure 5.2: Locations of irrigation structures in Lum Hach



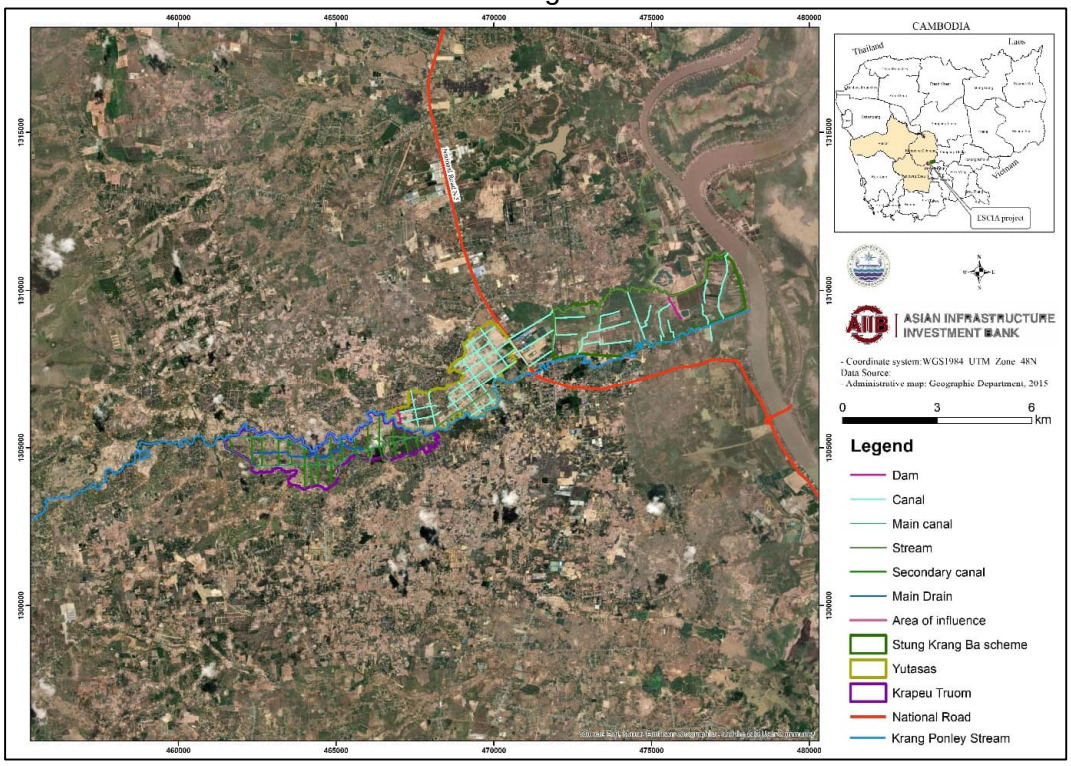
(Source: CAISAR Project, 2024)

Figure 5.3: Locations of irrigation structures in Prambei Mom



(Source: CAISAR Project, 2024)

Figure 5.4: Locations of irrigation structures in Kropeau Truom, Yutasas, and Stoeng Krang Bat



(Source: CAISAR Project, 2024)

5.3.2 Water Quality

The construction and operation of irrigation systems can significantly impact water quality, both in terms of surface water and groundwater.

Construction Phase:

- **Surface Water:** During the construction phase, sedimentation due to excavation, dredging, and earthworks is a primary cause of water quality degradation. Loose soil can be washed into nearby water bodies, increasing turbidity, reducing light penetration, and altering the aquatic habitat. Additionally, the use of machinery and equipment introduces risks of oil spills, fuel leaks, and chemical contamination, which can enter water sources through surface runoff, affecting aquatic life and water usability downstream.
- **Groundwater:** Construction activities, such as drilling and excavation, can disrupt the soil and rock layers, potentially allowing contaminants from surface activities, such as chemicals, to infiltrate groundwater. Chemical spills or leaching from construction materials can further degrade groundwater quality. Additionally, the disruption of natural flow patterns in the subsurface may allow pollutants to spread more easily, threatening water quality over a wide area.

Operation Phase:

- **Surface Water:** Once the irrigation system is in operation, water quality can be affected by the increased use of fertilizers and pesticides in the command areas. Runoff from agricultural fields may carry these chemicals into nearby rivers, streams, and lakes, causing nutrient pollution, algal blooms, and eutrophication, which can lead to oxygen depletion and harm aquatic ecosystems. Over-irrigation can also lead to increased runoff, carrying sediments and pollutants into surface water bodies.
- **Groundwater:** The operation of irrigation systems may result in groundwater contamination, particularly through leaching of agricultural chemicals such as nitrates and phosphates. Excessive irrigation can cause these chemicals to infiltrate the soil and reach groundwater aquifers, leading to long-term contamination. Furthermore, changes in water table levels due to extensive irrigation can alter the flow patterns of groundwater, potentially mobilizing contaminants that would otherwise remain contained.

In both phases, the key impacts on water quality include contamination of water resources with sediments, nutrients, chemicals, and reduced ecosystem health in the affected water bodies. These impacts can lead to long-term environmental damage and human health effects downstream along Ou Ta Paong River, Svay Don Keo River, the Tonle Sap Lake, Boribour River, Stung Krang Ponley and The Tonle Sap Lake due the reduction of the availability of clean water for agricultural, and domestic uses.

5.3.3 Soil Quality

The area of influence for soil quality during the construction and operation of irrigation systems extends well beyond the immediate project site, affecting surrounding agricultural land, natural habitats, and downstream regions impacted by runoff and water movement. In both phases, the area of influence extends beyond the construction site, impacting nearby agricultural land, natural habitats, and drainage systems. Proper management is essential to minimize long-term soil degradation across the broader irrigation zone.

Construction Phase:

- **Soil Erosion:** The area of influence for soil erosion encompasses not just the construction site but also adjacent areas, as excavation, grading, and vegetation removal expose large sections of land to wind and water erosion. This can lead to topsoil loss, affecting soil fertility on-site and causing sedimentation in nearby fields and water bodies.
- **Soil Compaction:** The influence of soil compaction extends several meters beyond the worksites, particularly where heavy machinery is used for construction or access. Compacted soil reduces water infiltration and root penetration, impacting surrounding agricultural land and natural ecosystems.
- **Soil Contamination:** While soil contamination from fuel spills and construction debris is often localized, it can spread through surface runoff during rainfall or irrigation, affecting nearby fields and watercourses, potentially degrading soil quality in those areas.

Operation Phase:

- **Salinization:** The area of influence for soil salinization covers the entire irrigated zone. Poor drainage and excessive irrigation can lead to salt buildup, particularly in low-lying areas, reducing soil productivity across large sections of the command area.
- **Nutrient Imbalance:** Nutrient leaching or accumulation affects the entire irrigated region and nearby fields. Over-irrigation can cause essential nutrients to wash away, while poor management of fertilizers can lead to nutrient buildup, creating imbalances that degrade soil quality.
- **Waterlogging:** The impact of waterlogging is concentrated in the irrigated fields but can extend to neighboring areas due to the movement of water through the soil layers. Prolonged waterlogging reduces soil aeration and affects soil structure, ultimately diminishing productivity.

At Ou Ta Paong sub-scheme, the area of influence will include the areas along the feeder canals which will extend beyond the command area. This includes the construction activities as described earlier and the acquisition of land and resettlement along the feeder canals.

5.3.4 Biodiversity

The environmental impact of the project on biodiversity extends across a larger landscape, as it influences the movement of wildlife, including birds, mammals, reptiles, and fish. The project's area of influence, determined through biodiversity assessments, encompasses regions identified as key habitats for these species, where they actively move and interact with their environment. Each sub-scheme of the project impacts these areas, reflecting the interconnectedness of ecosystems and wildlife movement patterns.

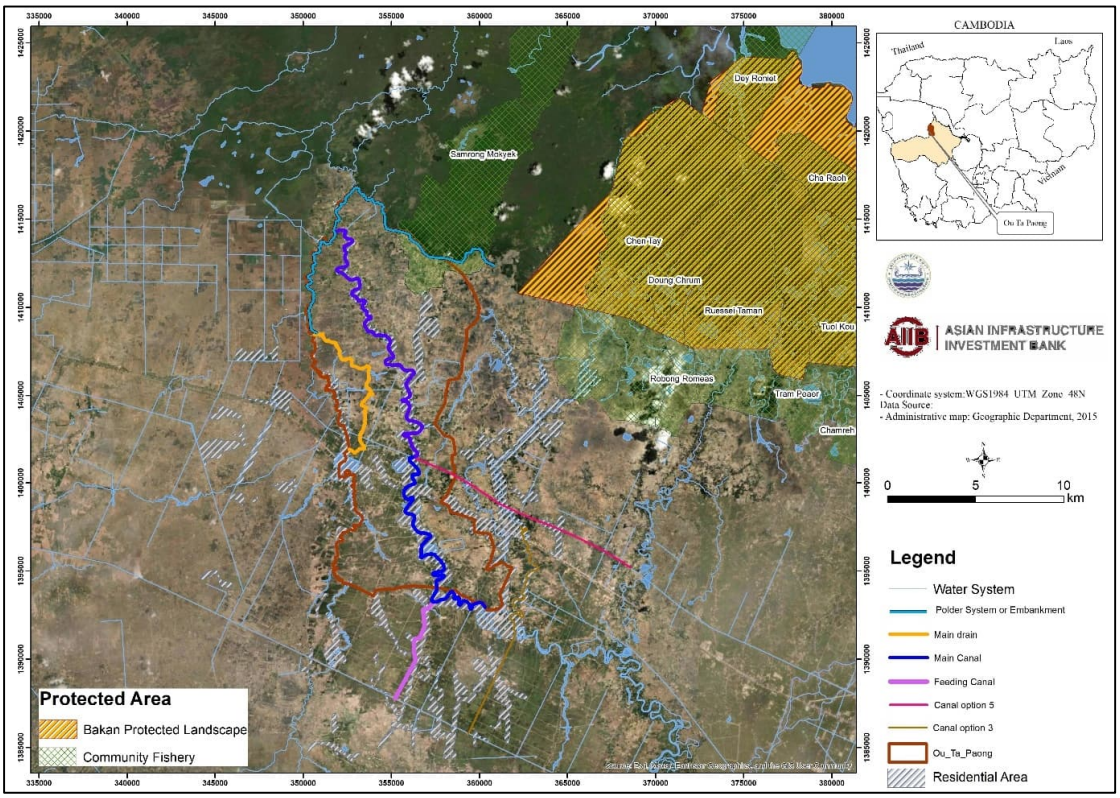
- **Ou Ta Paong**

The Ou Tapaong Irrigation Sub-scheme’s estimated area of influence encompasses a) the entire command area (some 14,000 hectare, including the upper, middle, and lower parts),

and b) any other areas outside the command area that project activities leave environmental footprint during project implementation, and sub-scheme operations. While the first is clear in terms of the boundary, the latter needs additional information based on the final project engineering design, and environment monitoring data to establish the additional area of influence that is outside of the command area (due to project's environmental footprint).

It is noted within the command area, there is a lake called Boeng Kanseang or Kanseang Lake which is home to fishes and birds. There are four (4) area located downstream the sub-scheme. The preliminary assessment focuses on the two (2) that are closest to the Ou Ta Paong: Flood Forest Conservation, b) Bakan Grassland protected area[7].

Figure 5.5: Map of Residential Area and protected areas in Ou Ta Paong

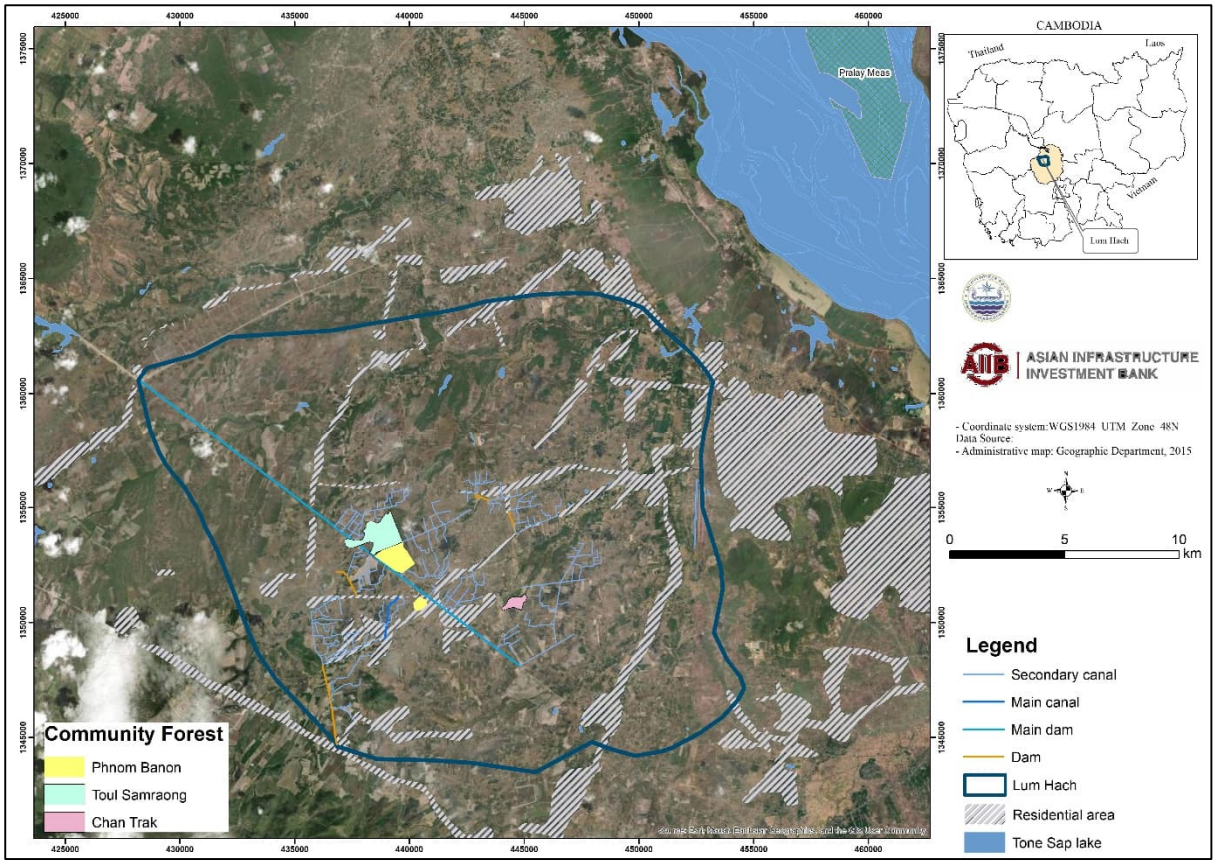


(Source: ESCIA Study, 2024)

- **Lum Hach**

The Lum Hach Irrigation Sub-scheme has a limited area of influence due to its small size and the surrounding farmland. The initial identified critical habitats within the area include Toul Samraong, Phnom Banon, and Chan Trak Community Forests. These areas are characterized by small, fragmented, and degraded dry deciduous forests (DDFs). However, these forests are crucial for the conservation of Green Peafowl, which have been confirmed to be present in these areas. The protection and restoration of these community forests should be a priority in the biodiversity action plan.

Figure 5.6: Map of Construction Sites and Residential Area in Lum Hach



(Source: ESCIA Study, 2024)

- **Stung Krang Ponley**

Brambei Mom. The Brambei Mom Irrigation Innovation sub-scheme has an extensive area of influence that includes adjacent communities and ecosystems dependent on its water resources. The areas directly affected by the project's activities include agricultural lands within a certain radius from irrigation canals or reservoirs.

Krapeu Truom. Potential areas of influence might include:

- **Downstream areas:** The lower reaches of the Stoeung Krang Ponley River and the Tonle Sap Lake, which may be affected by water quality, sediment loads, and fish migration from Krapeu Trom.
- **Upstream areas:** The upper reaches of the Stoeung Krang Ponley River and its tributaries, which may be influenced by water flow regulation and sediment transport from Krapeu Trom.
- **Adjacent ecosystems:** Forests, wetlands, and agricultural areas that are connected to Krapeu Trom through hydrological or ecological processes.

Yutasas. The area of influence for the Yatasas irrigation renovation scheme encompasses the direct and indirect impacts of the project. This includes:

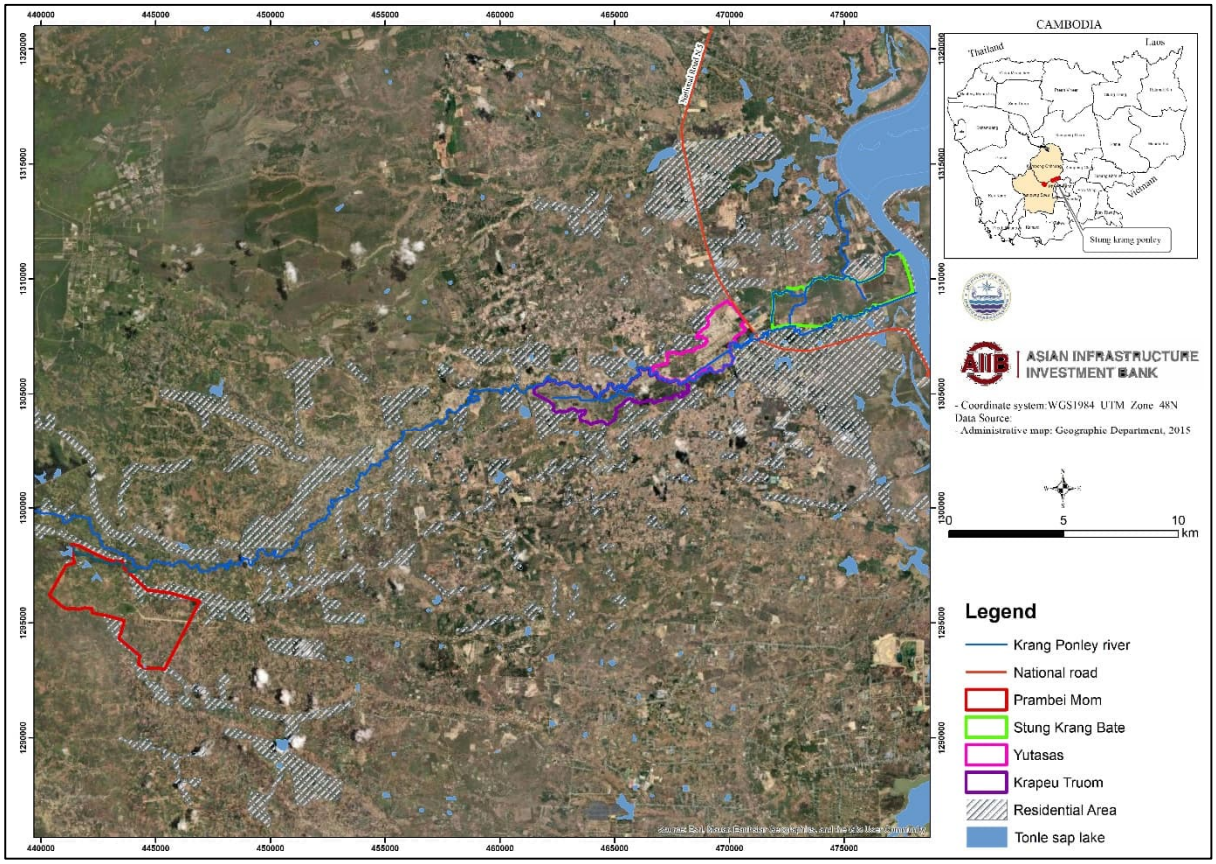
- **Direct Impacts:** The immediate area where the irrigation infrastructure will be constructed and operated, including canals, pumping stations, and reservoirs.
- **Indirect Impacts:** The surrounding areas that may be affected by changes in water flow, land use, or other project-related activities. This includes the Stueng Krang

Ponlai River, the Tonle River, and the habitats of endangered species within the Yotasas command area.

Stung Krang Bat. The area of influence for the Stueng Krang Bat irrigation sub-scheme encompasses both modified and natural habitats within its command area. It extends along the Tonle Sap River, encompassing floodplains, wetlands, and associated ecosystems. The project activities have the potential to directly or indirectly impact biodiversity within this region.

The area of influence for the Stueng Krang Bat irrigation sub-scheme includes both direct and indirect impacts. Direct impacts may occur within the project area itself, such as construction sites and irrigation canals. Indirect impacts may extend to surrounding areas, including the Tonle Sap River, wetlands, and adjacent ecosystems.

Figure 5.7: Map of Construction Sites and Residential Area in Stung Krang Ponley



(Source: ESCIA Study, 2024)

5.2.2.3.1 Extent of Social Impacts

The Project's Area of Influence for social aspects extends beyond the immediate project site to include the broader region where the project's effects will be felt throughout its implementation phases. This area encompasses not only the physical location of the project but also regions affected by environmental, physical, and biological changes resulting from project activities. Social interactions in this area of influence may involve communities and stakeholders impacted by changes in land use, water availability, employment opportunities, and local infrastructure development. These interactions might include shifts in livelihoods, migration patterns, or community dynamics because of project-related opportunities and disruptions, land acquisition and resettlement along the main canals, feeder canal, polder

system, and farm roads, ethnic minority, gender, and loss of access to natural resources. Additionally, the area of influence considers the indirect impacts on health, education, and social services, as local populations respond to new economic and environmental conditions brought about by the project's operations. The social area of influence often aligns with the environmental footprint but also includes areas affected by induced socio-economic changes and community adaptations to these footprints. In addition, although the construction activities are at the existing systems, the impacts on cultural sites need to be carefully considered at the surrounding area ranging up to 500 m from the identified cultural sites.

5.4 SUMMARY OF THE PROJECT AREAS OF INFLUENCE

As per the description above, the Project Area of Influence can be summarized as Table 5.1 Below.

Table 5.1: Summary of the project area of influence

No	Sub-Scheme	Direct/Indirect Impact Areas	Receptors and Scale of Impacts
1	**Ou Ta Paong**	Along the irrigation canals, mainly the Ou Ta Paong River, main canals of the Kbal Hong Canal to Ou Ta Paong command area, the feeder canals, and subsidiary canals within the command area where the construction occurs. Noise, vibration, and air quality from construction activities and noise from worker camps are potential occur along the transport roads while water quality impact can go directly at the site as well as beyond the areas such as downstream water body.	• Residential, school, pagoda and hospital areas along the river, streams, canals where construction occurs, transport roads, and camp sites. • Downstream water body where water can carry pesticides and other contamination and protected areas where people can reach for further expansion of agricultural land as water become available.
2	**Lum Hach**	Main canals where construction plan to rehabilitate and build the embankments. Noise, vibration, and air quality from construction activities and noise from worker camps are potential occur along the transport roads while water quality impact can go directly at the site as well as beyond the areas such as downstream water body. The project will directly impact the community forestry as the planned canal will make water become available within the forest area.	• Residential, school, pagoda and hospital areas along the river, streams, canals where construction occurs, transport road and camp sites. • Downstream water body where water can carry pesticides and other contamination. • Community forestry within the command area and beyond as the fragmented forest area are somehow connected to the mountain area at the upstream of Boribour river.
3	**Krang Ponley**	Main canals in all the four sub-schemes, drainage canals in Krapeu Troum, Yutasas, and feeder canal and Polder in Stung Krang Bat where construction occurs. Noise, vibration, and air quality from construction activities and noise from worker camps are potential occur along the transport roads while water quality impact can go directly at the site as well as beyond the areas such as downstream water body.	• Residential, school, pagoda and hospital areas along the river, streams, canals where construction occurs and camp site. • Downstream water body where water can carry pesticides and other contaminated substances to downstream.

CHAPTER 6 – BASELINE CONDITIONS

6.1 INTRODUCTION

This chapter provides a comprehensive overview of the existing environmental and social conditions within the project target areas. It serves as the baseline data, capturing the current state of the environment and social dynamics that may be influenced by the proposed project. Understanding these baseline conditions is crucial as environmental factors significantly contribute to poverty reduction and socio-economic development. This chapter focuses on the physical, biological, and socio-economic resources present in the area, establishing a foundation for assessing the potential impacts of the project. By presenting this detailed baseline information, we aim to highlight the intricate relationships between these resources and the broader environmental impacts within the project area. This understanding is essential for identifying the potential changes and influences the project may have, ensuring that all environmental and social aspects are carefully considered in the decision-making process.

6.2 METHODOLOGY

The collection and analysis of secondary and primary data to establish a set of environmental and social baseline conditions is an important part to identification and assessment of E&S risks and impacts. The method for collecting baseline information –as per the ToR, is described below.

6.2.1 Environmental and Natural Resources

6.2.1.1 Climate and Meteorology

Weather and climatic condition are essential to implementation and achieving expected results for project activities under Component 1 & 2.

To establish baseline weather and climate conditions, the study reviewed and analyzed climatic variability using available records mainly from Nasa Power website for each sub-scheme location because the existing data of the MoWRAM is discontinuous and limited in terms of number of years and duration. Moreover, available stations are mainly at the provincial level which are located far away from the sub-scheme locations. The parameters gathered from the study include rainfall, temperature, humidity, and wind speed.

6.2.1.2 Hydrological System and Water Quality

To understand the hydrological systems of the sub-schemes under the project, the existing studies on hydrology and water systems within the project areas were the main sources of information for consideration in this ESCIA report preparation.

For water quality, both surface and groundwater, collection of raw data from the field were conducted to gather the intended data. The process in collecting data and parameters for surface water quality and groundwater quality is provided beginning from the identification of

the potential risks on quality of water and soil in each sub-scheme. Firstly, parameters for water and soil testing were determined based on the environmental risks that are identified due to project activities for each of the six (6) sub–schemes as shown in Table 6.1.

Table 6.1: The identification of risks for determining the locations of water and soil quality testing in all sub-schemes

No	Names of Sub–Schemes	Contamination of **surface and ground water** due to project operation (increased use of chemical inputs) (Comp 1)	Contamination of **surface water** due to construction activities (Comp 2)	Contamination of **soils** due to construction (Comp 2)
1	Ou Ta Paong	X	X	X (upper part of OTP)
2	Lum Hach	X	X	X (main canal)
3	Brambei Mom	X	X	
4	Krapeau Trom	X	X	
5	Yutasas	X	X	
6	Steung Krang Bat	X	X	

Based on the nature of the risks, the following tests are proposed, including the time when the tests could be conducted to ensure result reliability.

- ***Testing for Surface Water Quality***

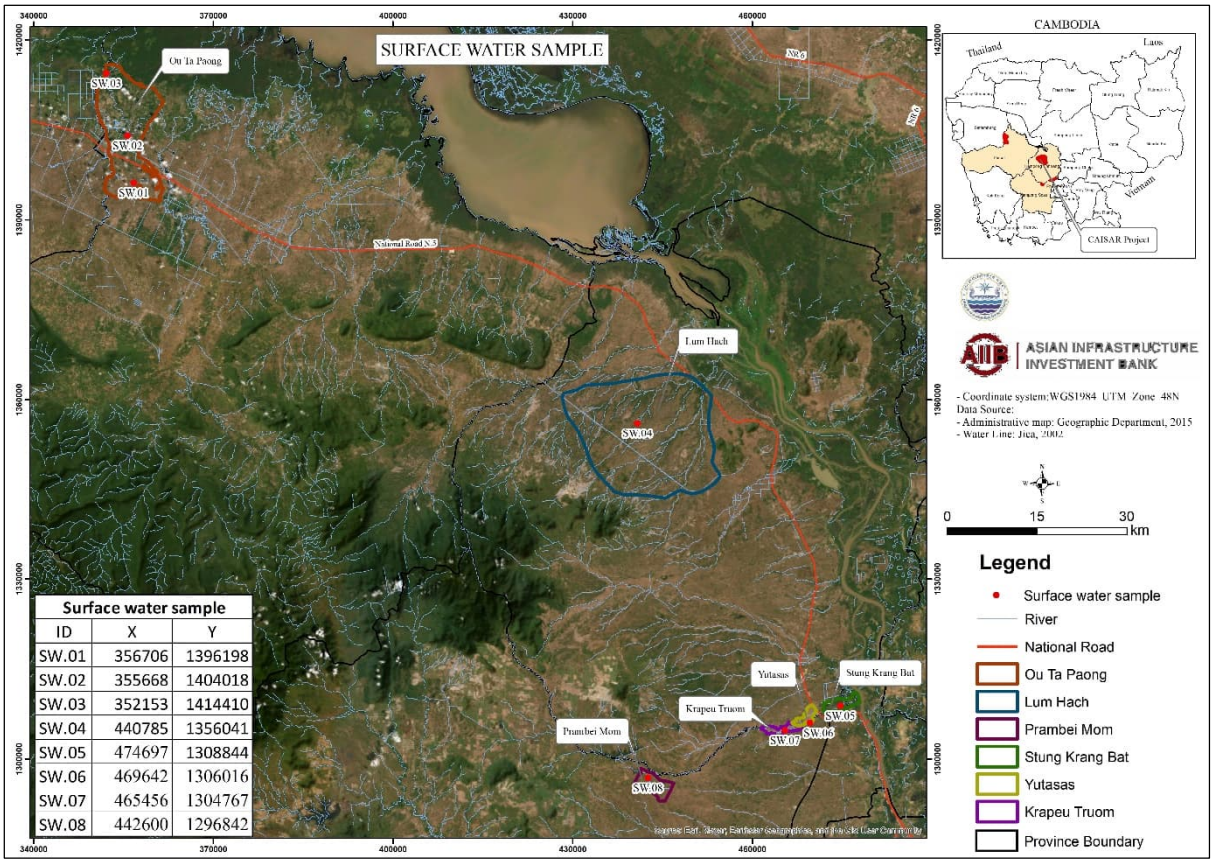
To obtain a representativeness for **surface water testing**, samples for surface water quality were taken as in table below. The number of samples are proposed based on the size of each sub–scheme and the connectivity of these sub–schemes. More samples are proposed for Ou Ta Paong because OTP is the largest and most complex scheme. Brambei Mom, Krapeau Trom, Yutasas, and Steung Krang Bat are connected and close to each other geographically. Thus 1 sample is proposed for each site (Table 6.2).

Table 6.2: The selected locations for surface water sample collection

No	**Names of Sub–Schemes**	**Upstream**	**Middle**	**Downstream**	**Total**
1	Ou Ta Paong	1	1	1	3
2	Lum Hach		1		1
3	Brambei Mom		1		1
4	Krapeau Trom		1		1
5	Yutasas		1		1
6	Steung Krang Bat		1		1
	Total	**1**	**6**	**1**	**8**

The locations of the sample collection are presented in Figure 6.1. The samples, labelled SW1 to SW8 respectively, were selected between 10 and 11 August 2024.

Figure 6.1: Map showing the locations of selected surface water samples



Surface water sample		
ID	X	Y
SW.01	356706	1396198
SW.02	355668	1404018
SW.03	352153	1414410
SW.04	440785	1356041
SW.05	474697	1308844
SW.06	469642	1306016
SW.07	465456	1304767
SW.08	442600	1296842

(Source: ESCIA Study 2024)

The geographical positions and descriptions of the surface water sampling points are given in Table 6.3.

Table 6.3: Locations of surface water quality sampling

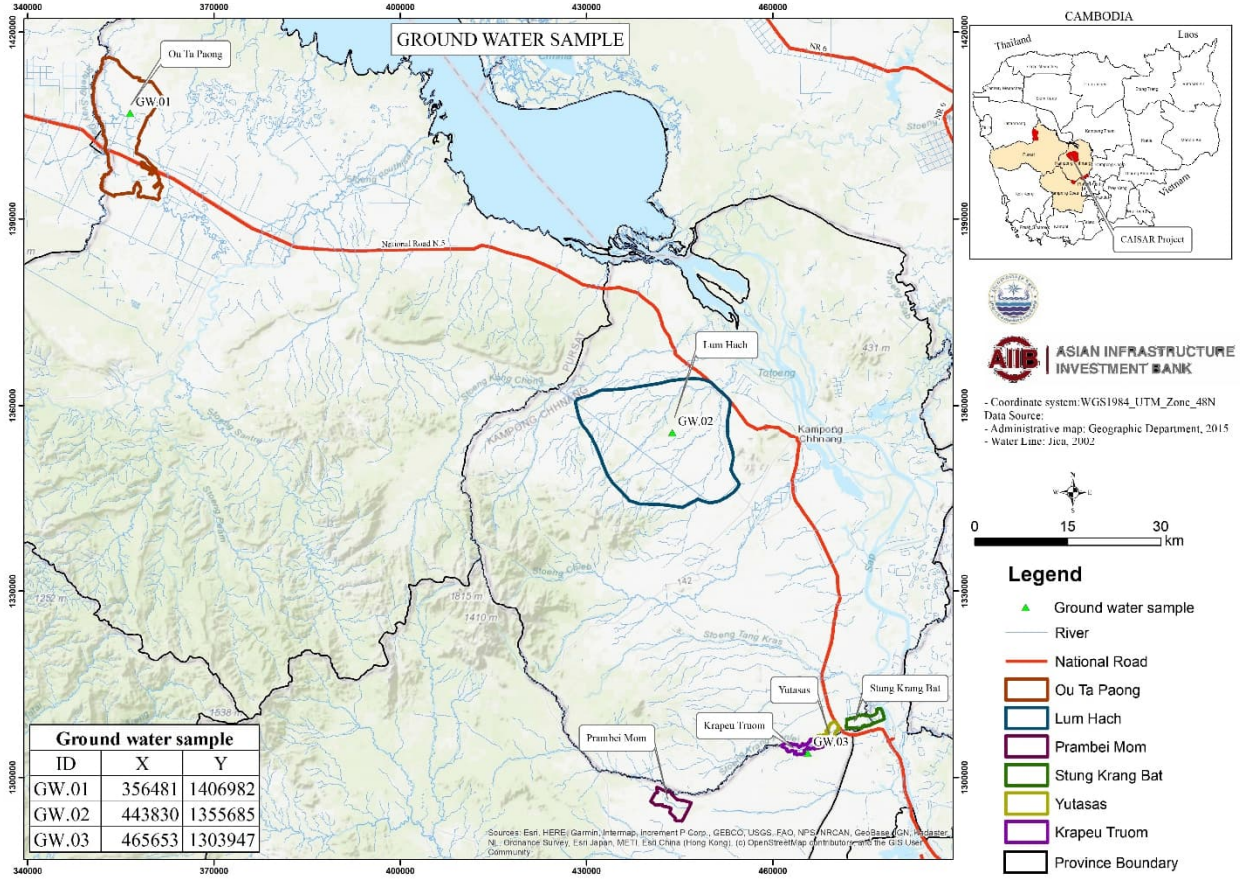
Sub-Scheme	Label	Location				UTM	
		Province	District	Commune	Village	X	Y
Ou Ta Paong	SW1	Pursat	Bakan	Rumlech	Prasat	356706	1396198
	SW2	Pursat	Bakan	Ou Ta Paong	Bat Kokir Thmei	355668	1404018
	SW3	Pursat	Bakan	Ou Ta Paong	Ta Nai	352153	1414410
Lum Hach	SW4	Kampong Chhnang	Rolea Bíer	Prasneb	Chonleav	440785	1356041
Stung Krang Bat	SW5	Kampong Chhnang	Kampong Tralach	Longvek	Wat	474697	1308844
Yutasas	SW6	Kampong Speu	Odongk	Preah Sre	Ta Cheal	469642	1306016
Krapeu Truom	SW7	Kampong Speu	Odongk	Veal Pung	Phkor	465456	1307467
Prambei Mom	SW8	Kampong Speu	Thpong	Prambei Mom	Tang Pou	442600	1296842

SW = Surface water, UTM = Universal Transverse Mercator.

In addition, since some community people use groundwater for irrigation, **three (3) groundwater samples** were collected for testing, including one (1) in Ou Ta Paong sub-

scheme, one (1) in Lum Hach sub-scheme and one (1) for Krang Ponley. The water from tube wells were sampled after 5–10 min of pumping to flush the standing water out. Groundwater quality was collected from various locations within the project sites. Water testing is used to determine the existing groundwater quality at the project sites before construction and operation. Note that the GW1 is a dug well with a depth of up to 40 meters that can be used in both dry and wet seasons. In the dry season, the water level is about 25 meters, while in the rainy season, the water level is about 7 meters above the surface. GW2 and GW2 is a type of open well with a depth of 10 meters and can only be used during the rainy season. In both wells, the water level is around two (2) meters above the surface during the rainy season. The groundwater analytical method follows the same method as surface water quality testing whereas the parameters are following the minimum standard of the Cambodian Drinking Water Quality Standard (CDWQS) (Figure 6.2 and table 6.4).

Figure 6.2: Map showing the locations of selected groundwater samples



(Source: ESCIA Study 2024)

Table 6.4: Groundwater sampling locations

No.	Location				UTM	
	Province	District	Commune	Village	X	Y
GW1	Pursat	Bakan	Ou Ta Paong	Oknha Moan	356481	1406982
GW2	Kampong chhnang	Rolea Bíer	Prasneb	Prey Sampov	443830	1355685

GW3	Kampong Speu	Odongk	Veal Pung	Khnaor Ampil	465653	1303947

GW = Groundwater, UTM = Universal Transverse Mercator.

- ***Testing for contamination of surface and ground water due to project operation (increased use of chemical inputs) (Comp 1)***

It is anticipated that use of chemical inputs such as pesticides and chemical fertilizers would be increased due to intensified crop production (rice) – indicative of increased area of cultivation per year and increased use of shorter rice varieties. Since testing of pesticide has not been yet available in Cambodia, the ESCIA suggests the testing of pesticides to be done at year 1 of project implementation and testing potentially carried out abroad as per the suggestion in Table 9.1 and Table 9.3 of Chapter 9.

- **Testing for contamination of surface water due to project construction (Comp 2)**

Since the scope and location where canal would be rehabilitated have not yet been confirmed at this stage, testing for contamination of surface water due to project construction will be determined when detailed design is available.

6.2.1.3 Air Quality, Noise and Vibration

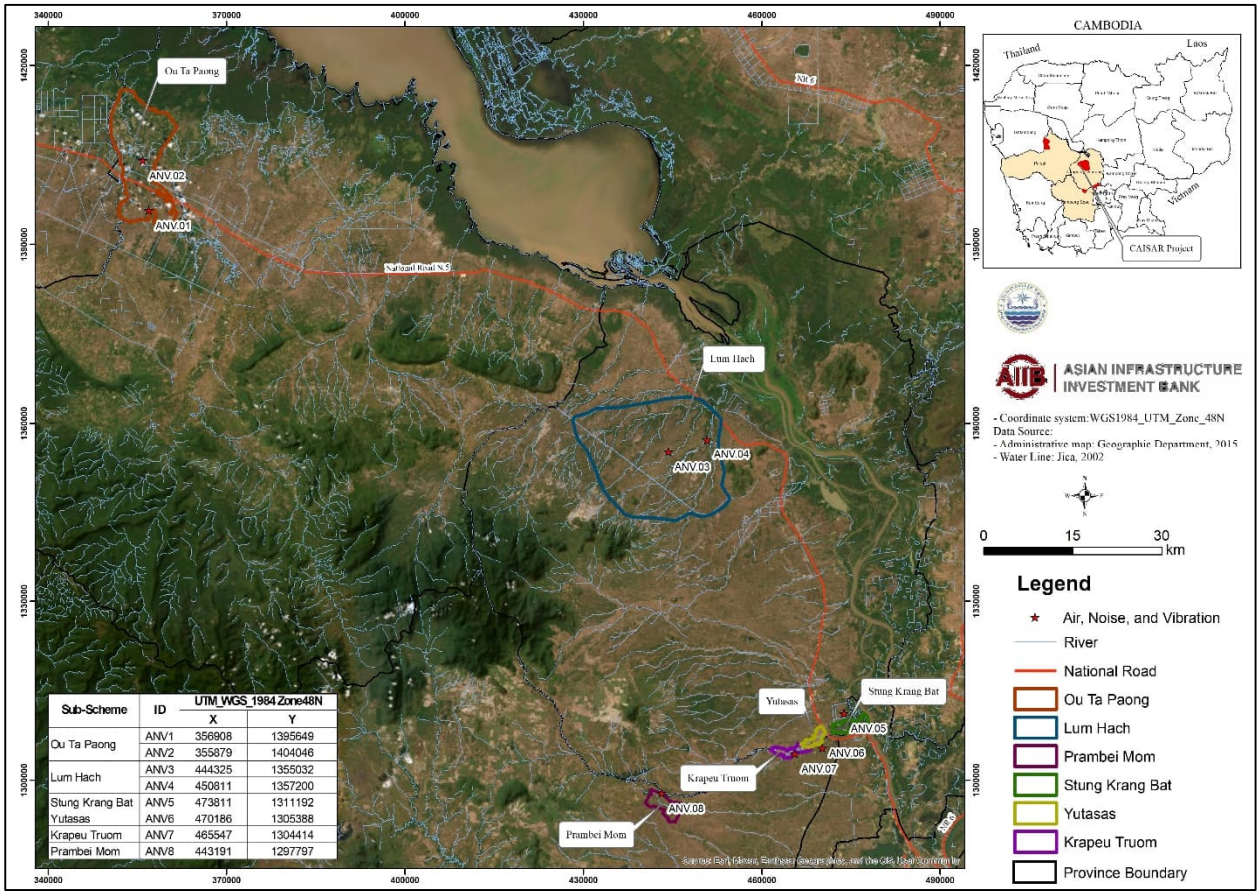
As the construction is expected to begin at the end of 2027, the ESCIA recommends the baseline data collection of the air quality and noise and vibration to be conducted prior to the construction (early 2027) as this period holds high potential of being changed. Due to the project's rural location, it is anticipated that project activities will have minimal impact on these environmental factors. Moreover, key Informant Interviews with village leaders included rating questions regarding the status of these parameters. The proposed locations for air quality, noise and vibration testing prior to the construction are proposed as Table 6.5 bellow.

Table 6.5: Locations of air quality, noise and vibration

Sub-Scheme	Label	Location				UTM	
		Province	District	Commune	Village	X	Y
Ou Ta Paong	ANV1	Pursat	Bakan	Rumlech	Prasat	356908	1395649
	ANV2	Pursat	Bakan	Ou Ta Paong	Bat Kokir Thmei	355879	1404046
Lum Hach	ANV3	Kampong Chhnang	Rolea Bíer	Prasneb	Chonleav	444325	1355032
	ANV4	Kampong Chhnang	Rolea Bíer	Banteay Preal	Ou Leach	450811	1357200
Stung Krang Bat	ANV5	Kampong Chhnang	Kampong Tralach	Longvek	Wat	473811	1311192
Yutasas	ANV6	Kampong Speu	Odongk	Preah Sre	Ta Cheal	470186	1305388
Krapeu Truom	ANV7	Kampong Speu	Odongk	Veal Pung	Phkor	465547	1304414
Prambei Mom	ANV8	Kampong Speu	Thpong	Prambei Mom	Tang Pou	443191	1297797

ANV = Air, Noise and Vibration, UTM = Universal Transverse Mercator.

Figure 6.3: Map showing the locations of selected air quality, noise and vibration



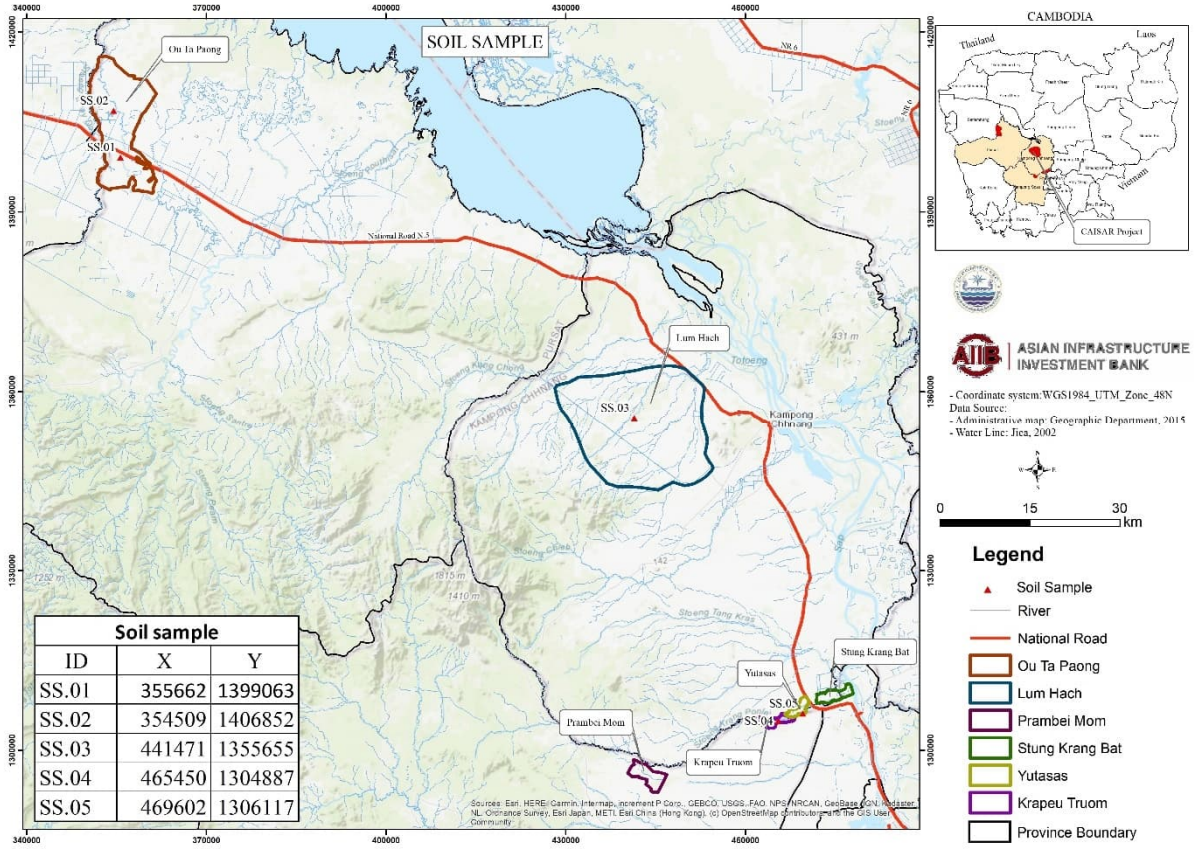
Sub-Scheme	ID	UTM_WGS_1984 Zone48N	
		X	Y
Ou Ta Paong	ANV1	356908	1395649
	ANV2	355879	1404046
Lum Hach	ANV3	444325	1355032
	ANV4	450811	1357200
Stung Krang Bat	ANV5	473811	1311192
Yutasas	ANV6	470186	1305388
Krapeu Truom	ANV7	465547	1304414
Prambei Mom	ANV8	443191	1297797

(Source: ESCIA Study 2024)

6.2.1.4 Geology, Soil and Land Cover

The primary data on soil quality and land pollution were determined through testing and reviewing the existing document relevant to the contamination of the soil within the area. Soil quality for agriculture were tested in five (5) locations as per shown in Figure 6.4.

Figure 6.4: Map with illustration of locations of soil quality samples



Soil sample

ID	X	Y
SS.01	355662	1399063
SS.02	354509	1406852
SS.03	441471	1355655
SS.04	465450	1304887
SS.05	469602	1306117

(Source: ESCIA Study 2024)

As per the guidance of MoE, the process will involve the collection of soil samples through the division of soil sampling area into equal-sized squares. Within each square, soil samples will be collected at the four (4) corners and the center, reaching a depth of approximately 50 centimeters below the topsoil. The collected soil from each square will be thoroughly mixed before being divided into four (4) equal portions. Subsequently, one (1) of these portions will be further divided into four (4) equal parts, with one (1) of the resulting sub-samples placed in a sample bag for storage taken for testing.

The primary data on soil quality and land pollution will be analyzed and compared to the national standard. Thirteen soil quality parameters in the context of agriculture as per the Circular No. 120 of Ministry of Environment were tested including:[8]

- ✓ Soil classification or particle size,
- ✓ Soil moisture,
- ✓ Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na),
- ✓ Organic Metter
- ✓ Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio),
- ✓ Total phosphorus (P),
- ✓ Cation exchange capacity (CEC),
- ✓ pH,

[8] Circular No. 120 on the Guidance for the development of Terms of Reference for the Infrastructure and Tourism development, MoE

- ✓ Electrode Conductivity.

- **Additional Soil Quality Testing**

In addition to the agricultural soil quality testing stated above, testing for soil should be taken focusing on 1) materials that will be dredged at certain part of Ou Ta Paong River and the main canal of Lum Hach and 2) disposal sites. Since exact locations where dredging will be carried out and where materials will be disposed of have not been determined at this stage, soil testing for these locations will not be carried out as part of this ESCIA until the detailed design stage for Ou Ta Paong and Lum Hach.

6.2.1.5 Biodiversity Assessment

a. Scope and Methodology

The assessment aims to align with relevant standards, contributing to the project's goals of climate resilience and sustainable development. This biodiversity assessment prioritizes the protection of endangered and critically endangered species and their habitats, promotes sustainable natural resource management, and ensures that development activities adhere to international conservation standards. The specific purpose of the Priority Biodiversity Values is to confirm the status of key wildlife species presenting in the area to ensure the protection and sustainable management of natural resources and livelihood improvement. This includes evaluating current conditions and potential impacts and developing mitigation and compensation measures. The identification and evaluation of Priority Biodiversity Values help prioritise areas with exceptional biodiversity or crucial ecological functions.

The assessment adopts the International Finance Corporation's Performance Standard 6 (PS6) and its associated Guidance Note (GN) as a framework for identifying and evaluating critical habitat (CH). Characterized by its irreplaceability and vulnerability, CH is essential for preserving biodiversity and ecological integrity. The three-step process outlined in PS6 and GN6 involves identifying CH through specific criteria, assessing its irreplaceability and vulnerability, and mapping its location. By understanding the distribution of CH, projects can effectively mitigate risks to biodiversity and ensure alignment with environmental sustainability goals.

The process involved literature review and field survey as described below:

- **Literature review**

The literature review was conducted for this assessment at the national, regional, and sub-scheme levels. The review at the regional level looks at the status quo on biodiversity and management at the Tonle Sap Floodplain because the project area is located upstream of the Tonle Sap Lake. At the sub-scheme level, based on IBAT and eBird data (where relevant), the review focuses on species that fall under the IUCN category as Endangered (EN) and Critically Endangered (CN) and assesses its potential impact due to CAISAR's project activities, and relevant projects that contribute to the cumulative impacts on biodiversity of the project's area of influence in the long run. The review illuminates the precarious state of Cambodia's critically endangered species. It underscores the multifaceted threats these taxa face, including habitat degradation, illegal hunting, pollution, and other anthropogenic

pressures. The diversity of taxa represented, spanning animals, birds, fish, plants, and fungi, highlights the intricate tapestry of Cambodia's ecosystems.

- **Field Assessment**

Field works: Based on the potential area of influence estimated based on proposed activities at the sub-scheme level, two field surveys were conducted for the six sub-schemes during July 25-27 and August 3-9, 2024 (which is the wet season). Prior to fieldwork, GIS-based habitat modelling was conducted to identify key hotspots for each of the six sub-schemes. This aims to facilitate the prioritization of locations that should be subject to field observation and data collection. Key hotspots were also screened based on the potential area of influence initially identified as part of the E&S screening exercise that was conducted for each sub-scheme9. Apart from a focus on the potential area of influence, an attempt has been made to visit the potentially vulnerable areas that are located beyond but adjacent to the potential AoI, particularly areas that are vulnerable to potential environmental impact due to environmental footprints (e.g. spreading of pesticide residues) that need sound evidence to support the extent of impact – as cumulative impacts. Observations by Drone10 and transect walks were used. A drone is particularly used for the areas that are difficult to conduct a transect walk and areas that need a broad aerial view at the boundary between the estimated AoI and beyond.

Consultation: Consultations were conducted with representatives of local authorities and community-based organizations to supplement and validate field observations, particularly information on the potential presence of species that have been screened and identified for the AoI. In the sub-schemes where hotspots such as community forests and community fisheries are found (either inside and outside the area of influence, or both, like the cases of Ou Ta Paoing and Lum Hach), local organizations that manage such community forests and community fisheries hotspots were consulted to gather local ecological knowledge and experience, particularly the historical background about the population change of a particular species in relation to human activities (e.g. related to farming and other income generation activities such as hunting for food, and for trading). Approximately 10-12 individuals were chosen from each sub-scheme and interviewed using a semi-structured and structured questionnaire with visual aids (photos). A multi-faceted approach was applied to elicit reliable information, including using all alternative local names and asking questions about species' ecological niches. This allowed us to assess the informants' depth of knowledge.

This data, combined with desk-based research and expert consultation, informs the assessment of potential impacts and the development of appropriate mitigation measures.

- **Forest resources and wildlife**

[9] Potential area of influence is defined by the respective command areas (which include cultivation area, its supporting utilities such as farm road, technical facilities, and houses…) and areas located adjacent to the above command area that may include paddy fields, natural areas such as forest, pasture, and roads that are potentially used by project's construction contractors in connection with construction material supply site, borrow pits, disposal site, and so forth.

[10] A DJI Mavic 3T, an advanced drone equipped with cutting-edge features, was utilized to gather essential data from key biodiversity hotspots, wildlife habitats, and areas crucial for ecological connectivity and functions. With a remarkable flight range of up to 15 kilometers, the drone's capabilities allowed for comprehensive aerial surveys, even in remote or inaccessible regions.

This comprehensive approach to ensure that both the environmental and economic values of forest resources, ecological functions and biodiversity are considered to protect and safeguard throughout the project lifecycle. Below are selective key assessment tools that were used for this study:

1. **Biodiversity Mapping:** Create comprehensive biodiversity maps by integrating data from field assessments, interviews, and existing maps from various management and administrative entities (CF, Community Fisheries (Cfi), KBA, protected areas).
2. **Species Inclusion Criteria:** Limit the assessment to species sighted within the past 1-5 years to ensure a focus on current and relevant data for developing risk and mitigation strategies. Sighting data older than 5 years is important for predicting future trends based on their habitats and ecological changes.
3. **Community Engagement:** Consult with committee members from Community Forests (CF) and Community Fisheries (CFi) to gather their insights on wildlife presence, movement patterns, and potential impacts of the proposed system on their conservation areas.
4. **Species Data Verification:** Verify all species sightings and information against existing literature to ensure accuracy and reliability.
5. **Detailed Species Assessment:** Conduct in-depth inquiries about confirmed species, focusing on morphological characteristics, behavior, habitat preferences, and reproductive strategies. This will provide valuable data on local ecological knowledge and species distribution for informing conservation efforts.
6. **Critical Habitat Identification:** Identify critical habitats for target species based on field data and biodiversity mapping. Highlight areas of significant influence on biodiversity, endangered (EN) and critically endangered (CR) species, and ecological functions to inform mitigation strategies.
7. **A3-Sized Color Maps:** Create A3-sized color maps for each scheme, containing key information such as administration boundaries, specific location names, and unique landscape features (streams, lakes, river reservoirs). These maps will be used to determine the distribution of endangered and critically endangered species based on information provided by key informants.

- **Aquatic Biodiversity and Fisheries**

This study aims to assess the status of endangered fish species in each sub-scheme. It involved data review, interviews with local fishers and authorities, and field surveys. The information will inform impact assessments, mitigation measures, and conservation efforts.

We adopted a similar assessment approach used for forest resources and wildlife, focusing on experienced fishermen. This comprehensive approach ensures a thorough understanding of aquatic biodiversity and fisheries.

Recognizing the challenges of identifying fish without direct observation, we will enhance our assessment by examining fish migration connectivity, and species ecological niches, and cross-verifying data with relevant government agencies and research institutions. This

rigorous approach will strengthen the reliability of our findings and inform effective management strategies.

- **Methods used for Critical Habitat Assessment**

IFC PS6 presented the following criteria to assess for projects in Critical Habitat. These were as follows:

- Criterion 1: Critically Endangered (CR)and Endangered (E) species;
- Criterion 2: Restricted-range/Endemic species;
- Criterion 3: Migratory/congregatory species;
- Criterion 4: Highly threatened and/or unique ecosystems; and
- Criterion 5: Key Evolutionary Processes.

In addition to the above five biological criteria, there were further circumstances in which an area might be recognized as Critical Habitat. For simplicity, there were two further criteria:

- Criterion 6: Most Legally Protected Areas (particularly IUCN Categories I-IV) and Internationally Recognized Areas (e.g., KBAs and IBAs);
- Criterion 7: Other areas of high biodiversity value, such as areas of high scientific value or areas of old growth forest.

Criteria 1-3 have quantitative thresholds which help determine whether an area is Critical Habitat. Criteria 4 and 5 are qualitatively defined at present and so require consultation with experts. Criterion 4 covers rare and threatened habitats which might not necessarily hold species triggering Criteria 1-3. Criterion 5 is particularly identified by physical landscape features promoting evolution (e.g. islands, mountains, ecotones), or by groups of species with distinct evolutionary history.

Table 6.6 provides the formal quantitative thresholds for species Criteria 1-3. Discreet Management Units (DMUs) may be ecologically-defined (e.g. a whole patch of a certain habitat type or a watershed) or politically-defined (e.g. a protected area, property or local political unit).

- DMUs with ≥10% global population of a CR or EN species (or, generally, the equivalent in terms of known sites for that species, e.g. if the DMU is one of only 10 sites globally) = Tier 1 (Sub-criteria 1a+1b)
- DMUs with a single regularly occurring individual of a CR species = Tier 2 (Sub-criterion 1c)
- DMUs with regionally important concentrations of a EN species = Tier 2 (Sub-criterion 1c)
- DMUs with ≥95% of the global population of a restricted-range, endemic or migratory/congregatory species (effectively site endemics) = Tier 1 (Sub-criteria 2a+3a)
- DMUs with ≥1% of the global population of a restricted-range, endemic or migratory/congregatory species (this is the easiest category in which to trigger CH) = Tier 2 (Sub- criteria 2b+3b)

Table 6.6: Quantitative thresholds for criteria 1-3 relating to tier 1 and tier 2 critical habitat

Criteria	Tier 1	Tier 2
1. Critically Endangered (CR)/ Endangered (EN) Specie	(a) Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally-important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/subspecies. (d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. (e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.
2. Endemic/ Restricted Range Species	(a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic).	(b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgement.
3. Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species lifecycle where that habitat could be considered a discrete management unit for that species.	b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species lifecycle and where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgement. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥ 5 percent of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 percent of the global population of recruits.

6.2.2 Socio-Economic Resources

6.2.2.1 Socio-Economic Survey

The project is estimated to benefit 100,000 households[11] residing within the six (6) sub-schemes of the four (4) provinces. Paddy rice is the main agricultural production for the benefited households, using the irrigation water from the systems. The assessment of socio-economic situation is to determine the scale of the impacts which they may face.

The socio-economic survey was conducted through various approaches including focus group discussion (FGDs), Key Informant Interviews (KIIs) and household survey.

Qualitative Information

The selection of the communes is conducted based on geographical location of each commune within the sub-schemes, i.e. upstream, middle and downstream. In addition, the commune with larger administrative boundary within the sub-scheme command area will be prioritized. The number of selected communes equal to 70% (14/20) of the total communes within the command areas whereas the number of selected villages represent 37% of the total villages in all sub-scheme (31/83 villages). The result of the number of selected communes and villages for each sub-scheme is presented in Table 6.7.

Table 6.7: The selected communes and villages for consultation in the six (6) sub-schemes

No.	Scheme Name	No. of Commune	No. of Selected Commune	No. of Total Village	No. of Selected Villages
1	Ou Ta Paong	7	4	26	8
2	Lum Harch	5	3	32	9
3	Kropeu Trom	3	2	9	4
4	Yotasass	1	1	5	3
5	Stoeung Krang Bat	2	2	2	2
6	Brambei Mom	2	2	9	5
Total		**20**	**14**	**83**	**31**

The consultations which were conducted including Focus Group Discussion (FGD) and Key Informant Interviews (KII). The question guides for KIIs with Farmer Water User Group (FWUG), Community Forestry (CF), Community and Fisheries (CFi) will be asked on relevant aspects to their situation and impact from the project. Vegetable farmers, rice farmers, poultry farmers and agricultural cooperatives (ACs) will be also consulted to understand changes as per the result of the project, both positive and negative. The identified list of KII is provided in Table 6.8 below:

Table 6.8: List of identified KIIs at local level

No.	Scheme Name	# of KII			
		FWUG	CF/CFi	AC	Total
1	Ou Ta Paong	1	1	3	5
2	Lum Hach	1	2	1	4
3	Kropeu Trom	1	1	3	5
4	Yotasass	1	1	1	3
5	Stoeung Krang Bat	1	0	1	2
6	Brambei Mom	1	1	1	3
Total		**6**	**6**	**10**	**22**

[11] The latest figure from the engineering team of CAISARP

KII = Key Informant Interviews, FWUG = Farmer Water User Groups, CF/CFI = Community Forestry/Community Fisheries, AC = Agricultural Cooperatives.

List of tools used for data collection of each group is provided as Annexes.

In addition, 30% of the FGDs will be given to the vulnerable groups for the number of FGDs in the target villages. The figures of the FGDs are provided in Table 6.9.

Table 6.9: List of FGDs to be consulted for agricultural production

No.	Scheme Name	No. of Selected Villages	# of FGDs				
			Veg. Farmers	Rice Farmers	Chicken Farmers	Duck Farmers	Total
1	Ou Ta Paong	8	3	6	2	2	**13**
2	Lum Hach	9	3	6	2	2	**13**
3	Krapeu Truom	4	3	3	2	2	**10**
4	Yutasas	3	3	3	2	2	**10**
5	Stoeung Krang Bat	2	1	2	1	1	**5**
6	Brambei Mom	5	3	4	2	2	**11**
Total		**31**	**16**	**24**	**11**	**11**	**62**

FGDs = Focus Group Discussions, Veg. = Vegetables.

Quantitative Information

As per the household survey is also important, the household survey was conducted to gather additional information regarding socio-economic data at household level. The calculation of sample size for the survey used the following formula:

$$x = Z^2 * r * (100 - r)$$

$$n = \frac{N * x}{(N-1)E^2 + x}$$

Where (Z) is confidence level, (r) is sample proportion rate, and (E) is error margin. Using the margin error of 6%, confidence level of 95%, sample proportion rate at 50%, the number of sample size to be interviewed is calculated at 263. The project rounded the number to 270 HHs. This sample size is distributed across the 3 target ESCMP sub-schemes and types of the benefits they are expected to obtain from the project. The proposed sample size and distribution is provided in Table 6.10.

Table 6.10: Sample sizes for socio-economic data collection at household level

No.	Scheme Name	No. of HHs	HH Survey		
			Beneficiary HHs	Potentially Adversely Affected HHs	Total
1	Ou Ta Paong	15,000	95	45	140
3	Krapeu Truom	700	45	20	65
4	Yutasas	650	45	20	65
Total		**16,350**	**185**	**85**	**270**

HH = Household.

6.2.2.2 Cultural Heritage and Archaeology

Through the consultation with the Provincial Department of Cult and Religion in each province and, all reported archaeological and cultural heritage locations were recorded for each sub-

scheme to generate the . Then, the consultations were conducted with relevant authorities as applicable to determine any potential negative impacts on cultural heritages so that the construction can be avoided and mitigation measures can be proposed, if not avoidable.

Key questions regarding the cultural heritages and archaeological sites were included in the KIIs with provincial department of culture and fine art, district governors, and commune leaders.

6.3 PHYSICAL AND ENVIRONMENTAL CONDITIONS

6.3.1 Geological Conditions

6.3.1.1 Ou Ta Poang

The geology of Ou Ta Poang is predominantly characterized by deltaic deposits, which cover 83.91% of the area, indicating that this region is primarily formed by sediment deposits from rivers, likely contributing to fertile land. Organic deposits, which are found in swamp areas, make up 6.64%, suggesting the presence of wetlands that might play a role in sustaining biodiversity. Floodplains account for 7.68%, indicating seasonal flooding, while a small portion, 1.77%, is water, likely from rivers or lakes within the area.

6.3.1.2 Lum Hach

The geology of Lum Hach is dominated by pediments, which make up 88.66% of the area. These gently sloping rock formations suggest significant erosion processes shaping the landscape. The sub-scheme has minor deltaic deposits (3.49%) and floodplains (6.52%), indicating some water-influenced geological features. Additionally, small percentages of various rock types such as rhyolite, dacite, granite, and metamorphic rocks reflect a diverse and complex geological structure, with potential implications for mineral resources or variations in soil properties.

6.3.1.3 Stung Krang Ponley

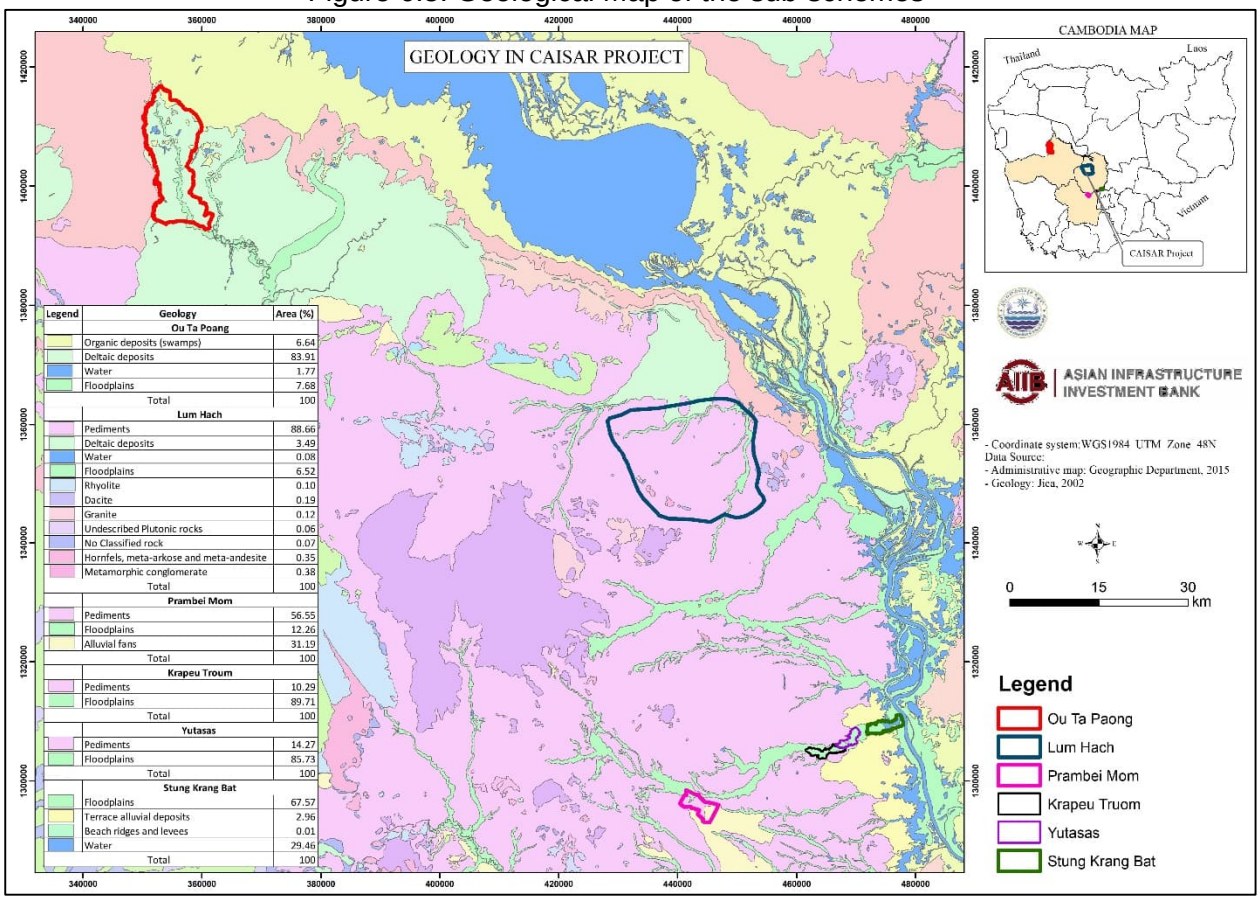
Prambei Mom. Prambei Mom is primarily composed of pediments, covering 56.55%, indicating the dominance of weathered rock formations. Alluvial fans account for 31.19%, suggesting areas where sediments are deposited by flowing water, often near mountain bases. Floodplains occupy 12.26%, reflecting regions that are seasonally flooded and may be important for agriculture or water management.

Krapeu Troum. The geology of Krapeu Troum is overwhelmingly characterized by floodplains, which cover 89.71% of the area, indicating that the region is highly influenced by periodic flooding, likely contributing to fertile soils for agricultural use. Pediments, which account for the remaining 10.29%, suggest some areas of more stable and eroded rock formations.

Yutasas. Yutasas is dominated by floodplains, which constitute 85.73% of the area, indicating frequent flooding and fertile soil suitable for agricultural practices. Pediments cover 14.27% of the area, suggesting some eroded rock formations. This geological composition highlights the importance of water management in this sub-scheme due to the extensive floodplain areas.

Stung Krang Bat. The geology of Stung Krang Bat is mainly composed of floodplains (67.57%), which indicates a landscape shaped by seasonal flooding, likely suitable for farming. Water bodies cover 29.46% of the area, emphasizing the significance of water features in this region. Terrace alluvial deposits make up a small portion (2.96%), which could represent old floodplain areas, while beach ridges and levees, though minimal (0.01%), suggest some coastal or riverine features.

Figure 6.5: Geological Map of the sub-schemes



Legend	Geology	Area (%)
	Ou Ta Poang	
	Organic deposits (swamps)	6.64
	Deltaic deposits	83.91
	Water	1.77
	Floodplains	7.68
	Total	100
	Lum Hach	
	Pediments	88.66
	Deltaic deposits	3.49
	Water	0.08
	Floodplains	6.52
	Rhyolite	0.10
	Dacite	0.19
	Granite	0.12
	Undescribed Plutonic rocks	0.06
	No Classified rock	0.07
	Hornfels, meta-arkose and meta-andesite	0.35
	Metamorphic conglomerate	0.38
	Total	100
	Prambei Mom	
	Pediments	56.55
	Floodplains	12.26
	Alluvial fans	31.19
	Total	100
	Krapeu Troum	
	Pediments	10.29
	Floodplains	89.71
	Total	100
	Yutasas	
	Pediments	14.27
	Floodplains	85.73
	Total	100
	Stung Krang Bat	
	Floodplains	67.57
	Terrace alluvial deposits	2.96
	Beach ridges and levees	0.01
	Water	29.46
	Total	100

(Source: ESCIA Study 2024)

6.3.2 Topography

6.3.2.1 Ou Ta Paong

Ou Ta Paong lies at a low elevation of less than 40 meters, indicative of flat, low-lying terrain. This relatively low elevation, combined with its predominant deltaic deposits and floodplains, suggests a region that is prone to seasonal flooding and is likely situated near river systems or coastal plains. The flat terrain, coupled with its elevation, makes it well-suited for agriculture but vulnerable to waterlogging.

6.3.2.2 Lum Hach

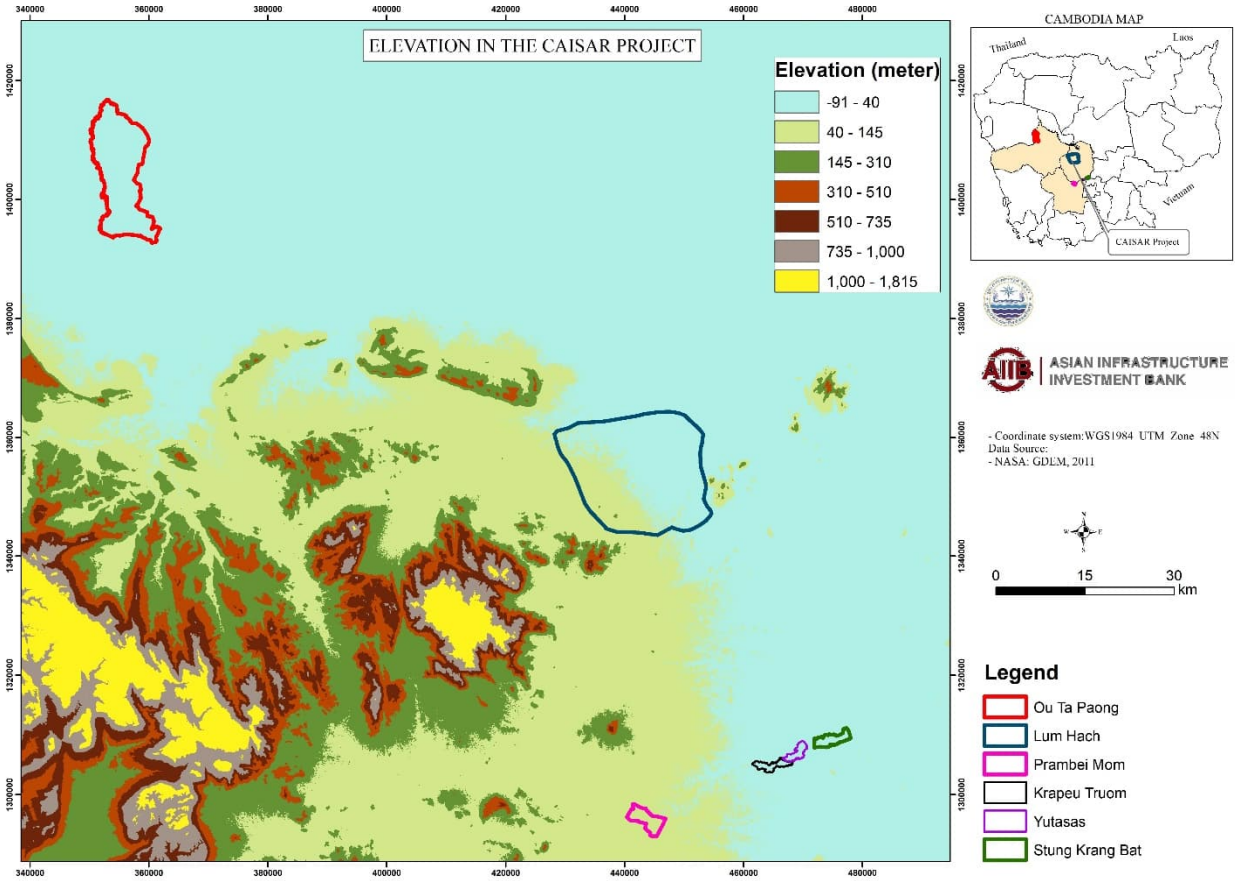
Lum Hach features a more varied topography, with some areas having an elevation between 40 and 145 meters and others below 40 meters. The higher elevation areas (40-145 m) are likely associated with pediments, suggesting gently sloping terrain or foothills that may have experienced significant erosion. Meanwhile, the lower elevation areas (<40 m) are likely to be

floodplains or deltaic regions, indicating a mix of flat and slightly undulating landscapes. The variation in elevation indicates more diverse landforms and potential differences in land use practices.

6.3.2.3 Stung Krang Ponley

Prambei Mom. Prambei Mom is situated in an elevation range between 40 and 145 meters, indicating moderate terrain with gentle to more noticeable slopes, particularly in pediment areas. The presence of alluvial fans further supports the idea of sloping land, as they are formed by sediment deposition on sloped surfaces. The higher elevation, relative to the other sub-schemes, suggests that the region might have less flooding risk compared to the floodplains, but the terrain is still conducive to water flow and drainage from nearby hills or mountains.

Figure 6.6: Topographical map of the project area



(Source: ESCIA Study 2024)

Krapeu Troum. The sub-scheme, with an elevation of less than 40 meters, has a predominantly flat topography. This low-lying region is dominated by floodplains, reflecting its susceptibility to seasonal flooding and water accumulation. The low elevation also suggests proximity to rivers, lakes, or coastal areas where sediment deposition has shaped the landscape. The flat terrain at this low elevation is likely ideal for wetland ecosystems or agriculture but may require careful water management.

Yutasas. The area is another low-elevation sub-scheme with terrain less than 40 meters. The topography here is mostly flat, with large expanses of floodplains. The presence of pediments suggests there may be minor elevations or gentle slopes within the otherwise flat landscape.

However, the general topography is primarily low-lying, prone to seasonal floods, and likely situated near river systems. This type of terrain is typically fertile but may face waterlogging challenges.

Stung Krang Bat. Stung Krang Bat is characterized by low-lying terrain with an elevation of less than 40 meters, like several other sub-schemes. The predominance of floodplains and significant water bodies at this elevation indicates that the region is flat, with large areas subject to periodic flooding. The overall flatness and low elevation suggest that the region may be part of a larger river basin or coastal plain, contributing to fertile soil and abundant water resources, but also presenting challenges related to flood risk management.

6.3.3 Land Cover and Water Use

6.3.3.1 Ou Ta Paong

The majority of the command area consists of existing rice fields interspersed with fragmented bushes, particularly along streams and rivers. Agricultural land dominates the Ou Ta Paong Command Area, covering approximately 80% of the total area. Soil fertility is relatively high, with 69% classified as high-productivity soil and 31% as medium-productivity soil. This fertility is largely attributed to the lowland nature of the area, with its northern section situated within the active floodplain of the Tonle Sap, which experiences annual flooding.

Farmers in the area typically cultivate two to three rice crops per year, making intensive use of the soil. Dry-season rice crops generally yield higher production per hectare due to the selection of rice varieties suited for this period and the increased application of fertilizers. With improved drainage and a more reliable water supply, the Ou Ta Paong Command Area has the potential to support up to three rice crops annually. Additionally, between rice cropping cycles, farmers may have opportunities to grow vegetables. However, most farmers remain reluctant to cultivate three rice crops per year, and vegetable cultivation is currently limited due to the lack of a reliable water source.

Water management in the command area faces several challenges. Inaccurate cultivation data, particularly the underreporting of actual cultivated areas, affects planning and resource allocation. Water shortages are also a major concern, as high demand often exceeds the available supply based on PDoWRAM guidelines. Conflicts in water allocation arise due to noncompliance with distribution rules, while some farmers neglect field maintenance and do not participate in water distribution or monitoring activities. Mismanagement further exacerbates the situation, with water gates often left open, leading to unnecessary water loss, while community representatives struggle to provide adequate oversight. Unauthorized water usage during off-hours, particularly between 10 p.m. and midnight, is another significant issue, as some individuals extract water when monitoring is unavailable. Addressing these challenges will require improved water governance, strengthened monitoring mechanisms, and greater farmer participation in sustainable water management practices.

6.3.3.2 Lum Hach

Currently, only 30% of the Command Area is agricultural land, while the remaining area consists of degraded forest and grassland. This is expected to change under the CAISAR project, as a more reliable water source is introduced. With an improved water supply, dry-

season rice cultivation would become feasible. Additionally, with availability of water, farmers will have opportunities to diversify into alternative horticultural crops such as cucumber, watermelon, and pumpkin between wet-season rice cycles. This diversification will help improve soil organic content and mitigate the negative effects of intensive rice cultivation, which often inhibits soil rejuvenation. One of the key challenges in the area is the insufficient water supply for pumping, as the stream frequently runs dry after each pump cycle. The village canal currently lacks a designated management authority, and all farmers collectively share the responsibility for its maintenance.

6.3.3.3 Krang Ponley

The land cover across all four sub-schemes is predominantly rice fields, with only a limited presence of bushes along streams, rivers, and the edges of the rice fields. Sharing the same water sources, farmers in this irrigation system face several key challenges, including water shortages during the dry season, limited market access, pest infestations, and conflicts arising from water scarcity. These issues are primarily driven by the lack of reliable water sources and the impacts of climate change, which have extended the duration of dry seasons. During the dry season, the canal frequently lacks sufficient water, and if there is no rainfall at the start of the wet season, the canal remains dry. Additionally, inefficient irrigation management results in water losses, while extreme heat negatively affects market conditions.

One of the most critical concerns is the water shortage during the rice reproductive stage, as there is no consistent water supply to the fields, leading to significant crop damage. Farmers are often forced to wait for water, which only reaches them after upstream farmers have secured an adequate supply. The Water User Community is responsible for managing the irrigation system, but the current canal infrastructure presents challenges, as the canals are shallow and can only store a limited amount of water. During the dry season, the canals frequently run dry, forcing villagers to take turns pumping water, a process that is both time-consuming and inefficient.

6.3.4 Soil Types

6.3.4.1 Cambodia

Dr. Crocker travelled across Cambodia to create a map, with a scale of 1 to 1,000,000 and it was publicly published by the Ministry of Agriculture in 1963 (Crocker, Charles D, 1962). The soil of Cambodia is classified into 16 types according to the soil taxonomy of the Ministry of Agriculture, the United States of America. Table below is the detailed information on 16 types of soil in Cambodia (please see in table 6.11).

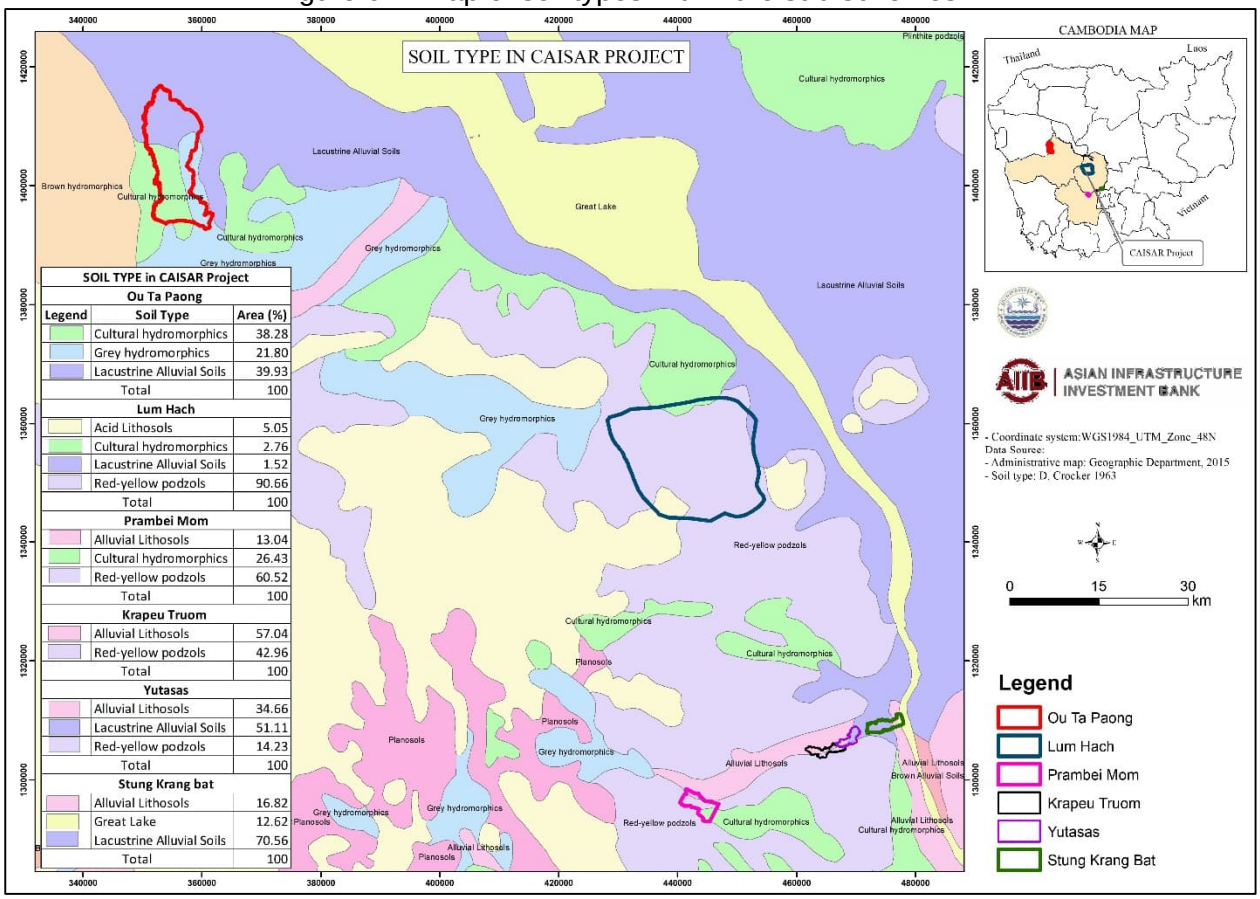
Table 6.11: Soil types and area in Cambodia

No.	Classification	Land area	
		Km^2	%
1	Red, yellow podzols	22,763.00	12.57%
2	Latosols	7,123.00	3.93%
3	Planosols	1,666.00	0.92%
4	Plinthite podzols	17,147.00	9.47%
5	Cultural hydromorphics	12,896.00	7.12%

6	Grey hydromorphics	17,252.00	9.53%
7	Plenthitic hydromorphics	1,275.00	0.70%
8	Brown hydromorphics	6,701.00	3.70%
9	Alumisols	2,782.00	1.54%
10	Regurs	6,570.00	3.63%
11	Acid lithosols	45,271.00	25.01%
12	Basic lithosols	3,418.00	1.89%
13	Alluvial soils	17,064.00	9.43%
14	Brown alluvials	2,764.00	1.53%
15	Lacustrine alluvials	10,373.00	5.73%
16	Coastal complex	2,229.00	1.23%
	Total (land area)	177,295.00	97.94%
	Water area	3,721.00	2.06%
	Total	**181,035.00**	**100.00%**

(Source: Crocker, 1962)

Figure 6.7: Map of soil types within the sub-schemes



SOIL TYPE in CAISAR Project		
Ou Ta Paong		
Legend	**Soil Type**	**Area (%)**
	Cultural hydromorphics	38.28
	Grey hydromorphics	21.80
	Lacustrine Alluvial Soils	39.93
	Total	100
Lum Hach		
	Acid Lithosols	5.05
	Cultural hydromorphics	2.76
	Lacustrine Alluvial Soils	1.52
	Red-yellow podzols	90.66
	Total	100
Prambei Mom		
	Alluvial Lithosols	13.04
	Cultural hydromorphics	26.43
	Red-yellow podzols	60.52
	Total	100
Krapeu Truom		
	Alluvial Lithosols	57.04
	Red-yellow podzols	42.96
	Total	100
Yutasas		
	Alluvial Lithosols	34.66
	Lacustrine Alluvial Soils	51.11
	Red-yellow podzols	14.23
	Total	100
Stung Krang bat		
	Alluvial Lithosols	16.82
	Great Lake	12.62
	Lacustrine Alluvial Soils	70.56
	Total	100

(Source: ESCIA Study 2024)

6.3.4.2 Ou Ta Paong

According to the soil type data collected by Dr. Crocker in 1962[12], three (3) distinct soil types were identified within the Ou Ta Paong scheme site including Cultural hydromorphics, Gray hydromorphics, and Lacustrine alluvial Soils. The first type is the cultural hydromorphics soils which human societies interact with, modify, and influenced by water bodies and landscapes over time. This type is characterized by a dense layer beneath the plow as per the continuous changes of soil nutrients due to human interaction including cultural practices, adaptation and modification in combination with hydrological regime influences. The second type is gray hydromorphics, a type of soil characterized by a wet, dry, and watery composition. They typically feature a gray layer overlying a yellow-gray clay layer. Lastly, lacustrine alluvial soils are annual, submerged soils that can accumulate varying amounts of sediment based on the surrounding topography.

6.3.4.3 Lum Hach

The Lum Hach sub-scheme features a diverse range of soil types, each contributing uniquely to the area's agricultural and environmental landscape. The dominant soil type in this region is red-yellow podzols, which make up 90.66% of the area. These soils are characterized by their distinct A2 layer (iron brick) and a B layer with a mix of red, yellow, or gray hues, lacking clear divisions between layers.

In addition to red-yellow podzols, the Lum Hach area includes acid lithosols, cultural hydromorphics, and lacustrine alluvial soils. Acid lithosols cover 5.05% of the sub-scheme and are derived from the underlying bedrock in the hilly and foothill regions of Cambodia, characterized by their acidic nature. Cultural hydromorphics, occupying 2.76% of the area, are notable for their dense layer beneath the plow, distinguishing them from other soil types. Lacustrine alluvial soils, which cover 1.52% of the sub-scheme, are periodically submerged soils that accumulate sediment influenced by local topography.

6.3.4.4 Stung Krang Ponley

Stung Krang Ponley area, encompassing the Brambei Mom, Krapeu Truom, Yutasas, and Steung Krang Bat sub-schemes, features a diverse range of soil types that influence land use and agricultural practices. The distribution of these soil types varies significantly across the different sub-schemes, affecting their suitability for various uses.

Brambei Mom is characterized by three (3) predominant soil types. The most widespread is red-yellow podzols, covering 60% of the area. This type is followed by cultural hydromorphics, which occupy 26.43% of the site. Alluvial lithosols are present but constitute a smaller proportion at 13.4%. This distribution suggests that red-yellow podzols are the primary soil type influencing land use in the Brambei Mom project area, with the other types providing supplementary characteristics.

Krapeu Truom also features a two-soil type distribution but with a different balance compared to Brambei Mom. Alluvial lithosols dominate 57.04% of the area, while red-yellow podzols make up 42.96%. This balance indicates that alluvial lithosols are the more prevalent soil type,

[12] Crocker, Charles D. (1962). *The general soil map of the Kingdom of Cambodia and the exploratory survey of the soils of Cambodia*.

which may influence agricultural practices and land management strategies within the project area.

Yutasas presents a diverse soil composition with three (3) types present. Lacustrine alluvial soils are the most common, covering 51.11% of the area, followed by alluvial lithosols at 34.66%. Red-yellow podzols are less common, comprising 14.23% of the site. The predominance of lacustrine alluvial soils suggests their significant role in shaping agricultural and land use practices in the Yutasas area.

Steung Krang Bat is characterized by a predominance of lacustrine alluvial soils, which cover 70.56% of the area. This is followed by alluvial lithosols at 16.82% and great lake soils at 12.62%. The dominance of lacustrine alluvial soils highlights their importance in the land management and agricultural planning of the Steung Krang Bat project site. The smaller proportions of the other soil types indicate their supplementary roles in the overall soil profile of the area.

6.3.5 Hydrological Resources

6.3.5.1 Cambodia

Cambodia has considerable water resource potential, with abundant surface water and aquifers and a high level of seasonal rainfall. In spite of the abundance of water sources, many areas in the central plains and plateaus lack water in the dry season and are therefore dependent on unreliable rainfall patterns. The country's water resources are dominated by the Mekong River system (86% of country's territory), including the catchments of the Bassac River, the Tonle Sap River, and the Lake Tonle Sap and its tributaries[13], and the river system flowing into the Gulf of Thailand (remaining 14%) as per shown in Figure 6.8.

Figure 6.8: River Basin Groups in Cambodia

[13] The Mekong River and Lake Tonle Sap are connected by the Tonle Sap River, which twice a year reverses its direction of flow. From July to October, when the level of the Mekong is high, water flows into the Tonle Sap River, which fills Lake Tonle Sap, thereby increasing the size of the lake from 2,600 km^2 to about 10,500 km^2 at its maximum. The storage capacity of Lake Tonle Sap is estimated at 72 km^3. In November, when the level of the Mekong decreases, the Tonle Sap river reverses its flow, and water flows from Lake Tonle Sap to the Mekong river and thence to the Mekong Delta (https://wateractionhub.org/geos/country/37/d/cambodia/).



(Source: Ministry of Water Resources and Meteorology, 2019)[14]

However, **75% renewable freshwater comes from upstream transboundary** sources via the Mekong River system (355.5 km^3/year of surface water), mainly from Lao PDR (91.3%), but also Thailand (8.4%) and Viet Nam (0.3%). As an intermediate basin country, up to 471.51 km^3/year of surface water flows out of the country to Vietnam through the Mekong and its tributaries. This emphasizes the critical inter-dependency of Mekong states, and their sensitivity to the actions of neighboring countries, particularly those that are upstream[15]. In terms of groundwater, 17.6 km^3/year is estimated to be produced in-country, although there is no register of transboundary for inflow or outflow of groundwater.

Agriculture accounts for 96% of all **water use,** domestic rural use 1%, and industry, domestic urban, and aquaculture use less than 1%16. Although the amount of water used is estimated to be only about 2% of total surface water volume[17], water shortages do occur during the dry season, especially in the Tonle Sap River system—due to the lack of stored water and limited access to water. [18] Cambodia's water resources sector faces a range of multisectoral, geographical, and hydro-meteorological issues. The Mekong River, particularly the Lower Mekong Basin (LMB), has been identified as a region that is highly vulnerable to the impacts of climate change, more frequent and intense. Climate change is affecting the water cycle, bringing change in the hydrology of major rivers and tributaries as well as groundwater recharge. Recurrent floods occurred in the last decade, with important economic losses,

[14] Irrigated Agriculture Improvement Project: National Water Resources Data Management Center and Water Resources Information System Report
[15] https://tableau.apps.fao.org
[16] Government of Cambodia. 2019. *National Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019–2033*. Phnom Penh.
[17] ADB. 2014. Cambodian National Water Status Report 2014. Phnom Penh.
[18] https://MoWRAM.adb.org/sites/default/files/publication/689106/adb-brief-171-surface-water-resouces-rbgs-cambodia.pdf

mainly on rice crops, but also people's lives[19]. Farmers, who depend on rain-fed agriculture, will be increasingly at risk of disasters, and especially droughts and floods, causing severe damage to rice harvests[20]. In short, Cambodia faces the common climate change challenges of **too much** water in the wet season, **too little** in the dry season, and gradually **too dirty** due the increasing pollution, particularly in populated cities.

The feasibility study report indicates that Cambodia is likely to face changes in water balances and flood regimes due to projected increases in temperature and altered precipitation patterns. An increase in consecutive dry days is expected to worsen water scarcity, especially during the dry season, impacting communities in rain-fed areas around the Tonle Sap more severely than those with year-round access to the Mekong River or irrigation systems.

6.3.5.2 Ou Ta Pong

The water sources for irrigation in Ou Ta Paong primarily come from three (3) rivers: the Pursat River, Ou Ta Paong River, and Svay Don Keo River. The Pursat River is the largest water source for Ou Ta Paong, originating approximately 25–35 km upstream and covering a catchment area of around 4,245 km². Water from the Pursat River is stored in three (3) main dams located on the river's tributaries: Dam No. 3, Dam No. 5, and Dam No. 1. The available water from Dam No. 3 and Dam No. 5 is relatively small (24.5 MCM and 25.5 MCM, respectively), while Dam No. 1, currently under construction, is expected to have a storage capacity of 1,014 MCM. However, the primary purpose of Dam No. 1 is hydropower. Downstream of the Pursat River, several headworks have been constructed to store and divert water mainly for irrigation, including Damnak Chheu Krom, Damnak Ampil, and Kbal Hong, which supply water to a series of agricultural lands along the river, primarily for paddy rice cultivation.

In contrast, the Svay Don Keo River is relatively small, with a catchment area of 322 km², and is situated on the left side of the command area. This river runs parallel to the Ou Ta Paong River, with both rivers discharging into Tonle Sap Lake at the end of their watercourses. Due to water diversions along the stream for agricultural production, Ou Ta Paong has now transformed into a series of ponds, especially in the lower part of the river.[21]

The CAISAR Feasibility Study reported that water availability will be adequate at the time that Dam No. 1 is completed, provided there is proper coordination among the stated dams. At the current stage, Pursat Provincial Department of Water Resources and Meteorology (PDoWRAM) has reported that the available water is insufficient for irrigation purposes within the province, with a shortfall of approximately 700 MCM. Additionally, PDoWRAM acknowledged that the water from Dam No. 1 is designated solely for hydroelectric purposes, which may limit the amount available for agriculture or irrigation. There is, however, another dam, Dam No. 2, which was approved by the government in late June 2024. PDoWRAM also reported that the construction is in the process of mobilizing equipment to the site. The

[19] i.e. Floods accounted for 70% of rice production losses between 1998 and 2002, whereas droughts accounted for 20% of those losses. The most recent report on floods showed that the country had lost 40, 45, 188, 250, and 43 lives in 2020, 2014, 2013, 2011, and 2009, respectively. In addition, the economic loss was estimated at USD 1.000, 521, 70, and 132 million due to floods in 2013, 2011, 2010, and 2009, respectively.

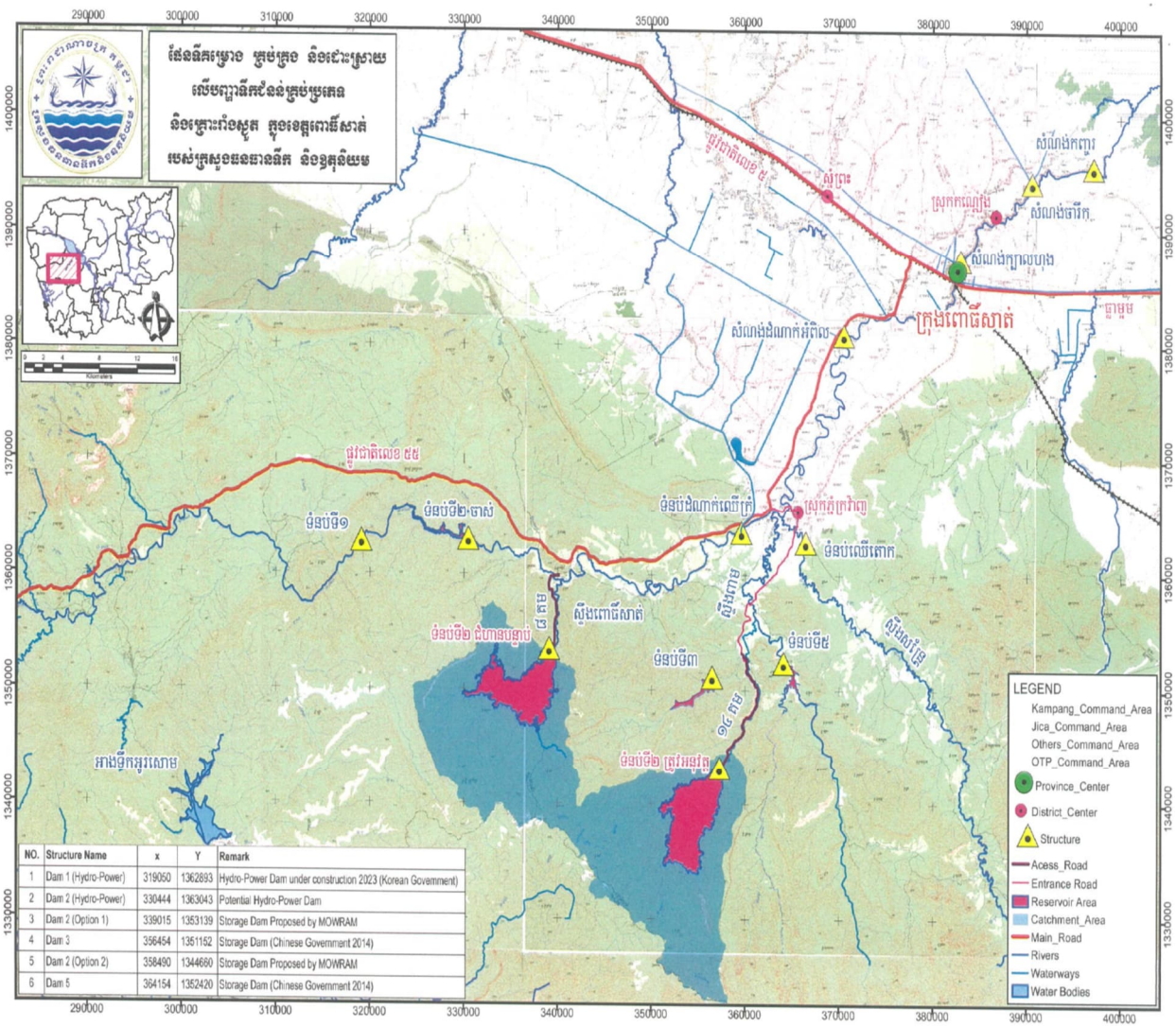
[20] Mak Sithirith (2017). Water Governance in Cambodia: From Centralized Water Governance to Farmer Water User Community. MDPI.

[21] MoWRAM. 2024. Report on Screening of Associated Facilities. CAISAR Project.

reservoir for this dam covers 4,016 hectares, with a storage capacity of 861.75 MCM. The dam is expected to be completed by the end of 2026 (Figure 6.9). Earlier projections indicated that the combined water supply from Dam No. 1, Dam No. 3, and Dam No. 5 would likely be sufficient. With the addition of Dam No. 2, it is highly likely that the province's water needs will be fully met.

The current discussion with farmers on water availability at Ou Ta Paong showed that during the periods that the crop requires irrigation, conflicts about water tend to arise. The available water along the river was diverted into the rice field via secondary canals along the river. The limited availability of water regulated from the upstream, mainly the Damnak Ampil canal cannot flow until the end of the river where the river has become a string of ponds, causing some locations of the rivers to have been turned into backyard garden of the residents along the river. As water is limited, water shortage has become the main cause for financial losses. This causes much stress, because of the risk of drought damage to the crops, and the cost of pumping from low water levels. The risks reduce farmers' motivation to invest in new technologies and climate-smart agriculture.

Figure 6.9: Map with Illustration of Dam No. 2



(Source: Pursat PDoWRAM, 2024)

6.3.5.3 Lum Hach

Water availability in the Lum Hach area has been a significant challenge, primarily due to the poor functionality and disrepair of the original irrigation infrastructure. The '1st of January Canal,' constructed in the mid-1970s, was intended to provide water from the Boribo River through a 30 km main canal and branch canals. However, a major flood soon after its completion caused the collapse of the headworks, rendering the canal non-operational. Since then, the canal has been neglected, with its hydraulic gradient too low to transport water effectively. In 2005, a study by JICA identified the potential for irrigation development in the area, focusing on a 3,100-ha command area under the first branch canal. JICA's efforts culminated in the completion of the Lum Hach 1 Scheme in 2020, which included a new barrage and modified canal systems. However, the new lower barrage required additional excavation work to fully re-establish water flow in the canal system.

Despite these improvements, water shortages remain a concern. The lower levels of the new headworks and canals prompted the CAISAR project to explore alternative water sources, including utilizing the network of streams to the southwest of the 1st of January Canal. Additionally, the sparse and inadequate irrigation infrastructure in the area limits the system's ability to function efficiently. Compounding the issue, the Achang Irrigation Scheme, constructed downstream in 2016, now competes for water from the Boribo River. Because the Lum Hach headworks are upstream, they can divert water, leaving the downstream Achang Scheme vulnerable to water shortages. This competition, coupled with the need for further canal excavation and improvements, presents ongoing challenges for reliable water supply in Lum Hach.

6.3.5.4 Stung Krang Ponley

The Stung Krang Ponley irrigation scheme relies on various water sources to support its sub-schemes, with water availability playing a crucial role in agricultural productivity. The Brambei Mom scheme is supplied by the Ou Khley River and its reservoir, completed in 2012 as part of the Krang Ponley Project. The reservoir, covering 67 hectares, supports domestic use and small-scale agriculture, particularly during the dry season. Water is also drawn from the larger Anlong Chrey Reservoir, enhancing the scheme's capacity. However, the system is incomplete, with canals that are too short and in poor condition, requiring rehabilitation. The siltation of the 37-kilometer-long Ou Khley River further complicates water management, leading to frequent flooding and reduced irrigation capacity, especially during the wet season.

Krapeu Truom, another sub-scheme, primarily relies on the Anlong Chrey Reservoir and the Kdol Dam as secondary water sources. The system consists of two (2) main canals, 11 secondary canals, and multiple distribution and check structures. While the canals are largely functional, some design defects have led to damage in the downstream structures. Additionally, the crest elevations of some offtakes are lower than the adjacent rice fields, hindering irrigation. Despite these challenges, the Farmer Water User Community (FWUC), established in 2016, has been successful in managing water distribution, although improvements are needed to enhance overall efficiency.

Yutasas and Steung Krang Bat, the remaining sub-schemes, also depend heavily on water from Anlong Chrey Dam and Kdol Dam. Yutasas, added to the CAISAR project in 2023, is located between Krapeu Truom and Steung Krang Bat, and shares a similar layout with its

neighboring schemes. Steung Krang Bat, with an extensive canal network, includes over 13 kilometers of main canals and over 20 kilometers of drainage canals. While functional, the scheme requires repairs to its crosscheck and offtake structures and extensions to its drainage system. Both schemes face infrastructure challenges but remain vital to the region's irrigation system, with ongoing efforts needed to ensure sustainable water availability.

6.3.6 Climatic Conditions

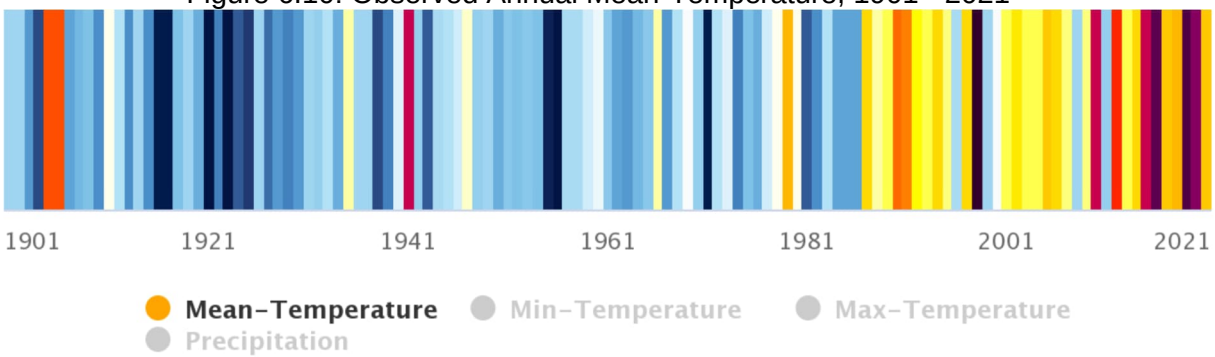
6.3.6.1 Overview

The feasibility study document of the project highlighted the vulnerability of Cambodia to climate change impacts at a high level, ranked at 12th out of 181 countries in the Global Climate Risk Index between period 1999 and 2018 as its score provided by the Notre Dame Global Adaptation Index between a high-vulnerability score and low-readiness score. The high-risk rating of Cambodia is attributable to geographical condition being highly exposed to climatic extreme events such as floods and droughts, high reliance on agriculture sector and low adaptive capacity of the country given its limited financial, institutional and technical resources. Such a trend has caused the projection of the country's GDP to be reduced by nearly 10% by 2050. It is also reported that the climatic changes will alter how land and natural resources are accessed and used as they are expected to induce geographic shifts in resource productivity and availability and land use patterns. Moreover, the general trend shows that the country will have less rainfall certainty with more and shorter duration and higher intensity posing significant challenges to water resource management of the country.[22]

6.3.6.2 Past Trends

The historical change of the country had been severely impacted by longer dry seasons and more intense "El Niño" related droughts with the delay of the monsoon season; increased rain intensity and frequency, leading to floods; and unexpected dry periods during the rainy season. The increase of the annual mean temperature anomaly in Cambodia is at a rate of 0.23 °C per decade since 1950, with a stronger signal during the dry season along with increasing number of hot days since 1960 to an average of 46 by 2016 (Temperature maximum >35 °C[2]).

Figure 6.10: Observed Annual Mean-Temperature, 1901 - 2021



(Source: ESCIA Study 2024)

[22] WAPCOS (2023). CAISAR Feasibility Study – Main Volume. Ministry of Water Resources, and Meteorology, Cambodia

It was also reported that precipitation across Cambodia varies significantly, ranging from 4,000mm annually near the Cardamom mountains to 1,400mm in the central lowlands, with the CAISAR project areas receiving 1,300–1,500mm mostly during the rainy season (May–October). Rainfall variability is linked to the El Nino Southern Oscillation, which correlates with periods of drought. Historical patterns show that floods and droughts have caused widespread damage to crops, infrastructure, and economic activities, while also increasing water-borne diseases. Although no significant trend in overall precipitation has been statistically confirmed, anecdotal evidence suggests an increase in rainfall intensity, floods, and severe droughts, leading to greater crop yield losses and pressures on authorities to manage these events.

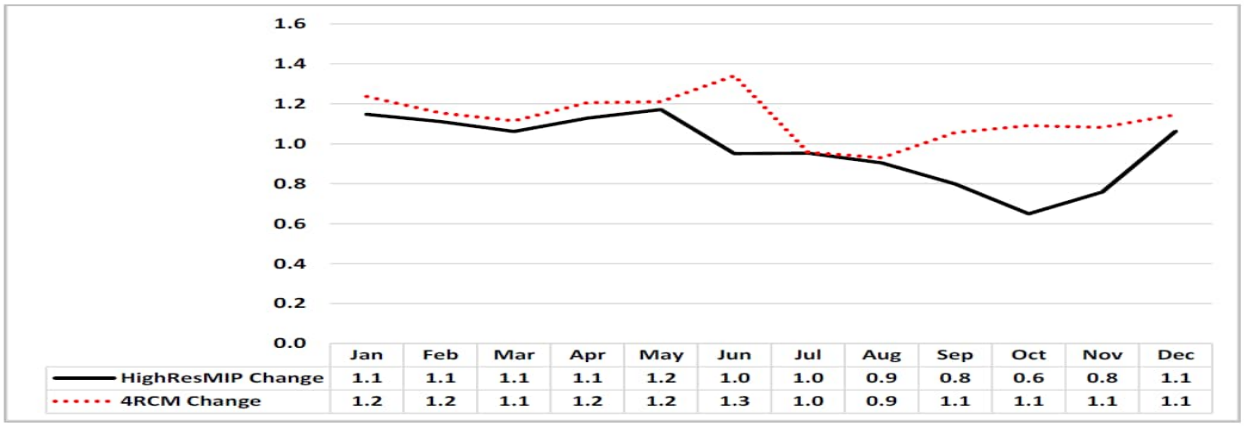
6.3.6.3 Future Trends

According to the Feasibility Study Report, the climate projections for Cambodia indicate an increase in average rainfall, with precipitation becoming more concentrated and leading to dry spells even during the wet season, which may result in more frequent flood events. Additionally, mean temperatures are expected to rise, extending drought periods and potentially causing significant economic impacts. A detailed analysis of the effects of climate change on agriculture reveals that changes in precipitation and temperature will critically affect water availability and crop yields, emphasizing the need for effective adaptation and resilience strategies.

The Climate Vulnerability Analysis (CVA) report – using historical data between 1990 and 2021 – compared historical climate data with future projections for 2026–2050 using various climate models, revealing variability and uncertainty in the results. While some models, such as the 4RCM, showed an annual increase in rainfall of about 6%, others, like HighREsMIP, suggested a slight decrease of around 1%. Seasonal fluctuations were evident, with some months experiencing significant increases in rainfall and others facing notable decreases. These findings highlight the complex nature of climate change predictions and the necessity for thorough analysis beyond annual averages. Overall, the models consistently indicate reduced rainfall during the dry season and increased rainfall during the wet season, which poses challenges for sustainable agriculture in Cambodia and underscores the importance of adaptive measures to cope with changing water availability.

Modelled changes in temperature between the historic period 1995 – 2021 and the future scenario 2026 – 2050 are consistent, with a general projected increase of 1°C. Temperature increases are expected to be marginally higher during the dry season compared to the wet season although there is still some degree of variability observed throughout the year (Figure 6.11).

Figure 6.11: Temperature change factor in °C between ’95-’21 and ’26-‘50



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HighResMIP Change	1.1	1.1	1.1	1.1	1.2	1.0	1.0	0.9	0.8	0.6	0.8	1.1
4RCM Change	1.2	1.2	1.1	1.2	1.2	1.3	1.0	0.9	1.1	1.1	1.1	1.1

6.3.6.4 *Floods*

The feasibility study report also described Cambodia as the most flood-prone countries in Southeast Asia due to its monsoonal climate condition with two (2) distinct hydrological regimes. There are two (2) main types of flooding in the country: seasonal overflows from the Mekong River, its tributaries, and the Tonle Sap, and flash floods from heavy rains in mountainous areas. Seasonal flooding can be beneficial by providing fertile soil for agriculture, but if it becomes severe, it can cause extensive damage to crops, infrastructure, and communities. Flash floods, often triggered by heavy rains, can destroy crops and damage infrastructure, particularly in the tributaries of the Tonle Sap Lake. Extreme flood events in recent years have led to significant economic losses, crop failures, and infrastructure damage, underscoring the need for improved flood management and disaster preparedness.

Inadequate maintenance of drainage channels and irrigation infrastructure exacerbates the impact of floods, leading to prolonged inundation and increased damage to agriculture and communities. The unpredictability of flood events, influenced by upstream development and climate change, highlights the vulnerability of Cambodia's agricultural sector and rural livelihoods. Understanding the expected annual damage from floods is crucial for managing risks and planning for future impacts, as it helps estimate the long-term economic effects of recurring flood events on rice cultivation and other agricultural activities.

6.3.6.5 *Droughts*

Droughts are a significant hazard in Cambodia, particularly affecting agricultural productivity for rain-fed rice farmers. Droughts are often linked to El Niño events, such as the severe 2015/16 drought that affected 2.4 million people across 18 provinces. During this period, many households reported water shortages, crop failures, decreased agricultural production, and high animal mortality rates, leading to significant income losses. Recent surveys indicate that consecutive years of drought have made farming economically unviable for many, forcing them to seek employment in neighboring countries like Thailand. Climate change is expected to exacerbate drought conditions by increasing the number of consecutive dry days, further straining limited water resources and impacting rain-fed agricultural communities.

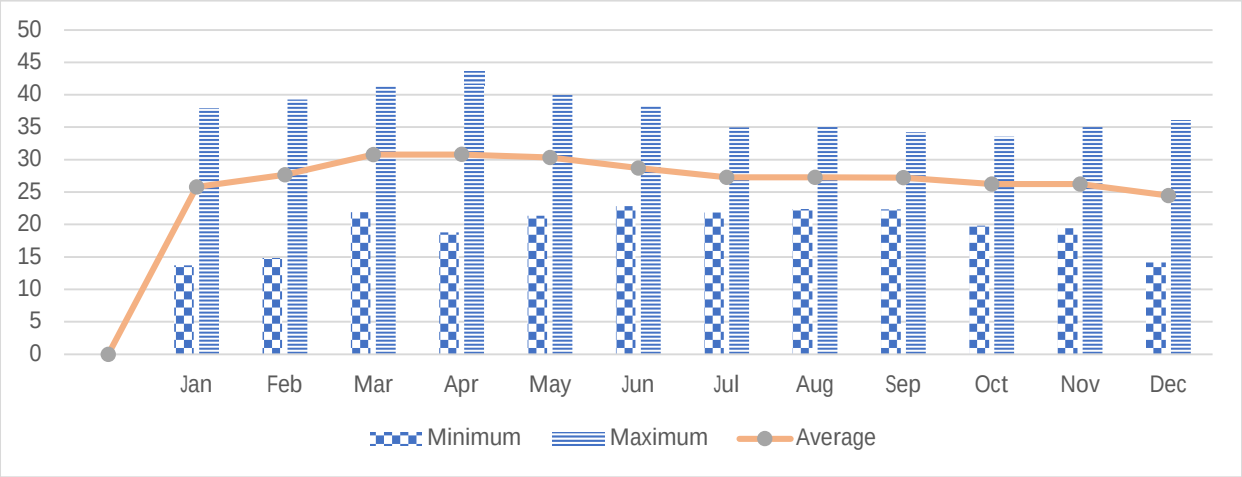
6.3.6.6 *Ou Ta Paong*

Temperature

This temperature study was conducted over the last 10 years (2013-2022) using NASA POWER data. For the last decade, the annual average maximum temperature was 43.55 °C,

the annual average minimum temperature was 13.68 °C, and the annual average temperature was 36.95 °C. In addition, for each 10-year monthly, the lowest minimum monthly temperature was in January at 13.68 °C and the highest maximum monthly temperature in April was 43.55°C.

Figure 6.12: The maximum average and minimum monthly temperature for the last 10 years (°C)

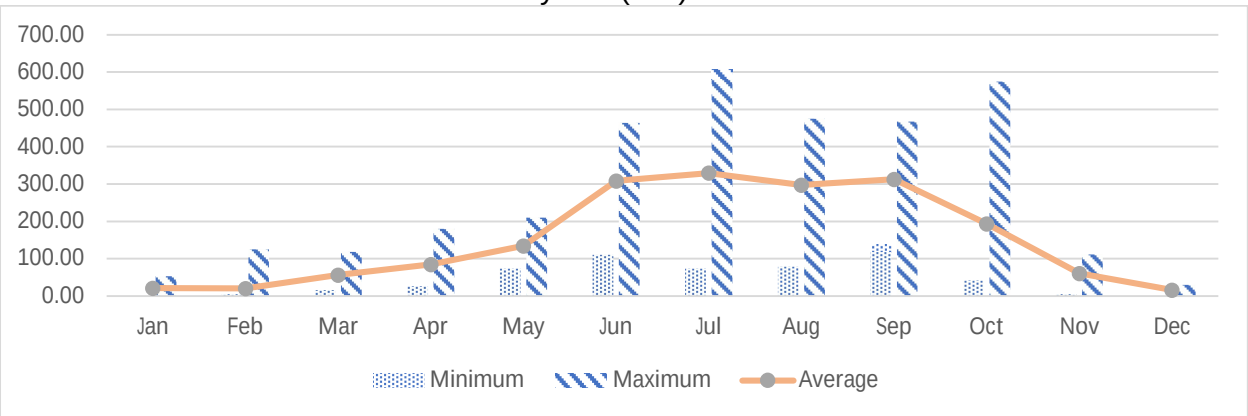


Source: NASA POWER (2024)

Precipitation

According to the latest 10-year rainfall data (2013-2022) by NASA POWER, the average annual rainfall was 1837.37 mm, the minimum annual rainfall was 791.02 mm in 2016, and the maximum annual total was 2591.04 mm in 2022. While the monthly rainfall indicates that July was the month with the highest average monthly rainfall of 329.81 mm, and the lowest average monthly rainfall was December, which had a rainfall of 16.39 mm.

Figure 6.13: The maximum, average, and minimum monthly precipitation for the last 10 years (mm)



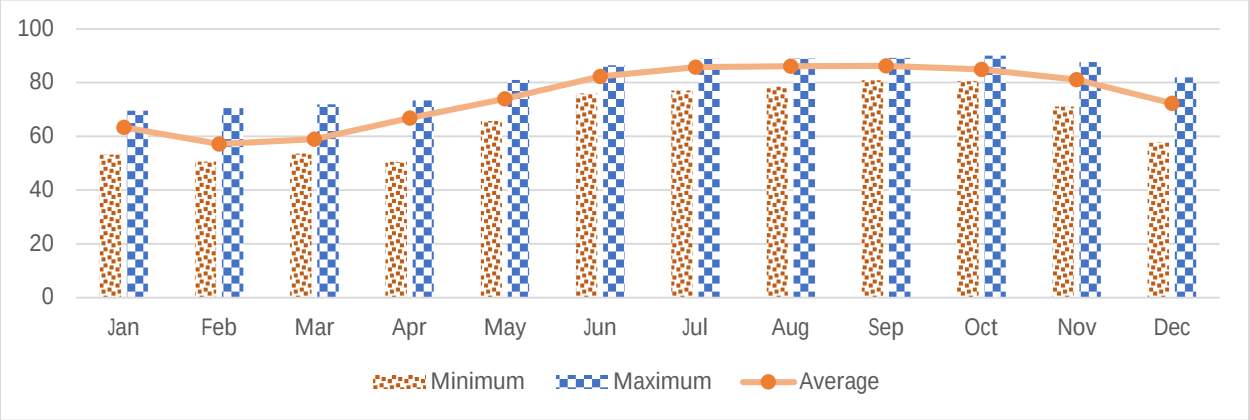
Source: NASA POWER (2024)

Humidity

Humidity data in the Ou Ta Paong scheme area for the last 10 years (2013-2022) show that the annual minimum average humidity was 69.62% in 2016, the maximum annual average humidity was 80.19% in 2022, and the annual average humidity equals 75.01%. On the other

hand, the highest monthly maximum humidity was 90.06% in October, and the lowest monthly minimum humidity was in April at 50.5%.

Figure 6.14: The maximum, average, and minimum monthly humidity for the last 10 years (%)

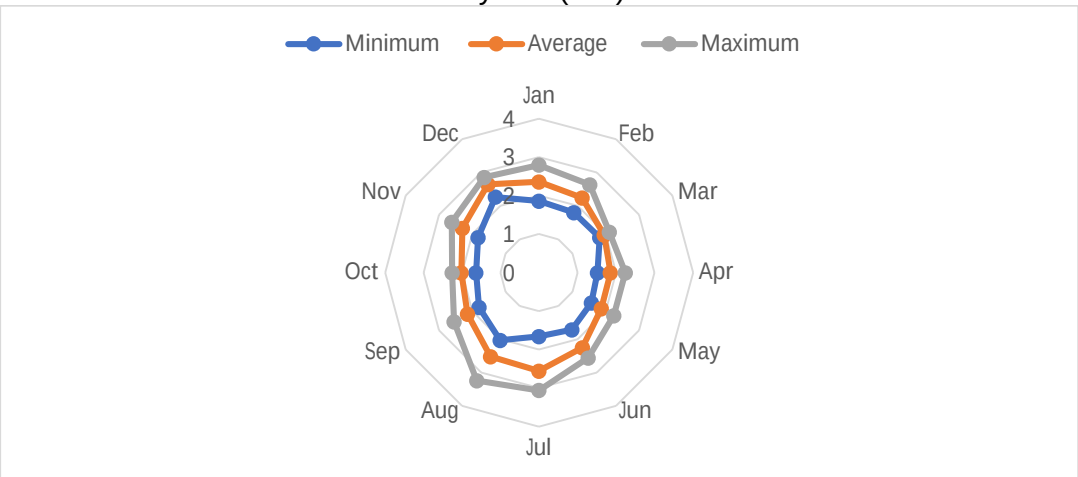


Source: NASA POWER (2024)

Wind speed

The table below shows the monthly wind speed in the Ou Tan Paong scheme area for the last 10 years (2013-2022). The annual minimum wind speed was 2.09 m/s in 2020, the annual average wind speed was 2.23 m/s, and the annual maximum wind speed was 2.38 m/s in 2016. In addition, the lowest monthly wind speed in April was 1.52 m/s, and the maximum wind speed in August was 3.24 m/s.

Figure 6.15: The maximum, average, and minimum monthly wind speed for the last 10 years (m/s)



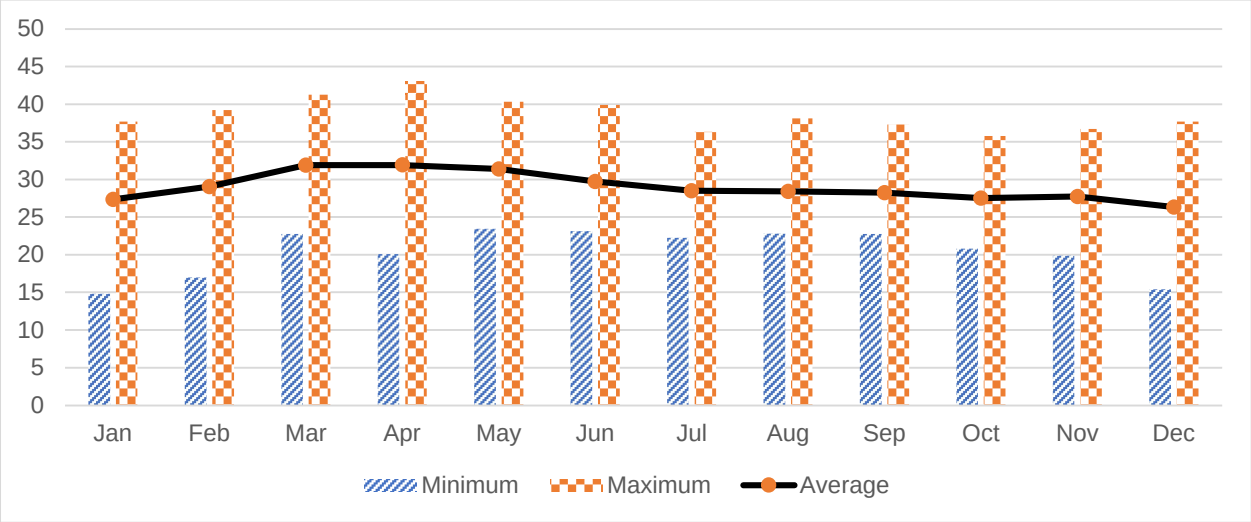
Source: NASA POWER (2024)

6.3.6.7 Lum Hach

Temperature

The table presents monthly temperature data for the Lum Hach scheme area from 2013 to 2022, based on NASA POWER data. In the table below also provides the overall minimum and maximum temperatures recorded during the decade, as well as average monthly and annual temperatures. In fact, the lowest monthly minimum temperature in January was 14.80°C, and the highest maximum temperature in other months was in April at 43.06°C.

Figure 6.16: The maximum, average, and minimum monthly temperature for the last 10 years (°C)

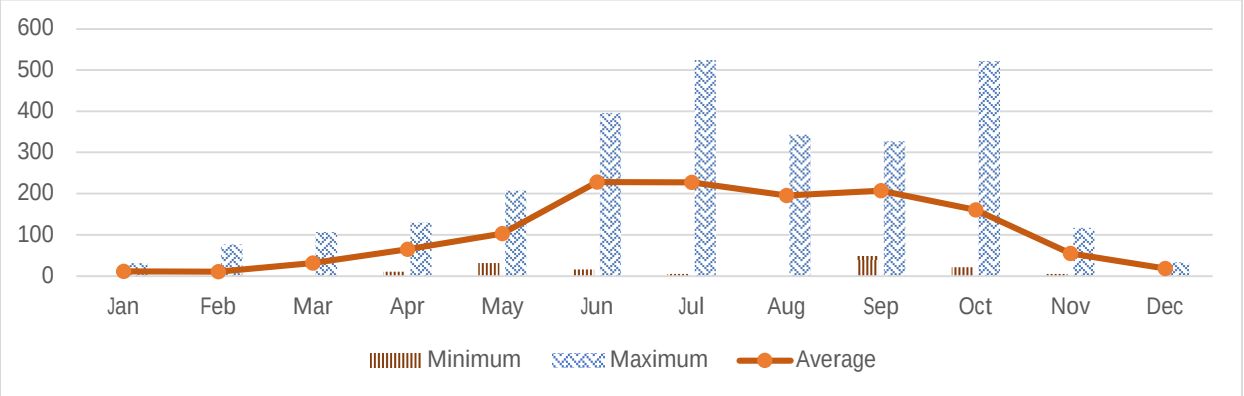


Source: NASA POWER (2024)

Precipitation

The table presents monthly precipitation data for the Hum Hach scheme area from 2013 to 2022. The lowest minimum precipitation recorded was 0 mm in multiple months throughout the decade. The highest monthly precipitation occurred in August 2021, reaching 342.77 mm. This indicates significant rainfall variability in the region, with some months experiencing no precipitation while others receiving a lot.

Figure 6.17: The maximum, average, and minimum monthly precipitation for the last 10 years (mm)

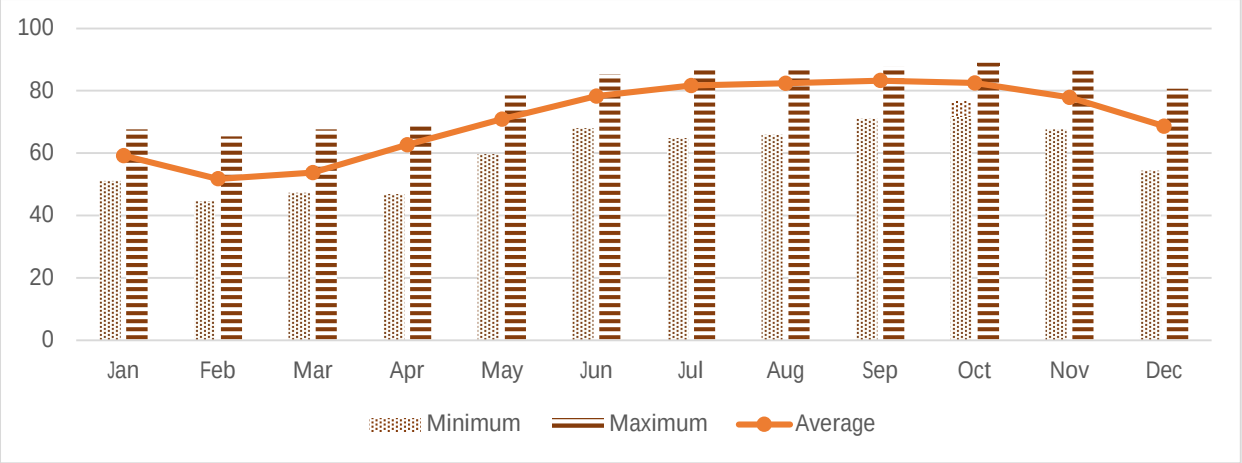


Source: NASA POWER (2024)

Humidity

The table presents monthly humidity data for the Lum Hach scheme area from 2013 to 2022. The annual minimum average humidity was 62.38% in 2016, while the maximum annual average humidity was 77.94% in 2022. Overall, the annual average humidity 71.19% over the decade. Regarding monthly variations, the highest monthly maximum humidity was observed in October 2020 at 89.06%, and the lowest monthly minimum humidity was recorded in February 2014 at 44.56%.

Figure 6.18: The maximum, average, and minimum monthly humidity for the last 10 years (%)

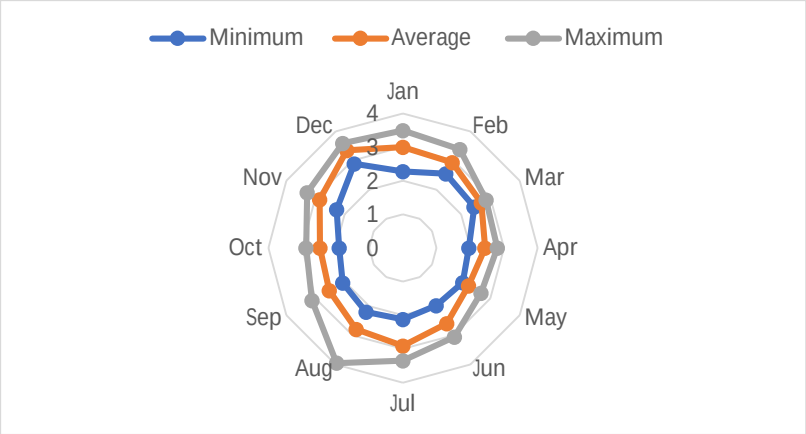


Source: NASA POWER (2024)

Wind Speed

The annual minimum average wind speed was 2.57 m/s in 2014, while the maximum annual average wind speed was 2.98 m/s in 2016 and 2022, and the annual average wind speed was 2.73 m/s over the decade. Regarding monthly variations, the highest monthly maximum wind speed was observed in August 2016 at 3.95 m/s, and the lowest monthly minimum wind speed was recorded in October 2015 at 1.9 m/s.

Figure 6.19: The maximum, average, and minimum monthly wind speed for the last 10 years (m/s)



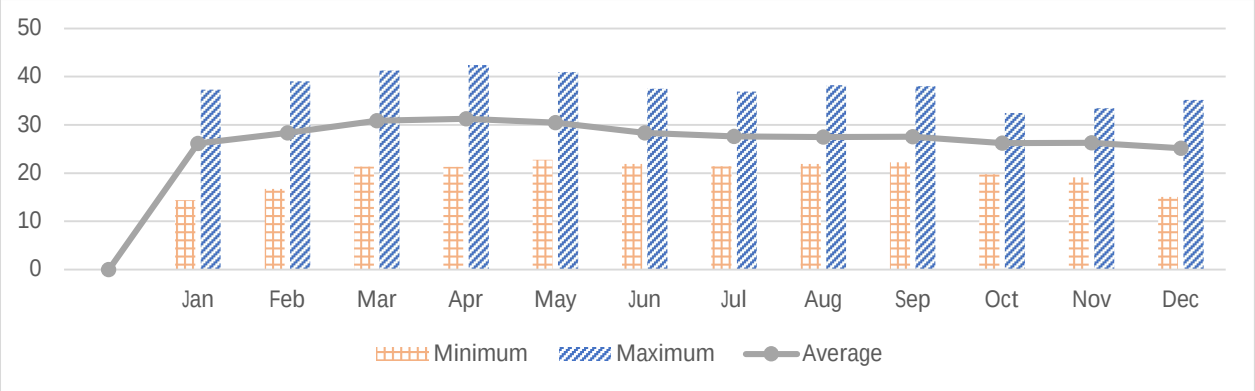
Source: NASA POWER (2024)

6.3.6.8 Stung Krang Ponley

Temperature

Temperatures in the Stung Krang Ponley scheme area for the last 10 years between 2013-2022 using NASA POWER data. According to the table below shown, the annual average temperature was 27.96 °C, the annual average minimum temperature was 14.37 °C in 2014, and the annual average maximum temperature in 2016 at 42.4 °C. Regarding monthly temperature extremes, the lowest minimum temperature of 14.37°C was observed in January, and the highest maximum temperature of 42.4°C occurred in April.

Figure 6.20: The maximum, average, and minimum monthly temperature for the last 10 years (°C)

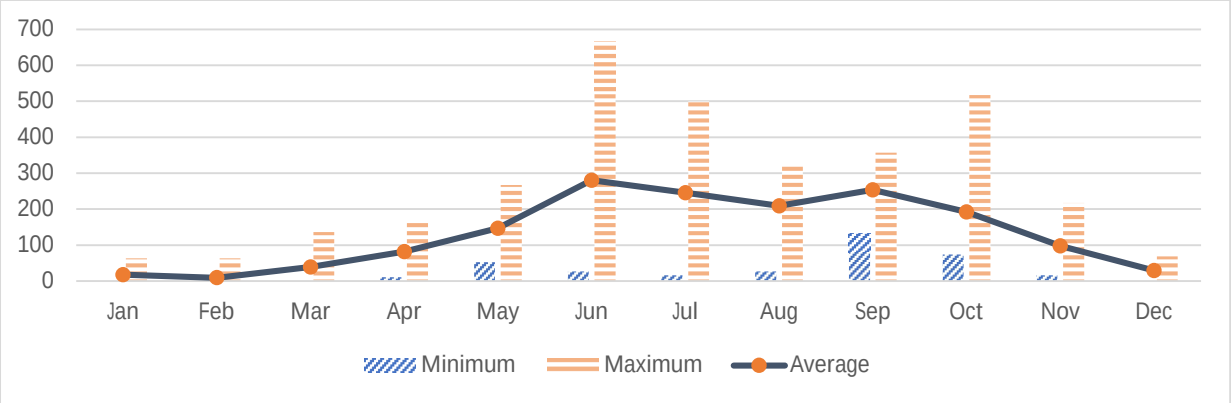


Source: NASA POWER (2024)

Precipitation

The Stung Krang Ponley scheme area shows an average annual precipitation of 1604.14 mm over the decade from 2013 to 2022. The annual minimum precipitation was recorded in 2016 at 653.91 mm, while the annual maximum precipitation occurred in 2020, reaching 2293.95 mm. The lowest minimum rainfall data were found in January, February, March, and December at 0 mm. In October, the highest average monthly rainfall was 516.6 mm.

Figure 6.21: The maximum, average, and minimum monthly precipitation for the last 10 years (mm)

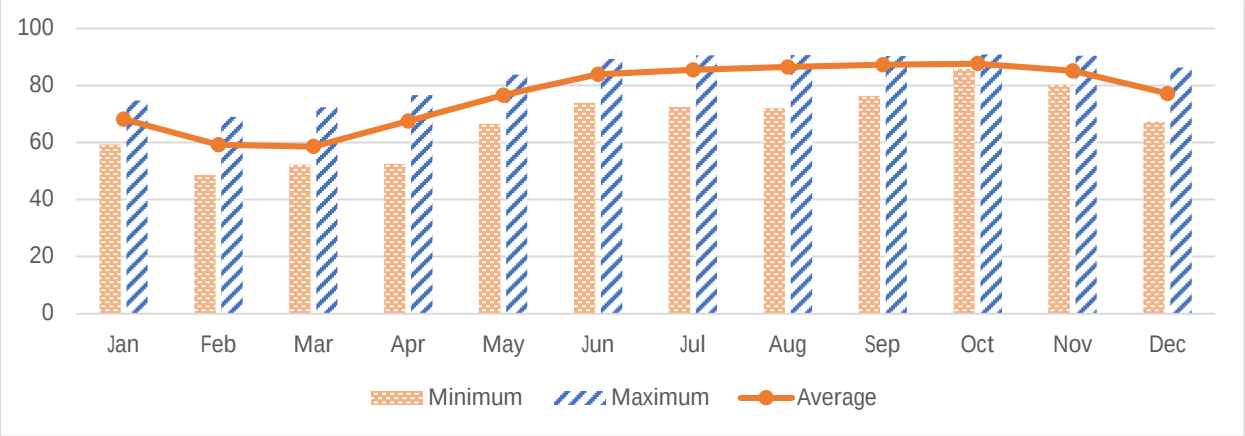


Source: NASA POWER (2024)

Humidity

The table presents monthly humidity data for the Stung Krang Ponley scheme area from 2013 to 2022. The annual minimum average humidity was 69.44% in 2016, while the maximum annual average humidity was 82.81% in 2022. In additional, the annual average humidity was 77.03% over the decade. Regarding monthly variations, the highest monthly maximum humidity was observed in October 2020 at 90.88%, and the lowest monthly minimum humidity was recorded in January 2016 at 48.69%.

Figure 6.22: The maximum, average, and minimum monthly humidity for the last 10 years (%)

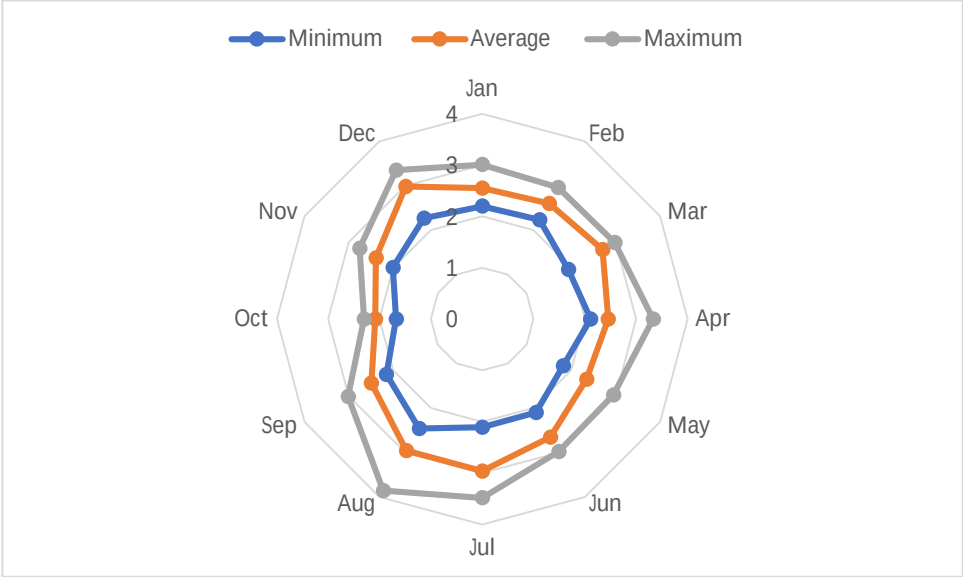


Source: NASA POWER (2024)

Wind Speed

The monthly wind speed data for the Stung Krang Ponley scheme area from 2013 to 2022. The annual minimum average wind speed was 2.45 m/s in 2022, and the maximum annual average wind speed was 2.85 m/s in 2016. While the annual average wind speed was 2.60 m/s in the last 10 years. Regarding monthly variations, the highest monthly maximum wind speed was in August 2016 at 3.86 m/s, and the lowest monthly minimum wind speed was recorded in October 2013 at 1.68 m/s.

Figure 6.23: The maximum, average, and minimum monthly wind speed for the last 10 years (m/s)



6.4 BASELINE ENVIRONMENTAL QUALITY

6.4.1 Unexploded Ordnances (UXO)

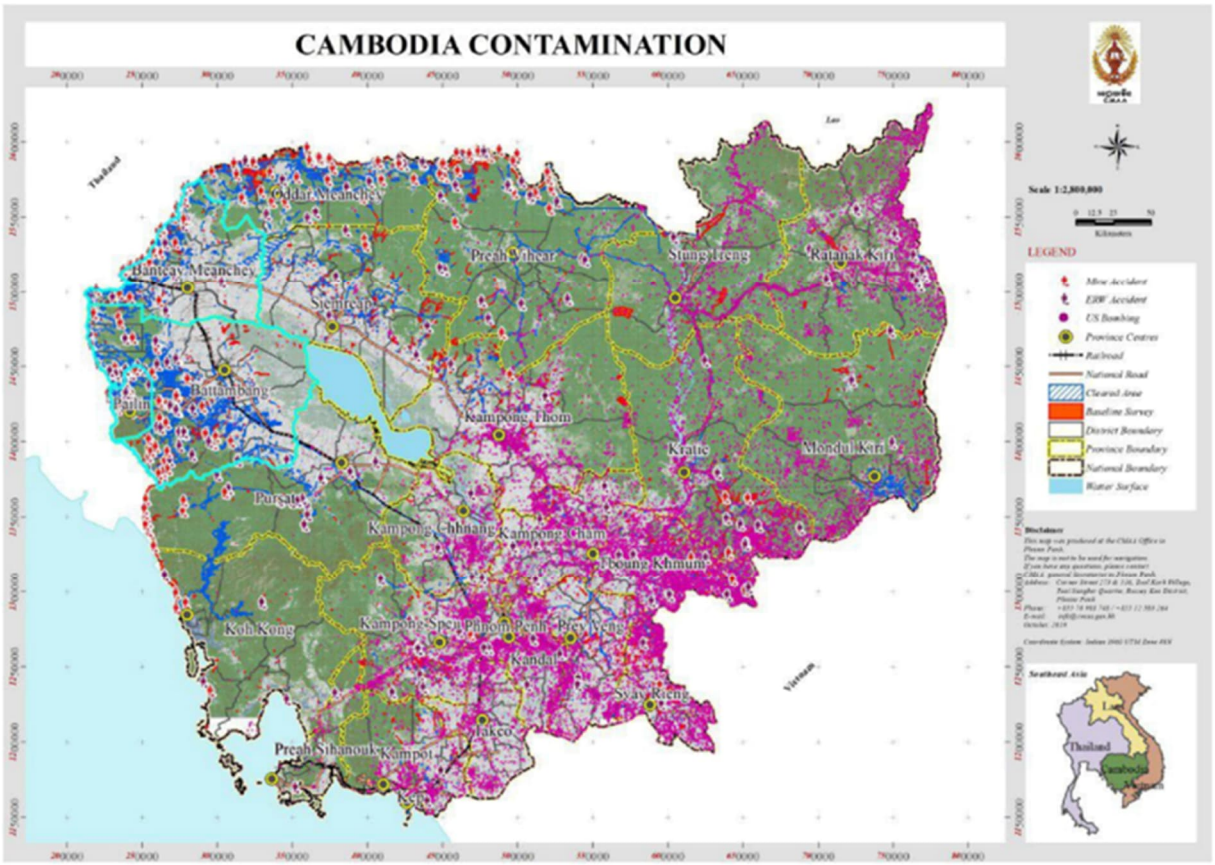
Cambodia remains one of the most heavily landmine-contaminated countries globally, a legacy of decades of conflict that has left a significant portion of its territory affected by landmines and unexploded ordnance (UXO). This contamination poses ongoing threats to safety and hinders socio-economic development, particularly in rural areas. According to the

Cambodian Mine Action and Victim Assistance Authority (CMAA), as of 2023, approximately 1,854 square kilometers of land remain contaminated, affecting more than 1.1 million people.[23]

This contamination has caused thousands of casualties over the years and continues to hinder socio-economic development by restricting land use, infrastructure projects, and agricultural expansion. Among the affected provinces, Pursat, Kampong Chhnang, and Kampong Speu have been identified as high-risk areas due to their history of intense conflict and strategic military significance. While mine clearance operations have made progress in these regions, large tracts of land remain dangerous, necessitating ongoing demining efforts to ensure safety and sustainable development. These provinces are critical for agriculture and infrastructure projects, making landmine clearance an urgent priority to enable safe land use and improve local livelihoods.

For construction projects, strict adherence to mine-related regulations is essential. Before initiating any construction activities, risk assessments and clearance operations must be conducted. This includes engaging professional demining organizations to carry out detailed surveys, safely remove and dispose of any detected UXO, and obtain official clearance certificates from recognized authorities like the CMAA. Ensuring compliance with these legal requirements is not only critical for the safety of construction personnel and future occupants but also aligns with Cambodia's national and international commitments to UXO and landmine management.

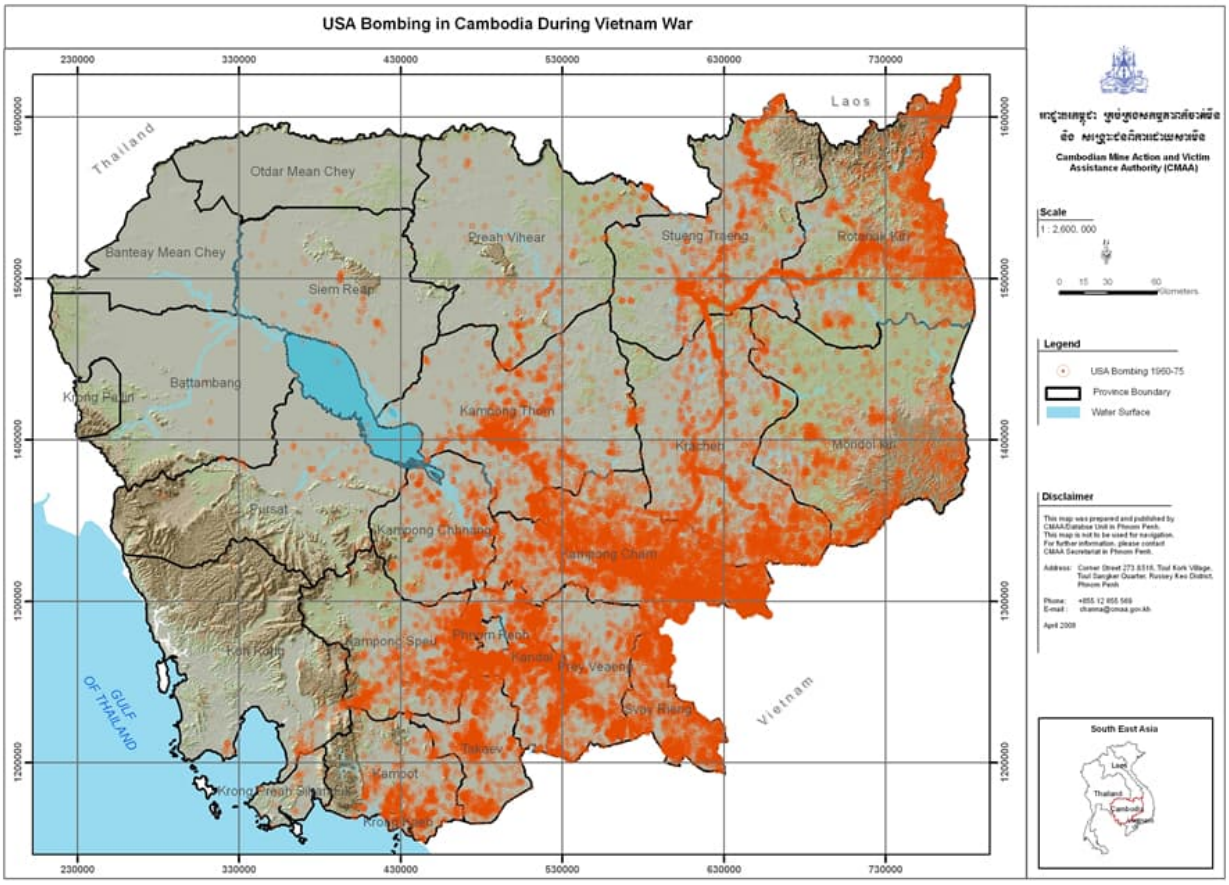
Figure 6.24: The landmine contamination map in Cambodia



[23] Yet another Cambodian province bids farewell to landmines - UCA News

(Source: Cambodian Mine Action and Victim Assistance Authority (CMAA) 2020)

Figure 6.25: Map of USA Bombing in Cambodia



(Source: Cambodian Mine Action and Victim Assistance Authority (CMAA) 2020)

Summary of the result of the landmine reports from local community is provided as Table below:

Table 6.12: Soil types and area in Cambodia

No.	Sub-scheme	Mine and UXO Situation
1	Ou Ta Paong	The location was declared a mine-free area in 2020. However, the last report on mine-explosion was in 2023 in Ou Ta Paong commune, indicating there is still a possibility of mine within the area.
2	Lum Hach	Although province was declared a mine-free area in March 2023, there was still a report on mine-witnessed in 2024 during a road construction in Krang Leav commune.
3	Krang Ponley	The province was declared a mine-free province in October 2023. However, there was a report of mine-discovered in the 2024 in Yutasas sub-scheme.

UXO = Unexploded Ordnance.

6.4.2 Ambient Air quality, Noise and Vibration

6.4.2.1 Air Quality

Overall, air quality in Cambodia has been reported to be at an acceptable level, given limited disturbance and emission of dust and gases within the country. In February 2024, Ministry of Environment (MoE) reported at the average air quality in Cambodia at excellent condition (MoE, 2024). Moreover, the air quality of the project target provinces is excellent, except Pursat which is good in quality. The same sources also reported the level of $PM_{2.5}$ in average in the four (4) provinces were below the permit standard of 50 ug/m^3.

6.4.1.1.1 Ou Ta Paong

At provincial level, the air pollution level is considered moderate[24]. The AQI is 58, which is equivalent to 13.1 µg/m^3. The ambient air quality, noise, and vibration is being linked to increases in industrial development, and the rapid urbanization. However, the Ou Ta Paong sub-scheme is located in the rural settings and about 35km from the major population centers and industrial areas in Pursat town. The baseline ambient air quality, noise and vibration in Ou Ta Paong scheme is considered generally good. Ambient air quality is sometime affected by dust from tillage and unpaved road users, including smoke from burning of rice stubble after harvest. Whilst noise and vibration disturbance are sometime affected by motorist. However, the impacts are minor and short time. In addition, the air testing results from the Damnak Chheu Krom irrigation system in Ta Lou commune, Bakan district, Pursat province located about 15 km from Ou Ta Paong reported that all five parameters (CO, NO2, SO2, TSP, and PM10) followed the standard of the Ministry of Environment at all durations (8 and 24 hours) (See Table below). The result can be referenced as the baseline for the sub-scheme since it is located within the same district and the environment of the area is the same. Further air quality tests can be conducted during the preparation of the domestic EIA.

Table 6.13: Air quality testing result of Damnak Chheu Krom project

No.	Parameter	Unit	Result	Standard
1	Carbon Monoxide (CO)	mg/m^3	0.35	<20 (8 hrs)
2	Nitrogen Dioxide (NO2)	mg/m^3	0.028	<0.1 (24 hrs)
3	Sulfur Dioxide (SO2)	mg/m^3	0.020	<0.3 (24 hrs)
4	Total Suspended Particles (TSP)	mg/m^3	0.088	<0.33 (24 hrs)
5	PM10	mg/m^3	0.044	<0.05 (24 hrs)

(Source: Ministry of Environment, June 2020)

Figure 6.26: Ou Ta Paong Water River Body

Figure 6.27: Kbal Hong Main Canal

[24] https://www.iqair.com/cambodia/pursat, accessed on 23rd September 2024





6.4.1.1.2 Lum Hach

At provincial level, the air pollution level is considered moderate[25]. The AQI is 58, which is equivalent to 12.8 µg/m^3. The Lum Hach scheme is located in the rural settings and about 60km from the major population centers and industrial areas in Kampong Chhnang town. The baseline ambient air quality, noise and vibration in Lum Hach scheme is considered generally good. The air testing results from another project reported that all five parameters (CO, NO2, SO2, TSP, and PM10) followed the standard of the Ministry of Environment at all durations (8 and 24 hours) (See Table below). In addition, the result can be used as the reference for the sub-scheme since the location of the test is only 17 km from the project location. Ambient air quality is sometime affected by dust from tillage and unpaved road users, including smoke from burning of rice stubble after harvest and burning from swidden cultivation activities. Whilst noise and vibration disturbance are sometime affected by motorist. However, the impacts are minor and short time. Further air quality tests can be conducted during the preparation of the domestic EIA.

Table 6.14: Air quality testing result

No.	Parameters	Unit	Testing Result	Standard	Duration
1	CO	mg/m^3	1.970	20	8 hrs
2	NO_2	mg/m^3	0.044	0.1	24 hrs
3	SO_2	mg/m^3	0.137	0.3	24hrs
4	O_3	mg/m^3	0.101	0.2	1hrs
5	Pb	mg/m^3	ND	0.005	24hrs
6	TSP	mg/m^3	0.029	0.33	24hrs
7	PM10	mg/m^3	0.017	0.05	24hrs
8	PM2.5	mg/m^3	0.010	0.025	24hrs

(Source: Laboratory of the Ministry of Environment 2023)

Figure 6.28: Lum Hach Main Dam

Figure 6.29: Lum Hach Main Canal

[25] https://www.iqair.com/cambodia/pursat, accessed on 23rd September 2024.





6.4.1.1.3 Stung Krang Ponley

Stung Krang Ponly located in two (2) provinces – Kampong Chhnang and Kampong Speu. At provincial level, the air pollution level in Kampong Chhnang province is considered moderate. The air pollution level in Kampong Speu province also consider moderate. The AQI is 58[26], which is equivalent to 12.7 µg/m^3. The Stung Krang Ponly is in the rural settings; therefore, the baseline ambient air quality, noise and vibration is considered generally good. Ambient air quality is sometime affected by dust from tillage and unpaved road users, including smoke from burning of rice stubble after harvest and burning from swidden cultivation activities. Whilst noise and vibration disturbance are sometime affected by motorist. However, the impacts are minor and short time. The air testing results from another project located about 8 km from Stung Krang Ponley, 6 km from Yotasas, 6 km from Krapeu Troum, and 25 km from Brambei Mom reported that all five parameters (CO, NO2, SO2, TSP, and PM10) followed the standard of the Ministry of Environment at all durations (8 and 24 hours) (See Table below). The actual air quality testing prior and during construction are required to be conducted. Further air quality tests can be conducted during the preparation of the domestic EIA.

Table 6.15: Air quality testing result

Parameters	**Unite**	**Testing Result**	**Standard (MoE)**
CO	mg/m^3	1.237	**20**
NO_2	mg/m^3	0.038	**0.1**
SO_2	mg/m^3	0.062	**0.3**
O_3	ppm	0.074	**0.2**
TSP	mg/m^3	0.018	**0.33**
PM10	mg/m^3	0.009	**0.05**
PM2.5	mg/m^3	0.007	**0.025**
Pb	mg/m^3	ND	**0.005**

Source: Laboratory of MoE (2023)

Figure 6.30: Brambei Mom sub-scheme

Figure 6.31: Krapeu Troum sub-scheme

[26] https://www.iqair.com/cambodia/kampong-speu, accessed on 23rd September 2024.



Figure 6.32: Yutasas sub-scheme



Figure 6.33: Stung Krang Bat sub-scheme



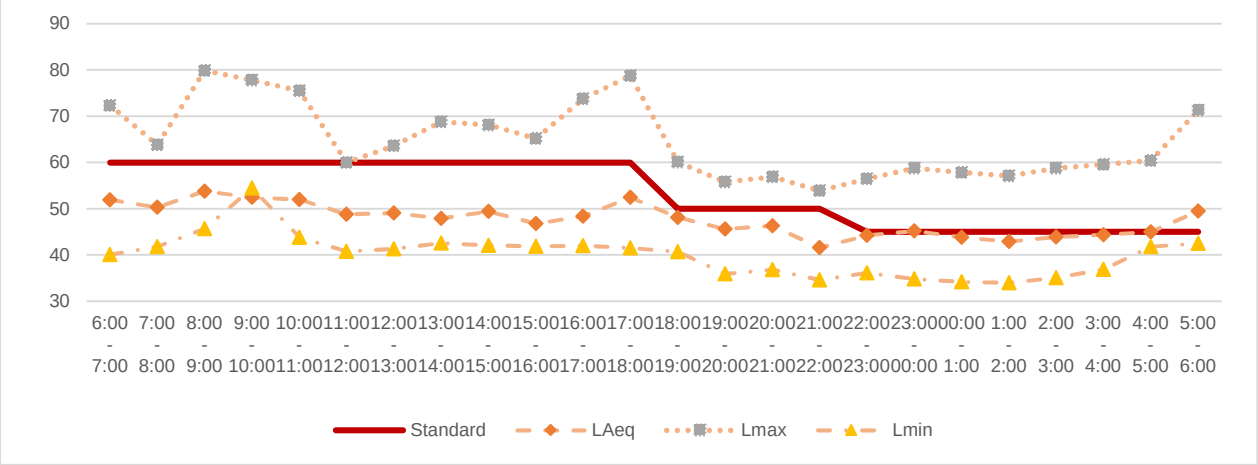


6.4.2.2 Noise and Vibration

Noise and vibration of the project locations in each sub-scheme are currently affected mainly by the commuters mainly along the roads within the areas which can be either the national or local road. As they are subjected to change over time, the testing of noise and vibration are required to be conducted right before the beginning of the construction.

Ou Ta Paong Field observation and result of interviews with village chiefs indicated a slight disturbance of traffic along national road # 5 which were reported to be moderately annoying. In addition, the result of noise testing from the ADB project at the Damnak Chheu Krom area, approximately 15 km away in 2020 can be used as the reference for the baseline of the sub-scheme. The prior and during construction activities are required to be conducted to ensure the noise will follow the standard of the IFC and MoE. Further noise and vibration tests can be conducted during the preparation of the domestic EIA.

Figure 6.342: 24-hour Average Noise level results

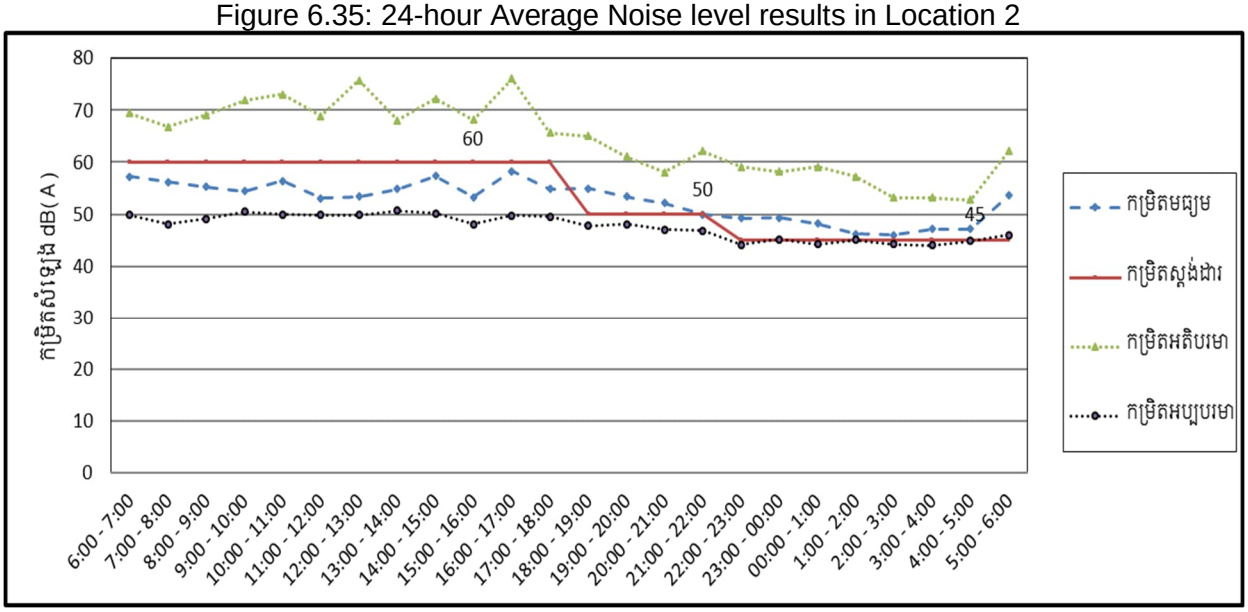


(Source: Laboratory of the Ministry of Environment, 2020)

Lum Hach

Interviews with village chiefs indicated that 5 out of 9 found noise within their communities moderately annoying, mostly due to neighbours' activities, particularly family gatherings and parties. While maximum noise levels were above the limit, vibration levels at both locations remained well below the standard. However, village chiefs reported that daily activities in their communities were still a source of annoyance. In addition, the result of the noise testing from Solar Power Project located in 2023 (Figure below) around 17 km from the project site can be used as the reference for the baseline as the situation of the area is the same to the project's environment. Further noise and vibration tests can be conducted during the preparation of the domestic EIA.

Figure 6.35: 24-hour Average Noise level results in Location 2



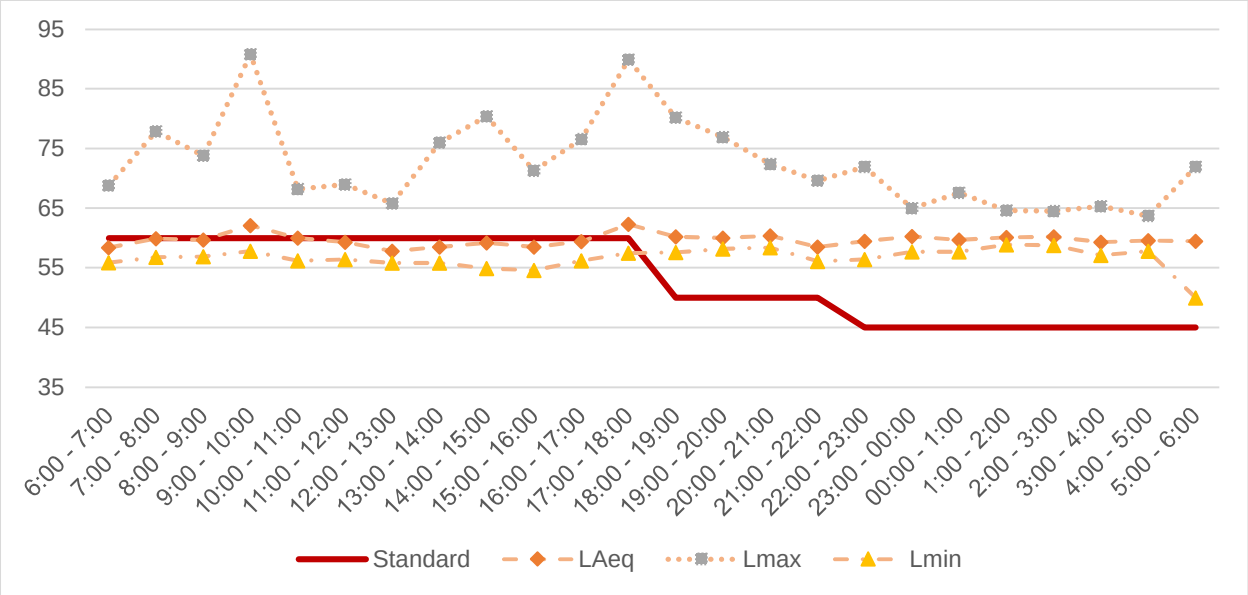
(Source: Laboratory of the Ministry of Environment, 2023)

Krang Ponley

Interviews with 14 village chiefs revealed that 64% of them perceived their villages as slightly (43%) or moderately (21%) noisy, primarily during the evening, with traffic and neighbors' activities being the main sources of disturbance. In addition, the noise testing result of the Animal Feeding Plant project in 2024 located 8 km from Stung Krang Ponley, 6 km from

Yotasas, 6 km from Krapeu Troum, and 25 km from Brambei Mom (shown in Figure below) can be used as the reference for the baseline of this project as it is situated within the same environmental condition as the project areas. Further noise and vibration tests can be conducted during the preparation of the domestic EIA.

Figure 6.36: Results of noise analysis at location 1



(Source: Laboratory of the Ministry of Environment, 2024)

6.4.3 Soil Quality

The soil quality study for this project took soil samples from five (5) agricultural locations across different schemes in the region. The Ou Ta Paong sub-scheme was represented by two (2) sites (SS.01 & SS.02), one (1) for Lum Hach (SS.03) and two (2) (SS.04 & SS.05) for Stung Krang Ponley (Please see Table 6.16). The analysis results, presented in the table below, provide valuable insights into the physical, chemical, and biological properties of the soils at these locations, which can inform agricultural management practices and decision-making.

Table 6.16: Soil analysis results in an agricultural context

No.	Description Parameter		Result				
			SS.01	SS.02	SS.03	SS.04	SS.05
1	Particle Size (Pipette Method)	(<0.002mm), Clay %	9.90	14.01	1.23	14.95	7.30
		(0.002-0.02 mm), Fine Silt, %	37.65	35.55	3.40	30.00	21.10
		(0.02-0.05 mm), Coase Silt, %	21.71	22.69	5.23	19.81	11.70
		(0.05-0.2 mm), Fine Sand, %	30.59	32.75	33.52	31.12	30.29
		(0.2-2 mm), Coase Sand, %	3.22	2.32	55.72	5.92	28.78
2	Ninnu Moisture %, (Oven dry at 105 °C and 24 hours)		1.67	1.73	0.20	2.64	2.62
3	Total Carbon (Black & Walkey Method), C%		2.22	1.84	1.80	1.63	1.87
4	Total Nitrogen (Kjeldal Sulfuric Method),N%		0.19	0.17	0.17	0.14	0.17
5	C/N Ratio (Unit)		12	11	11	12	11

No.	Description Parameter		Result				
			SS.01	SS.02	SS.03	SS.04	SS.05
6	Organic Matter (0M)%		3.82	3.16	3.10	2.80	3.22
7	Total Phosphorus (Nitric Digestion) P %		0.051	0.043	0.046	0.044	0.094
8	Available Phosphorus (Bray II), P (ppm)		51	41	46	29	37
9	Cation Exchange Capacity C.E.C meq/100g Soil (Method,1M Ammonium Acetate at pH=7 & Leach with 10% NaCl)		13.00	12.40	10.00	16.50	16.30
10	Exchangeable Cation (meq/100g Soil), (Method, IM Ammonium Acetateat H=7)	Calcium (Ca)	3.06	3.77	3.56	8.30	5.43
		Magnesium (Mg)	1.28	1.38	1.58	2.37	1.48
		Sodium (Na)	1.42	0.75	0.30	2.57	1.50
		Potasium (K)	0.77	0.27	0.13	0.36	0.35
	Total Exchangeable Bases (meq/100g soil)		6.53	6.17	5.57	13.60	8.76
11	Bass Saturation %		50	50	56	70	54
12	Exchange Acidity meq/100g Soil, (1 M KCI Method)		20.00	15.00	5.00	10.00	10.00
13	Exchange Al meq/100g Soll, (1 M KCI Method)		0.20	0.12	0.04	0.12	0.12
14	Electrode Conductivity µS/cm, (1:5 Soil: water)		96.80	36.10	99.30	108.40	63.00
15	pH H2O (1:5 Soil: water)		5.36	5.29	7.67	7.41	5.66
16	pl KCL (1:5 (Soil: IN KCL)		4.21	4.12	6.51	6.23	4.47

SS = Soil Samples.

(Source: Laboratory of the General Directorate of Agriculture, MAFF, 2024)

The soil characteristics of three (3) areas—Ou Ta Paong, Lum Hach, and Stung Krang Ponley—were analyzed for their agricultural suitability.

- **Ou Ta Paong** has loam soil, ideal for agriculture due to its balance of sand, silt, and clay, with moderate organic matter and slightly acidic pH (4.12 to 5.36). However, low nitrogen and potassium levels may need supplementation for optimal crop growth.
- **Lum Hach** is classified as sandy loam, with a higher sand content that improves drainage but reduces water retention. The soil is slightly acidic (pH 6.51-7.67) with low nitrogen and potassium, which may limit crop yields. The organic matter content is moderate, supporting soil health, but nutrient and irrigation management is necessary due to sandy texture.
- **Stung Krang Ponley** soils are also sandy loam, with similar challenges of low water retention due to the high sand content. The pH ranges from slightly acidic to neutral (4.47-7.41), and nutrient analysis shows low nitrogen and potassium levels. Despite these limitations, the soil is generally suitable for agriculture with careful nutrient and water management.

Overall, all three (3) areas show potential for agriculture, but improvements in nitrogen, potassium, and organic matter, along with proper irrigation, are necessary for sustained productivity.

6.4.4 Surface Water Quality

Water quality does not seem to be a critical issue for surface water, but the overuse of fertilizers and domestic wastewater are important threads. It is known to be a black market of all sorts of fertilizers, pesticides, insecticides, rodenticides, etc. sold at the borders with Viet Nam and applied indiscriminately by farmers to increase the numbers of crops a year[27]. Sub-Degree 103 on Water Pollution Control of Ministry of Environment (MoE) in 2021 with the purpose of regulating water pollution to prevent and reduce water pollution of public water areas so that the protection of human health and the conservation of biodiversity can be ensured. The collected water samples were measured at the premises as well as at the laboratory, commissioned by Innovation Lab which is partner of Royal University of Phnom Penh (RUPP).

6.4.4.1 Ou Ta Paong

The water quality data of Ou Ta Paong at the collecting point and time compared to the Ministry of Environment (MoE) standards reveals several concerns. Key parameters such as arsenic, cadmium, lead, pH, total dissolved solids, and electrical conductivity are within acceptable limits, meeting the MoE standards for rivers and lakes/reservoirs. However, total nitrogen, total phosphorus, and total coliform levels exceed the standard limits, with nitrogen levels (3.5-4.8 mg/l) surpassing the river and lake limits (<3 and <2 mg/l, respectively), and total phosphorus (0.4-0.8 mg/l) significantly higher than the allowed levels (<0.25 and <0.15 mg/l). Additionally, total coliform levels are alarmingly high, far exceeding the permissible limit of 1000 CFU/100mL. Dissolved oxygen levels are adequate, remaining above the minimum requirement (>3 and >4 mg/l). These results indicate potential nutrient pollution and microbial contamination in the water caused by the application of fertilizers for agricultural production, especially for dry season rice. In addition, domestic waste and animal production along the river were also the cause since the people are living along the river.

Figure 6.37: Ou Ta Paong Water River Body



Figure 6.38: Kbal Hong Main Canal



6.4.4.2 Lum Hach

The water quality data of Lum Hach at the collecting point and time, when compared to the Ministry of Environment (MoE) standards, shows compliance in several parameters but also some significant deviations. Parameters such as arsenic, cadmium, lead, total dissolved

[27] The sustainable rice platform, supported by MAFF, is working towards controlling this market and training farmers on proper use (products' labels are not translated to Khmer). https://sustainablerice.org

solids, electrical conductivity, temperature, and dissolved oxygen meet the required standards for both river and lake environments. However, the total nitrogen level (6.8 mg/l) is well above the MoE standards for rivers and lakes (<3 and <2 mg/l), and total phosphorus (0.6 mg/l) also exceeds the permissible limits (<0.25 and <0.15 mg/l) mainly caused by the application of fertilizers for agricultural production within the command area. Additionally, total coliform levels are extremely high (19,100 CFU/100mL), far surpassing the allowed limit of 1000 CFU/100mL, indicating severe microbial contamination, mainly caused by residential area along the canal as well as the decomposition of tree leaves and other biodegradable matters into the water body. The pH is slightly below the standard range, suggesting slightly acidic conditions. These results suggest nutrient pollution and microbial contamination in Lum Hach, posing environmental and health concerns. This result is sometime aligned and contrasting to the perception of some stakeholders.

Figure 6.39: Lum Hach Main Canal



Figure 6.40: Lum Hach Main Dam



6.4.4.3 Stung Krang Ponley

The water quality data for Stung Krang Ponley at the collecting point and time shows that while some parameters are within acceptable limits set by the Ministry of Environment (MoE), several issues are evident. Parameters such as arsenic, lead, total dissolved solids, electrical conductivity, temperature, and dissolved oxygen meet the MoE standards. However, the cadmium concentration at SW8 (0.009 mg/l) exceeds the standard limit of <0.003 mg/l. The total nitrogen levels are particularly high across most sampling points (4.7 to 18.1 mg/l), significantly exceeding the limits. Total phosphorus is also elevated at SW6 (0.9 mg/l) and SW7 (0.7 mg/l), far above the permissible levels (<0.25 and <0.15 mg/l). Furthermore, total coliform levels are alarmingly high at all sampling points. These results suggest substantial nutrient pollution and microbial contamination, especially concerning for health and environmental safety. The observation indicated the utilization of chemical fertilizers for rice production has caused the high level of substance along the command area since the upstream and natural decomposition of biodegradable matters within the water catchment is also the contribution. The result was similar to what was reported by the villagers on water quality of the areas.

Summary of the water quality testing is provided in Table 6.17 below:

Table 6.17: Result of surface water quality

No	Parameter	Unit	Ou Ta Paong			Lum Hach		Stung Krang Bat	Yutas as	Krapeu Truom	Brambei Mom	Standard (MoE)	
			SW1	SW2	SW3	SW4	SWS1[28]	SW5	SW6	SW7	SW8	River	Lake and reservoir
1	Arsenic	mg/l	0.005	0.005	0.005	0.005	0.18	0.005	0.005	0.005	0.005	<0.01	<0.01
2	Cadmium	mg/l	0.001	0.001	0.001	0.001	ND	0.001	0.001	0.001	0.009	<0.003	<0.003
3	Lead	mg/l	0.005	0.005	0.005	0.005	ND	0.005	0.005	0.005	0.005	<0.01	<0.01
4	pH	-	6.32	6.2	6.44	6.42	7.58	6.78	6.91	6.53	7.49	6.5-8.5	6.5-8.5
5	Total dissolved solids	mg/l	30.76	38.07	40.71	14.95	18	71.07	91.58	83.43	99.21	<1000	<1000
6	Total suspended solids	mg/l	11	29	39	5	2	17	43	93	21	<100	<100
7	Total Nitrogen	mg/l	4.8	3.8	3.5	6.8	2.90	18.1	17.7	4.7	5.1	<3	<2
8	Total Phosphorus	mg/l	0.8	0.6	0.4	0.6	0.11	0.3	0.9	0.7	0.3	<0.25	<0.15
9	Total coliform	CFU/100mL	50,200	38,750	31,650	19,100	430	85,000	157,500	92,500	82,850	<1000	<1000
10	Electrical conductivity	µs/cm	61.4	76.12	81.43	29.91	-	138.7	183.4	167.1	197,1	500-1500	500-1500
11	Temperature	^{0}C	31.3	30.8	30.9	31.7	-	32.8	33.4	33.7	38.7	<45	<45
12	Dissolved oxygen	mg/l	5.34	5.6	5.7	5.21	7.70	5.62	5.65	6.84	5.4	>3	>4

SW = Surface Water, SWS = Surface Water Samples, MoE = Ministry of Environment.

(Source: Water Innovation Lab, 2024)

[28] Laboratory of Ministry of Environment 2024.

Figure 6.41: Brambei Mom sub-scheme



Figure 6.42: Krapeu Troum sub-scheme



Figure 6.43: Yutasas sub-scheme



Figure 6.44: Stung Krang Bat sub-scheme



6.4.5 Groundwater Quality

The selected samples were analysed and the results of the testing both at the field and at laboratory is provided in Table 6.18 below. In addition to the selected samples, another groundwater quality testing result from another ESIA was also included to compare the groundwater quality of the sites. The reference sample was named “GWR1” and only some of the parameters are available for comparison due to the purpose of the ESIA was different.

Table 6.18: Result of groundwater quality

No	Parameter	Unit	Results				CDWQS
			GW1	GW2	GW3	GWR1[29]	
1	Arsenic	mg/l	0.005	0.005	0.005	0.00	0.05
2	Cadmium	mg/l	0.003	0.001	0.001	0.001	0.003
3	Lead	mg/l	0.0004	0.005	0.005	-	0.01
4	pH	-	**6.01**	**6.5**	**6.48**	7.49	6.5-8.8
5	Total dissolved solids	mg/l	345.8	58.12	325.5	213	800
6	Total suspended solids	mg/l	13	5	3	-	-
7	Total Nitrogen	mg/l	6.4	3.5	21.5	-	-
8	Total Phosphorus	mg/l	0.3	0.29	2.2	-	-

[29] Laboratory of the Ministry of Environment 2024

No	Parameter	Unit	Results				CDWQS
			GW1	GW2	GW3	GWR1[29]	
9	Total coliform	CFU/ 100mL	14,065	1,600	1,200	73	0
10	Electrical conductivity	µs/cm	691.4	116.1	651.6	442	-
11	Temperature	^{0}C	30.4	30.3	30.5	-	-
12	Dissolved oxygen	mg/l	1.92	1.45	1.25	-	-

GW = Groundwater, GWR = Groundwater Result, CDWQS = Cambodia Drinking Water Quality Standard.
(Source: Water Innovation Lab, 2024)

Test results show that almost all parameters are below Cambodia's drinking water quality standards of the Ministry of Industry, Science, Technology, and Innovation (MISTI) in 2004, except pH parameters are below the standard range and the total coliform exceeds the standard. Total coliforms are a common group of related bacteria found in soil, vegetation, and water. Boiling or filtering groundwater before drinking is required. Overall, the quality of groundwater in the project sites are safe for daily use, such as cooking, bathing, as well as laundry but not for drinking.

6.5 BIODIVERSITY

The result of the biodiversity assessment which are used as the baseline information for each sub-scheme is presented in below sub-sections. The baseline information covers three steps of the biodiversity assessment including the analysis for determining Critical Habitat status (Steps 1 & 2); and Determining Critical Habitat status (Step 3) whereas the results on the impact assessment on biodiversity are presented in the impact assessment chapters.

6.5.1 Ou Ta Paong

6.5.1.1 Analysis to prepare for determining CH status

6.5.1.1.1 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for OTP. The coordinates of OTP (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 11 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 4 reptile species, 2 mammals, 2 fishes, and 3 birds (See list of 11 EN and CR species in Table 6.19 below).

6.5.1.1.2 Description of screening for narrowing down

For Ou Ta Paong, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2025. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the OTP area of influence, covering reptiles,

mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 17 EN and CR species were identified in the OTP area of influence (See Table below). In the 3rd round of screening (in August 2024), however, 11 (out of a total of 17 species) were confirmed as “potentially present” in the OTP’s area of influence.

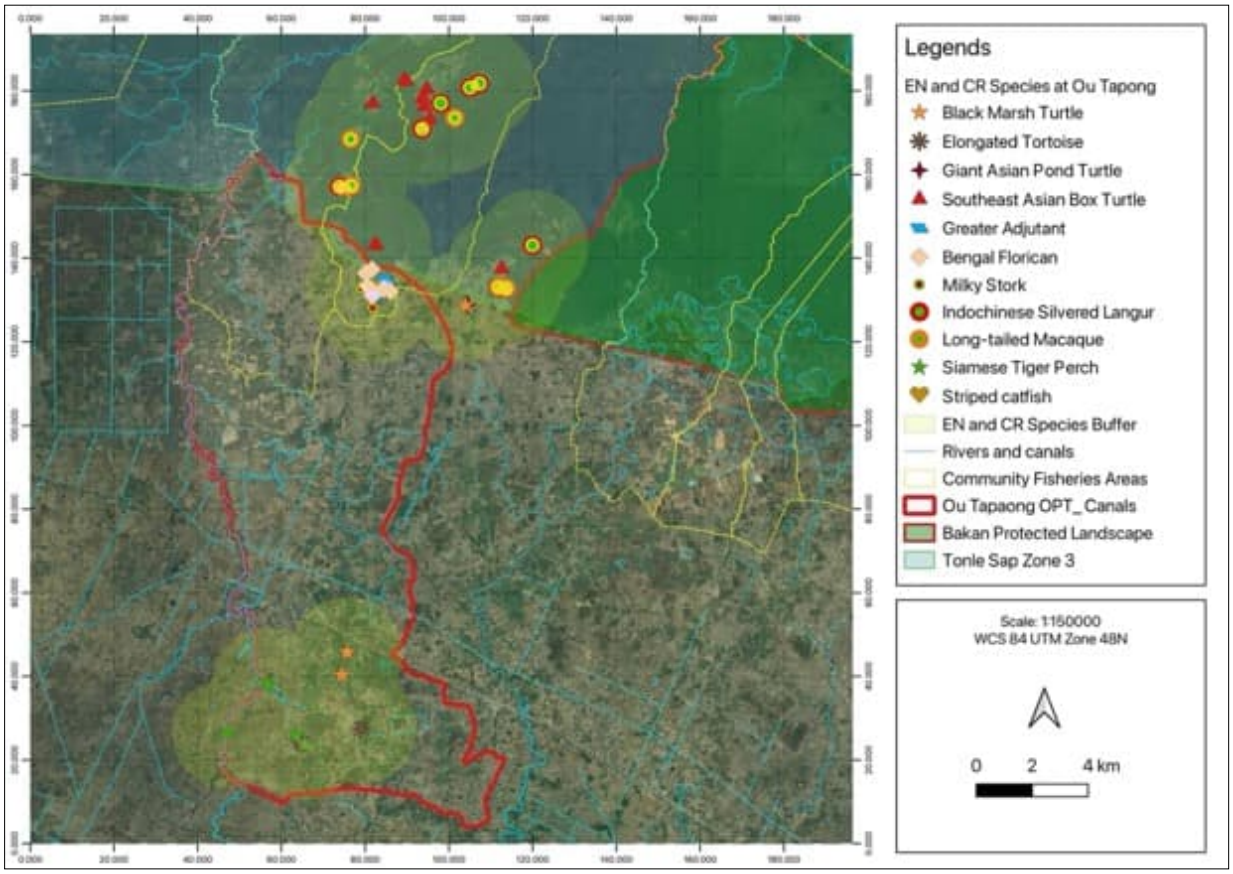
So, the assessment for Ou Ta Paong focuses on the confirmed list of **11 species** that are categorized by IUCN as EN and CR species, including 4 reptile species (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise), 2 mammals (Indochinese Silvered Langur and Long-tailed Macaque), and 2 fishes (Striped catfish and Siamese Tiger Perch), and 3 birds (Greater Adjutant, Milky Stork, and Bengal Florican) See Table 6.19 below for the list of confirmed species and see Figure 6.45 for potential locations of these species in the projects are of influence.

Table 6.19: Confirmed List of endangered and critically endangered species for the Ou Ta Paong sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=17)	Confirmed Species in Round 3 (Total = 11)
I. Reptile spices						
1	អណ្តើកភ្នែក	Black Marsh Turtle	*Siebenrockiella crassicollis*	EN	Yes	Yes
2	អណ្តើកសោម	Giant Asian Pond Turtle	*Heosemys grandis*	CR	Yes	Yes
3	អណ្តើកបិទមុខ	Southeast Asian Box Turtle	*Cuora amboinensis*	EN	Yes	Yes
4	អណ្តើកព្រេច	Elongated Tortoise	*Indotestudo elongata*	CR	No	Yes
II. Mammal species						
5	ឆកដាមច្រមុះ	Hairy-nosed Otter	*Lutra sumatrana*	EN	Yes	No
6	ស្វាព្រាម	Indochinese Silvered Langur	*Trachypithecus germaini*	EN	Yes	Yes
7	ស្វាក្តាម	Long-tailed Macaque	*Macaca fascicularis*	EN	Yes	Yes
III. Fish species						
8	ត្រីប្រាធំ	Striped catfish	*Pangasianodon hypophthalmus*	EN	Yes	Yes

9	ត្រីកន្ត្រៃប់ខ្លា	Siamese Tiger Perch	*Datnioides pulcher*	CR	Yes	Yes
	IV. Bird species					
10	ត្រដក់ធំ	Greater Adjutant	*Leptoptilos dubius*	EN	Yes	Yes
11	រនៀលស	Milky Stork	*Mycteria cinerea*	EN	Yes	Yes
12	ចាបព្រៃដង	Yellow-breasted Bunting	*Emberiza aureola*	CR	Yes	No
13	ខ្ទឹប ឬ ទ្រមាក់អណ្តើក	Bengal Florican	*Houbaropsis bengalensi*	CR	Yes	Yes
14	ពពូលទឹក	Masked Finfoot	*Heliopais personatus*	CR	Yes	No
15	ទាព្រៃស្លាបស	White-winged Duck	*Asarcornis scutulata*	EN	Yes	No
	V. Amphibians, and aquatic plants					
16	កញ្ជាញ់ចេកភ្នំក្រវាញ	Cardamon Shrub Frog	*Philautus cardamonus*	EN	Yes	No
17	ស្មៅស្ទឹង/ទន្លេ	River-weed	*Terniopsis chanthaburiensis*	EN	Yes	No

Figure 6.45: Map showing the observed distribution of identified EN and CR species (with the potential movement of 1-2 km within and around suitable habitats (2020 to 2024)



6.5.1.1.3 Ecological State of Habitats within the Area of Analysis (AoA)

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 11 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants[30].

The OTP command area, therefore, the ecosystem within the OTP command area has been subject to human-induced changes over the past several decades. Previously, the zoning areas of OTP contains Zone 1 (transition zone), Zone 2 (buffer zone) and Zone 3 (core zone)

[30] Community councils and committees, including community fisheries (CFi) and farmer water user community (FWUC), were convened on July 25 and August 4, 2024. These meetings aimed to identify potential field assessment areas and select individuals with deep local ecological knowledge and experience for interviews. A total of 13 key informants were interviewed in Ou Topaong. Five of these individuals were from the upper command area, while seven were from the lower command area. Additionally, one representative from Punleu Komar Organization, which supports the Samraong Muk Yeik Community Forest Initiative, was included. Notably, the Samraong Muk Yeik and Sdok Khlouk Community Fisheries locations overlaps with portions of the Lower Ou Tapaong Command Area.

which does not exist anymore for Zone 2 and Zone 1. As such, the OTP command area is a modified habitat.

❖ **Reptiles (4 species)**

The Black Mash Turtle was observed in both upper and lower sections of the command area, as well as along the main Ou Ta Paong River (which is being used as a key canal feeding irrigation water for the command area). Conversely, the Elongated Tortoise was only found in the upper reaches while the Giant Asian Pond Turtle and Southeast Asian Box Turtle were found only in the lower section within Tonle Sap Zone 3 (figure 6.46 above). Details are below:

- **The Black Mashed Turtle *(Cuora galbinifrons)*** was confirmed to be present in the area of influence based on the accounts of four local informants. Residents from the upper reaches of Ou Tapaong reported historical sightings of this species within the past 10-20 years although recent spotting has been scarce. Key informants who live in the lower part of the command area and had livelihoods closely intertwined with the Tonle Sap Management Zone indicated that there have been ongoing efforts to bring the **Black Mashed Turtle back** to the region albeit its rarity. One informant successfully captured a Black Mashed Turtle just before the interview. This species is highly valued in the local market, particularly among middlemen, and is often used for traditional medicinal purposes. The Black Mashed Turtle is listed as Critically Endangered by the IUCN Red List, and its presence in the area of influence indicates that the habitat is essential for its survival and reproduction. Therefore, the habitat meets the criterion of being significant for a Critically Endangered species of criteria 1a of IFC PS6.
- **Elongated Tortoise:** This species wasn't initially screened for the interview, but it was identified and spotted by two key informants at the upper section of the Ou Tapaong based on the turtle images that were shown to facilitate the identification of species. No such sightings have been documented in the lower portions of the command area. One informant, a local resident near Ou Tapaong, provided a firsthand account of capturing this species. After a thorough examination of the accompanying photographs and a comparison with verified identifying features, this species is confirmed present as reported by the local informant. The Elongated Tortoise is listed as Critically Endangered by the IUCN Red List. The presence of this species within the project area indicates that the habitat is essential for its survival and reproduction, meeting the requirements of Criterion 1a.
- **Giant Asian Pond Turtle:** Three local informants who were interviewed in the lower Ou Tapaong River region confirmed the presence of the Giant Asian Pond Turtle. One informant reported spotting this species in Boeung Kum Traeng, a wetland within Tonle Sap Zone 3 while the other two informants indicated their encounters with this species in the mountainous regions of Kravanh District. Asian Pond Turtle is listed as Critically Endangered by the IUCN Red List. The reported sightings in Boeung Kum Traeng and the mountainous regions of Kravanh District indicate that these areas may be important habitats for the survival and reproduction of this species, meeting the requirements of Criterion 1a.
- **Southeast Asian Box Turtle:** During our survey in the lower section of the Ou Ta Paong, we obtained valuable information about the Southeast Asian Box Turtle. All

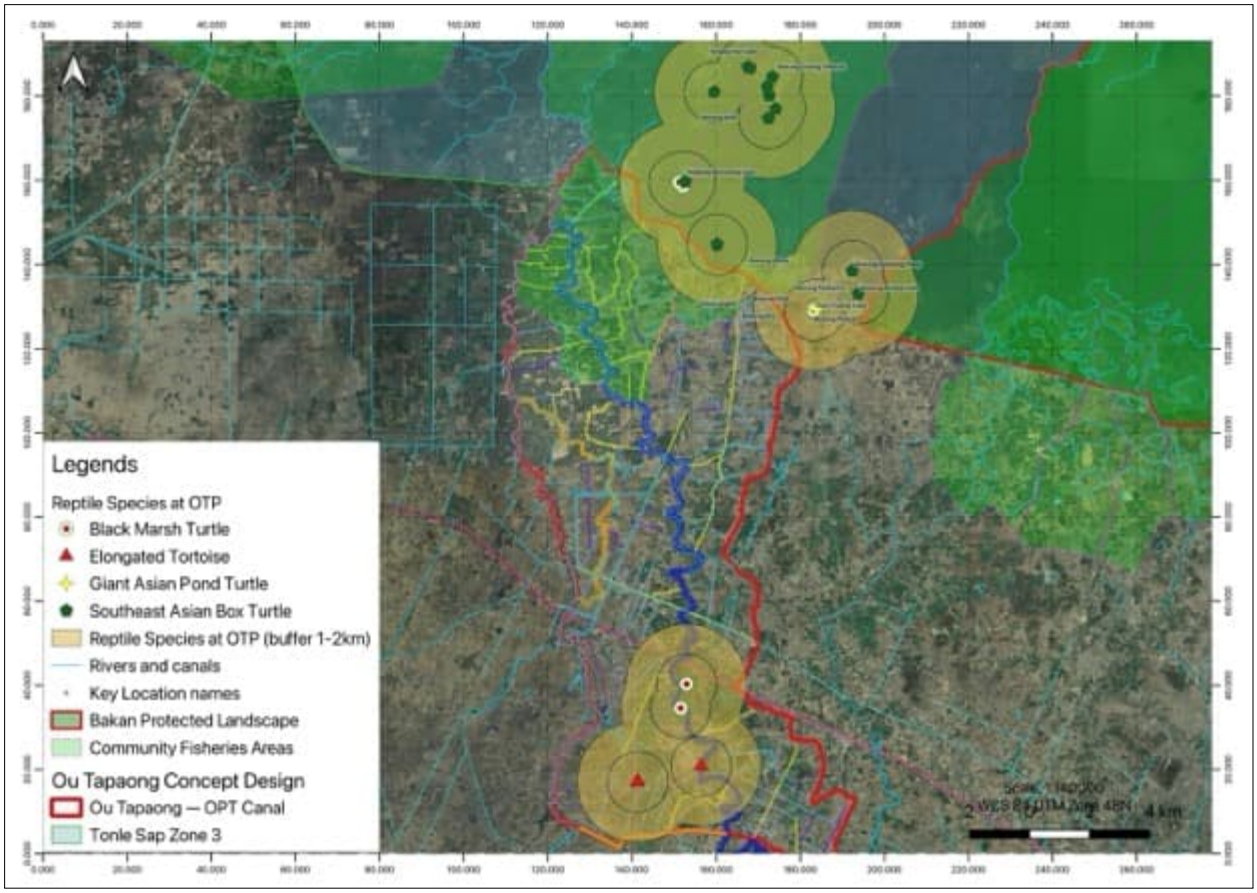
seven informants in this area confirmed the presence of this species in nearby wetlands and flooded forest areas within Tonle Sap Zone 3, which is close to the command area boundary. While three informants reported recent encounters with this species, the remaining four mentioned that they had encountered it 10 to 20 years ago. They explained that the turtle was once abundant but has become very rare in recent years.
Similarly, all turtle species, including the Southeast Asian Box Turtle, are threatened by ongoing illegal hunting for trading purposes. Some people were hesitant to share recent information about these species.

Mr. Pheoun Moeun, Deputy Chief of Samraong Muk Yeik Community Fishery (SMY-CFi) is exceptionally knowledgeable about wildlife species in his Cfi area. He has been actively participating in forest patrols and community activities. He mentioned that some people who go fishing in the forest occasionally bring back one or two turtles with them, but he preferred not to disclose this information.

One key informant admitted that they captureed a turtle from a nearby forest and sold it for income. Income was shared among the four individuals. While informants were willing to share their past incidents, they were reluctant to provide details about the recent events because these activities are illegal.

the Southeast Asian Box Turtle, a Critically Endangered species, is present in the lower section of the Ou Tapaong and nearby wetlands. These unique ecosystems are highly threatened. Therefore, Criteria 1a and 4 of IFC PS6. Additionally, Criteria 1b may also apply due to the high threat level and declining population. are potentially met.

Figure 6.46: Distribution of identified turtle and tortoise species in and outside the OTP Command Area



❖ **Birds (3 species)**

Despite extensive interviews with key informants residing in the upper reaches of Ou Ta Paong, numerous endangered or critically endangered bird species were reported within their community. Conversely, only three of six bird species were confirmed by both key informants and CFi committees in the lower section. The following paragraphs summarize the primary findings and justifications for each species' presence, along with the associated level of confidence. These conclusions are based on in-depth interviews, technical expertise, and consultations with relevant units, which provided valuable assistance in verifying species of high conservation significance. Several species were initially identified by local residents.

- **Bengal Florican:** Five informants confirmed the presence of the Bengal Florican in the area of influence. Two individuals reported sightings within the past 10-20 years while three others have observed the species within the last five years and in the past. Notably, one informant witnessed a pair (male and female) as recently as March 2024 (see Figure 6.47). The lower reaches of Ou Tapaong exhibit a diverse mosaic of habitats, including open wetlands, grasslands, flooded forests, and minimally intensified paddy fields, creating a relatively undisturbed environment that is potentially conducive to Bengal Florican populations. Notably, the Ou Tapaong Command Area is situated only 1 kilometre from the Bakan Protected Landscape (BPL), a region characterized by similar ecological conditions (figure 6.47).

  Established in July 2023 through a joint effort by the Ministry of Environment and the Wildlife Conservation Society (WCS), the BPL aims to safeguard the southernmost Bengal Florican subpopulation within the Tonle Sap Great Floodplain. Moreover, the

BPL serves as a critical wintering habitat for the Yellow-breasted Bunting, Manchurian Reedwarbler, and Cambodia's unique population of the Chinese Grassbird, along with other globally threatened avian and wildlife species (WCS 2023).

The project area likely meets Criterion 1a (habitat of significant importance to Critically Endangered species) due to the presence of the Bengal Florican. Additionally, it may meet Criterion 4 (highly threatened and/or unique ecosystems) given the diverse habitat mosaic. However, a detailed ecological assessment is crucial to confirm these findings and identify any other relevant criteria.

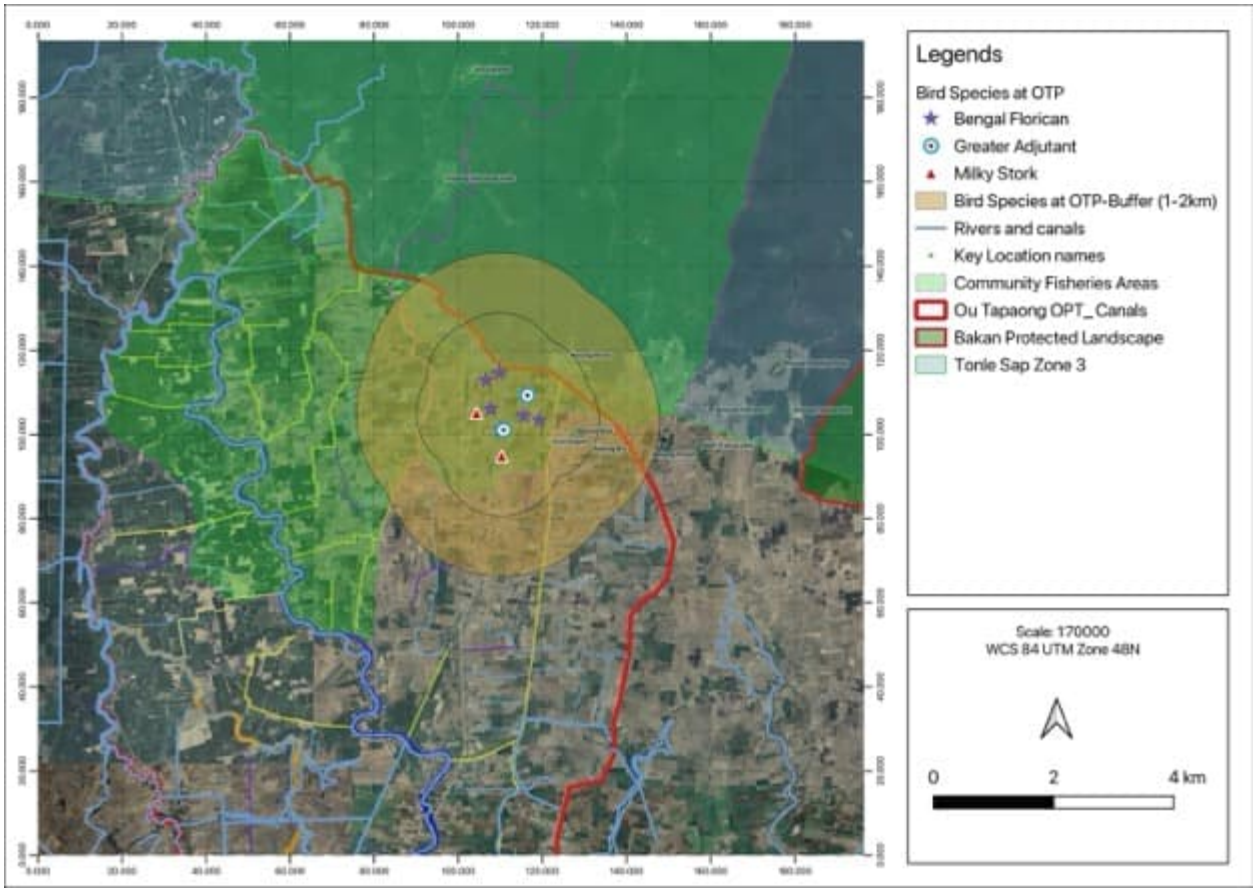
- **Greater Adjutant:** During field assessments within the study area, multiple informants reported sightings of Greater Adjutants. While most individuals were unable to definitively distinguish between the Greater Adjutant and the similar-looking bird, which is Lesser Adjutant), one informant positively identified a Greater Adjutant within the Ou Tapaong Command area. This sighting occurred in recent years (figure 6.47). Unfortunately, due to the time of the observation, the Greater Adjutant had likely already migrated to its breeding grounds at Prek Toal Ramsar Site, a protected wetland area situated in Koh Chiveang community, Ek Phnom District, Battambang province (MoE 2012).

  Prek Toal Ramsar Site is the sole known breeding habitat for the greater adjutant in Southeast Asia and is recognized as the second-largest breeding colony for this species globally, following Assam, India. In December 2015, the Royal Government of Cambodia and the Ramsar Convention Secretariat designated the Prek Toal Core Area as a Wetland of International Importance due to its exceptional biological, social, and economic value. This designation solidified Prek Toal's status as Cambodia's fourth Ramsar Site (WCS 2016). Following the breeding season, greater adjutants migrate across the Tonle Sap Floodplain to their foraging habitats, with the lower section of Ou Tapaong serving as a critical foraging ground.

  Despite the challenges faced during the field observation due to the time of year, the confirmed sighting of a Greater Adjutant in the study area is a significant finding. It suggests that the species may still be present in the region and that a suitable habitat may exist for its continued survival.

  The findings indicate that the project area meets IFC PS6 Criteria 1a and 3. This is due to the presence of the Critically Endangered Greater Adjutant, a migratory species that utilizes the area as a critical foraging habitat, particularly during the non-breeding season.

Figure 6.47: A spatial distribution map was generated for three bird species—the Bengal Florican, Greater Adjutant, and Milky Stork—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.



- **Milky Stork:** Despite repeated attempts to elicit accurate information, many key informants were unable to distinguish between the Painted Stork and the Milky Stork, two similar-looking bird species. This confusion is a common challenge in bird identification, especially for non-experts. While the Milky Stork is considered extremely rare in Cambodia, with sightings typically limited to 1-3 individuals, some informants claimed to have encountered larger groups. This discrepancy can be attributed to misidentification and the difficulty of accurately counting birds in the field.

  Based on my experience in bird identification and conservation, I was able to evaluate the credibility of the information provided. Two informants offered the most reliable accounts, describing sightings of 2-3 Milky Storks feeding alongside numerous Painted Storks in seasonal wetland areas near flooded forests (figure 6.48). These observations align with the limited available data on Milky Stork distribution and behavior in Cambodia. When the flooding season arrives, they migrate to degraded forest areas in the uplands. Milky Stork and Great Adjutant are migratory birds that move both locally and across international borders. The Prek Toal Ramsar Site serves as the only known breeding ground for Milky Stork and Greater Adjutant in Southeast Asia; after breeding, they migrate to other wetland areas throughout the country.

The Milky Stork's situation appears to align with several IFC PS6 criteria:

- **Species Level:** Endangered Species (Criterion 1a): The Milky Stork's rarity and the challenges in accurately assessing its population make it a strong candidate for this criterion. Its limited distribution and potential threats further emphasize its vulnerability.

Migratory Species (Criterion 3): The migratory nature of the Milky Stork, particularly its reliance on the Prek Toal Ramsar Site as a breeding ground and its movements to other wetland areas, highlights its dependence on various habitats throughout its range.

Ecosystem Level: Highly Threatened and/or Unique Ecosystems (Criterion 4): The wetland habitats used by the Milky Stork, especially the flooded forests and seasonal wetlands, are often threatened by human activities like deforestation, agriculture, and pollution. These ecosystems are essential for the survival of the species and other biodiversity.

Figure 6.48: Photograph of a Milky Stork foraging alongside a flock of Painted Storks (credit: Sang Mony, Sam Veasna Conservation Tour), and a map illustrating the distribution of Milky Stork sightings in Cambodia from 2020 to 2024, extracted from eBird data.



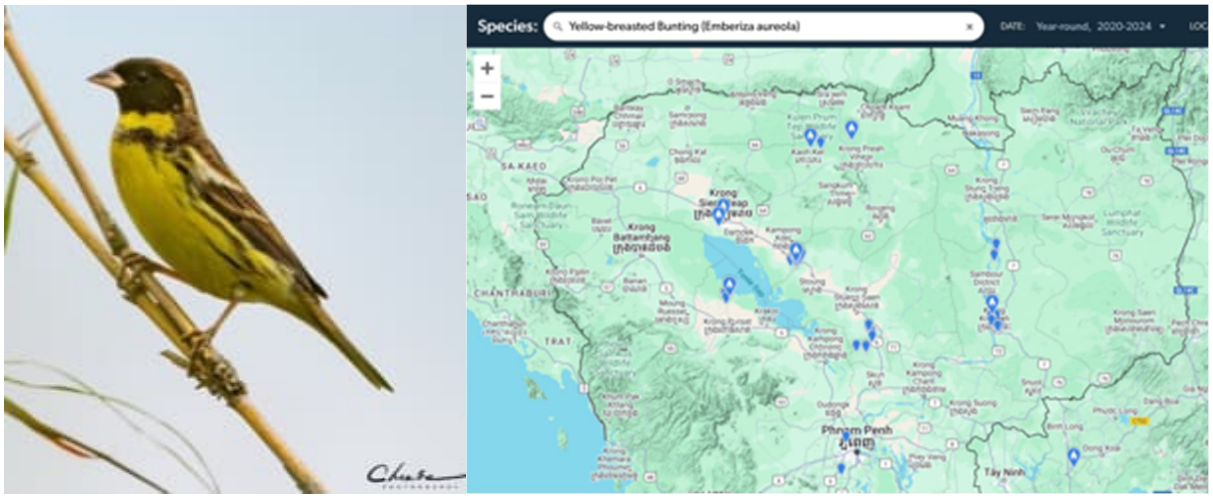
- **Yellow-breasted Bunting**: The Yellow-breasted Bunting is a small, migratory songbird found in Southeast Asia, including Cambodia. It is characterized by its bright yellow breast and throat, contrasting with its olive-green upperparts. The Yellow-breasted Bunting is a winter visitor and spring passage migrant in Cambodia, often found in rice fields, scrub, grasslands, and marshes in the lowlands. In Cambodia November to May, the species has been recorded in the Tonle Sap Floodplain and the Lower Mekong Delta. Yellow-breasted Buntings are typically observed in rice fields, scrublands, grasslands, and marshes in the lowlands of Cambodia (Ly et al. 2022).

  The local population often mistakenly identifies this species as a sparrow or a weaver due to their similar size, appearance, and shared habitats. After conducting inquiries, none of the locals could confirm whether they had observed this species in the area. This highlights a common gap in local ecological knowledge regarding small bird species like this one. Identifying such species typically requires individuals with advanced birdwatching experience, who can locate them in the appropriate habitat at the right time.

  Based on an overall assessment of the habitat conditions in the lower part of Ou Ta Paong, we can confirm that this area has the potential to serve as a wintering habitat for this species. Additionally, the boundary of the Ou Tapaong Command Area is just 1 km away from the Bakan Protected Landscape.

The Yellow-breasted Bunting's Critically Endangered status and the Ou Tapaong area's potential as a wintering habitat potentially meet IFC PS6 Criteria 1a. Additionally, the species' restricted range and migratory behavior align with Criteria 2 and 3. The Yellow-breasted Bunting, a CR species, is known to inhabit such areas during its winter migration.

Figure 3.49: Photo of Yellow-breasted Bunting (Emberiza aureola) and its distribution map from eBird data (2020-2024) recorded by birdwatcher and wildlife overserves.



- **Wild-winged Duck:** Regarding the Wild-winged Duck, there was some confusion among informants who mistakenly identified it as the Knob-billed Duck (Sarkidiornis melanotos). However, after discussing key identification features and ecological characteristics, such as breeding and nesting habitats, we determined that none of them had actually encountered the Wild-winged Duck before. Due to it's tiny population, Wild-winged Duck is very sensitive, and live in the forest close to the lake, wetland, river and waterhold with less disturbance. Due to its limited population, the Wild-winged Duck is particularly sensitive to disturbances and prefers to reside in relatively undisturbed forests adjacent to lakes, wetlands, rivers, and watering holes. This preference for quieter, less populated areas help to ensure the survival of this vulnerable species.

❖ **Mammals/ primates (2 species)**

No suitable habitats or sightings of three mammal species were identified in the upper section of Ou Ta Paong. Two primate species (Indochinese Silvered Langur and Long-tail Macaque) were confirmed at the lower section in the Flooded Forest habitat of the Tonle Sap Zone 3 and CFi Areas. Additionally, multiple reports indicated the presence of Hiary-nosed Otters in the region, particularly in the deep waters of the flooded forest near the Tonle Sap Great Lake's mouth. The following paragraphs summarize the key findings and justifications for the presence of these two primate species, along with their associated confidence levels. These conclusions are based on comprehensive interviews, technical expertise, and consultations with relevant units, which contributed to the verification of species with high conservation importance.

- **Indochinese Silvered Langur:** Six local informants (86%) reported frequent encounters with Indochinese Silvered Langurs within the flooded forests of Tonle Sap

Zone 3 which is outside of the OTP command area. These sightings, primarily near natural lakes, have been confirmed by multiple individuals engaged in livelihood activities within these areas. While the population of Indochinese Silvered Langur was once plentiful, informants noted a significant decline in recent decades, with only smaller troops now being observed. The species is known to inhabit areas near rivers and large bodies of water.

Mr. Chem Sophal from Punleu Komar Organization highlighted that his organization provides support for the Samraong Muk Yeik Community Fishery (SMY-CFi) and Sdok Khlouk Community Fishery (SK-CFi) in managing and protecting fisheries resources and flooded forests within their Community Fishery Area (figure 6.50). Portions of these CFi Areas overlap with the Lower section of Ou Tapaong Command Area. This effort is part of the EU “Our Tonle Sap” Project, led by the Wildlife Conservation Society and funded by the European Union. Mr Sophal emphasized the presence of numerous endangered and critically endangered species, including the Indochinese Silvered Langur, within this CFi Area. To confirm the presence of any Community Fisheries (CFIs) within the specified area, we interviewed the Chief of Pursat Fishery Administration Cantonment. Our inquiry revealed that two CFi areas overlap with the designated region, as illustrated in the accompanying map (see map below).

Based on the provided information, the following IFC PS6 criteria are potentially met regarding the Indochinese Silvered Langur and the flooded forests of Tonle Sap Zone 3:

Species Level:

- Criterion 1: Critically Endangered and Endangered Species: The Indochinese Silvered Langur is an endangered species, making its habitat a potential candidate for this criterion. Criterion 2: Highly Threatened Species: Given the observed decline in the population and potential threats to its habitat, the species could be considered highly threatened.

Ecosystem Level:

- Criterion 5: Highly Threatened and Unique Ecosystems: The flooded forests of Tonle Sap Zone 3 represent a unique and threatened ecosystem, particularly due to factors such as habitat loss and degradation.

- **Long-tailed Macaque:** Indochinese Silvered Langurs and Long-tailed Macaques were commonly reported by key informants residing within the Tonle Sap Zone 3. These informants, who frequently engaged in fishing activities in the surrounding forests, encountered Long-tailed Macaques regularly. They added that these primates, known for their social nature, live in troops and communicate vocally to alert their group members of potential threats or discoveries. Some troops inhabit flooded forests situated close near the command area.

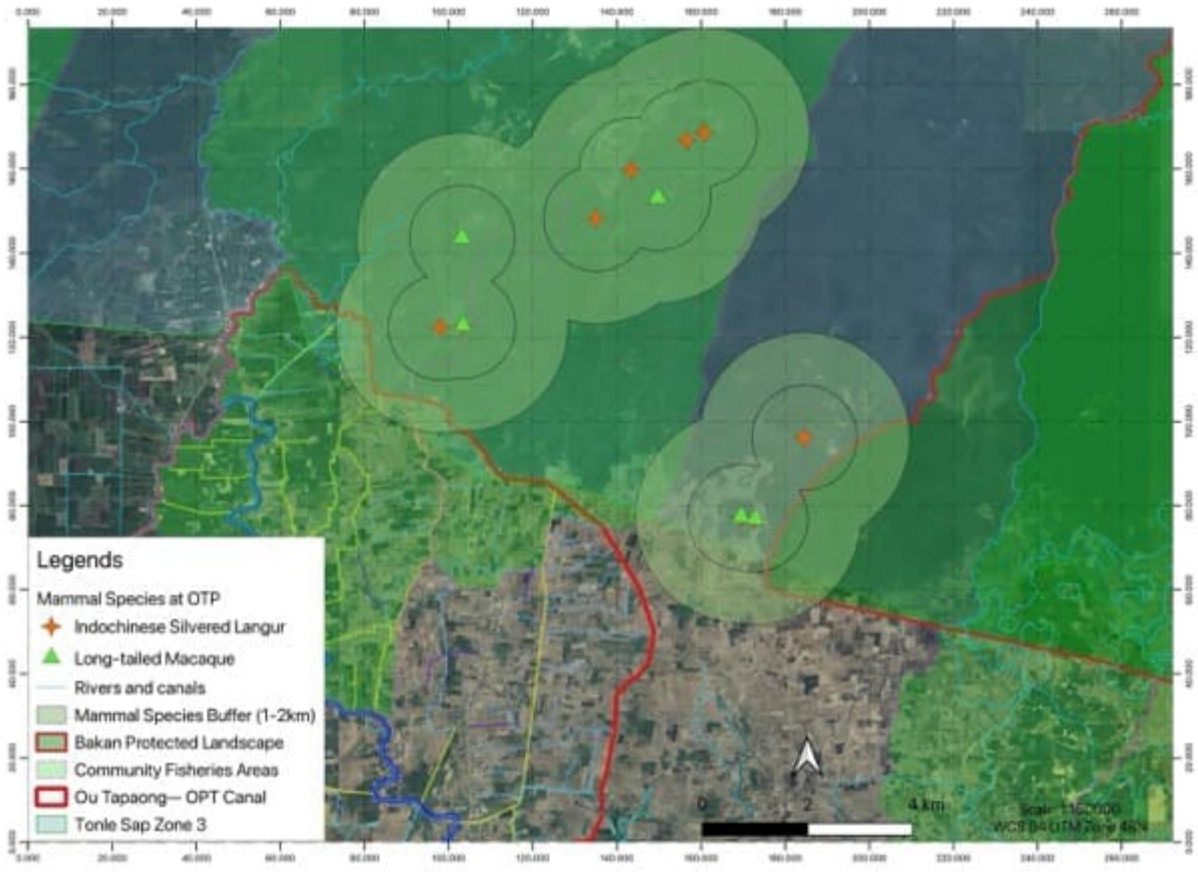
  However, informants expressed deep concern over the significant decline in the population of Long-tailed Macaques over the past several years. This alarming trend has prompted urgent action from conservation organizations. In response to the deteriorating situation, the primate specialist group upgraded the conservation status

of this species from Vulnerable to Endangered in March 2022. This elevated status underscores the urgent need for increased protection measures to mitigate the species' decline, which is primarily driven by the high demand for these primates in the illegal pet trade (*Primate Conservation Alliance. 2022)*

The provided information strongly suggests that the Tonle Sap Zone 3 adjacent to the OTP meets multiple IFC PS6 criteria related to the Critically Endangered Long-tailed Macaque:

- Criteria 1a: The recent uplisting of the Long-tailed Macaque to Endangered status by the IUCN Red List underscores the habitat's critical importance for the species' survival and reproduction. The frequent sightings of these primates by local informants, especially in the flooded forests, highlight the area's significance as a key habitat.
- Criteria 4: The flooded forests of the Tonle Sap Zone 3 represent a highly threatened and unique ecosystem. They face significant threats from habitat loss, pollution, and climate change. These forests provide a crucial habitat for the Long-tailed Macaque and other potentially threatened species.

Figure 6.50: A spatial distribution map was generated for two primate species—the Indochinese Silvered Langur and Long-tailed Macaque—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.



❖ **Fishes (2 species)**

Overall, these statements provide valuable insights into sightings and knowledge about Siamese Tiger Perch and Striped Catfish within different sections of the Ou Tapaong Command area. The following paragraphs summarize the key findings and justifications for the presence of these two fish species confirmed by key informants, along with their associated confidence levels and their ecological knowledge of fish diversity and migration.

- **Siamese Tiger Perch:** According to four key informants in the upper section of the Ou Tapaong Command area, Siamese Tiger Perch has been consistently observed in Boeng Kansaeng Lake, located in the southwest part of the Ou Tapaong Command Area. Three of them reported encountering a few individuals of this fish species in 2023 and 2024 (figure 6.51), while another informant saw them about 20 years ago during the fully flooded period. This particular informant stopped fishing for many years after becoming older.

  The Siamese Tiger Perch is believed to migrate from Tonle Sap Great Lake to the upstream through Svay Daun Kav River (along the western boundary of command area) and then move into Boeng Kansaeng through its tributary canal during flooding periods. Common fishing gear used includes line nets, cast nets, and small fish traps. The informants mentioned that catching this species is extremely rare, with only one to two individuals caught per season using line nets. They possess extensive knowledge about fish and make a living through fishing.

  On the other hand, two key informants from the lower Ou Tapaong section stated that although they are familiar with Siamese Tiger Perch, they have never seen them in their area. One informant mentioned having seen this species in 1979 but not recently. Similarly, Mr. Chem Sophal from Punleu Komar Organization confirmed his awareness of this species but stated that it is not present in the lower Ou Tapaong Area.

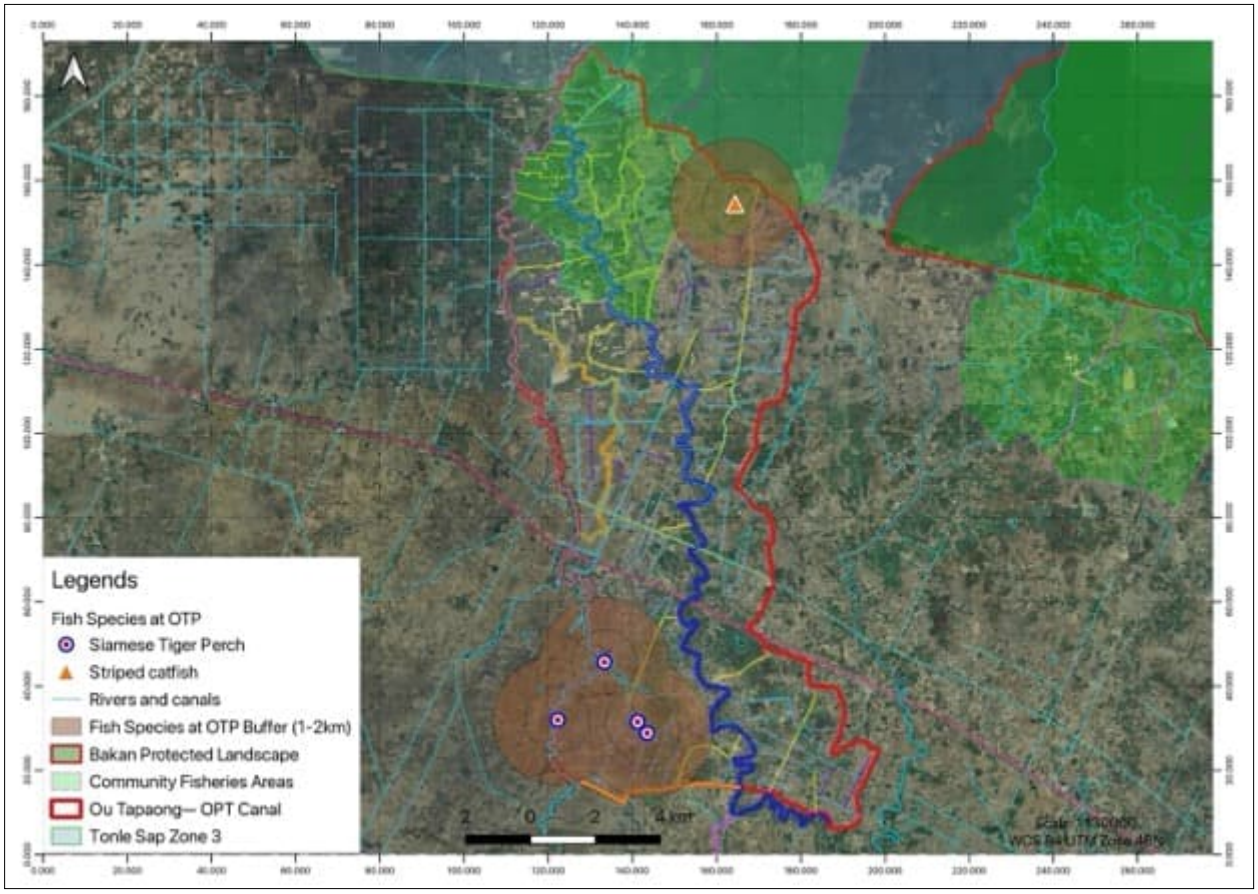
  The Criterion 1a of IFC Performance Standard 6 (PS6) is potentially met. The Siamese Tiger Perch, a Critically Endangered species, has been observed in Boeng Kansaeng Lake, a habitat within the Ou Tapaong Command Area. However, the frequency of sightings is low and historical, suggesting that further investigation is necessary to definitively establish the habitat's significance for the species' survival and reproduction.

- **Striped catfish**: One informant recalled seeing the Striped Catfish approximately 7 years ago in a small wetland area during the peak of flooding. This species is exceptionally rare, and it is known to migrate to this specific area when the entire region becomes submerged in floodwater.

  Based on what we know, the habitat for the Critically Endangered Striped Catfish likely meets two of the IFC PS6 criteria:

  - Criterion 1a: This habitat is super important for the survival of this super rare fish. It's like their special breeding ground during floods.
  - Criterion 3: The fish migrates to this specific area when it floods, making it a key spot for this travelling species.

Figure 6.51: A spatial distribution map was generated for two fish species—the Siamese Tiger Perch, and Striped Catfish (old record-7 years ago)—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.



6.5.1.1.4 Occurrence of Protected Areas near the Sub-scheme Area

A review of protected areas in the vicinity of the sub-scheme has been conducted as a preparatory step before proceeding with Step 3 of the CHA. There are four areas located near and downstream of the OTP sub-scheme (See Table below). The preliminary assessment focuses on the two that are closest to the OTB: Flood Forest Conservation, b) Bakan Grassland Protected Area[31].

No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
1	Flooded Forest Conservation	Royal Government of Cambodia: Sub-decree No. 197 dated 29 August 2011	The Tonle Sap's flooded forests are a vital part of its unique ecosystem. During the wet season, the Mekong River's waters back up into the Tonle Sap, flooding vast areas and creating a rich habitat for	0 (share the border)

[31] Bakan grassland is a protected area for birds designated by sub-decree No. 144 in 2023.

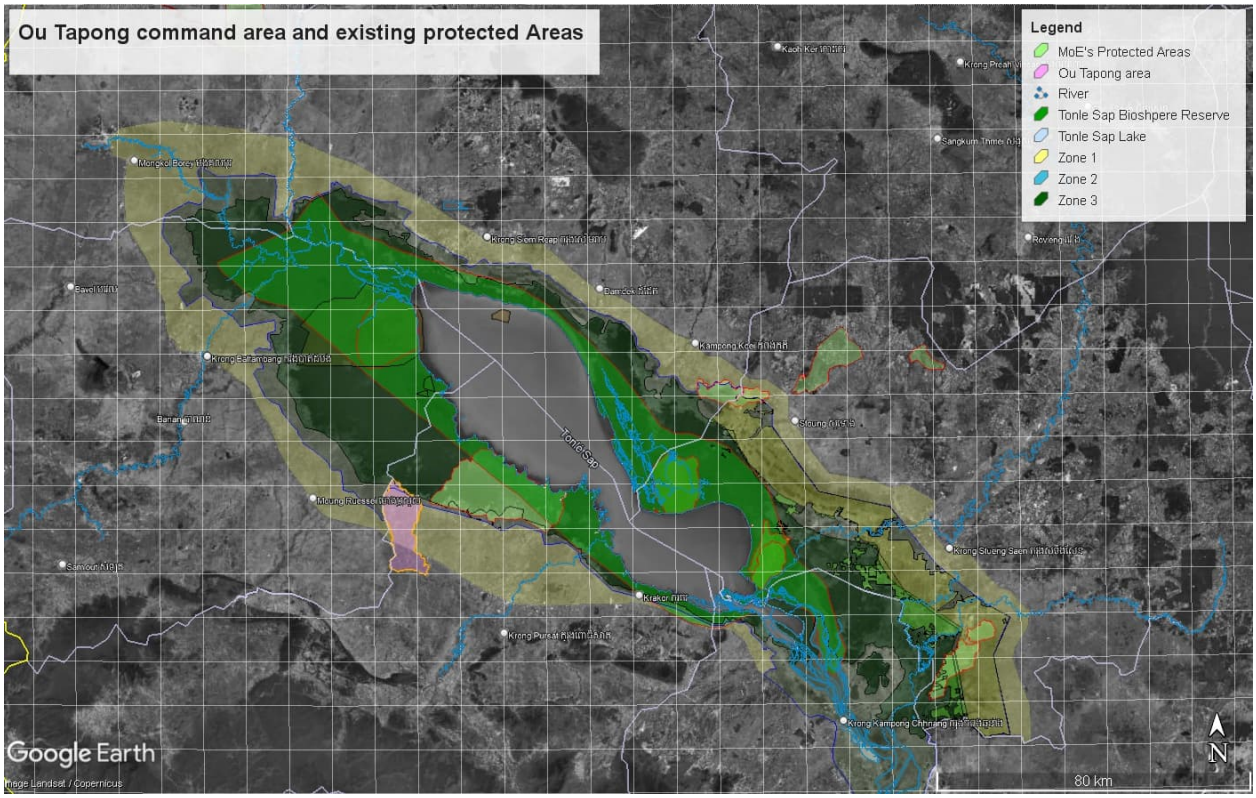
No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
			diverse wildlife. This dynamic ecosystem supports a multitude of fish species, waterbirds, and other wildlife. However, it faces threats like deforestation, overfishing, and pollution, necessitating conservation efforts to protect this vital resource.	
2	Bakan Grassland protected area	Royal Government of Cambodia: Sub-decree No. 144, dated 04 July 2023	Bakan Grassland, a 38,430-hectare protected area in Cambodia, is a vital part of the Tonle Sap ecosystem. It's home to endangered bird species like the Bengal Florican and Chinese Grassbird. The Wildlife Conservation Society (WCS) and local communities are working together to protect this unique habitat.	2
3	Dei Roneat Important Bird Area (IBA)	BirdLife Internation	The IBA supports breeding colonies of important birds like the Darter, Lesser Adjutant, and Greater Adjutant. Its diverse habitat supports various bird species, but faces threats from human activities. Conservation efforts include monitoring, community engagement, habitat restoration, and policy advocacy to protect this crucial site.	12
4	Tonle Sap Biosphere Reserve (TSBR)	Royal Government of Cambodia: Royal Decree in 2001[32]	The Tonlé Sap Biosphere Reserve is a distinctive ecological region encompassing the Tonlé Sap, or Great Lake of Cambodia. The reserve was successfully designated a UNESCO Biosphere Reserve in 1997 and subsequently	16

[32] https://www.unesco.org/en/articles/national-conference-tonle-sap-biosphere-reserve-brings-together-stakeholders-discuss-sustainable

No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
			enshrined in the Cambodian Royal Decree in 2001.	
5	Prek Toal Important Bird and Biodiversity Area (IBA), then designated at the core area of TSBR in 2001, and then promoted Prek Toal Ramsar Site in 2015	BirdLife Internation Royal Government of Cambodia: Royal Decree in 2001[33] Sub-decree in 2015	The area is well known as the largest waterbird breeding colonies in Southeast Asia, support a congregation of may globally threatened birds, fish and other wildlife specicis. It's the second world largest breeding habiatat for Greater Adjutant, and the only breeding habitat for Spot-billed Pelican, and Milky Stork in Southeast Asia. Prek Toal is only inland breeding population for Milky Stork in the world.	24

Figure 6.52: Map of Ou Tapong Command Area and other existing protected areas under administered of the Ministry of Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministries of Water Resources and Meteorology

[33] https://www.unesco.org/en/articles/national-conference-tonle-sap-biosphere-reserve-brings-together-stakeholders-discuss-sustainable



6.5.1.2 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species (identified in the list of 11 EN and CR species) qualify for Critical Habitat features.

All information presented in this study report has been meticulously verified against reliable sources, including key government research institutes, national and international organizations, and expert consultations. To ensure accuracy, fish, bird, mammal, and reptile species identification at Ou Ta Paong, Lum-Hach, Brambei Mom, Kraeu Trom, and Yutasas was confirmed through consultations as below:

Table 6.20: List of international and national key expert was consulted to check and verify each all target EN and CR species

Name	Position and institution	Key Area of expertise/ consultation	Contact
Dr. Ea Chitra	Head of the Aquaculture Faculty at the Kampong Speu Institute of Technologies	Key fish species were released by his faculty at Anlong Chrey and Brambei Mum Reserviors.	+855 14 388 694
Mr. Robert Tizard	Senior Project Lead for Tonle Sap Landscape, WCS Camodia	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme	rtizard@wcs.or

Mr. Tach Sovannara	Head of the Fisheries Lab at the Inland Freshwater Research and Development Institute of the Fisheries Administration	Identification and clarification of EN and CR species of fish and reptiles across all sub-schemes	
Mr. Khim Sokha	Chief of office of the Fisheries Conservation Department	Identification and clarification of EN and CR species of fish and reptiles across all sub-schemes	+855 12 784 687
Mr. Chuem Sophal	Program Manager, Punleu Komar Organization	Confirm present of birds and key wildlife species at Ou Ta Paong Sub-scheme	
Mr. Morn Ravy	Bakan Protected Landscape Project Coordination, WCS Cambodia	Confirm present of birds and key wildlife species at Ou Ta Paong Sub-scheme	morn@wcs.org
Mr. Somony Thay	Direct of Aquaculture Department, FiA	Fish identification, key fish species releasing data, and distribution range across all schemes	+855 12 829 971
Mr. Neang Ty	Conservation Program Manager, Wild Earth Allies	Internation and national expert on reptile	+855 12 864 409
Mr. Hong Chamnan	Director of the Freshwater Wetland Conservation Department, MoE	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme, national protected area data	+855 12 922 429
Mr. Sun Visal	Deputy Director of the Freshwater Wetland Conservation Department, MoE	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme, national protected area data	+855 12 708 836

All information concerning avian and other key wildlife species, including their behavioral patterns, was corroborated through sighting data verified by relevant experts from the Wildlife Conservation Society (WCS), a long-standing partner of the Ministry of Environment (MoE), Fisheries Administration, and Forestry Administration in conservation efforts spanning over 25 years. Additionally, consultations were held with Mr. Hong Chamnan, Director of the Freshwater Wetland Conservation Department, and Mr. Sun Visal, his Deputy Director and the head of the Tonle Sap Biosphere Reserve. Both individuals possess extensive experience, ranging from 20 to 30 years, in avian ecology and protected area management within the Tonle Sap Lake region.

Finally, information related to reptiles and amphibians was validated through consultations with Mr. Neang Ty and his team from Wild Earth Allies, renowned experts who have made

significant contributions to the discovery of new reptile and amphibian species in Cambodia, including the Cardamon Shrub Frog (Philautus cardamonus).

6.5.1.2.1 Overview of the current land use and land cover at OPT

The map below features the current land and use and land cover at Ou Tapaong Command Area in late 2023. The colour bands failed to distinguish between rice fields, grassland and shrubland areas. However, based on field assessment, the command area is dominated by existing rice fields and some modified habitats. There are some small and fragmented natural habitats like shrubland, and grassland along the natural streams, seasonal ponds and wetland habitat creating a mosaic habitat for many wildlife species to strive as the area is situated within the Tonle Sap Floodplain close to many protected areas and IBBAs. Residential areas are situated along the main roads, rivers, and streams.

The northern portion of the OTP Command Area is a dynamic landscape characterized by a varied mosaic of habitats. Here, agricultural lands coexist with modified habitats, wetlands, shrublands, and remnants of grassland, seamlessly transitioning into the vast expanse of the Tonle Sap Zone 3 flooded forest.

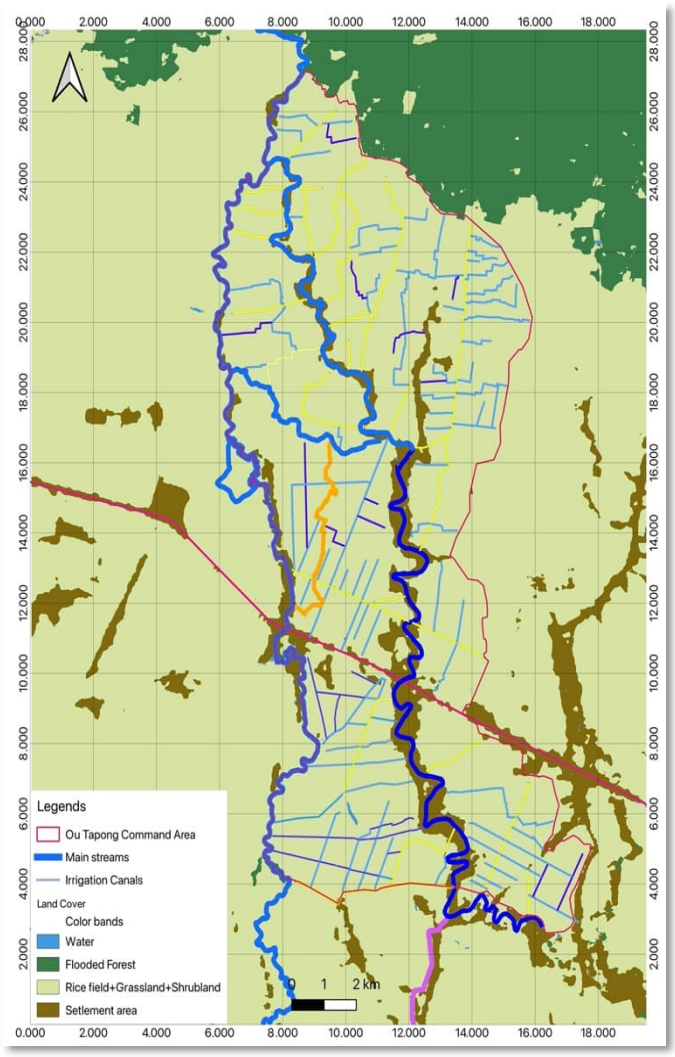
This diverse ecological mosaic plays a crucial role in supporting a rich array of biodiversity. The area serves as a vital foraging ground for numerous migratory bird species, providing them with abundant food resources. Additionally, it functions as a critical refuge and breeding ground for fish during the wet season, when the flooded forests and wetlands offer ideal conditions for spawning and juvenile development.

The intricate interplay of these habitats sustains a diverse community of wildlife, including birds, mammals, fish, and reptiles. These species rely on the unique characteristics of the flooded forest and wetland ecosystems for essential life cycle activities such as breeding, nesting, and foraging. The area's significance as a biodiversity hotspot is underscored by its role in supporting a wide range of Habitat of significant importance to CE and EN species

As presented in Section on Ecological State earlier, species that qualify as critical habitat features include:

- **Reptile** (4 species): Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise,
- **Mammals** (2 species): Indochinese Silvered Langur and Long-tailed Macaque),
- **Fishes** (2 species): Striped catfish and Siamese Tiger Perch, and
- **Birds** (3 species): Greater Adjutant, Milky Stork, and Bengal Florican.

Figure 6.53: Land use and land cover map based on the satellite image from Sentinel-2 with 10m resolution.

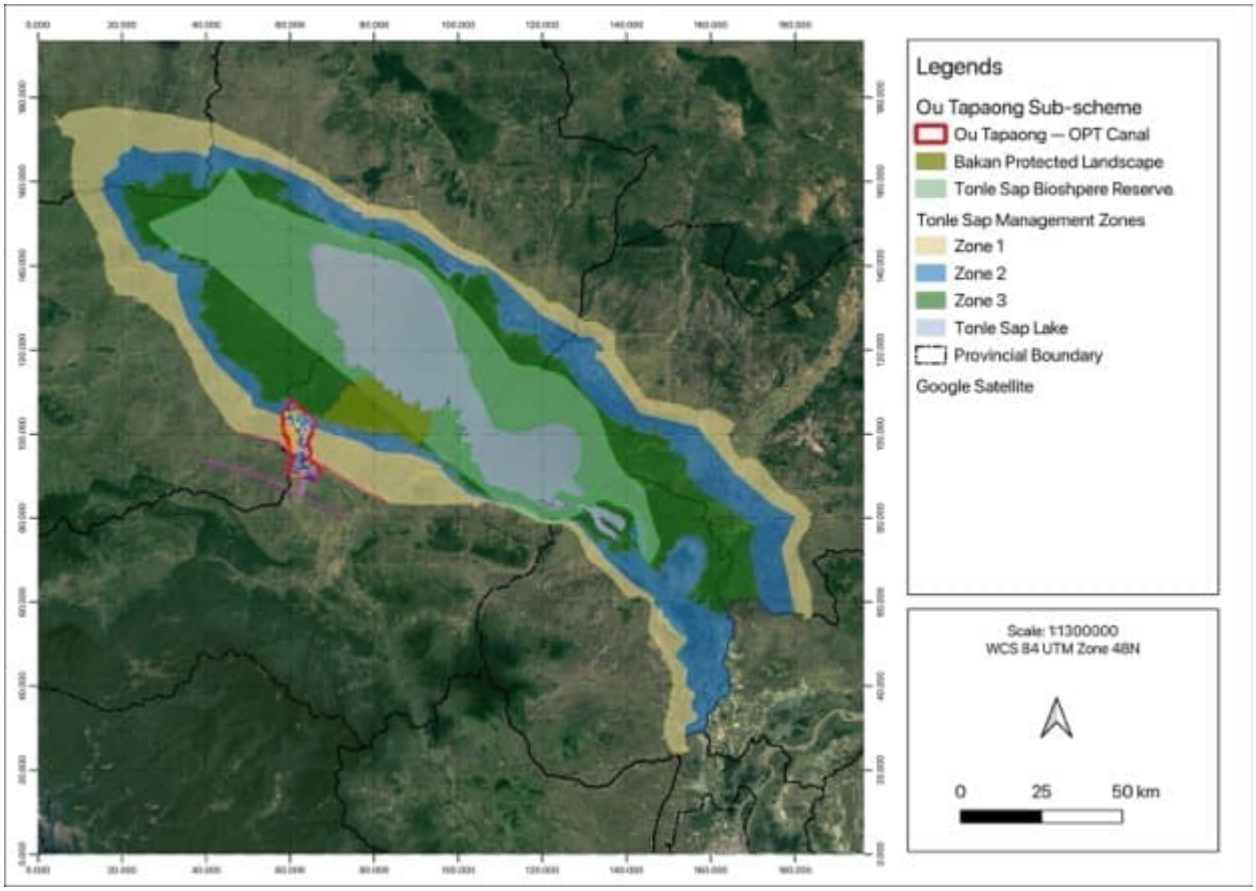


First of all, the Ou Tapaong command area was assessed as a modified habitat because the command area which is around 14,000 hectares is a mixture of paddy fields, rivers, shrubland, seasonal ponds, farmers, and houses. Rivers such as Ou Ta Paong River and Svay Donkeo River have been substantially modified at various locations of the river for water collection, storage, as well as for other living and farming purposes.

In this assessment, we divided Ou Tapaong Command Area into three parts: 1) the upper part to the south, 2) the middle part along National Road 5, and 3) the lower part to the north which is situated within the floodplain of Tonle Sap Zones 2 and adjacent to Tonle Sap Zone 3 for key informant interview and habitat assessment purposes as this command area is large and maintain different demographic and natural habitat conditions. On August 7, 2024, the Cambodian government discussed the decision to register two zones (Zone 2 and Zone 3) of the Tonle Sap Lake Basin as state land to protect the natural resources of the lake. This decision will prohibit any further requests for land concessions in these zones. The Ministry of Land Management, Urban Planning and Construction hopes that this will help to preserve the biodiversity of the lake[34]. The assessment focused on the upper and lower parts because these areas are known to have a diverse biodiversity landscape. While the survey revealed variations in knowledge about wildlife among local communities, it also highlighted the need for increased awareness and understanding across all areas.

Figure 6.54: Map of Ou Ta Paong command area and other existing protected area within the Tonle Sap Basin

[34] Land Management, Urban Planning and Construction, Cambodia (2024). Zones 2 and 3 of the Tonle Sap Lake will be registered as state land to preserve this precious natural resource for inheritance for all generations.



The southern part of the command area is predominantly agricultural, with limited remaining natural habitats. Boeng Kansaeng, the largest seasonal wetland, faces challenges in water retention during the dry season. While the command area mostly gets water for irrigation from the Svay Daunkaev and Pursat rivers, the water volume is insufficient to maintain natural flows (e.g. Ou Tapaung River). Additionally, human interventions such as earth dams and conversion of waterways into fishponds have fragmented the natural habitats and as such hindered the movement of aquatic species (Figures 6.55 and 6.56).

The northeastern part of the command area, though dominated by agriculture, includes a significant area of flooded forests. This diverse habitat supports a range of endangered and critically endangered species. However, the entire water system faces challenges that limit its suitability for species requiring extensive, interconnected habitats. The lowest part of this area is connected to a very healthy flooded forest habitat, consisting of many small and large waterholes, and wetland areas, creating a mosaic habitat that provides suitable ecological niches for many endangered and critical species in the area. This huge, flooded forest habitat is part of the Tonle Sap Multiple Use Area, Tonle Sap Biosphere Reserve under the Ministry of Environment, and Tonle Sap Management Zone under the administration mandate of the Tonle Sap Authority, and Flooded Forest Protected Area under the Fisheries Administration. Additionally, a portion of Ou Ta Paong's lower command area overlaps with two Community Fisheries (CFIs) areas.

The critical habitat for these bird species within the Ou Ta Paong Irrigation sub-scheme includes flooded forests, wetlands, lakes, rivers, grassland, abandoned and fellow rice fields, and waterways. The flooded forests in Tonle Sap Zone 3 serve as crucial habitats for several

endangered and critically endangered primate species like the Indochinese Silvered Langur and Long-tailed Macaque and are characterised with lakes and wetlands inside that are crucial foraging habitats for birds. Based on this key finding we can identify and characterise critical habitats of various EN and CR species presence within and close the command area as below:

- Flooded forests, particularly those in Tonle Sap Zone 3, are particularly significant for biodiversity. These forests provide crucial habitat for endangered primates such as the Indochinese Silvered Langur and Long-tailed Macaque. Additionally, the lakes and wetlands within these forested areas offer essential foraging grounds for various bird species including Greater Adjutant and Milky Stork.
- Wetlands, such as Boeung Kansaeng, play a vital role in supporting aquatic and terrestrial biodiversity. These areas provide essential food, shelter, and breeding grounds for a variety of species including birds, reptiles, and fish.
- Rivers and waterways, like the Svay Daun Kav River, serve as important corridors for fish migration and connectivity between different habitats. This can indirectly benefit birds by providing a healthy aquatic ecosystem.
- Grasslands and open areas, while less diverse than forested habitats, can still support certain Bengal Florican, Yellow-breasted Bunting and other bird species. Abandoned and fallow rice fields may also offer temporary refuge for many bird birds including the Florican. The Bengal Florican utilizes this habitat for nesting and feeding during the dry season. The Yellow-breasted Bunting winters in this region before returning to its breeding ground in Siberia, Russia, from May to November

Based on the biodiversity assessment conducted at Ou Tapaong Irrigation Sub-scheme, several critical habitats have been identified, and described below. These habitats support a range of endangered and critically endangered species, highlighting their ecological significance. The critical habitat assessment activities that should be taken for the Ou Tapaong Command area, considering IFC PS 6 guidance on biodiversity conservation and sustainable management of living natural resources, are as follows:

1. Baseline Studies: Conduct comprehensive baseline studies to identify and understand the biodiversity values in the area. This should include a literature review, stakeholder engagement and consultation, field surveys, and other relevant assessments. The focus should be on identifying key species (such as Greater Adjutant, Milky Stork, Bengal Florican), fish (Siamese Tiger Perch and Striped Catfish), reptiles (Black Marsh Turtle, Southeast Asian Box Turtle, Giant Asian Pond Turtle, Elongated Tortoise), mammals (Indochinese Silvered Langur and Long-tailed Macaque), and their habitats.
2. Habitat Mapping: Map out the different habitats present within the Ou Tapaong Command area. This should include flooded forests, lakes (such as Boeung Kamsaeng Lake), rivers (Svay Daunkav River), waterholes, grasslands, and fellowed rice fields used by bird species for foraging.
3. Threat Assessment: Assess potential threats to critical habitats identified in step 2. Consider factors such as habitat loss due to infrastructure development or land-use changes related to irrigation system renovation.

4. Stakeholder Engagement: Engage with relevant stakeholders including local communities living in or around critical habitats to gather their knowledge about biodiversity values in the area.
5. Mitigation Measures: Develop mitigation measures specific to each identified critical habitat that aligns with IFC PS 6 guidance on avoidance of impacts whenever possible; implementation of measures to minimize habitat fragmentation; restoration activities during operations or after project completion; implementation of set-asides for protection; consideration of biodiversity offsets where appropriate based on no net loss principle.
6. Environmental and Social Impact Assessment (ESIA): Conduct an ESIA that considers all potential impacts on critical habitats identified through steps 1-5 above.
7. Monitoring Plan: Develop a comprehensive monitoring plan that includes regular monitoring of key species populations within critical habitats identified in step 2 above.

Figure 6.55: Boeung Kansaeng located in Ou Tampaong's upper reaches, offers sighted records of Siamese Tiger Parch. The area's upper part in this photo is a settlement along the Svay Daunkav River.



Figure 6.564: Overview of Boeung Kansaeng, located upstream of Ou Tapaong Command Area. A canal connects to Stueng Svay Daunkav River (left) and Ou Tapaong (right), a potential fish migration route during floods.



Figure 6.57: Aerial photograph depicting the Ou Tapaong Stream/canal fragmented by earth dams, roads, and ponds, illustrating its diversion for non-intended purposes.

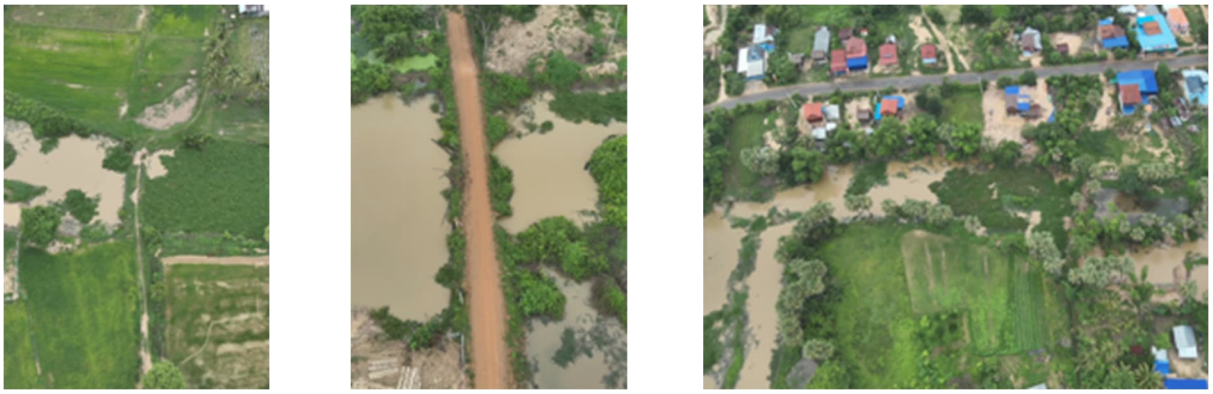


Figure 6.58: Aerial photograph of intake flooded forest habitat within Tonle Sap Zone 3 and the continuous land encroachment, converting forest land for rice cultivation.



6.5.1.2.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Ou Ta Paong).

6.5.1.2.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for OTP, therefore is expected to qualify as critical habitats under this criterion**.**

6.5.1.2.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

6.5.1.2.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

Boeung Kansaeng Lake still maintains hydrological connectivity for fish migration from Stueng Svay Daunkav River through its canals, where the Siamese Tiger Perch was confirmed. Some small wetland areas at the lower part of the OTP command area support ecological functions and connectivity for confirmed birds, reptiles and fish species for their local movement, nesting, and foraging ground. So, that is necessary to support biodiversity values that require applying biodiversity mitigation measures and protection efforts (described under the above criteria) have been identified. Pumping, drainage, and discharge of chemical inputs into that wetland can have a significant impact on the biodiversity and survival rate of EN and CR species present in that area.

6.5.2 Lum Hach

6.5.2.1 Analysis to prepare for determining CH status

6.5.2.1.1 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for the LH Command Area. The coordinates of this command area (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence

and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR, only one endangered bird species of Green Peafowl was confirmed see table 6.21 below.

Description of screening for narrowing down

For Lum Hach, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the Lum Hach area of influence, covering reptiles, mammals, fish, birds, and mushrooms. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 5 EN and CR species were identified in this area of influence (see Table below). In the 3rd round of screening (in August 2024), however, one of five species was confirmed as “potentially present” in the LH’s area of influence. So, the assessment for Lum Hach focuses on the confirmed list of **1 species** that are categorized by IUCN as Endangered species.

Table 6.21: Confirmed List of endangered and critically endangered species for the Lum Hach sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=5)	Confirmed Species in Round 3 (Total = 1)
I. Mammal species						
1	ឆ្កែព្រៃ	Dhole	Cuon alpinus	EN	Yes	No
2	ជ្រីងជំ	Large Flying-fox	Pteropus vampyrus	EN	Yes	No
II. Fish species						
3	ក្រីកន្ត្រៀប ខ្លា	Siamese Tiger Perch	*Datnioides pulcher*	CR	Yes	No
III. Bird species						
4	ក្អែក	Green Peafowl	Pavo muticus	EN	Yes	Yes
IV. Mashroom						
5	ផ្សិតកែវ	Puffball mushrooms	Calostoma insigne	EN	Yes	No

6.5.2.1.2 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the likelihood of occurrence (LoO) of Green Peafowl - as part of the CHA. For this CHA, species was classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into

account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the one confirmed species is presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

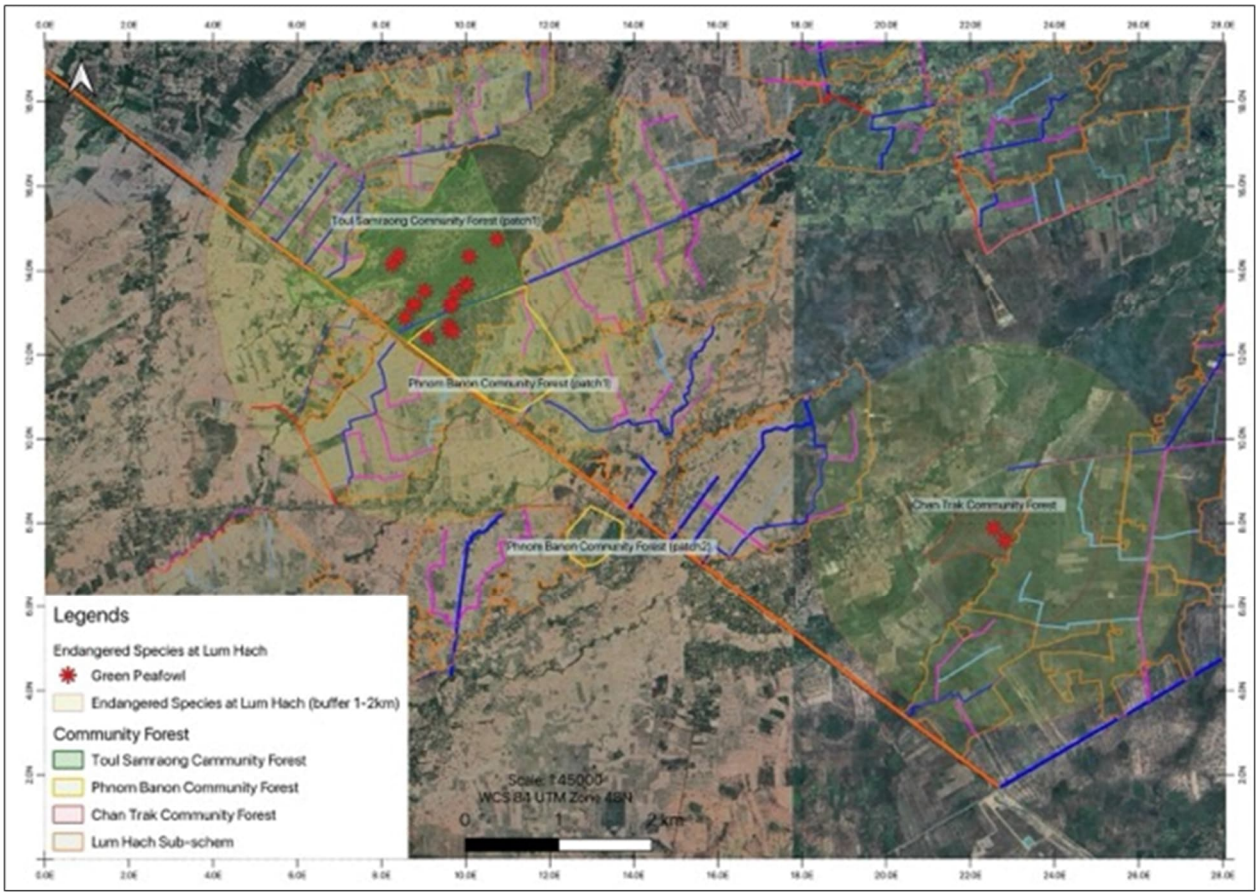
The remaining forest patches within the Lum Hach Irrigation Sub-scheme are characterized by small size, fragmentation, and degradation. They are classified as very open and degraded Dry deciduous forests (DDFs), which are not suitable for many species, including Long-tailed Macaques, Large Flying-fox, and Puffball mushrooms. The limited availability of suitable habitats is a significant factor contributing to the scarcity of biodiversity in the area.

The biodiversity assessment at Lum Hach Irrigation Sub-scheme initially identified several potential endangered (EN) or critically endangered (CR) species using the Integrated Biodiversity Assessment (IBAT) and key informant interviews. However, further investigation revealed that only Green Peafowl was confirmed to be present within the Toul Samraong, Phnom Banon, and Chan Trak Community Forests (see map in Figure 6.59 below).

Species Distribution:

- **Green Peafowl:** Found in all three community forests, indicating their adaptability to the local environment and the importance of these habitats for their conservation.
- **Dhole:** Despite initial screenings, no confirmed sightings were made within the study area. This may be attributed to factors such as habitat fragmentation, human disturbance, or low population densities.
- **Flying-fox:** The survey result is similar to the dhole, no flying-fox was confirmed within the study area. This could be due to habitat loss, hunting pressure, or other factors affecting their survival.
- **Siamese Tiger Perch:** This species was not found within the study area, likely due to its preference for larger water bodies like the Tonle Sap Great Lake. Three KII reportd that they countered this specie when they went for fishing at Tonle Sap every year but they had never seen this species within this area (Lum Hach).
- **Puffball mushrooms:** Although not confirmed within the study area, there is potential for their presence in higher elevations of the Cardamom Mountains.

Figure 6.59: Green Peafowl distribution in Toul Samraong, Phnom Banon, and Chan Trak Community Forests, as confirmed by local sources from 2020 to 204.



6.5.2.2 Determination of Critical Habitat Status (Step 3)

A habitat assessment was conducted in key areas known for endangered species within the region. Interviews with local authorities, community committees, and key informants confirmed the presence of Green Peafowl in three community forest areas.

Two of these forests, Toul Samraong and Phnom Banon (a large patch), share a boundary and are primarily composed of dry, open dipterocarp forests with some closed dipterocarp areas along the natural canal. These three community forests are small, fragmented, and surrounded by farmland, with some remaining degraded forest land nearby. Despite their poor ecological connectivity, they are crucial for supporting the small remaining Green Peafowl population.

During a meeting, it was discovered that two community forest boundaries had been revised, and one had changed its name from Trapeang Mlu to Phnom Banon. All forest representatives confirmed that their areas were undergoing registration with the Ministry of Land Management, Urban Planning, and Construction (PLMUPC). However, some key informants expressed

concerns about ongoing land encroachment into their community areas. Despite previous complaints, the offenders continue to use and sell the land without any repercussions.

6.5.2.2.1 Habitat of significant importance to CE and EN species

As presented in Section 4.2.3.3 (Ecological State), species that qualify as critical habitat features for Green Peafowl is listed as Endangered Species in the IUCN RedList. The natural dry forest habitats within the community forests of the Lum Hach Irrigation Sub-Scheme are critical for the survival of the Green Peafowl population. These forests provide essential

resources for Green Peafowl, including food, shelter, and breeding sites. However, the quality and extent of these habitats can vary significantly, affecting their suitability for the species (Figures 6.60 and 6.61).

Figure 6.60: The upperpart of Hum Hack next to Boribou river catchment area



Figure 6.61: Overview from the above of the general condition of Toul Samroang and Phnom Banon Community Forests



Figure 6.62: Overview from the above of the general condition of Chan Trak Community Forest



Figure 6.63: An expert consulted with the Toul Samraong CF management committee to verify the identification of a canine species, ensuring it was correctly identified as either a dhole or a jackal.



6.5.2.2.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Lum Hach).

6.5.2.2.3 Habitat supporting globally or nationally significant concentrations of migratory or congregatory species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for LH, therefore is expected to qualify as critical habitats under this criterion.

6.5.2.2.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies of there the three community forest areas are trimmed out from the command area. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion. However, the concern of illegal agriculture expansion into the community forest areas was questioned by some key informants (management committee and patrol members of community forests).

6.5.2.2.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

6.5.3 Brambei Mom

6.5.3.1 Analysis to prepare for determining CH status

6.5.3.1.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

6.5.3.1.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Brambei Mom. The coordinates of BM (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening, there's on EN and CR species confirmed.

Description of screening for narrowing down

For Brambei Mom, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the Brambei Mom area of influence, covering reptiles, mammals, fish, birds, and mushrooms. Screening was done based on the IBAT report generated and provided by the AIIB.

The four sub-schemes (Brambei Mom, Krapeu Truom, Yotasas, and Stueng Kang Bat) are integral components of the Stoeung Krang Ponley River catchment system, a tributary of the Tonle Sap. These areas share geographic connectivity and ecological functions. Semi-structured and structured interviews were conducted to collect data on species information, distribution, and fisheries ecosystems. In the first two rounds of screening, 2 EN and CR species including 1) one reptile (Black Marsh Turtle), and 2) one fish species (Striped Catfish) were identified in this area of influence. In the 3rd round of screening (in August 2024), however, none of these species was confirmed" in the Brambei Mom's area of influence.

6.5.3.1.3 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the likelihood of occurrence (LoO) of the above 2 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this

session, a brief assessment of the 11 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The four sub-schemes (Brambei Mom, Krapeu Truom, Yotasas, and Stueng Kang Bat) are integral components of the Stoeung Krang Ponley River catchment system, a tributary of the Tonle Sap. These areas share geographic connectivity and ecological functions. Semi-structured and structured interviews were conducted to collect data on species information, distribution, and fisheries ecosystems. Two National Fisheries Day ceremonies were held at Kbol and Anlong Chrey Reservoirs, during which millions of fish were released by the former prime minister. The aquaculture department of the Technology Institute of Kampong Speu also releases fish into these reservoirs. Investigations with relevant government departments confirmed that no endangered or critically endangered species were released during these events.

6.5.3.2 Habitat Assessment

Brambei Mom Command Area is located within the Stoeung Krang Ponley River catchment system, a tributary of the Tonle Sap. These areas are geographically and ecologically interconnected. The habitat is characterized by three large reservoirs (Anlong Chrey, Brambei Mom, and Kdol) in the upper reaches, while the lower areas consist of riverine, wetland, and agricultural landscapes. The water quality, vegetation density, and soil composition vary across these habitats. However, the hydrological functions of the system are disrupted by numerous dams and spillways along the main canal and irrigation canals, hindering fish migration from downstream to upstream. This may be one factor contributing to the absence of the targeted species in the area.

Semi-structured interviews were conducted with multiple fishermen at Anlong Chrey and Brambei Mom reservoirs. Many claimed to have seen or caught Striped Catfish, Mekong Giant Barb, and Isok barb/Jullien's Golden Carp. To verify their claims, we sent photographs of the fish to Thach Panara, head of the Inland Fisheries Research and Development Institute. It was determined that all of the fishermen had mistakenly identified Mekong Giant Barb as Rohu (Labeo rohita). Additionally, none of the fishermen reported encountering any turtles or tortoises in their fishing area. Despite consulting visual aids, we were unable to confirm the reported sightings of Jullien's Golden Carp and Striped Catfish due to a lack of clear identification evidence.

Ten key informants were interviewed with the support of commune councils. None reported encountering the targeted species within the command area. Discussions with the Chief of Brambei Mom commune revealed a history of large-scale fish farming in the area, including Pangasianodon sp. and Hypsibarbu sp. A flood event years ago led to the release of these fish into the Anlong Chrey reservoir, resulting in increased catches by local fishermen. However, it remains uncertain whether the Pangasianodon sp. was indeed Striped Catfish.

Figure 6.64: Interviewing and verifying Mekong Giant Barb with similar look of other fish species and their ecological niches

Figure 6.65: Local fishermen in Brabei Mom mistakenly identified their catch of Rohu (Labeo rohita) as Mekong Giant Barb.





6.5.3.3 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). Based on the assessment result there are no EN and CR with their critical habitat confirmed for this sub-scheme.

6.5.3.3.1 Habitat of significant importance to CE and EN species

As presented in Section 4.3.3.2 (Ecological State), no EN and CR species confirmed.

6.5.3.3.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for for Brambei Mom).

6.5.3.3.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for Brambei Mom, therefore is expected to qualify as critical habitats under this criterion.

6.5.3.3.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

6.5.3.3.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

6.5.4 Krapeu Trom

6.5.4.1 Analysis to prepare for determining CH status

6.5.4.1.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

6.5.4.1.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Krapeu Trom (KT). The coordinates of KT (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species.

6.5.4.1.3 Description of screening for narrowing down

For Krapeu Trom, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the OTP area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, there were two fish species (Isok barb/Jullien's Golden Carp and Leaping barb/Flying Minnow) were screened for the first two rounds. After three rounds of screening focusing on EN and CR species, only Flying Minnow is confirmed as potentially present in the sub-scheme area of influence.

6.5.4.1.4 Ecological State of Habitats within the AoA

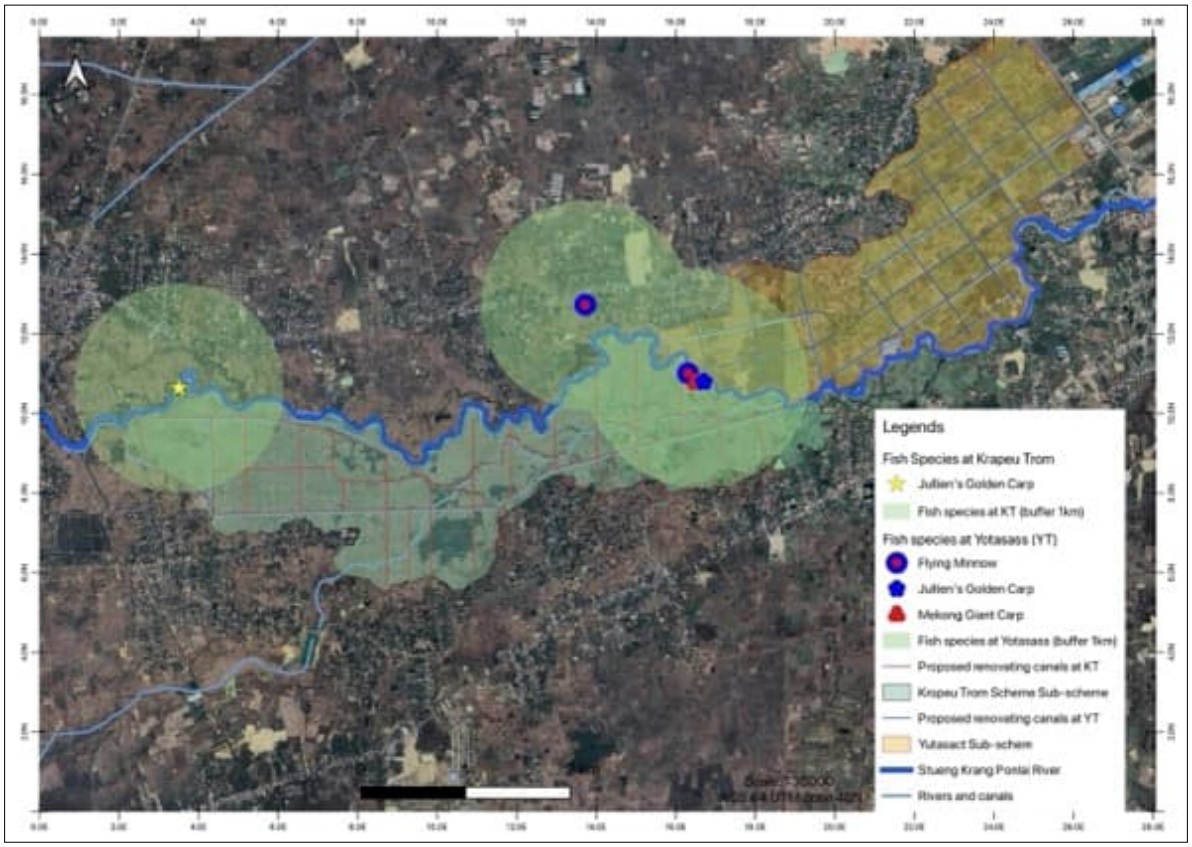
Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the one confirmed species is presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The Krapeu Trom command area has been in existence since the 1970s. The KT is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the Stueng Krang Ponlai serve as the sole ecological and hydrological connection between its upstream watershed and the Tonle Sap River basin downstream. This river is crucial for fish migration during the flooding season. However, reservoirs, spillways, and drought conditions have disrupted these essential ecological functions.

- **Fish (1 species)**

Krapeu Trom, like Brambei Mom, is situated within the same river catchment area in the lower reaches, near the Tonle Sap's annual floodplain. Two fish species, the Isok barb/Jullien's Golden Carp (Probarbus jullieni) and Leaping barb/Flying Minnow (Laubuka caeruleostigmata), were targeted for interviews in this command area. Among ten key informants interviewed, only one reported encountering the Jullien's Golden Carp once in 2022, approximately 500 meters downstream of the reservoir facility during a flooding event (see map below). This individual stated that the species migrated upstream from the Tonle Sap during the flood season but became trapped in spillways. They added that if flooding is insufficient, fish populations decline, and rare species may no longer be present in the area.

Figure 6.66: A spatial distribution map was generated for four fish species at Krapeu Trom and Yotasas Command Area. 1 km buffer zones were included to approximate their minimum movement range around suitable habitats.



6.5.4.2 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section on - CH assessment method). This assessment aims to determine whether any species qualify for Critical Habitat features.

6.5.4.2.1 Habitat of significant importance to CE and EN species

As presented in Section 4.4.3.3 (Ecological State), the species that qualifies as a critical habitat feature is the Flying Minnow. Krapeu Trom Command Area is part of Stueng Krang Ponlai River system (Tonle Sap's tributary) and situated approximately 11 km from Tonle Sap River. The area was influenced by flood-plus water from Stueng Krang Ponlai upstream and the push-up of flood water from Tonle Sap River Basic allowing fish to short distance migration for food and breeding.

Although climate change has caused dry and drought more frequently, this area still receives a good amount of flood from its upstream and downstream making a good connectivity and providing ecological function for migratory fish.

6.5.4.2.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for sub-scheme).

6.5.4.2.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for KT, therefore is expected to qualify as critical habitats under this criterion.

6.5.4.2.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

6.5.4.2.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

6.5.5 Yutasas

6.5.5.1 Analysis to prepare for determining CH status

6.5.5.1.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

6.5.5.1.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Yutasas. The coordinates of Yutasas (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 6 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 3 reptile species, and 3 fishes (See list of 11 EN and CR species in Table below).

Description of screening for narrowing down

For Yutasas, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in

August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the Yutasas area of influence, covering reptiles and fish. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 5 EN and CR species were identified in the Yutasas area of influence (See Table 6.22 below). In the 3rd round of screening (in August 2024), however, 3 (out of a total of 5 species) were confirmed as “potentially present” in the Yutasas’s area of influence.

So, the assessment for Yutasas focuses on the confirmed list of **3 species of fish** that are categorized by IUCN as EN and CR species (see map in Krapeu Trom section above).

Table 6.22: Confirmed List of endangered and critically endangered species for the Yutasas sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=5)	Confirmed Species in Round 3 (Total = 3)
I. Reptile species						
1	អណ្តើកព្រោច	Elongated Tortoise	Indotestudo elongata	CR	Yes	Yes
II. Fish species						
2	ត្រីក្រសក់ក្រហម	Jullien's Golden Carp	Probarbus jullieni	CR	Yes	Yes
3	ត្រីចង្វាស្ទឹង	Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	Yes	Yes
4	ត្រីកាហោ/ត្រីកុលរ៉ាង	Mekong giant barb/Giant Carp	Catlocarpio siamensis	CR	Yes	Yes
II. Bird species						
5	ទាព្រៃស្លាបស	White-winged Duck	Asarcornis scutulata	EN	Yes	No

6.5.5.1.3 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 3 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 3 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The Yutasas command area has been in existence since the 1970s. This command area is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the Stueng Krang Ponlai, are the sole ecological and hydrological connection between its upstream watershed and the downstream Tonle Sap River basin. This river is crucial for fish migration during the flooding season. However, reservoirs, spillways, and drought conditions have disrupted these essential ecological functions.

6.5.5.2 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species (identified in the list of 3 EN and CR species) qualify for Critical Habitat features

6.5.5.2.1 Habitat of significant importance to CE and EN species

As presented Ecological State, species that qualify as critical habitat features include:

Based on the interviews and habitat assessments, three of the five endangered species were confirmed to be present in the Krapeu Trom section: Jullien's Golden Carp, Flying Minnow, and Mekong Giant Barb (see map above in Krapeu Trom section).

- **Jullien’s Golden Carp:** A female fisher reported encountering this rare species in the lower part of the reservoir during a flood in 2022. She caught five individuals using a fishing net. The other informants had not seen this species in several years. After careful verification, it was determined that the fishers were familiar with the species and had not mistaken it for another.
- **Flying Minnow:** Two informants reported encountering this small fish species in 2022 and 2023. One caught them in the lower part of the Yotasass reservoir, where they had migrated from a downstream area. The other found them in her natural fish pond after pumping it. Both informants were confirmed to be familiar with the species.
- **Mekong giant Barb**: A key informant reported catching five individuals of this species in July 2022 after heavy rains. The fish were small, approximately 1.5 kilograms each, and were found in the lower part of the reservoir. The informant was familiar with the species and believed that they were attempting to migrate upstream but were trapped by the reservoir.

6.5.5.2.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Yutasas).

6.5.5.2.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for Yutasas, therefore is expected to qualify as critical habitats under this criterion.

6.5.5.2.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

6.5.5.2.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

Table 6.232: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Yutassas sub-scheme of the Project Area

English Name	Scientific Name	IUCN Status	Global population	Cambodia population	Migratory/ Congregatory	Habitat and Distribution	Likelihood of Occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Reptile									
Elongated Tortoise	Indotestudo elongata	CR	Unknown-kept declining	Unknown-kept declining	No	Endangered and elusive, inhabit the Tonle Sap Floodplain's diverse wetlands, including flooded forests and marshes. Their survival is threatened by habitat loss, hunting, and bycatch.	Not confirmed	There's some qualified habitat but lack of permanent and deep-water body. The species was confirmed present around 15 to 12 km way downstream far from the project area. Therefore, It's likely absent in the project AoI.	Out
Fish									
Jullien's Golden Carp	Probarbus jullieni	CR	Unknown-kept declining	Unknown-kept declining > 80% over three generations	Yes	*Probarbus jullieni* inhabits Cambodia's Mekong tributaries and large rivers, favoring deep, flowing lowland pools. Once widespread in the Mekong and Tonle Sap systems, its range is now fragmented and drastically reduced.	Low - Confirmed in AoI in 2024	Critically endangered due to overfishing, dams, and habitat loss, it is now extremely rare in Cambodian waters. This species migrates from Tonle Sap River system into the AoI through Stueng Krang Ponlai river system (Tonle Sap tributary). Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4threshold.	IN
Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	Unknown-kept declining	Unknown-kept declining	Yes	This species prefers clear, forested streams and tributaries across Cambodia's river systems. While likely widespread in suitable freshwater habitats, its precise distribution remains poorly documented.	Low-Confirmed in AoI in 2024	Endangered due to overfishing, dams, and habitat loss, it is now extremely rare. This species migrates from Tonle Sap River system into the AoI through Stueng Krang Ponlai river system (Tonle Sap tributary). Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4 threshold.	IN
Mekong giant barb/ Giant Carp	Catlocarpio siamensis	CR	Unknown-declined over 90%	Unknown-kept declining	Yes	*Catlocarpio siamensis* once lived in deep Mekong pools and tributaries but are now extremely	Very Low - Confirmed in AoI in	Critically endangered, with severe population declines attributed to overfishing, dam construction, and	IN

			in the last three generations			rare and restricted to isolated spots due to overfishing and habitat loss.	2024	habitat degradation, rendering it exceptionally rare. It's reported that only juvenile individuals migrate from the Tonle Sap River system into the Area of Influence (AoI) via the Stueng Krang Ponlai River, a Tonle Sap tributary. Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4t hreshold.	
Bird									
White-winged Duck	Asarcornis scutulata	EN	Unknown	Unknown	No	Rare and poorly studied aquatic plant species endemic to Thailand, specifically found in the Chanthaburi Province.	Not confirmed	IUCN listed as EN and as the Endemic to the Thailand and therefore it has been screened out	**Out**

6.5.6 Stueng Krang Bat

6.5.6.1 Analysis to prepare for determining CH status

6.5.6.1.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

6.5.6.1.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Stueng Krang Bat (SKB). The coordinates of SKB (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 5 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 3 reptile species, and 2 fishes (see a list of 6 EN and CR species in Table 6.24 below).

Description of screening for narrowing down

For Ou Ta Paong, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the SKB area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 5 EN and CR species were identified in the SKB area of influence (See Table below). In the 3rd round of screening (in August 2024), however, 6 (one additional critically endangered species) were confirmed as "potentially present" in the OTP's area of influence.

So, the assessment for SKB focuses on the confirmed list of 6 species that are categorized by IUCN as EN and CR species including 3 reptile species (Asian giant softshell turtle, Black Marsh Turtle and Southeast Asian Box Turtle) and 3 fish species (Striped catfish, Mekong Giant Barb and Siamese Tiger Perch). See Table below for the list of confirmed species and see Figure 6.67 for potential locations of these species in the project's area of influence.

Table 6.24: List of endangered and critically endangered species based on the IBAT Screening result vs. key informant interview at Stueng Krang Bat Sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=5)	Confirmed Species in Round 3 (Total = 3)
I.	**Reptile spices**					

1	កន្ធាយក្បាលកង្កែប	Asian giant softshell turtle	Pelochelys cantorii	CR	No	Yes
2	អណ្តើកក្អែក	Black Marsh Turtle	Siebenrockiella crassicollis	EN	Yes	Yes
3	អណ្តើកបិទមុខ	Southeast Asian Box Turtle	Cuora amboinensis	EN	Yes	Yes
III. Fish species						
4	ត្រីជ្រោង	Striped catfish	Pangasianodon hypophthalmus	EN	Yes	Yes
5	ត្រីកាហោ/ត្រីគុលរ៉ាង	Mekong Giant Barb	Catlocarpio siamensis	CR	Yes	Yes
6	ត្រីកន្ត្រៃប់ខ្លា	Siamese Tiger Perch	Datnioides pulcher	CR	Yes	Yes

6.5.6.1.3 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 11 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The SKB command area has been in existence since the 1970s. The SKB is a mixture of paddy fields, farm roads, and residential areas. The Stueng Krang Bat (SKB) irrigation sub-scheme was initially screened for a biodiversity assessment, utilizing the Integrated Biodiversity Assessment (IBAT) approach and key informant interviews. Located on the edge of the Tonle Sap River and annual floodplains of the Tonle Sap and Mekong Rivers, this area holds significant ecological importance. The initial screening identified six EN and CR of reptiles and fish species for this command area. These included the Black Marsh Turtle, Southeast Asia Box Turtle, Striped catfish, Mekong giant barb/Giant Carp, and Siamese Tiger Perch.

Upon conducting key informant interviews (KII), it was confirmed that several endangered (EN) and critically endangered (CR) species inhabit SKB. These included reptiles such as the Black Marsh Turtle, Southeast Asia Box Turtle, and Asian giant softshell turtle along with fish species like Striped catfish, Mekong giant barb/Giant Carp, and Siamese Tiger Perch. The confirmation of these vulnerable species underscores the ecological significance of SKB's command area (see map below).

This information emphasizes the importance of further biodiversity surveys in this region to comprehensively document all wildlife present. Furthermore, these findings highlight potential

conservation efforts needed to protect these threatened or endangered species identified through initial screening at SKB.

Ten key informants were selected in collaboration with the commune council and village chiefs for interviews. These individuals were chosen based on their extensive local ecological knowledge and experience in fishing within their communities. The following paragraphs summarize the key information gathered from interviews regarding each confirmed species.

❖ **Reptiles (3 species)**

- **Asian giant softshell turtle:** This species was not initially screened for interviews at this sub-scheme but was confirmed during the interview process. Only one informant reported encountering the Asian Giant Softshell Turtle in 2024 at Boeung Thom. This extremely rare species was last sighted by this informant many years ago. It prefers large lakes and river systems with abundant vegetation and flooded forests. The remaining key informants had not seen this species in many years, and some had never encountered it in their lifetimes.
- **Black Marsh Turtle**: Two key informants confirmed their familiarity with this species. One informant reported encountering the Black Marsh Turtle in the area over a decade ago but has not seen it since then. A second informant also recalled encountering the species more than ten years ago, but not within the specific command area.
- **Southeast Asian Box Turtle:** Five key informants confirmed their familiarity with the Southeast Asian Box Turtle. Two of these informants reported encountering the species in the Boeung Thom and Rek Trors areas in 2022. Another two informants encountered the turtle 7 years ago near the spillway close to the village and in Reahny Longvaek, which has since been converted into a real estate development project. One informant reported seeing the species in the same location for over a decade but has not observed it recently.

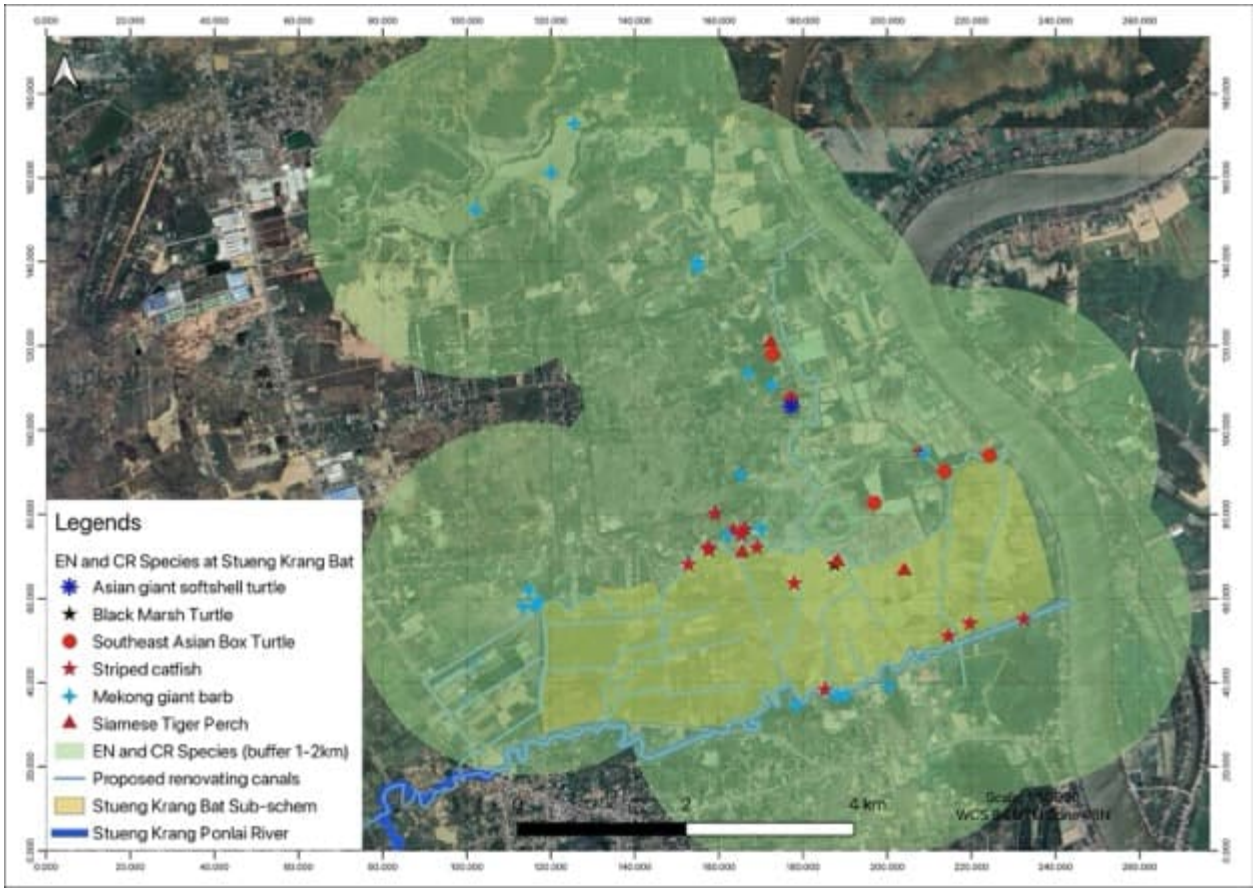
❖ **Fish Species**

- **Striped Catfish:** The local fishermen in the Stueng Kran Bat Command Area have consistently encountered the Striped Catfish species during the flooding season for several years. However, they have noticed a rapid decline in population size, with individuals being caught at much smaller sizes. The estimated catch by comparison to previous years is only around 30%. The fishermen report encountering these fish annually during full flooding and receding periods, with sightings randomly occurring within approximately 900m distance surrounding the village area. These fish typically migrate from the Tonle Sap Lake to the Stueng Kraing Ponlai River in August or September, depending on flood levels. Once in the Stueng Kraing Ponlai River, they disperse throughout the floodplain during the flooding season. All key informants reported consistently catching this species in the following areas for all reported fish species: Veal Braing (the floodplain area around the village), Trek Tor, Boeung Kralor Meach, Boeung Braing, Stueng Krang Ponlay River, Boeung Thom, and Boeung Toek La-ork.
- **Mekong Giant Barb:** Local fishermen in the Stueng Kran Bat Command Area have consistently encountered the Mekong Giant Barb species during the flooding season

for several years. However, they have noticed a rapid decline in population size, with individuals being caught at much smaller sizes. The fishermen do not intentionally target these fish species they are at the fingerling stage, but they often become trapped in line nets. Two of the fishermen mentioned that they had encountered this species around a decade ago but stopped going out for fishing for many years. Seven fishermen reported encountering them every year during flooding and early receding periods near the village and within the floodplain area. The catch sizes are small during flooding season but grow significantly (2 to 3 km per individual) during receding periods. Another fisherman noted that there has been a decrease in both catch amounts and size of these fish over time, with fewer being caught with nets each year. They also mentioned that some of these fish get stuck in large lakes near the Tonle Sap River when floods occur. Overall, it is estimated that there has been a significant decline of more than 70% in catch amounts, and today's Mekong Giant Barb are much smaller compared to previous years at this time of year due to their rarity and the delay and not enough floods.

- **Striped Catfish:** The information provided by the local fishermen regarding the Striped Catfish species in the command area is varied. Two of them reported recent sightings in 2022 and 2023 between 3 to 5 individuals per catch, while one informant mentioned their last encounter was 7 years ago, and two others stated that they haven't seen this species in over a decade. The encounters typically occurred during flooding and receding periods. The number of individuals caught has been very low, and the size of the fish has been decreasing year by year. One fisherman mentioned that he encountered this species in the Tonle Sap River but not around the village area.

Figure 6.67: Map showing the distribution of endangered (EN) and critically endangered (CR) species, with 1-2 km buffers indicating their potential movement ran ge within and around suitable habitats as identified by key informants sighted from 2020 to 2024.



6.5.6.2 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in CH assessment method). This assessment aims to determine whether any species (identified in the list of 11 EN and CR species) qualify for Critical Habitat features.

6.5.6.2.1 Habitat of significant importance to CE and EN species

As presented in Ecological State, species that qualify as critical habitat features include:

The habitat assessment identified both modified and natural habitats within the command area. Modified habitats include areas substantially altered by human activity, such as agricultural land, natural lakes, wetlands, and river systems. Natural habitats consist of viable assemblages of native plants and animals, where primary ecological functions and species composition remain largely intact. Identifying critical habitats is essential for understanding the ecological requirements of different fish species within the project areas. The critical habitats identified in the assessment are diverse and support a range of endangered and critically endangered species. These habitats include:

- **Floodplains:** The floodplains, particularly those connected to the Tonle Sap Lake and Mekong River, provide important habitats for fish species during the flooding season. These areas are periodically inundated, creating a dynamic ecosystem that supports fish migration, spawning, and feeding.
- **Rivers and Streams:** The rivers and streams within the sub-schemes serve as crucial habitats for fish migration and spawning. The Stueng Krang Ponlai River in Krapeu

Trom sub-scheme plays a vital role in connecting upstream watersheds to the Tonle Sap River basin.

- **Wetlands:** Wetlands such as marshes, swamps, lakes, and ponds are critical for supporting aquatic biodiversity. They provide breeding grounds for fish species and serve as important habitats for reptiles like Black Marsh Turtle and Southeast Asia Box Turtle.
- **Aquatic Vegetation:** Aquatic plants play a key role in providing food, shelter, and spawning sites for various fish species. They contribute to the overall health of aquatic ecosystems by improving water quality through nutrient uptake.

6.5.6.2.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for SKB).

6.5.6.2.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

This command area lies on the heart of Tonle Sap River Basin (TSRB) receiving annual flooding and submerging under the water seasonally. The whole floodplain area provides a signification congregation under the water during the wet season from August or September to January or February (depending on the flood situation) creating significant habitat for migratory fish, congregating downstream to upstream and vice versa.

6.5.6.2.4 Highly threatened or unique ecosystems

The Stueng Krang Bat irrigation sub-scheme is located in an area of high ecological importance within the Tonle Sap River system. The area is characterized by its proximity to the Tonle Sap Lake, the Mekong River, and their connecting channels, which provide a diverse range of habitats for fish species. This complex network of waterways supports a diverse range of fish species, making it a global hotspot for aquatic life. The confirmed presence of endangered and critically endangered species in the sub-scheme area highlights its ecological significance.

6.5.6.2.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

Stueng Kang Ponlai or Krang Bat and its floodplain area serve as critical habitat for EN and CR species of fish and reptiles. These ecological functions are necessary to support biodiversity values (described under the above criteria). Protecting flooded forest habitats and maintaining hydrological functions and connectivity are key to securing the free movement of these rare species.

Table 6.25: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Stueng Krang Bat sub-scheme of the Project Area

English Name	Scientific Name	IUCN Status	Global population	Cambodia population	Migratory/ Congregatory	Habitat and Distribution	Likelihood of Occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Reptile									
Giant Asian Pond Turtle	*Heosemys grandis*	CR	Unknown (suspected to have decreased by about 80%)	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds; 5-20 masl.	Very Low - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 4 threshold.	IN
Black Marsh Turtle	*Siebenrockiella crassicollis*	EN	Unknown (suspected to have decreased by about 80% in SEA)	Unknown-kept declining	N/A	Inhabits slow-moving shallow wetlands (marshes, swamps, ponds) in Cambodian lowlands. Historically widespread, its range remains broad but fragmented due to habitat loss, though it persists in some degraded areas.	Moderate - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 4 threshold.	IN
Southeast Asian Box Turtle	*Cuora amboinensis*	EN	Unknown-kept declining	Unknown-kept declining	N/A	The species inhabits lowland still-water environments such as ponds, marshes, and rice paddies. Their distribution is considered widespread across suitable wetland habitats in Cambodia, with a higher concentration likely in southern and western regions.	Moderate - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 4 threshold.	IN

Fish									
Striped catfish	*Pangasianodon hypophthalmus*	EN	Unknown	Unknown	Yes	This freshwater fish is native to the Mekong River Basin in Southeast Asia, including countries like Thailand, Laos, Cambodia, and Vietnam	Moderate - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**
Mekong giant barb/ Giant Carp	Catlocarpio siamensis	CR	Unknown-declined over 90% in the last three generations	Unknown-kept declining	Yes	*Catlocarpio siamensis* once lived in deep Mekong pools and tributaries but are now extremely rare and restricted to isolated spots due to overfishing and habitat loss.	Very Low - Confirmed in AoI in 2024	Critically endangered, with severe population declines attributed to overfishing, dam construction, and habitat degradation, rendering it exceptionally rare. It's reported that only juvenile individuals migrate from the Tonle Sap River system into the Area of Influence (AoI) via the Stueng Krang Ponlai River, a Tonle Sap tributary. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**
Siamese Tiger Perch	*Datnioides pulcher*	CR	Unknown	Unknown	Yes	This freshwater fish species is native to the Mekong and Chao Phraya River basins in Southeast Asia, including Thailand, Cambodia, Laos, and Vietnam.	Moderate - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**

6.6 SOCIO-ECONOMIC AND CULTURAL CONDITIONS

6.6.1 Administrative and Social Structure

6.6.1.1 Administrative System

Cambodia's administrative system at sub-national level is organized into three (3) tiers: capital city/province, district/municipality/khan, and sangkat/commune. Phnom Penh, the capital, is divided into khans and further into sangkats, while provinces are divided into municipalities and districts, with municipalities subdivided into sangkats and districts into communes and sangkats. The sub-national government is guided by organic laws, including the Law on Administration of Commune/Sangkat and the Law on Administration of Capital City, Province, Municipality, District, and Khan, supporting decentralization and deconcentration. Commune/sangkat administrations operate with legal, financial, and administrative autonomy, governed by elected councils responsible for budgets, development, and public order. Higher levels, such as provinces and districts, are governed by councils (legislative) and boards of governors (executive), with council members indirectly elected by commune/sangkat councils and supported by technical committees. Boards of governors, nominated by the Ministry of Interior, implement policies and supervise ministry units in their jurisdiction. Recent legal amendments aim to expand local administrations' authority over civil servants from national bodies, awaiting implementation through sub-decrees.

6.6.1.2 None-Governmental Organizations

Another institution which are playing an important role in the development of the country at sub-national level is the civil society. The civil society in Cambodia, particularly the NGOs plays a vital role in development and democratization. These organizations address challenges such as poverty, education, human rights, gender equality, and environmental conservation, filling gaps in governance and social services. NGOs contribute by providing microfinance, vocational training, and livelihood programs to alleviate poverty; supporting education through school construction, scholarships, and inclusive learning; and improving health outcomes with maternal health programs, HIV/AIDS awareness, and mental health support. They advocate for human rights, labor rights, and good governance, engaging in election monitoring and raising awareness about corruption and land rights. Additionally, NGOs promote environmental sustainability and climate resilience while advancing gender equality by combating violence and discrimination and empowering women in leadership. Within the project area, there are a number of NGOs being identified within the area in different sectors including environment, community development, such as Wildlife Conservation Society (WCS), Adventist Development Relief Agency (ADRA), Advocacy Policy Institute (API), and People In Need (PIN).

6.6.1.3 Community-Based Organizations

Another social organization is Community-based organizations (CBOs). Cambodia, CBOs play a critical grassroots role, directly addressing local needs. Unlike NGOs, they are often less formalized and focus on mobilizing local resources for infrastructure, livelihood improvements, and strengthening community networks. CBOs contribute significantly to

disaster resilience, especially in flood-prone areas, and foster cultural preservation and social cohesion through community events and initiatives. Together, NGOs and CBOs empower communities, protect rights, and promote inclusive development, offering hope for a more equitable and sustainable future despite ongoing challenges. Types of CBOs include Community Fishery, Forestry Community, Agricultural Cooperatives, and social organizations such as saving groups, old age association, etc. All of these types are reported within the project target areas.

The identified agriculture-related community-based association is provided in Table below:

Table 6.26: Status of relevant CBOs within the project area

No.	Types of Associations	OTP	Lum Hach	Krang Ponley
1	Agricultural Cooperatives	There are three (3) agricultural cooperatives in OTP focusing on vegetables, and rice.	There is one (1) agricultural cooperative allocated in this command area focusing on rice and vegetable production.	Seven (7) agricultural cooperatives located in Brambei Mom (1), Yutasas (1), and Krapeu Trom (5) which focus on rice and vegetable. Stueng Krang Bat is the only sub-scheme without AC.
2	Farmer Water User Community	There is a farmer water users' community. However, it is nonfunctional due to insufficient water supply for farmers.	Farmer water user community is not available in this sub-scheme due to the unstable water support for irrigation system.	Yutasas and Krapeu Trom sub-scheme has FWUC but none of them are operational due to lack of cooperation in paying contribution fees of members. Brabie Mom and Stung Krang Bat sub-scheme has no FWUC.
3	Community Forestry	No community forestry in the command area.	There are three (3) communities' forestry in Lum Hach. These CFs aim to protect remain forest land, restoration, and sustainable forest consumption.	No community forestry in the command area.
4	Community Fishery	There is one community fishery in Ou Ta Paong sub-scheme, located in this sub-command area covering a total area of 60 hectares.	No community fishery within this sub-scheme	No community fishery within this sub-scheme

6.6.1.4 Culture and Religion

Cambodia's culture reflects its rich history and diversity, shaped by the ethnic Khmer majority (90%) and minority groups like ethnic Vietnamese, Cham Muslims, and indigenous highland

communities. While Khmer is the official language, many minorities maintain unique languages and traditions. Buddhism, practiced by 95% of the population, deeply influences cultural norms, often blended with Hindu and animist elements such as ancestor worship. As per the commune database and consultation with local authorities regarding the indigenous people, there is no indigenous people being present within the target areas.

6.6.2 Social Conditions

The project covers a large and distinctive areas in four (4) provinces: Pursat, Kampong Chhnang, Kampong Speu and Kandal province. Ou Ta Paong and Lum Hach sub-schemes are administratively and geographically independent whereas Prambei Mom, Krapeu Truom, Yutasas and Stung Krang Bat are connected to each other as the sub-schemes share the same river basin and somehow have associated water sources. The sociological conditions of the sub-schemes are described in the following sections.

6.6.2.1 Ou Ta Paong

Ou Ta Pong command area is located solely in Bakan District, Pursat Province. The command area is approximately 16,074 hectares, comprising of cultivation area, residential, and non–residential areas (e.g. farm roads, other infrastructure works). The sub-scheme spans across parts of six (6) communes in Bakan district including Boeung Khnar, Ou Ta Paong, Rumlech, Svay Don Keo, Me Teok, and Khnar Torteng. In total, there are 38 villages from these communes that are geographically located within the command areas, resulting from the verification with commune councils, the SECAP II team and overlaying of map between the administrative boundary of the communes and the command area. The total number of households within these 38 villages were reported at 8,130 HHs, given the total population of 34,189 people (out of which 17,602 are females) (Table 6.27).

Table 6.27: Administrative and population coverage of Ou Ta Paong sub-scheme

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
1	Pursat/ Bakan	Beung Khnar	1	254	1040	516
		Ou Ta Paong	19	3,973	17,263	8,949
		Rumlech	1	263	960	503
		Svay Doun Keo	6	1,178	2,691	5,143
		Me Teok	8	2,176	4,385	8,686
		Khnar Torteung	3	286	1,097	558
	Total	**6**	**38**	**8,130**	**34,189**	**17,602**

(Source: Ministry of Planning, Commune Database, 2023)

6.6.2.2 Lum Hach

The updated gross command area of Lum Hach is estimated at approximately 3,900 ha situated within three (3) districts of Kampong Chhnang province including Toek Phus, Rolea B'ear, and Boribour districts. The sub-scheme spans across five (5) communes including Krang Skear commune, Toek Phus district, Banteay Preal, Krang Leav, and Praseob commune in Rolea B'ear district and Anchang Rong commune in Boribour district. In total, there are 36 villages from these communes that are geographically located within the

command areas as the result of the verification with commune councils, the SECAP II team and overlaying of map between the administrative boundary of the communes and the command area. The total number of households within these 36 villages in 2023 were reported at 7,958 HHs, given the total population of 30,844 people (out of which 16,019 are females) (Table 6.28).

Table 6.28: Administrative and population coverage of Lum Hach sub-scheme

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
1	Kampong Chhnang / Toek Phus	Krang Skear	6	2,044	7,746	3,926
2	Kampong Chhnang / Rolea B'ear	Banteay Preal	10	1,301	4,929	2,568
		Krang Leav	8	1,729	6,647	3,528
		Prasneob	6	1,412	5,377	2,767
3	Kampong Chhnang / Boribour	Anchanh Rung	6	1,472	6,145	3,230
Total		**5**	**36**	**7,958**	**30,844**	**16,019**

(Source: Ministry of Planning, Commune Database, 2023)

6.6.2.3 Stung Krang Ponley

The command areas of Stung Krang Ponley under the project is 3,277 ha, home to four (4) sub-schemes of the project including Brambei Mom (1,000 ha), Krapeu Truom (700 ha), Yutasas (650 ha), and Steung Krang Bat (1,000 ha).

Administratively, the command areas located in three (3) provinces including Kampong Chhnang, Kampong Speu, and Kandal span across the 7 communes of the three (3) provinces, giving the total of 30 villages, giving the total households of 6,702 HHs with a total population of 28,163 people (out of which 14,612 are females) (Table 6.29). One (1) commune, Svay Commune, Sameaki Meanchey district, Kampong Chhnang province, stretches across two (2) sub-schemes: Krapeu Truom and Yutasas.

Table 6.29: Administrative and population coverage of Lum Hach sub-scheme

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
	Brambei Mom					
1	Kampong Speu / Thpong	Brambei Mom	5	1,042	4,405	2,288
		Rung Reung	4	872	3,832	1,964
	Sub-Total	**2**	**9**	**1,914**	**8,237**	**4,252**
	Krapeu Trom					
1	Kampong Speu / Odoung Maechey	Veal Pong	8	932	4,165	2,201
2	Kampong Chhnang /Sameakki Meanchey	Thbeng Khpos	4	1,281	5,207	2,688
		Svay	1	217	1,163	594
	Sub-Total	**3**	**13**	**2,430**	**10,535**	**5,483**
	Yutasas					

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
1	Sameakki Meanchey (Kampong Chhnang)	Svay	5	1,339	5,330	2,773
	Sub-Total	**1**	**5**	**1,339**	**5,330**	**2,773**
	Steung Krang Bat					
1	Kandal/ Ponnhea Leu	Kampon Leung	1	369	1,653	856
2	Kampong Chhnang/ Kampong Tralach	Longvek	2	651	1,248	2,408
	Sub-Total	**2**	**3**	**1,020**	**4,061**	**2,104**
	Total	**7**	**31**	**6,703**	**28,163**	**14,612**

(Source: Ministry of Planning, Commune Database, 2023)

6.6.3 Demographic and Facilities

As per the description from above section on sociological condition, the ESCIA extracted the data from Commune Database, Ministry of Planning to obtain the statistics of all villages located within and nearby the command areas. It is noticeable that not all households hold the land assets within the command areas whereas it is possible that villagers from the other residential locations can also own the land within the command areas. The later population are not included in this information describes in the following section. It is noted that the commune database in 2023 is the full recorded information of village chief in every village across the country being submitted to commune further submitted to district, province and national level for compilation. Annually the data is collected during June or July and the release will be around 6 to 8 months later.

According to the commune database in 2023, the total number of households who are residing within and nearby the command area is 21,319 HH (out of which 3,941 HHs (17%) are female headed), giving the total population of 86,876 people (48,233 females). Moreover, the population are young with more than 64% of them are aging below 34 years old. More than half of the people (54%) completed education at primary school and below whereas those with secondary, high school, and higher education is only 23%, 14%, and 4%, respectively. It is noticeable that illiterate people have still existed at 4% (Table 6.30).

Overall, it is apparent that all the sub-schemes contain young population indicating its high potential in future development activities. However, it is a concern as the population have very limited education, especially for Lum Hach, Brambei Mom, and Krapeu Tuom. Stung Krang Bat was found to be the best among the 6 sub-schemes.

Table 6.30: Demographic information of the HH living within and the vicinity of the command areas

Parameters	Sub-scheme						Total
	Ou Ta Paong	Lum Hach	Brambei Mom	Krapeu Truom	Yutasas	Stung Krang Bat	
Overall							
Total HH	8,130	6,486	1,914	2,430	1,339	1,020	22,791
Female HH Head	1,397 (17%)	1,065	317 (17%)	379 16%)	247 (18%)	179 (18%)	3,941 (17%)

Parameters	Sub-scheme						Total
	Ou Ta Paong	Lum Hach	Brambei Mom	Krapeu Truom	Yutasas	Stung Krang Bat	
Total Population	34,189	24,699	8,237	10,360	5,330	4,061	93,196
Female	17,602	12,789	4,252	5,308	2,773	2,104	48,233
Age							
<18 years old	37%	37%	40%	36%	37%	32%	37%
18 – 34 years old	25%	28%	29%	27%	32%	28%	27%
35 – 60 years old	26%	25%	24%	25%	24%	26%	25%
> 60 years old	12%	10%	7%	12%	7%	15%	11%
Educational Level							
Kindergarten	23%	14.6%	15.7%	13.2%	20.7%	10.2%	17%
Primary school	22%	51.3%	51.5%	52.1%	10.5%	15.3%	37%
Secondary school	22%	20.5%	23.4%	24.8%	41.6%	22.1%	23%
High School	16%	10.2%	7.2%	8.1%	21.0%	25.8%	14%
College/University	6%	2.3%	1.4%	1.3%	1.7%	15.0%	4%
TVET	2%	0.9%	0.4%	0.0%	0.2%	9.2%	2%
Illiterate	10%	0.3%	0.4%	0.6%	4.2%	2.5%	4%

HH = Household, TVET = Technical and Vocational Education and Training.
(Source: Ministry of Planning, Commune Database, 2023)

Energy access of the population within the target area was found to be high, giving its proportion at 93% access to electricity and only a minority of them continue using battery (4%), solar energy (2%), and biogas (0.1%). However, the sources of water for domestic consumption were low with only 27% of them having access to water supply system while the rest continue using pump well, tube-well, opened-well, rainwater and river, indicating the access to clean water continue to be a huge constraint within the project target areas. A good sign for the people is how they are using water for drinking purposes which was found to be almost all using safe water for drinking (tape water 21%, filtered water 61%, and boiled water 19%). There is a concern, however, regarding the reliability of the tape water quality which may create significant impact on the people's health, if they are not properly monitored. Interestingly, almost all the people within the target areas own a toilet showing their understanding of the importance of water, sanitation and hygiene.

Across the sub-schemes, Lum Hach has the lowest access to energy, water and sanitation facilities while the rest was found to be at a high proportion. Interestingly, Brambei Mom has the highest rate of utilizing solar energy (6%) indicating potential in promoting this type of clean energy (Table 6.31).

Table 6.31: Access to energy and water and sanitation facilities

Parameters	Sub-scheme						Total
	Ou Ta Paong	Lum Hach	Brambei Mom	Krapeu Truom	Yutasas	Stung Krang Bat	
Source of Energy							
Electricity	99.8%	78%	93.3%	98.1%	100%	100%	93%

Battery	0.1%	16%	0.6%	0.0%	0%	0%	4%
Solar	0%	6%	6.1%	1.9%	0%	0%	2%
Biogas	0.1%	0%	0.0%	0.0%	0%	0%	0.1%
Water Source for HH consumption							
Tape water	19%	3%	14%	83%	64%	92%	27%
Pump well	13%	69%	23%	5%	19%	5%	30%
Wells	4%	14%	0%	2%	2%	3%	6%
Opened Well	3%	14%	0%	0%	0%	0%	8%
Pond	27%	0%	42%	2%	4%	0%	14%
Rainwater	22%	0%	1%	5%	11%	0%	9%
River	11%	0%	21%	2%	0%	0%	6%
Drinking Water							
Tape water	30%	0.1%	47%	53%	39%	53%	21%
Filtration	61%	81.3%	27%	20%	40%	13%	61%
Boiled	9%	18.6%	26%	26%	21%	35%	19%
Toilet							
Pour Toilet	99%	98%	100%	100%	100%	100%	99%
Flush toilet	1%	2%	0%	0%	0%	0%	1%
Total toilet	100%	100%	100%	100%	100%	10%	100%

(Source: Ministry of Planning, Commune Database, 2023)

6.6.4 Socio–economic Conditions of the Beneficiaries

Agriculture was reported as the main occupation of the population within the command areas (Table 6.32). However, the second rank for the main occupation varies from one (1) sub-scheme to another. Whle business and services is the second highest proportion (22%) for all command areas, full-time worker was found to be the highest in Brambei Mom (23%), Krapeu Truom (24%) and Yutasas (29%). It is observable that Lum Hach is the most agricultural dependent sub-scheme with 62% of the households engaged in agriculture as their main occupation. Another significant main occupation is working as laborers, giving its proportion at 6% with the highest proportion in Ou Ta Paong (9%), followed by Lum Hach and Stung Krang Bat at 5%.

As a secondary occupation, rice and crop production remains the most prevalent among the population, with animal raising as the second most common activity, followed by business and service sectors.

Table 6.32: Occupation of the HHs living within and the vicinity of the command areas

Parameters	**Sub-Schemes**						**Total**
	Ou Ta Paong	**Lum Hach**	**Brambei Mom**	**Krapeu Truom**	**Yutasas**	**Stung Krang Bat**	
Main Occupation							
Rice and crop production	57%	65%	42%	37%	29.6%	19%	52%
Fishing	1%	0%			-	2%	1%
Animal raising	3%	2%		2.5%	0.9%	6%	2%

Non-Timber	0%	0%			0.0%	0%	0.1%
Handcraft	1%	0%			0.1%	0%	0.2%
Business and trade	3%	2%	2%	1.1%	0.5%	4%	2%
Repair	0%	0%	1%	0.2%	0.2%	0%	0.4%
Transportation	2%	0%		0.2%	0.2%	0%	1%
Laborers	9%	5%	3%	4.1%	3.0%	5%	6%
Workers (full-time, private sector)	3%	7%	23%	23.8%	29.0%	20%	12%
Government officer	2%	2%	1%	1.1%	1.9%	7%	2%
Business & service	19%	16%	19%	30%	34.7%	37%	22%
Secondary Occupation							
Rice and crop production	45%	48%	61%	55%	77.5%	31%	49%
Fishing	2%	2%				4%	1%
Animal raising	7%	20%	1%	14%	8.3%	20%	15%
Non-Timber	0%	1%					0.5%
HandCraft	0%	4%			0.2%		2%
Business and trade	3%	4%	1%	2%	0.3%	7%	3%
Repair	1%	0%	0.1%	0.2%	0.2%		0.3%
Transportation	1%	0%		1%	2.7%	1%	0.5%
Labor sale	19%	6%	9%	5%		12%	10%
Workers (full-time, private sector)	10%	2%	9%	8%	3.7%	2%	5%
Business & service	12%	13%	19%	15%	7.0%	22%	13%

(Source: Ministry of Planning, Commune Database, 2023)

A significant proportion of the population with poor 1 & 2 is reported at 14%, indicating the level of economic condition of the areas while the proportion of the people with disability (PWD) is at 1.5%. The highest rate of poverty is reported at Ou Ta Paong (15%), followed by Lum Hach (8%), Brambei Mom (6%), Stung Krang Bat (4%), Krapeu Truom (2%), and Yutasas (1%), indicating the project should pay attention the most to Ou Ta Paong and Lum Hach. People are migrated to both inside and outside the country with the highest one is within the country (6.4%) while only 2.7% migrated to abroad. This makes the total migration of 9.1% (Table 6.33).

Table 6.33: Migration and vulnerability of the people within the sub-schemes

Parameters	**Sub-Schemes**						**Total**
	Ou Ta Paong	**Lum Hach**	**Brambei Mom**	**Krapeu Truom**	**Yutasas**	**Stung Krang Bat**	
Vulnerability							
Poor 1	9.5%	6%	6%	1.5%	1%	3%	6.4%
Poor 2	5.4%	2%	0.5%	0.4%	0%	1%	2.7%
Total	**15%**	**8%**	**6.5%**	**2%**	**1%**	**4%**	**9.1%**
Disable person	1.1%	1.1%	1%	1.1%	0.36%	2.4%	1.1%
Old people	0.2%	0.3%	0%	0.0%	0.13%	0.1%	0.2%
Orphan	0.2%	0.2%	0%	0.1%	0.06%	0.0%	0.2%
Total	**1.5%**	**1.6%**	**1%**	**1.2%**	**0.54%**	**2.5%**	**1.5%**

Migration							
Inside the country	5%	5%	6%	2%	1%	3%	6.4%
Out of the country	5.4%	2%	0%	0%	0%	1%	2.7%
Total	**15%**	**7%**	**6%**	**2%**	**1%**	**4%**	**9.1%**

(Source: Ministry of Planning, Commune Database, 2023)

Wooden houses are the most dominated shelter of the people comprising of 57% of the total settlement. One (1) floor or brick wall is the second most popular (34%) while the rest belong to apartments, semi-permanent, and villa. Interestingly, 1% of them live in temporary houses. Stung Krang Bat is the one (1) with the highest proportion of wooden houses (72%) while Brambei Mom is the highest in one (1) floor or brick wall. Lum Hach is the one (1) with the highest proportion of temporary houses being reported indicating the people are spreading their living associated with the most agricultural occupation sub-scheme. The assets that people own the most are Television (73%), followed by motorbike (70%), and bicycle (58%), and power tiller (34%) while the rest are in small proportion (Table 6.34).

Table 6.34: Houses and Assets of the HHs within the Sub-Schemes

Parameters	**Sub-Schemes**						**Total**
	Ou Ta Paong	**Lum Hach**	**Brambei Mom**	**Krapeu Truom**	**Yutasas**	**Stung Krang Bat**	
Type of Houses							
Wooden house, thatched	68%	51%	41%	41%	64%	72%	57%
Semi-permanent	6.%	3%	1%	5%	2%	1%	4%
One floor or more/brick wall	23%	40%	57%	42%	28%	18%	34%
Apartment	2.6%	5%	1%	12%	6%	5%	5%
Villa	0.3%	2%	0%	0%	0%	3%	1%
Temporary house	0.8%	5%	0%	2%	0%	0%	2%
Assets							
HH with Tractor	1.4%	1%	1%	0.1%	0.0%	0.2%	1%
Power Tiller	25.4%	69%	40%	11%	8.1%	7%	34%
HH with Rice Harvester	0.8%	0%	0%	0.0%	0.0%	0.1%	0.4%
Threshing Machine	0.0%	1%	1%	0.2%	0.1%	0%	0.5%
Harvest and Threshing Machine	0.2%	0%	0.4%	0%	0.0%	0%	0.1%
Mobile rice mill	0.0%	0%	0%	0.2%	0.0%	0%	0.1%
Car	6.2%	4%	9%	6%	8.4%	6%	6%
Other Machinery	0.3%	0%	0%	0%	0.0%	0%	0.2%
Motorbike	59.2%	90%	86%	71%	73.0%	90%	70%
Tricycle	0.2%	0%	1%	1%	0.7%	2%	0.5%
Bike cycle	51.0%	93%	50%	39%	48.9%	49%	58%
Boat	7.0%	0%	0%	0%	0.0%	7%	3%
TV	-	72%	71%	81%	95.2%	88%	73%

HH = Household

(Source: Ministry of Planning, Commune Database, 2023)

The data highlights family violence (2.2%) and drug use (1.7%) as the most pressing issues, followed by land disputes (1.3%). In contrast, sexual harassment, human trafficking, and crime report no cases, suggesting potential areas for further investigation into reporting mechanisms or community dynamics (Table 6.35).

Table 6.35: Issues in the project communities

Parameters	Sub-Schemes						Total
	Ou Ta Paong	Lum Hach	Bramb ei Mom	Krapeu Truom	Yutasas	Stung Krang Bat	
Sexual Harassment	0.00%	0.00%	0.0%	0.00%	0.0%	0.0%	0.0%
Human Trafficking	0.00%	0.00%	0.0%	0.00%	0.0%	0.0%	0.0%
Violence in the family	0.71%	0.38%	0.6%	0.07%	0.5%	0.0%	2.2%
Drug using	0.36%	0.03%	0.9%	0.19%	0.2%	0.0%	1.7%
Crime	0.00%	0.00%	0.0%	0.00%	0.0%	0.0%	0.0%
Stolen Cases	0.02%	0.03%	0.5%	0.01%	0.1%	0.0%	0.6%
Land Issues	0.28%	0.59%	0.1%	0.00%	0.3%	0.1%	1.3%

(Source: Ministry of Planning, Commune Database, 2023)

6.6.5 Cultural Sites

A key aspect of the environmental and social safeguards assessment (SECAP) includes the consideration of sites of cultural importance and heritage. Cultural heritage is an important component of the cultural identity of local communities, groups and individuals. It is key to social cohesion and therefore cultural heritage sites, structures and values should be protected, where possible, from construction of project components which could cause disturbance or disruption. Sites of cultural and heritage importance within the CAISAR command areas shall be protected and not affected during or after the irrigation system design and construction phases.

Across the command areas of CAISAR, there are two (2) important cultural sites, the post-Angkorian capital of Longvek, the 16th century king's palace, near the Stung Krang Bat command area and Bardez Stupa in Lum Hach command area. Firstly, the Longvek Capital is an ancient complex containing varies of cultural important sites across vast areas. A canal, Preak Longvek', connects the site of the King's palace to the Tonle Sap River. Creeks through the paddy field area connect Preak Kruos/Chumnik in the South with Preak Longvek in the North. The preaks were for navigation towards/out from Krang Ponley/Krang Bat, and perhaps also functioned as a flood way to protect the low-lying paddy field area from water coming in from the Krang Ponley, via the Krang Bat. The alignment of the walls of the capital can still be distinguished and is indicated on the topographic map.

Another important cultural site is the Bardez Stupa, a standalone stupa located in the Lum Hach command area. This stupa was built in commemoration of a French administrator who was killed by the Krang Leav villagers in 1925 for attempting to collect taxes considered excessive at the time. The murder angered the French, and the King later ordered to change the village's name from Krang Leav to Derichhan Village.

In addition to these two (2) historic and culturally important sites, there are also many cultural sites being identified in each of the sub-scheme as per shown in the following maps of each sub-scheme.

Figure 6.68: Maps of archaeological and cultural sites in and near Ou Ta Paong Sub-scheme

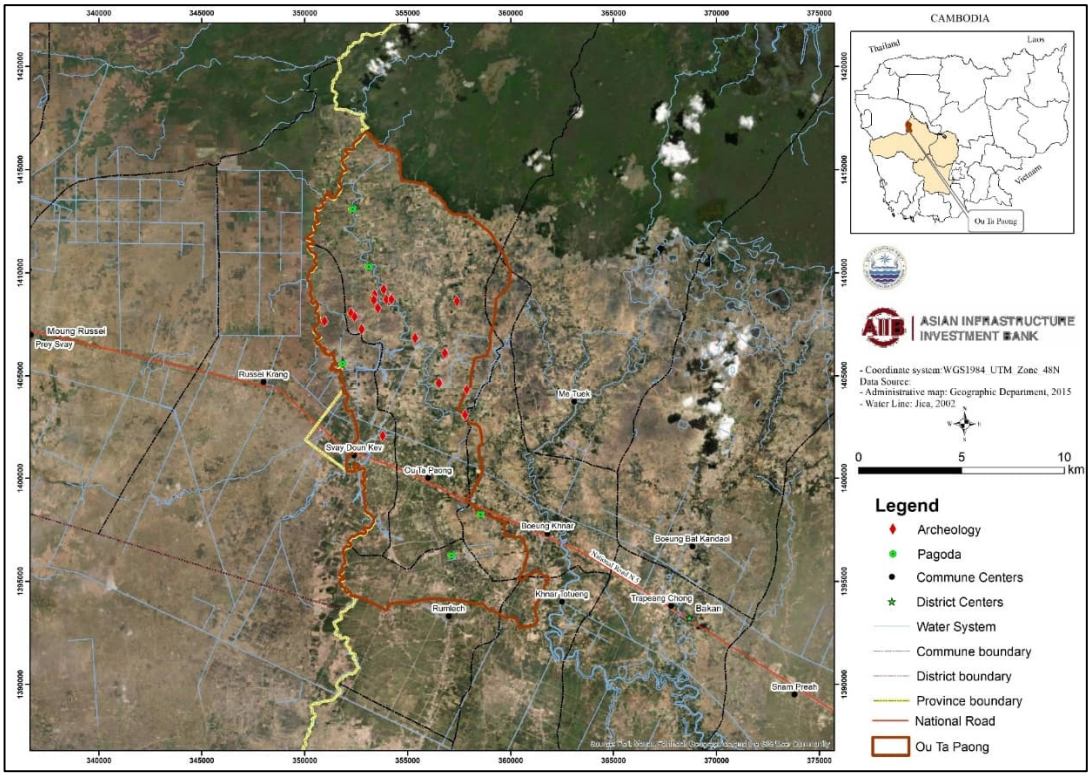


Figure 6.69: Maps of archaeological and cultural sites in and near Lum Hach Sub-scheme

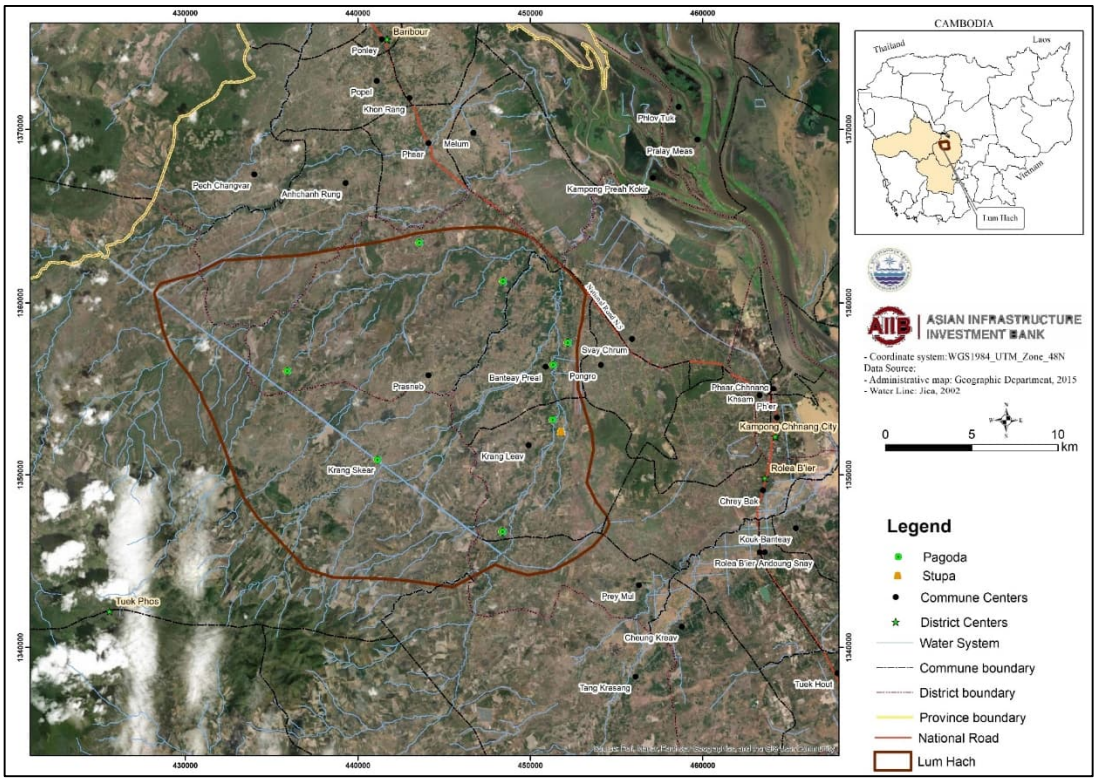
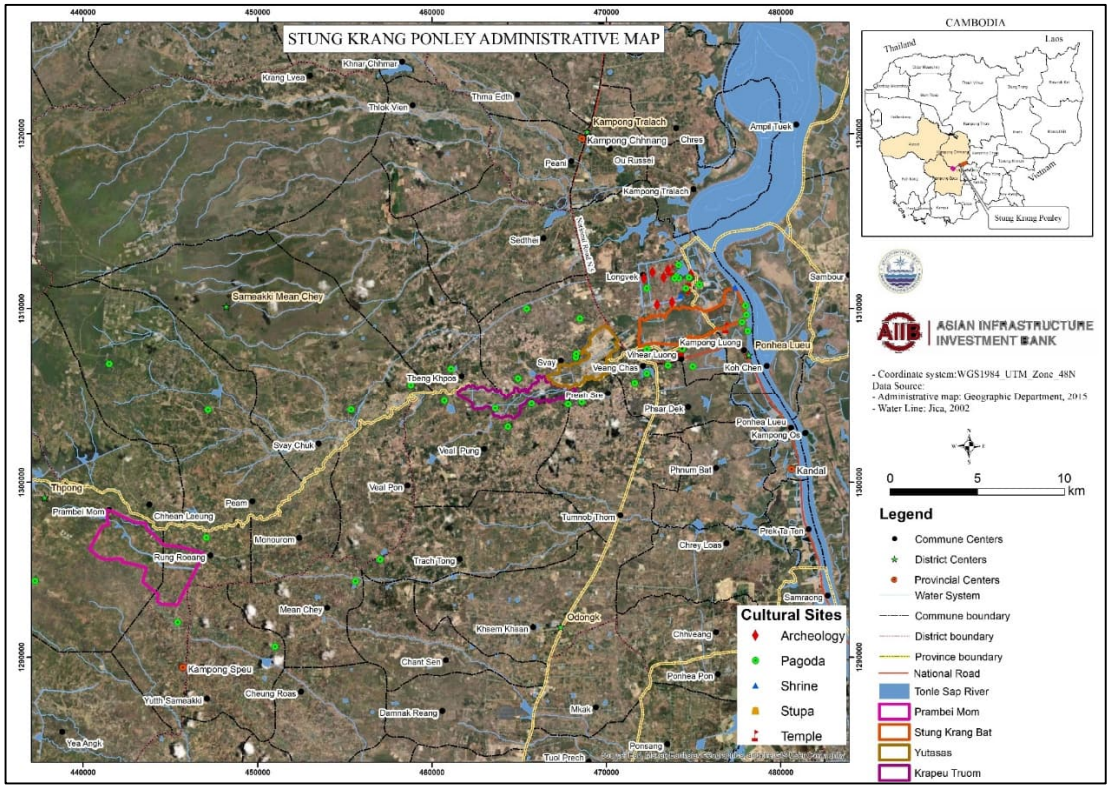


Figure 6.70: Maps of archeological and cultural sites in Stung Krang Ponley Sub-scheme



6.6.6 Agricultural Production

6.6.6.1 Rice Production

Ou Ta Paong

In the Ou Ta Paong area, farmers adapt to seasonal flooding from the Tonle Sap Lake, which lasts about three (3) months annually. They plant long-duration, flood-resistant crops in areas prone to shallow flooding, and short-duration, rain-fed crops before the floods in more severely flooded areas. After the floodwaters recede, a second short-duration crop is planted, though it is vulnerable to drought without irrigation. The dominant crop is rice, with most farmers cultivating about 2.15 hectares per household. Roughly 40% of the area is rain-fed, while 60% benefit from irrigation. Farmers typically plow in May, seed in May-June, and harvest in September. Wet season rice yields range from 4 to 5.5 tons per hectare, slightly higher than dry season yields, which range from 4 to 5 tons per hectare.

About 5% of farmers plant traditional, long-duration rice varieties, which are more drought-tolerant and yield around 2.5 to 3 tons per hectare. In irrigated, flood-free areas, farmers can grow two (2) wet-season crops, with short-growth varieties like OM 5451, known for high yield and pest resistance, being popular. Direct seeding is common, and seed sources include both saved seed and purchases. Fertilizer use is higher in the dry season, with application rates ranging from 180 to 250 kg/ha, while pesticide application occurs 3 to 5 times per season. Urea and di-ammonium phosphate (DAP) are the most used fertilizers.

Farmers face challenges such as water shortages during the dry season, shallow riverbeds, water conflicts, high input costs, lack of capital, counterfeit pesticides in the market and labor shortages.

Some farmers hire labor for seeding and pesticide spraying, while machinery is used for soil preparation, harvesting, and threshing. The average rice production cost is about $615 per hectare. In addition to rice, around 5% of farmers grow non-rice crops, like watermelon and sweet corn, during the dry season, with potential to expand into exportable crops such as soybeans, mung beans, and maize if irrigation improves. Some of rice farmer group addressed that previously they attended in training course on rice production but some mentioned that they never and request to obtain planting and relevant techniques for rice cultivation. Moreover, they also request to MAFF to conduct inspections of fertilizers and pesticides in the market to address counterfeit products.

Lum Hach

With limited access to irrigation systems, most farmers can only cultivate one (1) paddy crop per year, primarily using medium or late-maturity rice varieties such as Romdoul and Krasang Teap, with growth periods ranging from 130 to 150 days. The areas capable of producing two (2) or more crops annually are few and rare. Planting usually begins between May and June when the rains start, but yields vary across regions. In Rolea B'ier district and parts of Krang Skear commune, yields range from 3.2 to 3.8 tons per hectare, whereas lower yields of 1 to 2 tons per hectare are reported in Prasneb and Krang Leav communes. The average yield across the region is estimated at 1.75 tons per hectare.

Labor shortages are a significant challenge in the area, as many men and young women seek jobs in construction or factories, leaving behind the elderly and children who cannot meet the labor demands. This lack of labor affects the potential for horticulture, and the few vegetables grown near homes are shared among neighbors with no market for sales. The average land size for rice production is 1.56 hectares, and farmers rely on self-produced seeds, purchasing only when necessary. On average, 120 kg of seed is used per hectare during the wet season, while no rice is grown during the dry season due to water scarcity.

Farmers use 235 kg of chemical fertilizer and 450 kg of compost per hectare in the wet season, along with three (3) pesticide applications for pests and one (1) for weeds. Farmers use chemical fertilizer and compost as their traditional knowledge.Challenges include a lack of capital, weed management, pest outbreak, market and unreliable water sources. Straw is typically used as cattle feed, burned, or left in the field for 2-3 months before plowing into the soil for the next season. The cost of rice production is $403.13 per hectare, and while some farmers have received training on transplanting, organic production, and crop management, others have not received any capacity-building support. Farmers request to obtain training on fertilizer and pesticide usage. There are less farmers consume water from irrigation system where farmer mostly rely on groundwater and rain water for farming.

Stung Krang Ponley

Brambei Mom. Rice cultivation in the area is primarily for household consumption, but there are opportunities for commercialization during the wet season (WS) due to low production costs, particularly for medium to late-maturity rice varieties, and the aromatic qualities of the chosen strains. Despite the proximity to the Anlong Chrey water reservoir, dry season (DS)

rice cultivation is limited because the land is not suitable for large-scale farming, lacking the vast plains needed for effective DS production.

The average land size for rice farming ranges from 1 to 3 hectares, with common rice varieties including Chhmar Lait, Chhmar Prum, Phka Mlis, and Phka Rumduol. During the wet season, farmers use approximately 100-150 kg of rice seed per hectare, while no rice is grown in the dry season due to water scarcity. Most farmers produce their own seeds and only purchase additional supplies when community shortages arise. Fertilizer use during the wet season varies, with 150-300 kg of chemical fertilizers and 500-1000 kg of compost applied per hectare. Pesticide use is minimal.

Household labor is the primary source for rice production, but external labor is often hired for tasks such as soil preparation, harvesting, and transporting rice from the field. The average yield during the wet season is 4.25 tons per hectare, but challenges such as water scarcity, high soil preparation costs, high price of fertilizers and pesticide and lack of capital hinder production. Environmental issues like heavy rains during broadcasting, pest outbreaks (especially fall armyworm), and weed infestations further complicate cultivation efforts.

After harvesting, straw is typically stored for cattle feed, while stubble is left in the field for three (3) months before either being burned or plowed under. The average cost of production ranges from 1,200,000 to 1,500,000 riel per hectare, approximately $350. Unfortunately, none of the four (4)-focus group discussion reported having received any formal capacity-building training to improve their practices. As the consultation with rice farmer group, they mentioned that previously they never received any training on rice production.

Krapeau Truom. In Kropeau Troum, most farmers cultivate paddy rice during the wet season, while some areas grow watermelon, wind gourd, and cucumber in the dry season between March and May. The average land size for rice production ranges from 0.3 to 1 hectare. Common rice varieties grown include Neang Menh, Phka Mlis, Reang Chey, and Phka Rumduol. Farmers typically use about 120 kg of rice seed per hectare during the wet season, with no rice production in the dry season due to water scarcity. Most seeds are self-produced, and farmers only purchase additional supplies when shortages arise.

Fertilizer use during the wet season averages 100 kg of chemical fertilizer and 200 kg of compost per hectare, while pesticide application is not common. Labor for rice farming is primarily household-based, but machinery is hired for tasks such as soil preparation, harvesting, and transporting rice. The average rice yield during the wet season is 4.25 tons per hectare, but production faces significant challenges due to damaged irrigation gates, which lead to water shortages, along with pests like the walker insect and weed infestations.

After harvesting, straw is typically kept for cow feed, sold, or left in the field for 2-3 months before being either burned or ploughed under. The average cost of production ranges from 1,500,000 to 2,000,000 riel, approximately 400 USD per hectare. Farmers in the area have received training on water consumption management, techniques for rice seed storage and use, as well as proper fertilizer and pesticide application techniques. Regarding to consultation with rice farmer group, farmer have previously received training from the APSARA company on the use of seeds, fertilizers, and pesticides. However, some mentioned that they never gain any training course related rice production.

Yutasas. In Yutasas, rice is the main crop cultivated by most farmers, with a small number of households also growing cash crops like watermelon and vegetables. The average land size for rice production ranges from 1 to 1.5 hectares. Common rice varieties include Reang Chey, Changkuah Ampeak, Angka No 55, and Angka No 85. Farmers use between 70 to 200 kg of rice seeds per hectare, with traditional varieties being self-produced, while Angka No 55 and 85 are purchased from the market.

Fertilizer use varies between the wet and dry seasons, with 100-300 kg of chemical fertilizer and 40-60 kg of compost applied per hectare during the wet season, and 100-320 kg of chemical fertilizer during the dry season. Pesticide usage is focused on controlling pests and weeds, with application occurring 2-4 times for pests and 1-2 times for weeds in the wet season, and 4-5 times for pests and 1-2 times for weeds in the dry season. Labor for rice farming is primarily sourced from households, but rented labor is used for soil preparation, pesticide spraying, harvesting, and transporting rice.

The average rice yield ranges from 2.5 to 5 tons per hectare in the wet season and about 3 tons per hectare in the dry season. Farmers face several challenges, including water scarcity for both rice and crop production, with canals often lacking water and no inflow sources. Other issues include limited capital, pest infestations (such as the walker pest during the boosting stage), limited market and weed management.

After harvesting, straw is either kept for cow feed or sold, while stubble is typically left in the field for 2-3 months before being burned or plowed under. The average cost of rice production is between 1,500,000 and 2,000,000 riel per hectare. In terms of capacity building, some groups have received training on rice production (three (3) times) and crop production (once), but one (1) group has not received any training.

Stung Krang Bat. In the Krang Bat area, which spans an estimated 1,000 hectares of low-lying rice fields, farmers primarily cultivate paddy rice. The area is intersected by several creeks and experiences seasonal flooding from the Mekong River via the Tonle Sap River, with inundation depths reaching up to three (3) meters for about three (3) months. This flooding affects the crop patterns, with farmers planting paddy rice as soon as the water recedes sufficiently. By the end of the crop cycle, the fields dry out, creating a need for irrigation, and during severe dry seasons, there is a high risk of crop failure. The area's agricultural potential is declining as parts of the command area are being converted into residential and commercial developments due to rising land prices.

The average land size for rice production ranges from 0.5 to 2 hectares. Farmers cultivate rice varieties like Reang Chey, Phka Rumduol, Chhmar Prum, Kang Soay, and Angka No 85. They use 200-300 kg of rice seeds per hectare, with most seeds being self-produced and additional supplies purchased from the market when necessary. Fertilizer usage varies, with 170-300 kg of chemical fertilizer applied per hectare during the wet season and 300 kg per hectare during the dry season. Pesticide use is minimal, applied twice for pest control in both seasons, and weeds are only treated once during the dry season.

Household labor is the primary source of manpower, though machinery is rented for tasks like soil preparation, harvesting, and transporting rice from the field. The average yield in the wet season ranges from 1 to 2.5 tons per hectare, while the dry season yield reaches 4 tons per hectare. Farmers face several challenges, including a lack of water and an insufficient

irrigation system, frequent flooding from Anlong Chrey, rising fertilizer costs, and issues with pests (particularly walker pests during the boosting stage), weeds and market access. After harvesting, straw is either kept for cow feed, sold, or left in the field for 2-3 months before being burned or plowed under. The average cost of rice production is between 1,200,000 and 1,400,000 riel per hectare. Notably, neither farming groups in the area have received any capacity-building training.

6.6.6.2 Vegetable Production

Ou Ta Paong

In the area, very few households are involved in vegetable production for the market, with small-scale horticulture activities taking place around homesteads during the dry season. These activities are supported by water from wells and ponds and are observed in two (2) 'Agriculture Communities' (AC): Psar Andeth AC and Chamkar Khluy AC, as well as in the neighboring Rumlech Commune, where farmers grow crops like watermelon on dry paddies.

The most popular vegetables grown in the area include pumpkin, cucumber, eggplant, wax gourd, long bean, luffa gourd, morning glory, mustard, and green onion. The average land size for vegetable cultivation ranges from 450 to 600 square meters. Farmers use both organic and chemical cultivation practices, applying compost and chemical fertilizers. Seeds are typically purchased from the market, and water sources for irrigation include canals, ponds, rainwater, and rivers. There are no agricultural cooperatives or associations in the area.

Farmers spend between 250$ and 450$ on vegetable production, covering expenses for seeds, pesticides, water, fertilizers, labor, and land preparation. The income from vegetable sales is approximately 500$ per year, which constitutes about 10% to 30% of their total income. The main markets for these vegetables are local markets and brokers. Key challenges faced include a lack of water during the dry season, extreme heat, insect pests, low prices, poor soil fertility, diseases, and climate change. Farmers have received agricultural services related to seed variety selection, nursery management, crop irrigation, and the use of fertilizers and pesticides. However, some farmers never attended in training course or agricultural information. Therefore, a request is made for the project to provide training on vegetable cultivation techniques, natural pest control methods, and to supply vegetable seeds.

Lum Hach

In the area, the most popular vegetables grown include luffa gourd, morning glory, pumpkin, wax gourd, long bean, white radish, cucumber, mustard green, amaranth, and corn. The average land size dedicated to vegetable cultivation ranges from 100 to 1,000 square meters. Farmers employ both organic and chemical cultivation practices, using manure and chemical fertilizers along with pesticides.

Water sources for irrigation include rainwater, wells, and ponds. In terms of agricultural associations, two (2) out of three (3) areas have associations, while one (1) does not. Farmers' expenditures on vegetable production typically range from 100,000 to 400,000 riels, covering costs for seeds, fertilizers (both manure and chemical), and irrigation materials. Income from vegetable sales varies between 1,600,000 and 3,000,000 riels, or approximately USD 325 and USD 750.

Vegetables are sold through household consumption, village markets, and brokers. Challenges faced by farmers include insect pests, (esp. armyworm), low market prices, diseases, water shortages, high level of sediment in water, lack of access to modern agricultural techniques due to limited participation in training programs and the impacts of climate change. They have received some agricultural services related to planting techniques, seed production, and crop maintenance. However, some farmers have not received any training as well as smart agriculture.

Stung Krang Ponley

Brambei Mom. In Brambei Mom district, particularly in Doun Tip village, horticultural activities are prominent, with a focus on vegetables like curly cabbage, cucumber, choy sum, pumpkin, luffa gourd, long bean, peanut, green bean, and morning glory. The average land size for vegetable cultivation varies from 200 to 8,000 square meters. Farmers use a combination of organic and chemical cultivation practices, including Good Agricultural Practices (GAP). They primarily use compost and manure fertilizers and apply pesticides less frequently.

Irrigation for these vegetable farms is sourced from the Stung Krang Ponley river, accessed mainly through diesel-powered pumps with a pumping distance of up to 500 meters. Some areas have agricultural associations. The expenditures on vegetable production are highly varied ranging from 150 USD to USD 1,500 per household, covering costs for seeds, labor, pesticides, manure, plastic covers, fertilizers, nets, and other materials. Income from vegetable sales ranges between USD 500 and USD 3,500 per household with GAP cultivation yielding higher income and involving larger land areas.

Vegetables are sold in local markets and through brokers, including wholesalers at Oudong market. Challenges include insect pests, diseases, high temperatures, water shortages, infertile soil, and water containing limestone. Farmers have received agricultural services from NGO related to smart climate agriculture and planting techniques. However, they request more training program, also organic fertilizer support.

Krapeu Truom. The average land size for vegetable cultivation ranges from 200 to 2,000 square meters. During the dry season, watermelon fields are situated near Stung Krang Ponley, with water accessed through short-distance pumping. In the wet season, some farmers relocate their watermelon cultivation to upland areas, relying on rainwater for irrigation. Rice fields used for watermelon in the dry season are converted back to rice paddies for the wet season. Farmers practice both chemical and organic cultivation methods. Water sources include rainwater, ponds, canals, rivers, and tap water. There are no agricultural associations in the area. Expenditures for vegetable production, including seeds, fertilizers (both chemical and manure), labor, and irrigation (pump rentals), range from USD 50 to USD 500. The average income from vegetable sales is around USD 1,000.

Vegetables are sold for household consumption and at local markets. Challenges faced include insect pests, diseases, water shortages, inadequate planting techniques, lack of materials, low quality of soil, high temperatures, low prices, and climate change. Farmers have received agricultural services such as seed provision from the provincial department, market information, and farm demonstrations on planting techniques. However, they remain more training courses related to agriculture.

Yutasas. In the area, vegetable cultivation includes a variety of crops such as cucumber, watermelon, curly cabbage, luffa gourd, wax gourd, morning glory, long bean, and peanut. The average land size for vegetable farming ranges from 1,000 to 10,000 square meters. Farmers employ both traditional and chemical cultivation practices, using water sourced from canals, ponds, and wells from the Yutasas scheme. Soil quality in Yutasas is good, allowing for high yields, as farmers regularly use cow manure to enrich the soil's nutrients. Some areas have agricultural associations.

Expenditures for vegetable farming range from USD 250 to USD 3,500, covering seeds, manure, fertilizers, pesticides, pump machines, petroleum, straw, nets, drip systems, and soil covering materials. Income varies between USD 500 and USD 6,000, with higher earnings in areas that use land covering and irrigation systems.

Vegetables are sold at local markets, through brokers for Phsar Doem Kor, Phsar Odoung, and supermarkets. Key challenges include insect pests, diseases, low soil fertility, and water shortages. Farmers have received agricultural services such as growing techniques, compost making, irrigation system practice, implementation of good agricultural practices (GAP), market information from social media, and support from trainers and agriculture district officers. Farmers in the village have substantial knowledge of smart agriculture but practice it to a limited extent and they request to obtain more training course on modern agricultural techniques and assistance in finding markets for farmers.

Stung Krang Bat. The area is not popular in terms of vegetable production. In the area, vegetable cultivation features crops such as luffa gourd, morning glory, long bean, eggplant, cucumber, and wax gourd. The average land size used for vegetable farming is between 700 and 1,000 square meters. Farmers practice traditional cultivation methods, utilizing manure fertilizer and chemical pesticides. Water for irrigation is sourced from ponds and pump wells.

There are no agricultural associations in the area. Expenditures for vegetable farming range from USD 100 to USD 135, covering seeds, manure, and pesticides, while income is between USD 135 and USD 150. Vegetables are sold at local markets, including village and district markets.

Challenges faced by farmers include insect pests, diseases, low prices, lack of water, and water containing limestone. Agricultural services received include learning growing techniques from social media.

6.6.6.3 Animal Production

In the CAISAR Project area, a diverse range of animal production activities is prevalent among local households. Cattle farming is the most common, with 38% of households raising cows. Buffaloes are also kept, though by a smaller proportion of households, with only 9% engaging in buffalo farming. Pig farming is similarly practiced by 9% of households. Chicken farming is the most widespread, with 66% of households involved in raising chickens, reflecting their significant role in the local economy and diet. Ducks are the least common among the livestock options, with just 4% of households raising them. This distribution highlights the varied livestock practices within the area, with a strong emphasis on poultry farming and a notable presence of cattle and buffalo farming. However, there is a limitation of livestock production. As the consultation with chicken and duck farmers, faced challenge is lack of technical, and they request to exist more training program on breeding, as well as the whole production of

poultry. Fish farming also limited due to inadequate infrastructure, insufficient location, limited technical and expert, and market access.

6.6.7 Profiles of the Beneficiaries

6.6.7.1 Demographic Information

The survey conducted by the ESCIA with 272 households (HHs) reported a total of 1,274 family members, averaging 4.68 members per household. Of the total population, 644 are female (50.55%) and 630 are male (49.45%), with an average of 2.37 female members and 2.32 male members per household. The near-equal distribution of male and female members indicates a balanced gender ratio across the surveyed households. In addition to this figure, there are 25 HHs (9%) of the households are categorized as poor households (table 6.36).

Table 6.36: Demographic Information of the beneficiaries HHs (n=272)

Family Members	**Figure**
Total HHs	272
Total HH members	1274
Avg. member per HH	4.68
Total female members	644
Avg. female member per HH	2.37
Total male members	630
Avg. male member per HH	2.32
% of female members	50.55%
% of male members	49.45%

HH = Household, Avg. = Average.

6.6.7.2 Occupation

The majority of household heads are primarily engaged in rice and crop production, accounting for 72% of the main occupations whereas animal production is reported the most as secondary occupation, accounting for 22% of the respondents. Other notable occupations include trade (5% for main and 3% for secondary), government staff (4% for main and 1% for secondary), and seasonal private sector work, which, though only 3% report it as their main job, represents 7% of secondary occupations. The service and handicraft sectors provide modest contributions to both primary and secondary employment. Interestingly, a considerable portion (32%) of household heads report having no secondary occupation, while 3% also indicate having no primary job. This data highlights the heavy reliance on agriculture as the backbone of household livelihoods, supplemented by a mix of other occupations, particularly in secondary roles (table 6.37).

Table 6.37: Occupation of the beneficiaries HHs (n=272)

HH head	**Main Occupation**		**Secondary Occupation**	
	#	**%**	**#**	**%**
Rice and crop production	197	72%	37	14%
Animal production	3	1%	61	22%
Fishing/aquaculture	1	0%	4	1%
Forest	0	0%	0	0%

Trade	14	5%	7	3%
Service	8	3%	15	6%
Handicrafts	2	1%	4	1%
Government staff	12	4%	4	1%
Workers (full-time, private sector)	7	3%	5	2%
Workers, (seasonal, private sector)	8	3%	20	7%
Housewife	6	2%	16	6%
Student	0	0%	0	0%
Other (specify)	7	3%	12	4%
No job	7	3%	87	32%
Total	**272**	100%	**272**	100%

Table 6.38 shows the occupations of the members of the potentially affected households showing a diverse distribution, with rice and crop production being the predominant one for main occupation, representing 31% of households, while also serving as a secondary occupation for 18%. A notable 22% of household heads are students, which is consistent across both main and secondary occupations. Full-time workers in the private sector make up 16% of both main and secondary occupations, reflecting significant engagement in formal employment. Government staff account for 2% of main occupations and 3% of secondary occupations, while trade represents 4% of main occupations and 3% of secondary occupations. Interestingly, 14% of household heads report having no main job, while a higher proportion, 20%, report no secondary job. Seasonal private sector work, services, and housewives contribute smaller percentages to the household economy, with some variation between main and secondary roles. Overall, the data highlights a strong reliance on agriculture and formal employment, supplemented by a variety of other roles, while a significant portion of the population is engaged in education or lacks formal employment.

Table 6.38: Occupation of the members of the potentially affected beneficiaries HHs

Variable	**Main Occupation**		**Secondary Occupation**	
	#	**%**	**#**	**%**
Rice and crop production	397	31%	232	18%
Animal production	4	0%	66	5%
Fishing/aquaculture	2	0%	5	0%
Forest	-	0%	-	0%
Trade	48	4%	41	3%
Service	28	2%	34	3%
Handicrafts	4	0%	6	0%
Government staff	42	3%	34	3%
Workers (full-time, private sector)	207	16%	204	16%
Workers, (seasonal, private sector)	26	2%	38	3%
Housewife	31	2%	44	3%
Student	280	22%	280	22%
Other (specify)	28	2%	32	3%
No job	177	14%	258	20%
Total	**1,274**	**100%**	**1,274**	**100%**

The data on the types of houses of beneficiary households (Table 6.39) indicates that the majority (48.53%) live in semi-permanent houses, which are likely more durable but not fully modern, with a larger average size of 67.23 square meters. Wooden houses with thatched roofs, with an average size of 54.85 square meters, accounting for 39.34%. These homes represent traditional, simpler structures commonly found in rural or less developed areas. A smaller proportion, 9.19%, live in more modern and durable houses made of brick walls or reinforced concrete roofs, which are typically larger, with an average size of 107.24 square meters, indicating better living conditions for these households.

Only 2.57% of the households live in temporary houses, which are the smallest, with an average size of just 20.43 square meters, suggesting highly vulnerable living conditions. Another 0.37% fall into the other category, with an average size of 48 square meters, but no further details are provided. Overall, the majority of the affected households live in relatively simple and modest housing, with a small proportion living in more durable and spacious homes.

Table 6.39: Houses of the beneficiaries HHs (n=272)

Types of the houses	Number	Figure	Average size (m²)
Semi-permanent	107	48.53%	67.23
Wooden house, thatched	132	39.34%	54.85
House built of 1 floor or more/brick wall, reinforced concrete roof	25	9.19%	107.24
Temporary houses	7	2.57%	20.43
Other	1	0.37%	48.00

6.6.7.3 Land Ownership/Land Tenure

Table 6.40 shows different levels of land ownership and documentation across various land types. Residential land is owned all households (270), with an average land size of 1,298 m². Of these, 75% hold official title deeds, 15% have soft title deeds, and 10% do not have any form of title. Riceland, which is much larger at an average size of 14,237 m², is owned by 256 households, with the same percentage (75%) holding official title deeds. However, 12% hold soft title deeds, and 13% have no title. Garden land, owned by 52 households with an average size of 4,709 m², has lower formal ownership rates, with only 63% holding official title deeds. 12% have soft title deeds, and 25% of garden landowners do not have any form of title. This data highlights a strong degree of formal land ownership for residential, Riceland, and other land categories, but garden land shows a considerable gap in formal land documentation. Additionally, households without any form of land title are most prevalent in garden land and Riceland, pointing to potential areas of concern for securing land rights.

Table 6.40: Lands of the surveyed HHs (n=270)

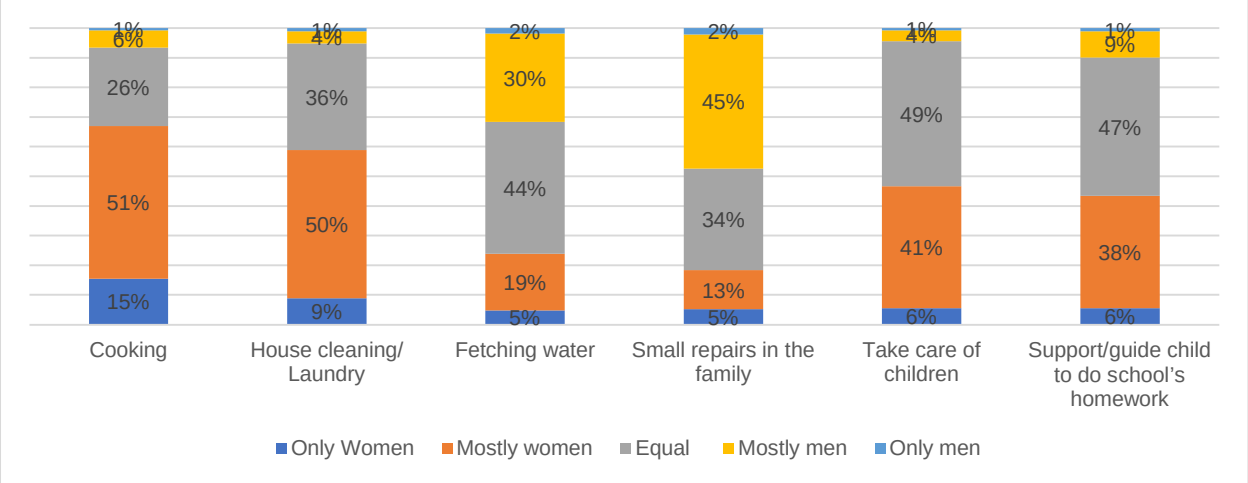
No.	Type of Land	N	Size (m2)	Tittle Deed	Soft Tittle Deed	None
1	Residential land	270	1,298	75%	15%	10%
2	Riceland	256	14,237	75%	12%	13%
3	Garden land	52	4,709	63%	12%	25%
4	Other land	2	37,500	100%	0%	0%

6.6.7.4 Labor Division and Decision Making

CAISAR Gender Assessment and Social Inclusion Plan reported that men spend on average of 59.4% of their time for farming whereas women spend only 40.5%. In traditional farming context, men involve the most during cultivation stage while women are more engaged in the later production. Heavy duty tasks such as land preparation are designated to men while seedling preparation and weeding are commonly assigned to women. Transplanting, uprooting, harvesting, and marketing are generally shared by both. However, the practices have been changed lately due to the presence of mechanization where land preparation, harvesting and threshing have been replaced by machinery.[35]

Coming comes to household chores; women handle 90% of the workload. During the COVID-19 outbreak, women spent even more time on domestic and caregiving tasks. Elderly family members bear the full responsibility for raising grandchildren when their mothers have migrated. In the project area, similarly, in families where women work in nearby garment factories or migrate for paid employment, domestic duties are often shifted to young girls and the elderly. [36]The ESCIA field survey showed that cooking, housing and cleaning, child caring and schooling are mainly at the hand of women, except repairing in the household and fetching water where men involve the most (Figure 6.71).

Figure 6.71: Division of Roles in Household Chores of the Beneficiaries HHs (n=270)



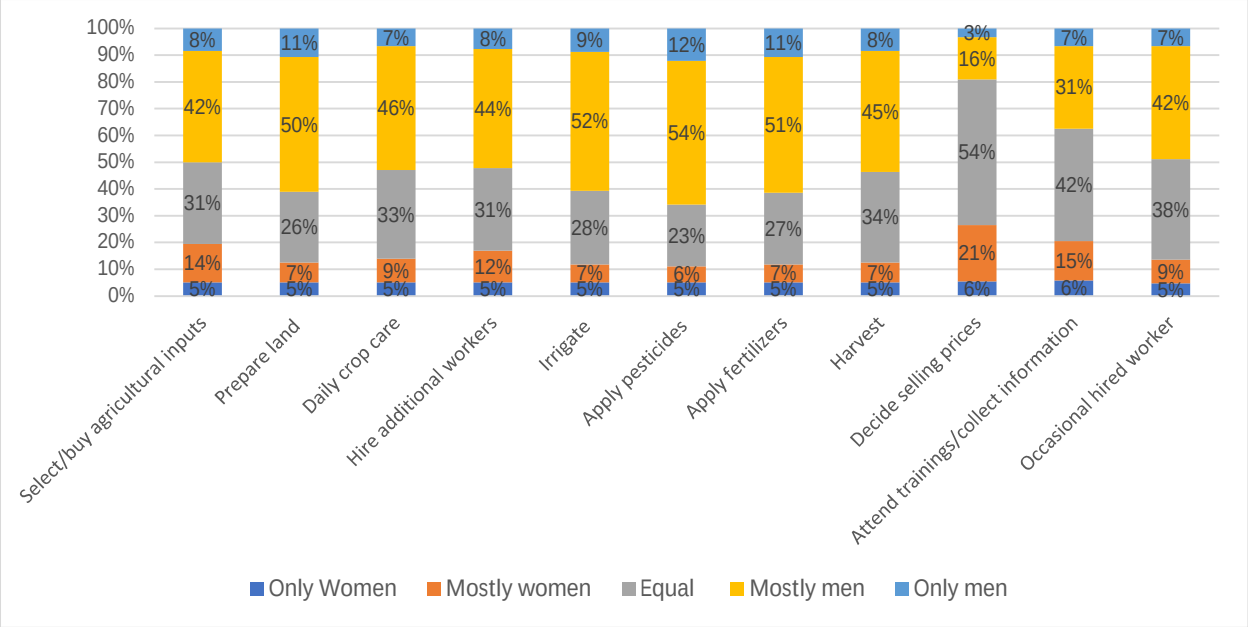
(Source: ESCIA Field Survey, 2024)

In crop production, the distribution of labor was found to be male dominated for majority of the tasks, especially at production level. However, women were found to be a slightly higher dominated at the time of selling prices for their produces. Interestingly, men are the one involves the most in the production, but it tends to be women who participated the most in the occasion of training or obtaining any agriculture related information (Figure 6.72).

Figure 6.72: Share of Roles in Crop Cultivation of the Beneficiaries HHs (n=272)

[35] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

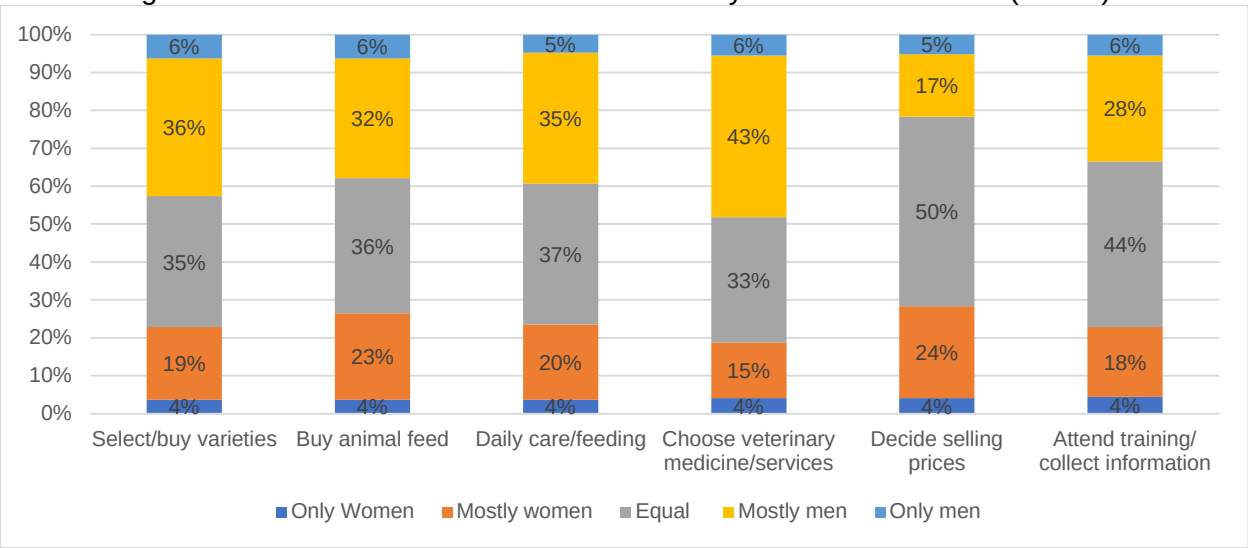
[36] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.



(Source: ESCIA Field Survey, 2024)

In animal production, the distribution of labor is still found to be male dominated for majority of the tasks at production level. Once again, women were found to be a slightly higher dominated at the time of selling prices for their animals. Interestingly, the involvement of men and women are bias to a more equally contributed at the time of selling and training and obtaining related information.

Figure 6.73: Share of roles in Animal Husbandry of the Beneficiaries (n=272)



(Source: ESCIA Field Survey, 2024)

6.6.7.5 Income

According to the ESCIA survey, the average annual household income is USD 10,490, given the average annual income amounts to USD 2,239.54 per household member. Table 31 reported the distribution of annual household income across 272 households. A total of 37 households (14%) earns less than USD 2,500 annually, while 56 households (21%) fall within the USD 2,500 to 5,000 income range. Another 51 households (19%) earn between USD

5,001 and 7,500, and 27 households (10%) report an income between USD 7,501 and 10,000. The largest group, comprising 101 households (37%), earns more than USD 10,000 annually. This distribution shows that a significant portion of the households (37%) are in the higher income bracket, while a smaller proportion (14%) earns below USD 2,500 annually (table 6.41).

Table 6.41: Average annual income per household of the survey households (n=272)

Total annual income (US$)	Figure	%
Less than 2,500	37	14%
2,500 - 5,000	56	21%
5001 - 7,500	51	19%
7,501 - 10,000	27	10%
Higher than 10,000	101	37%
Total	**272**	**100%**

The CAISAR Gender Assessment and Social Inclusion Plan revealed notable findings regarding income differences by gender. On an individual level, the average monthly income for female household members is $121.4 (n=238), which is lower than the $166.6 earned by male members (n=366), showing a statistically significant income gap of $45.2. However, at the household level, there is no significant difference in average income between female-headed and male-headed households, with a small mean difference of $17.3. Nationally, 48% of married men (aged 15–49) reported making joint decisions with their wives on income use, 46% said their wives mainly make these decisions, and 6% said they decide alone. Additionally, 97% of married women (aged 15–49) who earn cash from employment participate in decisions about their earnings, with 63% making these decisions mainly on their own.[37]

6.6.8 Profiles of the Potentially Affected Households

6.6.8.1 Demographic Information

The survey conducted by the ESCIA with 85 affected households (HHs) reported a total of 387 family members, averaging 5 members per household. Of the total population, 204 are female (52.71%) and 183 are male (47.29%), with an average of 2.4 female members and 2.2 male members per household. The near-equal distribution of male and female members indicates a balanced gender ratio across the affected households. In addition to this figure, there are 5 HHs (6%) of the households are categorized as poor households (please see table 6.42).

Table 6.42: Demographic Information of the potentially affected HHs (n=85)

Family Members	Figure
Total HHs	85
Total HH members	387
Avg. member per HH	5
Total female members	204
Avg. female member per HH	2.4
Total male members	183

[37] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

Avg. male member per HH	2.2
% of female members	52.71%
% of male members	47.29%

HH = Household, Avg. = Average.

6.6.8.2 Occupation

The majority of household heads are primarily engaged in rice and crop production, accounting for 69% of the main occupations whereas animal production is reported the most as secondary occupation, accounting for 25% of the respondents. Other notable occupations include government staff (7% for main and 4% for secondary), trade (5% for main and 1% for secondary), and seasonal private sector work, which, though only 4% report it as their main job, represents 8% of secondary occupations (Table 6.43). The service and handicraft sectors provide modest contributions to both primary and secondary employment. Interestingly, a considerable portion (34%) of household heads report having no secondary occupation, while 5% also indicate having no primary job. This data highlights the heavy reliance on agriculture as the backbone of household livelihoods, supplemented by a mix of other occupations, particularly in secondary roles.

Table 6.43: Occupation of the potentially affected HHs head (n=85)

HH head	Main Occupation		Secondary Occupation	
	#	%	#	%
Rice and crop production	59	69%	10	12%
Animal production	0	0%	21	25%
Fishing/aquaculture	1	1%	0	0%
Forest	0	0%	0	0%
Trade	4	5%	1	1%
Service	3	4%	4	5%
Handicrafts	1	1%	1	1%
Government staff	6	7%	3	4%
Workers (full-time, private sector)	0	0%	1	1%
Workers, (seasonal, private sector)	3	4%	7	8%
Housewife	1	1%	4	5%
Student	0	0%	0	0%
Other (specify)	3	4%	4	5%
No job	4	5%	29	34%
Total	**85**	**100%**	**85**	**100%**

HH = Household.

Table 6.44 shows the occupations of the members of the potentially affected households showing a diverse distribution, with rice and crop production being the predominant one for main occupation, representing 31% of households, while also serving as a secondary occupation for 18%. A notable 22% of household heads are students, which is consistent across both main and secondary occupations. Full-time workers in the private sector make up 14% of both main and secondary occupations, reflecting significant engagement in formal employment. Government staff account for 5% of main occupations and 4% of secondary occupations, while trade represents 4% of both categories. Interestingly, 13% of household heads report having no main job, while a higher proportion, 19%, report no secondary job. Seasonal private sector work, services, and housewives contribute smaller percentages to the

household economy, with some variation between main and secondary roles. Overall, the data highlights a strong reliance on agriculture and formal employment, supplemented by a variety of other roles, while a significant portion of the population is engaged in education or lacks formal employment.

Table 6.44: Occupation of the members of the potentially affected HHs

Variable	Main Occupation		Secondary Occupation	
	#	%	#	%
Rice and crop production	120	31%	71	18%
Animal production	0	0%	21	5%
Fishing/aquaculture	2	1%	1	0%
Forest	0	0%	0	0%
Trade	17	4%	14	4%
Service	11	3%	11	3%
Handicrafts	1	0%	1	0%
Government staff	18	5%	15	4%
Workers (full-time, private sector)	55	14%	55	14%
Workers, (seasonal, private sector)	10	3%	14	4%
Housewife	8	2%	12	3%
Student	86	22%	86	22%
Other (specify)	10	3%	11	3%
No job	49	13%	75	19%
Total	**387**	**100%**	**387**	**100%**

The data on the types of houses of potentially affected households (Table 6.45) indicates that the majority (48.24%) live in wooden houses with thatched roofs, with an average size of 48.54 square meters. These homes represent traditional, simpler structures commonly found in rural or less developed areas. Semi-permanent houses, which are likely more durable but not fully modern, account for 40% of the households, with a larger average size of 55.38 square meters. A smaller proportion, 9.41%, live in more modern and durable houses made of brick walls or reinforced concrete roofs, which are typically larger, with an average size of 96.13 square meters, indicating better living conditions for these households.

Only 1.18% of the households live in temporary houses, which are the smallest, with an average size of just 21 square meters, suggesting highly vulnerable living conditions. Another 1.18% fall into the other category, with an average size of 48 square meters, but no further details are provided. Overall, the majority of the affected households live in relatively simple and modest housing, with a small proportion living in more durable and spacious homes.

Table 6.45: Houses of the potentially affected HHs (n=85)

Types of the houses	Number	Figure	Average size (m^2)
Wooden house, thatched	41	48.24%	48.54
Semi-permanent	34	40.00%	55.38
House built of 1 floor or more/brick wall, reinforced concrete roof	8	9.41%	96.13
Temporary houses	1	1.18%	21.00
Other	1	1.18%	48.00

6.6.8.3 Land Ownership/Land Tenure

The potentially affected households hold various types of land with different levels of tenure security. Residential land is the most common, averaging 1,452 square meters, with 75% of households having hard title deeds, 12% holding soft titles, and 13% lacking documentation. Riceland, with an average size of 14,741 square meters, is similarly well-secured, with 74% holding hard titles, 12% soft titles, and 14% without documentation. Garden land, averaging 6,012 square meters, with only 52% of households having hard titles, 19% soft titles, and 29% have no documentation (Table 6.46). The other land is owned by one (1) household with a secure hard title. Overall, while most households have secure tenures for residential and Riceland, a significant portion, particularly in garden land, lacks formal documentation.

Table 6.46: Lands of the potentially affected HHs (n=85)

Type of Land	N	Size (m2)	Types and Land Titles					
			Hard title deed		Soft title deed		None	
Residential land	85	1,452	64	75%	10	12%	11	13%
Riceland	77	14,741	57	74%	9	12%	11	14%
Garden land	21	6,012	11	52%	4	19%	6	29%
Other land	1	5,000	1	100%	0	0%	0	0%

6.6.8.4 Gender, Labor Division and Decision Making

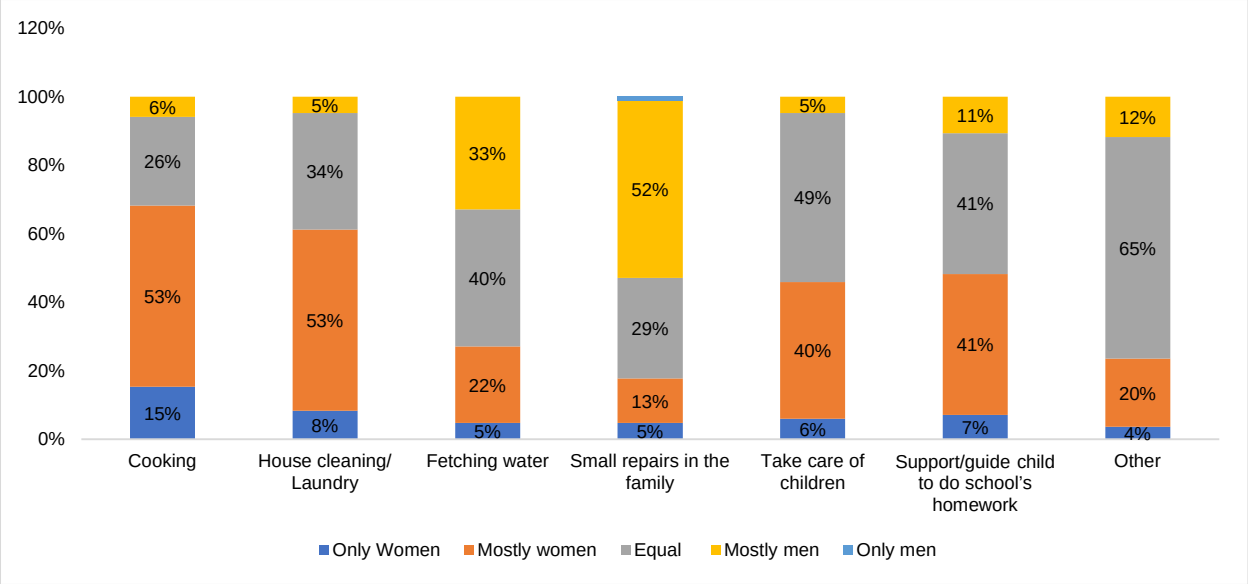
CAISAR Gender Assessment and Social Inclusion Plan reported that men spend on average of 59.4% of their time for farming whereas women spend only 40.5%. In traditional farming context, men involve the most during cultivation stage while women are more engaged in the later production. Heavy duty tasks such as land preparation are designated to men while seedling preparation and weeding are commonly assigned to women. Transplanting, uprooting, harvesting, and marketing are generally shared by both. However, the practices have been changed lately due to the presence of mechanization where land preparation, harvesting and threshing have been replaced by machinery.[38]

Coming comes to household chores; women handle 90% of the workload. During the COVID-19 outbreak, women spent even more time on domestic and caregiving tasks. Elderly family members bear the full responsibility for raising grandchildren when their mothers have migrated. In the project area, similarly, in families where women work in nearby garment factories or migrate for paid employment, domestic duties are often shifted to young girls and the elderly. [39]The ESCIA field survey with affected household showed that cooking, and housing and cleaning, are mainly at the hand of women, except repairing in the household where men involve the most while fetching water, take care of their children and other tasks addressed to be equal both men and women (Figure 6.74).

Figure 6.74: Division of Roles in Household Chores of Affected HHs (n=85)

[38] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

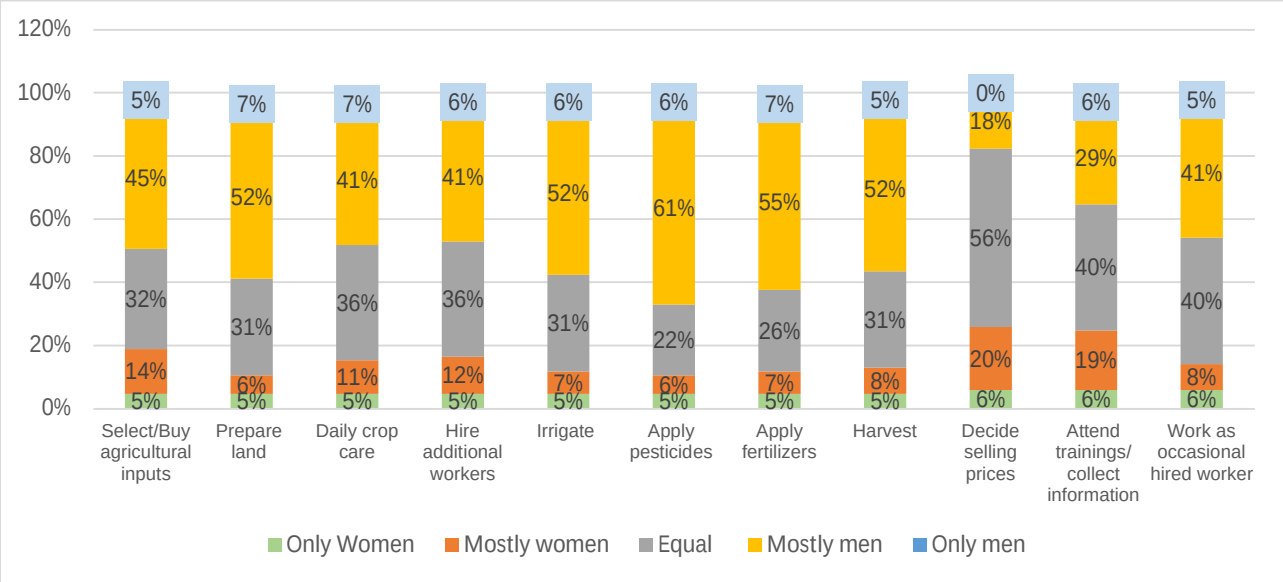
[39] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.



(Source: ESCIA Field Survey, 2024)

In crop production, the distribution of labor was found to be male dominated for majority of the tasks, especially at production level. However, women were found to be a slightly higher dominated at the time of selling prices for their produces. Men are the one involves the most in the production and they participated the most in the occasion of training or obtaining any agriculture related information (Figure 6.75).

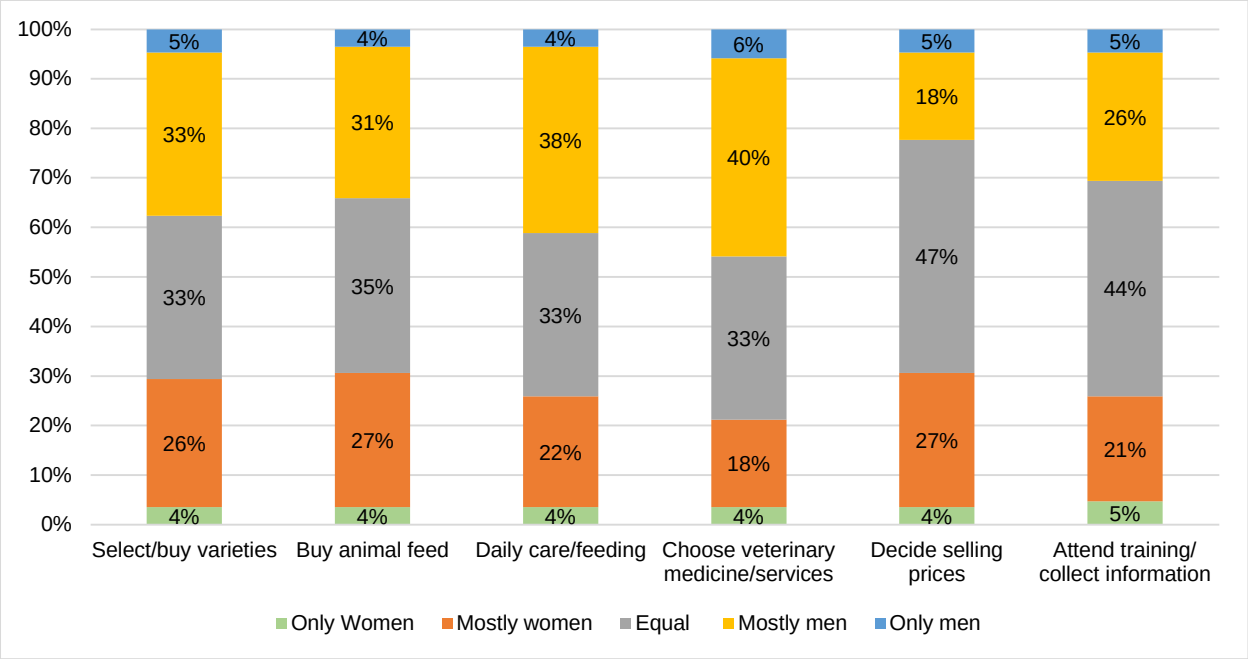
Figure 6.75: Share of Roles in Crop Cultivation of the Affected HHs (n=85)



(Source: ESCIA Field Survey, 2024)

In animal production, the distribution of labor is still found to be male dominated for majority of the tasks at production level. Once again, women were found to be a slightly higher dominated at the time of selling prices for their animals. Interestingly, the involvement of men and women are bias to a more equally contributed at the time of selling and training and obtaining related information.

Figure 6.76: Share of roles in animal husbandry of the affected HHs (n=85)



6.6.8.5 *Social Issues within the Vulnerable Households*

According to the commune database, a number of social issues are reported. The violence in the family and land-related disputes are the most significant social issues in Ou Ta Paong and Lum Hach sub-schemes. In Ou Ta Paong, 15 households were reported for domestic violence, compared to 13 in Lum Hach. Land disputes impacted 14 households in Ou Ta Paong and 18 in Lum Hach. Additionally, nine households experiencing land issues in both areas appeared to be linked to social conflict. No cases of sexual harassment or crime were reported in two area (Please see also Table 6.47). However, a case of human trafficking was recorded in each category group in Ou Ta Paong. In Brambei Mom and Krapeu Trom sub-schemes, cases of violence, drug use, theft, and land disputes were reported across all categories though in small number. Interestingly, Krapeu Trom reported one (1) case of sexual harassment. In Yutasas, only three social issues—violence in the family, drug use, and theft—occurred. Meanwhile, Stueng Krang Bat recorded only one (1) land-related issue.

Table 6.47: Socio-economic and safety challenges affecting different segments of the population in the sub-scheme

Parameters	Vulnerable Group	People with Disability	Women Household Head	Poor Household	Conflict
Ou Ta Paong					
Sexual Harassment	-	-	-	-	-
Human Trafficking	1	1	1	1	1
Violence in the family	15	15	15	15	9
Drug using	7	7	7	7	3
Crime	-	-	-	-	-
Stolen Cases	2	2	2	2	1
Land Issues	14	14	14	14	9
Lum Hach					

Sexual Harassment	-	-	-	-	-
Human Trafficking	-	-	-	-	-
Violence in the family	13	13	13	13	9
Drug using	1	1	1	1	1
Crime	-	-	-	-	-
Stolen Cases	2	2	2	2	1
Land Issues	18	18	18	18	13
Brambei Mom					
Sexual Harassment	-	-	-	-	-
Human Trafficking	-	-	-	-	-
Violence in the family	5	5	5	5	2
Drug using	4	4	4	4	2
Crime	-	-	-	-	-
Stolen Cases	3	3	3	3	3
Land Issues	1	1	1	1	1
Krapeu Trom					
Sexual Harassment	1	1	1	1	1
Human Trafficking	-	-	-	-	-
Violence in the family	3	3	3	3	1
Drug using	3	3	3	3	2
Crime	-	-	-	-	-
Stolen Cases	1	1	1	1	-
Land Issues	1	1	1	1	-
Steung Krang Bat					
Sexual Harassment	-	-	-	-	-
Human Trafficking	-	-	-	-	-
Violence in the family	-	-	-	-	-
Drug using	-	-	-	-	-
Crime	-	-	-	-	-
Stolen Cases	-	-	-	-	-
Land Issues	1	1	1	1	-
Yutasas					
Sexual Harassment	-	-	-	-	-
Human Trafficking	-	-	-	-	-
Violence in the family	3	3	3	3	-
Drug using	2	2	2	2	-
Crime	-	-	-	-	-
Stolen Cases	1	1	1	1	-
Land Issues	-	-	-	-	-

6.6.8.6 Income

According to the ESCIA survey, the average annual household income is USD 10,490, given the average annual income amounts to USD 2,239.54 per household member. Table 6.48 reported the distribution of annual household income across 85 households. A total of 8 households (9%) earns less than USD 2,500 annually, while 16 households (19%) fall within

the USD 2,500 to 5,000 income range. Another 22 households (26%) earn between USD 5,001 and 7,500, and 9 households (11%) report an income between USD 7,501 and 10,000. The largest group, comprising 30 households (35%), earns more than USD 10,000 annually. This distribution shows that a significant portion of the households (35%) are in the higher income bracket, while a smaller proportion (9%) earns below USD 2,500 annually.

Table 6.48: Average annual income per household of the affected HHs (n=85)

Total annual income (US$)	Figure	%
Less than 2,500	8	9%
2,500 - 5,000	16	19%
5001 - 7,500	22	26%
7,501 - 10,000	9	11%
Higher than 10,000	30	35%
Total	**85**	100%

The CAISAR Gender Assessment and Social Inclusion Plan revealed notable findings regarding income differences by gender. On an individual level, the average monthly income for female household members is $121.4 (n=238), which is lower than the $166.6 earned by male members (n=366), showing a statistically significant income gap of $45.2. However, at the household level, there is no significant difference in average income between female-headed and male-headed households, with a small mean difference of $17.3. Nationally, 48% of married men (aged 15–49) reported making joint decisions with their wives on income use, 46% said their wives mainly make these decisions, and 6% said they decide alone. Additionally, 97% of married women (aged 15–49) who earn cash from employment participate in decisions about their earnings, with 63% making these decisions mainly on their own.[40]

6.7 CLIMATE CHANGE SCENARIOS

In this section, climate assessment and projection for climate change was drawn from the works of the Feasibilty Study team and the FAO team who do the Climate Change Project using EXACT model (This information was drawned from Annex 2 of the Funding Proposal which is prepared to fulfil the requirements of the Green Climate Fund).

6.7.1 Current Impacts of Climate Change

On average, annual damage and loss of wet season rice caused by floods and droughts is approximately 120,501 hectares, of which 70 percent of the damage and loss is due to floods and 30 percent is the result of droughts. Flooding occurs frequently and extensively in Cambodia. The source of these floods can be the Mekong River including the Tonle Sap Great Lake, tributary flash floods, urban flooding, and failure of structures such as protection levees and storages.

[40] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

The agricultural sector accounts for 94-98% of the water use in Cambodia, with 1-2% from industry and 4% from domestic sectors (FAO 2005).[41,42] Water use across sectors is 2-7% of available water that flows through the country annually, and water scarcity results primarily from limited access to irrigation and a lack of water storage capacity, particularly in the dry season[43]. Projections in 2003 suggested that industrial and domestic uses will increase to 15% and 11% by 2025 in Cambodia and other South-east Asian countries, and while this may no longer apply, it is plausible that there will be increased competition in the near-future due to climate impacts and economic changes upstream of the river basins (industrial use, deforestation, etc.) that are transboundary or national. Therefore, enhancing water use efficiency in agriculture and the agro-industrial sector are critical – including through tailoring advisories linked to agrometeorological information and climate forecasts.

Floods also damage roads, collapse ponds and cause canal breakages – impacting the irrigation infrastructure directly, and this then results in inadequate water supply for cultivation in subsequent years. Of the estimated[44] US$ 356.23 million loss and damage from 2013 floods, water and irrigation infrastructure accounted for US$ 52 million (14.5%) and national / rural roads for another US$ 79.61 million (22.3%). It is also the case that when irrigation infrastructure is designed without taking climate scenarios into account — as they are currently, it can affect water flow and drainage from fields. Stakeholder consultations[45] identified at least one instance when a drain that passes under the main canal was too small in diameter to handle large flows, resulting in rice fields upstream becoming flooded during the wet season, breakage of main canal embankment and drainage water entering the main canal, and another where the opening of the water gates was too narrow and under conditions of large discharge, the flow and velocity of turbulence causes soil erosion.

Climate change affects women, men, and vulnerable people differently, and their responses to its impacts also differ, including in relation to safeguarding food security and livelihoods and coping with hazards and risks. In the project area, women have significantly less access than men to financial instruments, land, natural resources, climate change resources and technologies, education, and other development services for successful adaptation to climate change. Women are also underrepresented in FWUCs, and typically perform administrative roles. A study of 10 selected irrigation schemes: three (3) in Kompong Thom, three (3) in Pursat and four (4) in Kompong Chhnang showed that among 43 members of FWUCs in the study areas, only nine (9) are female (21%)[46]. Most of the important positions in FWUCs, such

[41] Cambodia National Mekong Committee (CNMC) Water Security, Food Security and Livelihoods in Cambodia and the Lower Mekong Basin. https://ppcrcambodia.files.wordpress.com/2012/11/watt-1106-w-food-security.pdf

[42] https://www.worldometers.info/water/cambodia-water/

[43] ADB Cambodia Agriculture, Natural Resources, and Rural Development, Sector Assessment, Strategy and Road Map. https://www.adb.org/sites/default/files/publication/718806/cambodia-agriculture-rural-development-road-map.pdf

[44] Note: WATSAN was a separate category from water and irrigation infrastructure. Roads included drainage structures such as pipe and box culverts and spillway locations. Government of Cambodia (2014). Post-flood early recovery need assessment report. https://www.undp.org/sites/g/files/zskgke326/files/migration/kh/Cambodia-post-flood-recovery-need-assessment-report.pdf

[45] Field visits 17-20 May 2022: Learning about and from FWUCs. Annex 4, CAISAR – Feasibility Study and Project Preparation.

[46] Gender and Water Governance: Women's Role in Irrigation Management and Development in the Context of Climate Change. CDRI Working Paper Series No. 89 -2014

as chair and first and second vice-chair, are dominated by men. While women mostly hold positions as treasurers and accountants in the committees. Cambodia's Women's Resilience Index found women less resilient in times of disaster than men due to women's unstable and insecure sources of income, limited access to shelters or safe places, inadequate climate information and early warning systems, poor housing, weak social safety nets and absence of emergency networks. Furthermore, women's responsibilities in household resources position them well to contribute to livelihood strategies adapted to changing environmental realities. However, lack of information, access to planning processes, and care obligations, limit their ability to contribute.

6.7.2 Climate Change Projections

Precipitation and temperature have become increasingly unpredictable. The temperature anomalies by 2040-2059 against the reference period of 1986-2006 for Cambodia and CAISAR provinces are presented in Table 6.49. The average monthly temperature is projected to increase by 1.83°C by 2040-59. By mid-century, climate change will result in more frequent heavy precipitation days: from 2.4 days to 4.9 days in the rainy season, and an increase in the number of consecutive dry days in the same season: from 0.8 days to 4.4 days.

Table 6.49: Projected anomaly (changes °C) for average monthly temperatures, using median values of CCKP multi-model ensembles and showing 10-90th percentile in brackets

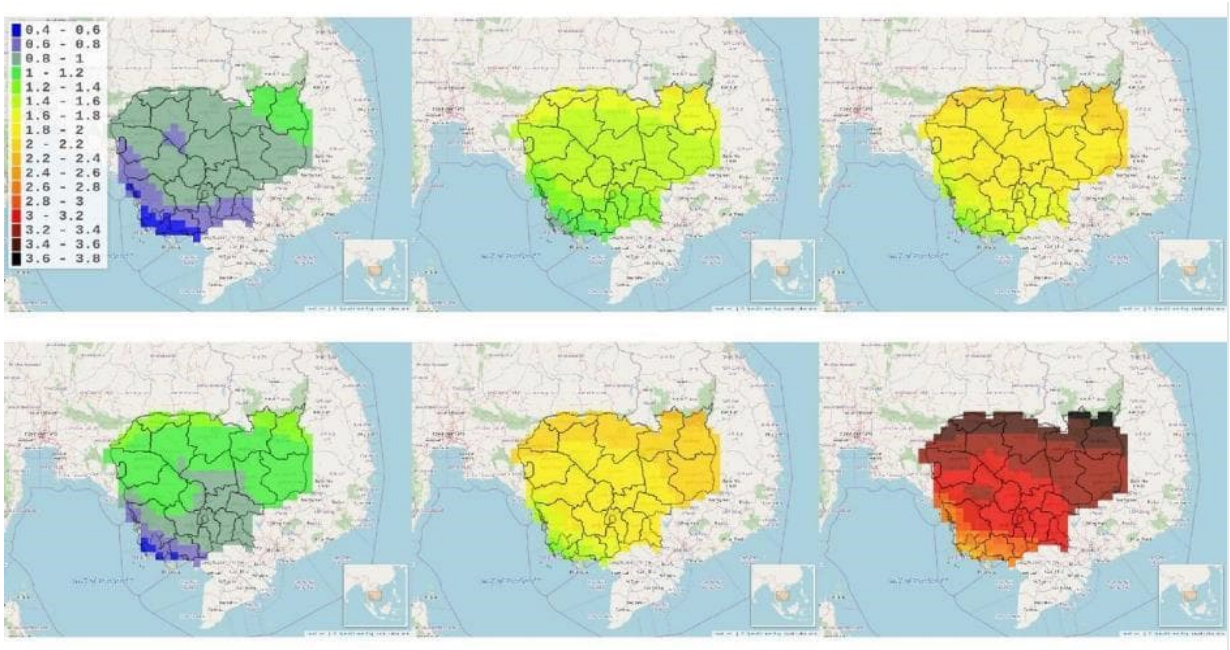
Region	Average Monthly temperature, 2040-2059	
	RCP 4.5	RCP 8.5
Kampong Speu	1.35 (0.22, 2.05)	1.75 (0.49, 2.54)
Kampong Chhnang	1.37 (0.13, 2.21)	1.81 (0.34, 2.83)
Kandal	1.34 (0.17, 2.1)	1.76 (0.49, 2.62)
Pursat	1.36 (0.10, 2.29)	1.72 (0.35, 2.89)
National	1.39 (0.04, 2.23)	1.83 (0.22, 2.78)

RCP = Representative Concentration Pathways.

Future projections of climate change in the project area under the RCP4.5 scenario (Figure 6.77) indicate a temperature increase of 1.4-1.6°C by mid-century (2040-2070) and up to 2.2°C by the end of the 21st century (2070-2100); the increase is much higher under RCP8.5 scenario (3.6°C, 2070-2100). With regards to the spatial variability, the inner Cambodia will experience a higher temperature change compared to coastal areas. While the changes over time will be lower than 1°C along the coastal areas, the inner parts of the country will experience a temperature rise of more than 2°C in both RCPs.

Nights exposed to high temperatures are projected to become more frequent during the 21st century (+114 nights by mid-century and +151 nights by the 2080s). Population, crop and livestock systems will also experience heat extremes more frequently in comparison to the reference period (42 days by mid-century and reaching 62 days by the 2080s) and IFAD is expecting a drastic reduction in the productivity of crops and livestock.

Figure 6.77: Temperature maximum deviation from historical baseline period (1980-2005) under RCP 4.5 (top row) for the period 2011-2040 (left), 2040-2070 (middle) and 2070-2100 (right) and RCP8.5 (bottom row) for the same time periods. The deviation highlights the projected changes into the future in degree Celsius based on projections from bias corrected regional CORDEX data (FAO analysis, CAVA tool).



While annual rainfall is expected to increase, the number of days with rain is decreasing and daily rain intensity is increasing, resulting in extreme rainfall events and flooding risks[47].

Across Southeast Asia, a modest increase in precipitation is projected – from 1-8% by 2100 (IPCC AR5), but there are some uncertainties in the direction of changes in annual precipitation and river flows for the Mekong River Basin[48]. In general, it can be said that for the CAISAR observation points, models[49] show a reduction in rainfall during the dry season but an increase in rainfall during the wet season and an increase in frequency and intensity of heavy rainfall events which is described in more detail later.

For the Lower Mekong Basin, both an increase in drought days by 2100[50] and an increase in drought frequency[51] is predicted, and flooding is expected to increase in frequency, severity, and duration[52]. Studies find more severe flood inundation magnitude in the Lower Mekong Basin, in the future (2075-2099) compared to 1979-2003, under four (4) RCP scenarios and sea surface temperature patterns[53].

[47] World Bank and ADB, 2021.

[48] Piman, T., Cochrane, T.A., Arias, M.E., Dat, N.D. and Vonnarart, O., 2014. Managing Hydropower under Climate Change in the Mekong Tributaries. Chapter 11 in S. Shrestha et al. (Ed.), Managing Water Resources under Climate Uncertainty: Examples from Asia, Europe, Latin America, and Australia, In Press, Springer. https://doi.org/10.1007/978-3-319-10467-6_11

[49] Global Climate Models and Regional Climate Models comparing data for 1995-2001 with 2026-2050 projections. WAPCOS and Phnom Penh International Consultants, 2023. CAISAR Feasibility Report D8, Version 1.2.

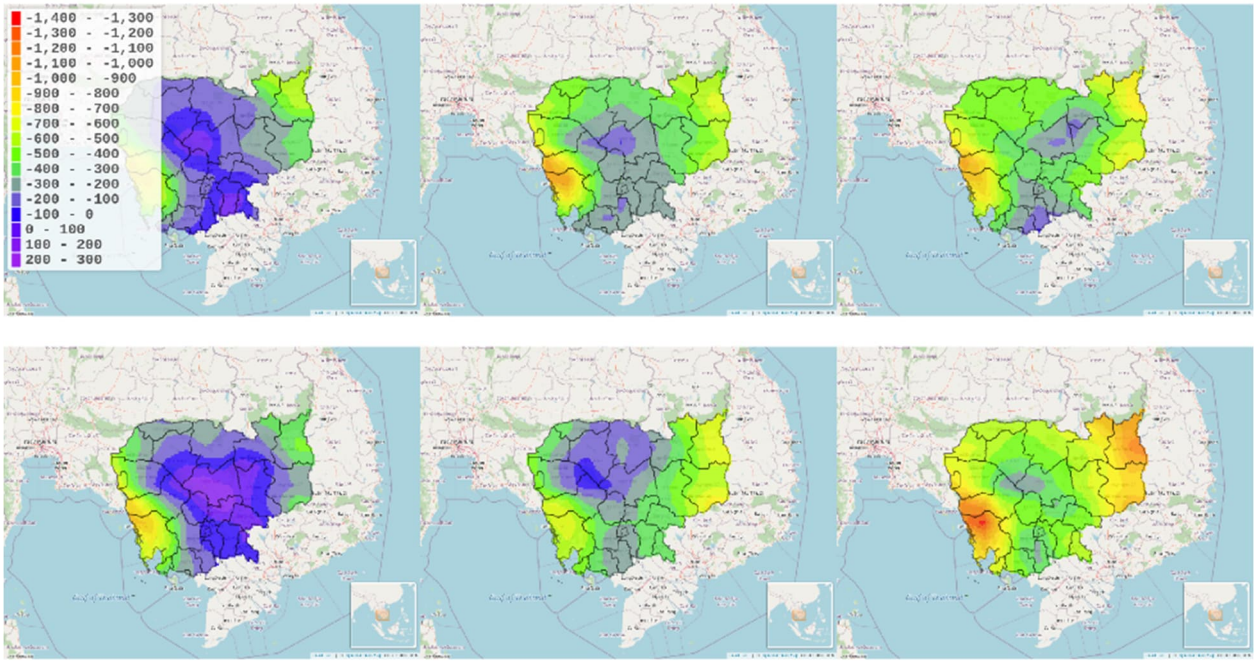
[50] Hirabayashi, Y., Kanae, S., Emori, S., Oki, T., and Kimoto, M., 2008. Global projections of changing risks of floods and droughts in a changing climate. Hydrological Sciences, 53 (4): 754-772. https://doi.org/10.1623/hysj.53.4.754

[51] MRC, 2010. State of the Basin Report 2010. Mekong River Commission: Vientiane.

[52] Thoeun, 2015.

[53] Try, S., Tanaka, S., Tanaka, K., Sayama, T., Lee, G., and Oeurng, C., 2020. Assessing the effects of climate change on flood inundation in the lower Mekong Basin using high-resolution AGCM outputs. Progress in Earth and Planetary Science, 2020 (7): 34. https://doi.org/10.1186/s40645-020-00353-z

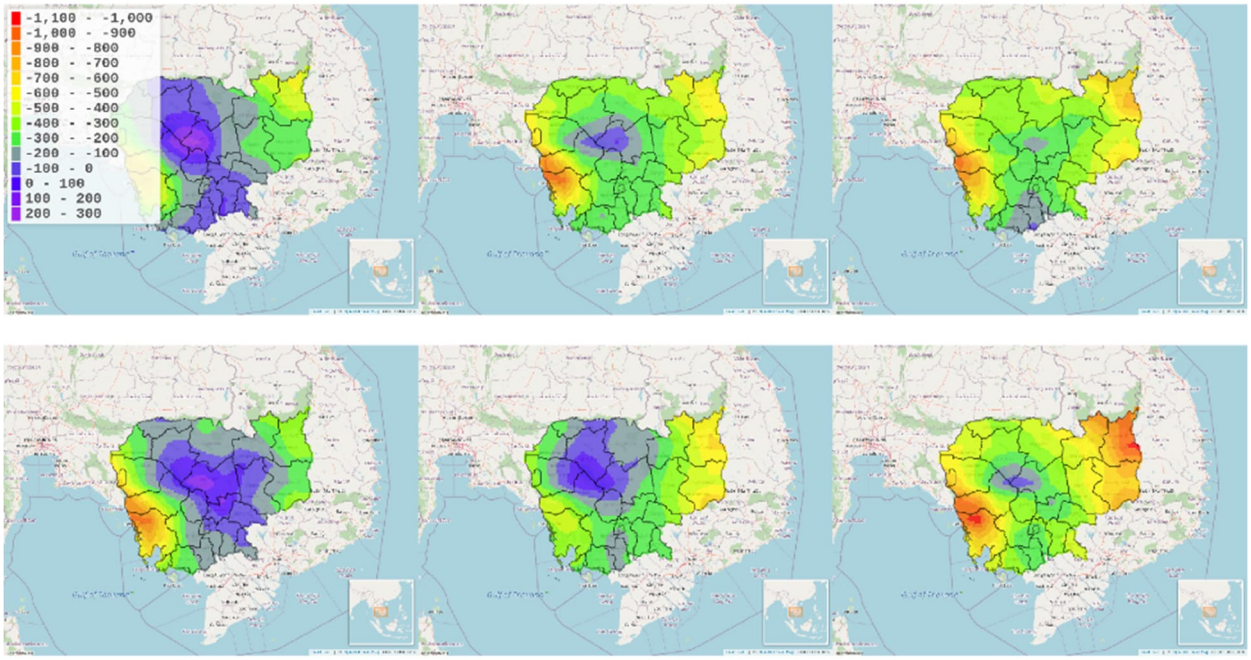
Figure 6.78: Cumulative precipitation per year deviation from historical baseline period (1980-2005) under RCP 4.5 (top row) for the period 2011-2040 (left), 2040-2070 (middle) and 2070-2100 (right) and RCP8.5 (bottom row) for the same time periods. The deviation highlights the projected change into the future in millimeter/year based on projections from bias corrected regional CORDEX data (FAO analysis).



Although there is significant variability in modelled future precipitation projections in Cambodia, most estimates of the mean annual rainfall indicate a decrease in rainfall into the near future (Figure 6.78) with potential more intense decreases in the medium to far future. There is an increasing trend in seasonal rainfall between June and August in the northwest, and a decreasing trend in the northeast of the country. Precipitation deviation from the historical average period (1980-2005), shows the largest increase in the near future, with subsequent decreases in annual precipitation in the medium and far future, with variation geographically.

As many agricultural producers rely on rainfed production in the wet season, Figure 6.79 shows changes in cumulative precipitation in the wet season precipitation and deviation from the historical average in the wet season, respectively. This analysis suggests decreasing wet season precipitation into the future, to a higher degree under RCP8.5 and with changes up to -500 mm/year.

Figure 6.79: Deviation in cumulative precipitation in rainy season (May-October) from historical baseline period (1980-2005) under RCP 4.5 (top row) for the period 2011-2040 (left), 2040-2070 (middle) and 2070-2100 (right) and RCP8.5 (bottom row) for the same time periods. The deviation highlights the projected change into the future in millimeters based on projections from bias corrected regional CORDEX data (FAO analysis).



Other studies[54] find that climate change, in combination with land use change and other developments, could significantly reduce river flows within the Mekong River basin. That is, climate change will also likely induce a decrease in both wet and dry season river flows in all 11 sub-basins contributing to Tonle Sap Lake: mean annual projected flow reductions range from 9-29% for 2030s, 10-35% for 2060s, and 7-41% for 2090s. Additionally, future flood magnitudes are projected to reduce for all 11 sub-basins over a majority of time horizons and under at least one (1) scenario; reductions are also projected for other scenarios used in the simulation for most sub-basins. Since a decrease in extreme river flows is also modeled, this would cause a decline in flood magnitudes and an increase in drought occurrences (in both wet and dry season) throughout the basin as well as an increase in extreme droughts in most sub-basins.

6.7.3 Greenhouse Gas Emissions and Agriculture Sector in NDCs

In Cambodia, GHG emissions (2016) are dominated by the Forestry and Other Land Uses (FOLU) sector (60.9%)– the main driver for which is deforestation – and agriculture (16.9%), followed by energy (12.0%), IPPU (7.9%) and waste (2.1%) sectors. Forest cover of Cambodia was 73% in 1960 and had declined to 57% in 2010 and 54% in 2014[55]. GHG emissions without the FOLU sector are dominated by the agriculture sector (43.3%), followed by energy (30.9%), waste (5.5%), and IPPU (20.3%). Agricultural emissions increased by ~3% each year between 1994 and 2016 – the main driver being rice cultivation. Under a business-as-usual (BAU)

[54] Oeurng, C., Cochrane, T.A., Chung, S., Kondolf, M.G., Piman, T., and Arias, M.E., 2019. Assessing Climate Change Impacts on River Flows in the Tonle Sap Lake Basin, Cambodia. Water, 11(3): 618. https://doi.org/10.3390/w11030618

[55] Cambodia, Third National Communication, September 2022.

scenario, Cambodia forecasts an increase in emissions from 125.2 MtCO2eq in 2016 (Table 6.50, Col A) to 155.0 MtCO2eq in 2030 (Table 6.50, Col C).

The NDC emissions reduction scenario by 2030 (Table 6.50) largely targets FOLU and energy but also IPPU sectors with 40-50% reduction. Agriculture emissions will only reduce by 23% in the same period – the sector contributing about 9.6% of the overall 64.5MtCO2eq reduced (difference between Table 6.50 Col C and Col D); but owing to the links between FOLU (land-use and forest conversion) and agriculture, actions to increase productivity of agricultural lands and interventions such as land management and organic input agriculture are likely to have an indirect effect on FOLU targets. Improving water use efficiency of rice cultivation using techniques such as AWD or SRI, introducing stress-tolerant and improved seed varieties, and deploying drip irrigation for certain crops can directly reduce methane emissions from rice and indirectly reduce intensity of agricultural emissions (CO2eq per ton of production) through better yield stability or increased yields. Finally, gravity irrigation is not feasible in all parts of the command area, and farmers resort to pumping water from rivers and canals using diesel engines to irrigate their rice fields. In fact, even farmers who primarily rely on gravity irrigation may resort to pumping groundwater or surface water from ponds during the dry season or dry days in the rainy season. Shifting to solar irrigation would help reduce costs in the long run and reduce energy emissions associated with agriculture.

Table 6.50: GHG emissions and scenarios (BAU, NDC)

Sector	A. BAU 2016[56], MtCO2eq (% of total)	B. 2016 GHG inventory[57], MtCO2eq (% of total)	C. BAU scenario 2030[58], MtCO2eq (% of total)	D. NDC scenario 2030[59], MtCO2eq (% of total)	E. BAU scenario 2050[60], MtCO2eq (% of total)
FOLU	76.3 (60.94%)	131.01 (80.08%)	76.3 (49.2%)	38.2 (42.21%)	21.2 (13.59%)
Agriculture	21.1 (16.93%)	18.39 (11.25%)	27.1 (17.5%)	20.9 (23.09%)	34.9 (22.37%)
Energy	15.1 (12.06%)	9.60 (5.87%)	34.4 (22.19%)	20.7 (22.87%)	82.7 (53.0%)
Waste	2.7 (2.16%)	2.76 (1.69%)	3.3 (2.13%)	2.7 (2.98%)	6.5 (4.17%)
IPPU	9.9 (7.91%)	1.82 (1.11%)	13.9 (8.97%)	8.0 (8.84%)	10.7 (6.86%)
Total	125.2	163.59	155.0	90.5	156.0

FOLU = Forestry and Other Land Uses, IPPU = Industrial Processes and Product Use, BAU = Business-as-usual, GHG = Green House Gas, NDC = Nationally Determined Contribution.

6.8 CAPACITY, EXPERIENCE OF THE IMPLEMENTING AGENCIES AND NEEDS

6.8.1 MOWRAM/ PMU and PDWRAM

[56] Cambodia, First NDC (Updated submission), Dec 2020

[57] Cambodia, First Biennial Update Report, August 2020 & NCSD, MOE

[58] Cambodia, First NDC (Updated submission), Dec 2020

[59] Cambodia, First NDC (Updated submission), Dec 2020. FOLU has 3 NDC scenarios, and the numbers presented here correspond to scenario 2: reduction of 50% of historical emissions by 2030 (REDD+ programme).

[60] Cambodia, National Inventory Report (NIR), November 2020.

The institutional assessment report by PPIC and WAPCOS (December 2022) highlighted that the weak and insufficient human resource capacity at all levels of irrigation management is a key factor slowing rural development in Cambodia. There is a clear need for adequately trained professionals in water resources and irrigation management, which can be addressed through education, training, and workshops.

According to the institutional assessment of the Water Resources Management Sector Development Program (WRMSDP), training for MOWRAM and PDWRAM personnel at both central and provincial levels involved in the CAISAR project is necessary. This includes officers engaged in the project, along with the need for Training of Trainers (TOT) for FWUCs. It is recommended that the training plan for the CAISAR project cover all six (6) irrigation schemes and include both CAISAR PMU and PDWRAM staff. Key training topics should include: 1) Project Orientation and Plan Presentation, 2) FWUC Formation and Strengthening, 3) Gender Awareness and Action Plan, 4) Data Management for Hydro and Meteorological Data and O&M for Equipment, 5) Environmental Awareness, 6) Construction Management and Supervision, and 7) On-Farm Water Management and O&M.

6.8.2 FWUC/FWUG/FWUSG

To ensure trainees understand and apply the training effectively, sufficient time should be allocated for each topic. FWUC management training programs should focus on strengthening capacity in key areas, including a) Basic administrative management, b) Accounting and finance, c) Conflict resolution, d) Operation and maintenance of irrigation facilities, and e) Collection of irrigation service fees.

Regular meetings between FWUCs are recommended to facilitate knowledge exchange and reduce conflicts within the same irrigation scheme or reservoir. Since each FWUC faces unique geographical and socio-economic conditions, training materials should be simplified using language familiar to local communities.

A well-structured FWUC Organizing Framework within MOWRAM/PDWRAM should align with the Water Distribution Schedule and be agreed upon by the FWUC, ensuring it is communicated to all farmer-water users in the scheme. The project will construct secondary and tertiary canals up to the tertiary gates and assist FWUCs in collecting irrigation service fees (ISF).

The institutional assessment report recommends providing technical and financial support to FWUCs managing the Ou Tapoang, Lum Hach, and Kraing Pomley schemes to ensure effective and sustainable O&M. As per the consultation with stakeholders, water fee needs to be discussed and properly considered within the management plan of the FWUCs.

For consistent and effective E&S training, especially under the new IFAD SECAP (2021) and GCF ESS (2022), qualified national consultants should deliver the training. In addition to refresher training on safeguards like waste management and pesticide use, there should be a focus on improving contractor performance, particularly in ensuring adequate health and safety services for workers and local communities.

6.8.3 Training and Technical Assistance

Training and capacity building on IFAD SECAP/GCF ESS should focus on proportionality, adaptive management, and implementing safeguards related to: (i) contractor management and labor issues, (ii) community health and safety, (iii) environmental health and safety, and (iv) systematic stakeholder engagement. These E&S risk management training programs will enhance inter-agency coordination, critical for climate change adaptation. Qualified national consultants will provide support and on-the-job training for assessing and managing risks during project preparation and implementation.

During project implementation, E&S training and technical assistance will be provided at both the project and subproject levels. In the first three (3) years, the CPMU will hold at least two (2) safeguard training workshops per year (one (1) on environment, one (1) on social) for subproject owners on ESCMF and safeguard document preparation. An IFAD SECAP Specialist will participate when possible. Specific safeguard technical training will be held annually, covering:

1. ESCMF processes for preparing and supervising E&S instruments.
2. Training on IP Plans, SEP, labor management, and GRM pathways for local complaints.
3. Supervision and monitoring of contractor performance, health and safety, SEA Codes of Conduct, and communicable diseases.
4. IPM and safe use/disposal of pesticides and chemicals.
5. Waste management, including hazardous waste.
6. PPE use and best practices for construction and pesticide application.

6.8.4 Technical Assistance on E&S Capacity Building

Given the specific E&S training needs and limited capacity of some agencies regarding the latest AIIB, IFAD SECAP and GCF ESS, the CPMU may mobilize a qualified national firm to provide E&S training, supervision, monitoring, and reporting on ESCMF implementation and SECAP/ESS compliance for IFAD and GCF. If needed, an Independent Monitoring Agency (IMA) will be engaged to monitor IP Plan implementation, voluntary land donation (if applicable), and other E&S activities. PPMUs may also hire E&S consultants to support ESCMF implementation, document preparation, and mitigation measures for their subprojects.

MoWRAM has extensive experience applying the Bank's ESF and ADB's safeguards policy from similar past projects, maintaining a strong track record for safeguards compliance. The ministry continues to develop the capacity of its Environmental and Social Office (ESO), which has staff with expertise in engineering, community development, environment, social issues, and public administration. Many of the seven (7) ESO staff (four (4) of whom are female) have been trained by the World Bank in E&S management for rural development. Additional technical support, including national consultants, will be required to assist ESO in E&S implementation during the WASAC project.

6.8.5 Review Of MOWRAM/PMUS Capacity in Prevention of SEA/SH Risks

MoWRAM PMUs have experience in identifying and managing SEA/SH risks based on lessons learned from previous projects. For this project, a framework for addressing SEA/SH risks has been proposed and integrated into the Labor Management Procedures. Each PMU will appoint a social officer and a GRM officer to monitor and report SEA/SH risks, and a gender focal point will provide on-the-job training to contractors.

Early in the project, MoWRAM PMUs will recruit E&S consultants, including a SEA/SH specialist to deliver training to PMU members and relevant MoWRAM staff. SEA/SH risks will be updated based on local conditions, and preventive actions will be incorporated into ESCMPs and contractor responsibilities. A budget will be allocated to ensure contractors can hire SEA/SH consultants to raise public awareness and manage SEA/SH risks among workers.

Land acquisition and voluntary donation training will be provided by the E&S Consultant, starting as soon as specialized staff are engaged. Additional E&S support will be required monthly or bimonthly during construction, and quarterly or biannually during maintenance, depending on project needs.

The training will be face-to-face or virtual options as per condition allow. These sessions will include knowledge sharing, discussions, role plays, and quizzes, with Q&A at the end of each day. The duration of the training will vary based on the topics, participant numbers, and time availability, typically ranging from one (1) to three (3) days. MoWRAM will engage qualified trainers and may request support from AIIB and IFAD for new topics, including training materials and facilitation, to ensure practical, hands-on experience at the early stages of project implementation.

CHAPTER 7 – ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

7.1 INTRODUCTION

This chapter identify, and assess the nature, scope and scale of the environmental and social risks and impacts which are potentially associated with the proposed project, particularly with activities under Component 1 (intentified crop production and rehabilication of farm road) and Component 2 (rehabilitation of canal for water use efficiency). Activities under Component 1 and Component 2 are inter-related – in the sense that the results obtained under Component 2 (which focuses more on irrigation infrastructure) is desgined to facilitate the achievement of results expected under Component 1 (which introduces and facilitates farmers's uptake of climate-smart agricutlural practices to improve income, livelihoods, and enhance their resilience to climate change impact.

The risks and impacts identified, and assessed, in this chapter cover the direct, indirect, and cumulative impacts that would arise under the six (6) sub-schemes, to varying extent, during project design, implementation, and operations. In risk assessment, assessment of risks in this chapter are rated on the basis of no consideration of mitigation measures that are in place.

7.2 APPROACH TO ASSESMENT OF RISK AND IMPACTS

7.2.1 Identification and Assessment of Risks and Impacts

The assessment of environmental and social risks and impacts involves three (3) steps: identification, analysis, and assessment. Assessment of risks and impacts involves evaluating the nature, scope and scale, duration of project activities, potential impact receptors, and the magniture of impact – indicative of direct, indirect, or cumulative effects from proposed project activites.

The following factors are considered when assessing the risks and potential impacts:

- Impacts characterization (negative, positive, mixed);
- Impacts nature and duration (direct, secondary, indirect, cumulative; short-term, long term, permanent, reversible);
- Impact significance/magnitude (negligible, minor, moderate, major);
- Impacts likelihood (unlikely, possible, very likely);
- Spatial scale (national, regional, local);

- Measures to mitigate (adverse) or enhance (positive) impacts;
- Significance/magnitude of residual impacts (negligible, minor, moderate, major); and
- Where relevant receptor sensitivity/vulnerability (negligible, low, medium, high).

7.2.2 Project Activities

As per the description in Chapter 02, the project involves the construction of a number of structures aimed at enhancing agricultural productivity and flood control. River dredging and rehabilitation improve water flow and reduce siltation, while canal rehabilitation, expansion, and upgrades (both main and tertiary) facilitate better irrigation for farming. Dam upgrades and rehabilitation strengthen water storage and management capabilities. The installation or upgrading of hydraulic structures such as cross-check structures and head regulators ensures controlled water distribution. River training and drainage system construction help mitigate flooding, while the polder system provides land protection from floods by controlling water levels. Solar pumping system installation promotes sustainable water access, particularly in remote areas, and the construction of feeder canals and ponds further supports water availability for agriculture and community use, enhancing overall water management systems. Summary of the construction works in the six (6) sub-schemes are provided in Table 7.1 below:

Table 7.1: Key project activities potentially causing environmental & social risks & impacts – during project implementation & operations

No.	Key Project Activities	Descriptions	Sub-Schemes (06)					
			Ou Ta Paong	Lum Hach	Brambei Mom	Krapeu Truom	Yutasas	Stung Krang Bat
	COMPONENT 1	**Improving farm-level climate adaptation, resilience, and water use efficiency**						
1	Planning	Preparation of community-based action plans (AP) to transform agriculture with Climate Resilience (CR) practices.	√	√	√	√	√	√
2	Training	Preparation of training materials to support implementation of the Action Plan.	√	√	√	√	√	√
		Conduct trainings to create a pool of expertise to demonstrate and propagate the CR technologies and practices.	√	√	√	√	√	√
		Train farmers on applying CR technologies using the FFS approach.	√	√	√	√	√	√
3	Mechanization	Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery.	√	√	√	√	√	√
4	Farm road	Improve 50 Kilometers of farm roads	√	√	√	√	√	√
	COMPONENT 2	Irrigation Infrastructure for increased resilience						
1	River dredging or rehabilitation	The activities will involve the excavation of existing river/stream which have become shallow or too small to store water or limit the water flow regime.	√	√				√
2	Canal rehabilitation / minor expansion canals	These activities will include the widening, deepening, or structural improvement of both main and tertiary canals to enhance their capacity for water conveyance, ensuring efficient irrigation and water distribution to agricultural fields.	√	√	√	√	√	√
4	Installing small–scaled structure (e.g. cross structure, head regulator)	This includes the construction or enhancement of hydraulic control structures that regulate water flow, ensuring proper water distribution across irrigation systems and improving the overall efficiency of water management.	√	√	√	√	√	√

No.	Key Project Activities	Descriptions	Sub-Schemes (06)					
			Ou Ta Paong	Lum Hach	Brambei Mom	Krapeu Truom	Yutasas	Stung Krang Bat
4	River training	These activities will focus on reshaping river channels and constructing drainage systems to manage water flow effectively, reduce the risk of flooding, and protect agricultural lands and surrounding communities.	√					
5	Polder system construction	This will involve creating an embanked area to prevent flooding by controlling water levels, typically through the construction of levees or dikes, enabling the reclaimed land to be used for agriculture or habitation.						√
6	Solar pumping system installation	These activities will involve the installation of solar-powered water pumps, providing a sustainable and energy-efficient means of extracting water from rivers, canals, or groundwater sources for irrigation and community use.	√	√	√	√	√	√
7	Construction of feeder canals	This includes the development of smaller, subsidiary canals designed to distribute water from main canals to agricultural fields, improving the reach and efficiency of irrigation systems.	√					
8	Pond construction/ rehabilitation	This will involve the excavation or repair of ponds to increase water storage capacity, providing reliable water sources for irrigation, livestock, and community use, especially during dry seasons.		√				

AP = Action Plan, CR = Climate Resilience, FFS = Farmer field school.

7.3 ASSESSMENT OF ENVIRONMENTAL AND CLIMATE RISKS AND IMPACTS

In this section, the E&S risks and impacts (that potentially arise during activity implementation and operationalization) are identified, analysed, and evaluated at project level — with regards to the nature, scope, scale, and the potential extent of activity impacts — through classification of such risks and impacts as direct, indirect, and cumulative. The assessment of E&S risks and impacts in this chapter is based on the following grounds that is fundamental to proposing measures to avoid, minimize, and mitigate for the impacts in the next chapter:

Project's original technical reports

- Feasibility Studies (August 2023)
- Feasibility Studies (updated by November 2023).
- Additional Pre–Feasibility for Ou Ta Pong Sub–scheme.
- Environmental and Social Management Framework – ESMF (Updated by October 2023)
- IBAT reports for project locations (Ou Ta Pong, Lum Hach and Stung Krang Ponley Irrigation Schemes)

Stakeholder Consultations (national, provincial, district, commune, and village levels)

- Community Meetings
- Focus Group Discussions
- Key Information Interview.

Field observation, using

- Transect walks.
- Drones (for E&S screening and biodiversity assessment)
- For detail information on Biodiversity Assessment, please refer to Biodiversity Impact Assessment Report

External technical reports

- Statistical reports/database.
- Publications and Technical Reports from national and internation institutions.

The description on the assessment as per each aspect is provided in the following section:

The assessment was conducted vis-a-vis the environmental and social risks and impacts that were initially identified for each of the six sub-schemes. The assessment, in particular, focuses on the direct, indirect, and cumulative effects of identified E&S risks and impacts. As a result, this process considered relevant threats to biodiversity and ecosystem services due to a) project activities, and b) activities of relevant projects that constitute the cumulative impact on the identified species, including habitat loss, interference with migratory routes or wildlife movement, degradation and fragmentation, invasive alien species, overexploitation,

hydrological changes, nutrient loading, and pollution (61). It also accounted for the diverse values attached to biodiversity and ecosystem services upon which affected communities' livelihoods depend.

The six sub-schemes are located to upstream of the Tonle Sap Lake, constituting the Tonle Sap Floodplain which is a complex ecosystem. This ecosystem and its ecosystem services are characterized with unique hydrology, rich biodiversity, vital livelihood support, and irrigated agricultural production which are located upstream of the Tonle Sap. Given the link between the project's command area and ecosystems located downstream of these sub-schemes, this assessment also evaluate the significance of the risks and impacts due to project activities. This assessment would focus more on areas immediately located outside the command area and to downstream.

Based on the potential risks and impacts, an adaptive management approach is proposed. Under this project, due to a lack of reliable information to confirm the extent and severity of potential impact – over a time dimension, mitigation and management measures proposed would be responsive – based on the changing conditions that were known based on monitoring results conducted periodically throughout the project cycles. Where necessary, adjustments can be made to mitigation and management measures. This iterative process aims to ensure the project follows the hierarchy of mitigation that avoids impacts. Where avoidance is not possible, adverse effects on the ecosystem and local communities will be minimized.

7.3.1 Risks and Impacts at Preparation and Construction Stage

7.3.1.1 UNEXPLODED ORDNANCES (UXO)

Construction and rehabilitation activities, particularly those involving earthworks, soil excavation, and river dredging, pose a significant risk of unexploded ordnance (UXO). Despite past demining efforts and clearance of the UXO existence in some sub-scheme as per the report in the Baseline, mortar shells, aerial bombs, and other UXO may still be present within the subproject area. This risk is particularly high in areas where deep excavation is required for structural upgrades or dredging.

The potential detonation of UXO poses a substantial threat to residents, construction workers, animals, and any other entities located near the construction sites. The risk of encountering UXO is considered **moderate** due to the country's long history of civil war and the limitations of past demining operations, which are often focused on surface-level clearance. While consultations with local authorities and communities on the incidents and presence of UXO were reported in Ou Ta Paong, Lum Hach, and Yutasas sub-schemes, the case should be put on alert.

- **Mitigation Measures**

- Carry out UXO screening/assessment by certified UXO experts before any physical/ construction activities are allowed.
- In case UXOs are found by certified experts during on-site screening, removal of UXO will be carried out by certified experts.

(61). World Bank Performance Standards (OP 4.03), 20220. Environmental and Social Review Summary (ESRS Concept Stage)

- A UXO clearance certificate shall be obtained from related authority for each sub-project prior to commencing any subproject activities.
- As part of site-specific ESCMP, conduct training and awareness activities for local community with regards to UXO risks and chance finds.

7.3.1.2 ENVIRONMENTAL, HEALTH, AND SAFETY

❖ **Noise and Vibration**

During construction phase, noise and vibration will be generated where machineries such as excavator, bulldozer, cement concrete mixing, and trucks are operated. While noise will be a nuisance to construction workers and nearby residents, these impacts are anticipated to local and intermittent during mostly during daytime. During night–time, noise may be occasionally generated from workers' camps due to living activities and occasional maintenance of machinery and equipment. These impacts are expected to have no or minimal impact on local residents as workers' camps will be located near construction site and far away from residential area. The construction of small-scale hydraulic structures is mostly located in the cultivation area and as such far away from residential areas (except for Ou Ta Paong and Lum Hach where some hydraulic structures are located near areas with limited residence. However, people who live along the national road (e.g. in Stung Krang Ponley) and small roads that project's trucks use to carry project's equipment and materials, may experience occasional traffic noise during daytime. Given the nature and scope of physical works under the six schemes, impact of noise on local residents is expected to be none to minor, and temporary.

▪ **Mitigation Measures**

- Before commencing the irrigation system restoration, the Ministry is requested to organize public forums in collaboration with the commune to gather feedback from the local population, especially from residents who may be affected by the project. Moreover, training sessions for the commune help them understand the project's processes, including the size of the infrastructure systems and the standards for excavation and construction. This will ensure that the commune is well-informed about the project
- Right before the construction, conduct noise testing at the sensitive locations as per the detail engineering design comparing to the national and IFC EHS Guideline
- Locate the workers' camp far away from the residential area as much as possible
- Avoid night-time construction in populated/village areas.
- Minimize project transportation through community areas where possible.
- Ensure proper maintenance and proper operation of construction machinery to minimize noise generation.
- No construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and during religious or cultural events near the subproject
- All construction equipment and vehicles must be well maintained, regularly inspected for noise emissions

- Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located (houses, schools, temples, hospitals, etc.
- Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.

❖ **Air pollution**

During construction phase, a number of project activities may cause air pollution. These include physical activities such as movement of trucks (for transportation of materials), clearing & grubbing, grading, excavation, leveling, truck hauling, stockpiling, disposal of solid waste, dredging which may generate dust and particulate matter (PM10 and PM2.5) (if water spraying does not apply). Exhaust emissions from trucks and heavy machinery will release nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO2), and volatile organic compounds (VOCs) which may contribute to smog formation and greenhouse effect. Burning of waste (by contractors) may release harmful pollutants into the air. While air pollution due to dust, particulate matter, and exhaust emissions from trucks and engines, are anticipated, location where pollution is generated vary and impact for one (1) location is temporary, intermittent, and minor, and are particularly for residents who live along the project's roads.

▪ **Mitigation Measures**

- Avoid burning solid waste or construction waste
- Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition
- Conduct proper maintenance of machineries and equipment
- Place sitting concrete mixing plants, crushing plants, quarries and other facilities far from settlement and other sensitive receptors
- Use cover for vehicles that transport all construction materials such as cements and excavated soils
- Test air quality (NO2, SO2, CO, TSP, PM10, PM2.5) prior and during the construction to assess the level of impact

❖ **Impact on Water**

Water pollution is anticipated, primarily due to physical activities that involves dredging and excavation near or in water course/ source. Such activities do not only cause turbulence for water but also cause increased sedimentation. Disturbed soil – caused by excavation to improve irrigation canal, for instance, may contaminate water at places where water is collected for domestic purpose (e.g. along Ou Ta Paong river which serves as the main canal). sources. The impact is anticipated particularly for planned dredging operation at the upper part of Ou Ta Paong canal. However, water pollution would be minimized through construction methods and time. For example, dredging operation of Ou Ta Paong river could be concentrated during dry season when water on Ou Ta Paong and other canals are minimal, and some Ou Ta Paong river sections are completely dry.

Wastewater (released from workers' camps) and leaks of hazardous materials (e.g., oil, diesel, chemical) could make their way into nearby water bodies and during rainy season which cause water contamination and leave varying level impacts on the receptors. The main receptors

vulnerable to water pollution during construction include nearby residents and construction workers. Due to the scope and scale of physical works anticipated for each of the six schemes, project impact due to water pollution is anticipated to be minor and localized.

- **Surface Water:** During the construction phase, sedimentation due to excavation, dredging, and earthworks is a primary cause of water quality degradation. Loose soil can be washed into nearby water bodies, increasing turbidity, reducing light penetration, and altering the aquatic habitat. Additionally, the use of machinery and equipment introduces risks of oil spills, fuel leaks, and chemical contamination, which can enter water sources through surface runoff, affecting aquatic life and water usability downstream.
- **Groundwater:** Construction activities, such as drilling and excavation, can disrupt the soil and rock layers, potentially allowing contaminants from surface activities, such as chemicals, to infiltrate groundwater. Chemical spills or leaching from construction materials can further degrade groundwater quality. Additionally, the disruption of natural flow patterns in the subsurface may allow pollutants to spread more easily, threatening water quality over a wide area.

▪ **Mitigation Measures:**

- Implement a waste management plan to ensure the proper disposal of all construction waste, including wastewater
- Use environmentally friendly construction materials and techniques to reduce the amount of pollutants that are released into the environment
- Install erosion and sediment control measures, such as silt fences, sediment basins, and check dams
- Properly manage construction chemicals, fuels, and waste to prevent water pollution.
- Regularly inspect and maintain construction equipment to prevent leaks and spills.
- Wash construction vehicles and machinery only in designated areas where runoff will not pollute natural surface water bodies.
- Train construction workers on the importance of preventing water pollution.
- Construct of retaining structures.
- Test surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform)

❖ **Solid and Hazardous Waste**

During project implementation, solid wastes – both non–hazardous and hazardous, are anticipated to be generated, primarily due to rehabilitation of irrigation canals and rural roads. In particular, solid waste could be generated from operations that involved site clearing, excavation, trenching, demolition of existing cement and earthworks structures, construction and disassembly of worker camps, maintenance of machineries, and so forth. Regarding dredged and excavated material, the construction activities can lead to surface erosion and sedimentation, particularly in water bodies. However, the estimates for the amount of dredged or excavated material per scheme do not estimate amounts for reuse or disposal. Improper handling of solid waste generated from the above operation may result environmental pollution

that may include soil and water contamination, habitat disruption, visual pollution and give rise to concerns of public health.

- **Mitigation Measures**

- All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering.
- The Contractor will be required to train the workers in proper waste management.
- Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum).
- Non-hazardous, non-recyclable solid waste will be temporarily deposited and managed together at existing landfill/dumpsite.
- Safe temporary storage of hazardous waste as required.
- Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations.
- Vehicles, machinery, and equipment maintenance and re-fueling will be carried out in such a way that spilled materials do not seep into the soil.
- Oil traps will be provided for service areas and parking areas.
- Fuel storage and refilling areas will be located at least 50m from canals and channels and will be protected by temporary drainage bunds to contain spills.
- Use or reuse the dredge material on properties with a residential or recreational use (dredging material, if planned for reuse, will be subject to testing to ensure the material is safe for reuse).

❖ **Wastewater**

During construction phase, generation of wastewater is expected, mainly from a) workers' camp (e.g. domestic wastewater), b) cleaning and washing of machinery, c) treatment of leakage and spill, etc. Depending how wastewater is managed, receptors of wastewater may include immediate receiving environment which may include soil, water bodies which may subsequently affect human including construction workers, residents nearby, and fauna and flora along the way wastewater goes.

- **Mitigation Measures**

- Reduce, recycle, and reuse waste [e.g. plastic waste, electronic waste, agricultural waste (natural, animal faces for later use as manure, plant waste)] wherever and whenever possible.
- Latrines must be built at construction sites and camp sites for appropriate domestic waste management.
- Hazardous waste, including any spills of chemicals or fuels, should be collected separately and disposed of following environmental regulations.
- Ensure construction sites have enough well-maintained sanitation facilities to prevent the direct discharge of untreated wastewater.
- Promote clean living practices, reduce plastic usage, and improve waste management.

- The construction company must regularly monitor the workers' living conditions, waste management, and ensure there are proper sanitation facilities and adequate housing for the workers.
- The company provides education and guidance on maintaining cleanliness and hygiene for the workers (such as proper waste disposal and handling of oil) and prohibits activities like fish poaching and hunting.

7.3.1.3 OCCUPATIONAL HEALTH AND SAFETY

❖ **Physical Hazards**

The construction or rehabilitation of irrigation canals and farm roads during the construction phase of the project presents significant physical hazards to workers and those in close proximity to the construction sites. These hazards can result in a range of consequences, from minor injuries requiring medical attention to severe and potentially fatal accidents. The sources highlight several specific types of physical hazards, including Falls from Heights, Drowning and Water-Related Injuries, Falling Objects, Falls into Open Holes, and Injuries from Heavy Equipment.

The impact receptors for physical hazards are primarily construction workers, but also include inspectors, visitors, and nearby residents and children, as well as domestic animals. The sources assess the risk of physical hazards as high, acknowledging that working in the construction field can result in injuries or fatalities if safety standards are not met. The sources emphasize that unsafe practices by construction companies can lead to accidents, injuries, illnesses, and fatalities. While the overall risk might be lower due to the anticipated number of workers involved, stakeholders at the community, district, and provincial levels have expressed concerns about the potential hazards posed to both workers and community members.

▪ **Mitigation Measures**

- Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines.
- Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements.
- Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks.
- Install appropriate fencing and control access to the site.
- Install appropriate safety signage and markings.
- Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m.
- Ensure there are safe ways to enter and exit the excavation.
- Provide safety precautions when using high voltage electric power tools.
- Carry out daily toolbox meetings (safety briefings).
- Maintain an accident record book where all major or minor accidents and incidents are recorded with actions taken.
- Educate the workers on construction hazards.
- Train drivers in safe driving skills and traffic regulations.
- Appoint an Environment, Health and Safety Officer who is a qualified engineer.

- Make adequate first aid equipment available on site.
- Carry out training and awareness of the workers on HIV-AIDS prevention.
- implement emergency preparedness and response procedures Response Plan as planned in the CEMP.
- Ensure that all workers are equipped with and use Personal Protective Equipment (PPE).
- The Contractor will set out an Emergency Response Plan

❖ **Heat Stress**

The construction phase of the project, which includes rehabilitating irrigation canals and ponds, presents potential risks of heat stress to workers. This is particularly concerning given Cambodia's tropical climate, characterized by high temperatures and humidity. Construction activities are often physically demanding and performed outdoors, increasing the risk of heat-related illnesses.

Construction workers exposed to prolonged high temperatures and humidity may experience heat stress, potentially leading to heat exhaustion or heat stroke. This can result in reduced productivity, increased accidents, and even fatalities. Heat stress can also exacerbate existing health conditions. The project's Environmental and Social Management Framework (ESCMF) highlights the importance of considering temperature extremes during the construction phase, emphasizing the need for mitigation measures to ensure worker health and productivity.

▪ **Mitigation Measures**

- Providing regular breaks and shaded rest areas for workers to cool down and rehydrate.
- Ensuring access to cool drinking water throughout the workday.
- Adjusting work schedules to avoid the hottest hours of the day, if feasible.
- Providing training to workers and supervisors on recognizing the signs and symptoms of heat stress and appropriate first aid measures.
- Encouraging the use of personal protective equipment, such as light-colored, loose-fitting clothing and wide-brimmed hats, to minimize heat absorption.
- Monitoring weather conditions and adjusting work practices accordingly.
- Developing and implementing an emergency response plan for heat-related illnesses.
- Providing adequate ventilation and cooling systems in worker accommodations.
- Encouraging workers to maintain good physical fitness and hydration levels.
- Regularly monitoring workers for signs of heat stress and taking appropriate action.

7.3.1.4 COMMUNITY HEALTH AND SAFETY

The construction phase, the project will rehabilitate existing irrigation canals and build new irrigation channels in an estimated six schemes located in four provinces. Construction activities may disrupt local transportation networks and increase traffic volume, including heavy trucks and machinery, impacting communities and businesses along transportation routes. Construction sites pose health and safety risks to workers and nearby communities. Accidents and exposure to construction-related hazards can have serious consequences. The influx of construction workers from different regions may increase the risk of spreading communicable diseases such as HIV/AIDS to the local community.

Open canals and ponds during rehabilitation work pose a risk of drowning, particularly to children and individuals unfamiliar with the area. Construction activities may increase the depth or alter the flow of water, further increasing the risk. Construction sites can attract curious individuals, particularly children, who may be unaware of the potential hazards. This includes the risk of falls, being struck by moving machinery or vehicles, and contact with hazardous materials. It is important to secure construction areas, implement safety awareness campaigns, and enforce hygiene and sanitation standards at construction camps.

- **Mitigation Measures**

- Prior to start of construction work, the contractor in cooperation with the PIU will consult with the local authorities and potentially affected residents/private landowner. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM).
- The contractor shall fence off the construction area and control access to the site.
- A speed limit of 30 km/h for construction related traffic through inhabited areas.
- The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities.
- The contractor in cooperation with the local authorities shall implement traffic management to ensure a smooth traffic and prevent congestion.

7.3.1.5 BIODIVERSITY

- **Impact Assessment Results**

The result of the impact assessment on biodiversity are presented here where a number of the results can be also applied within the project operation phase as well. The results are the finding from the biodiversity assessment covering step 4 on Potential Impacts & Feasibility of Net Gain Requirements.

Ou Ta Paong

- Potential Impacts & Feasibility of Net Gain Requirements

The species that are assessed as “Present” or “Possible” in sub-scheme AoI are included in the impact assessment. These include the following 8 species: 1) Four reptiles (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, Elongated Tortoise), 2) Three birds (Greater Adjutant, Milky Stork, and Bengal Florican), and 3) One fish (Siamese Tiger Perch).

- Potential impacts

Reptiles (Substantial risk)

All four species of reptiles are found in the upper and lower part of the OTP command area, particularly in areas near natural water courses (rivers and streams). During construction, these reptiles are potentially affected directly due to a) disturbances from noise and vibration due to increased vehicle activity and human presence, b) being hit by vehicles, equipment from increased traffic movement and river dredging/training at Ou Ta Paong river, excavating of the extended canal of Kbal Hong and other relevant canals, c) caught by workers, local people, and hunters. During project operation, these reptiles may be directly affected, including a) being caught by local people and hunters, and b) pesticide residues from intensified crop production.

Birds (Moderate risk)

Greater Adjutant, Milky Stork, and Bengal Florican are found seasonally in the command area, mainly in the lower/downstream part which is subject to annual flooding. These birds are migratory and as such are rare. Local people don't catch these birds for food. However, since these birds feed on aquatic species available from the command area, they may be affected by the feeds that are contaminated with pesticide residues.

- Net gain assessment

Additionally, during construction activities, these birds may be indirectly affected through disturbance and habitat loss caused by increased human activity and changes in water levels. It is important to note that the Ou Tapaong Command Area serves as a critical habitat for these endangered bird species, making it crucial to minimize any potential negative impacts.

Based on the potential impacts identified above, it is evident that measures need to be implemented to achieve a net gain in biodiversity within the Ou Tapaong Command Area. These measures should focus on minimizing direct disturbances and habitat loss during construction activities, as well as implementing sustainable agricultural practices to prevent pesticide contamination of food sources for these bird species.

In conclusion, based on the assessment results, it is recommended that comprehensive actions be taken to protect critical habitats for species such as reptiles (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle Elongated Tortoise), birds (Greater Adjutant, Milky Stork, Bengal Florican), ensuring their survival alongside irrigation system renovation projects.

Lum Hach

The species that are assessed as "Present" or "Possible" in sub-scheme AoI are included in the impact assessment on one bird (Green Peafowl).

- Potential impacts on Green Peaflow (Substantial risk)

The Green Peafowl is found in three community forest areas located within the vicinity of Lum Hach command area. During construction, these species is potentially affected directly due to a) disturbances from noise and vibration due to increased vehicle activity and human presence, b) caught by workers, local people, and hunters.

- Net gain assessment

Based on the assessment conducted for the Lum Hach Irrigation Sub-scheme, it has been determined that there is a net loss of biodiversity and ecological value within its area of influence. The critical habitat analysis identified only one endangered species, the Green Peafowl, with a confirmed presence in the sub-scheme's area of influence. The ecological state of habitats within this area is classified as very open and highly susceptible to human disturbances, posing potential threats to the Green Peafowl population.

It is evident that despite efforts to balance agricultural needs with conservation, there are significant risks and impacts on biodiversity within this project. Therefore, measures must be taken to mitigate these risks and minimize further loss of ecological value in order to achieve a net gain for biodiversity in the long term. This may include prioritizing protection and restoration efforts for critical habitats such as Toul Samraong, Phnom Banon, and Chan Trak Community Forests within the sub-scheme's area of influence.

❖ **Habitat Loss and Fragmentation**

During the construction phase of the irrigation infrastructure project, habitat loss and fragmentation pose some risk to biodiversity. The primary activity contributing to this risk is the rehabilitation of irrigation canals and farm roads. This process often necessitates the clearance of bushes, forests, or vegetation along the areas designated for rehabilitation, leading to the direct removal of farm-level habitats. Additionally, activities like river dredging and rehabilitation, as well as the construction and upgrading of dams in specific schemes like Ou Ta Paong, Lum Hach, and Stung Krang Bat, can further contribute to habitat loss and fragmentation.

The construction of canals and roads, especially those that cut across community forestry like the one planned in Lum Hach, can lead to significant changes in wildlife habitats. The removal of vegetation for these projects directly results in habitat loss. Moreover, the construction of these linear features can create barriers for wildlife movement, leading to habitat fragmentation. This fragmentation isolates populations, making it difficult for species to migrate, find mates, and maintain healthy populations.

The impact receptors for habitat loss and fragmentation are primarily terrestrial species, especially those dependent on forests and wetlands. The Lum Hach command area as a location where the project might cause a significant change for wildlife due to the plan to construct the canal across community forestry through the existing road trail. The assessment of the impact of habitat loss varies depending on the specific location and scale of the activities.

In the Ou Ta Paong (OTP), the receptors include avian species such as the Greater Adjutant, Milky Stork, and Bengal Florican. Construction activities such as canal rehabilitation and farm road development, as well as land use changes and altered water management practices, may lead to habitat loss and fragmentation. These activities involve digging, dredging, or changing existing waterways and infrastructure. This can destroy habitats, make it harder for animals to find places to nest and eat, and mess up the natural flow of water, which can have an effect on life on land and in water.

For the case of Lum Hach, there will be the division of Toul Samroang community forestry where the irrigation will be broken the protected area into two parts, even if it is built on the existing road trial. The total protected land area that will be acquired was estimated at 36,182 m^2, giving the length of the main canal across the protected area at 1.49 km and the width the canal at 24.3 meters. However, the construction is along the existing road trail crossing the protected area rather than a fresh new forestry area. Regarding the biodiversity impact assessment report, it was found that the green peafowl was confirmed to be present within the Toul Samraong, Phnom Banon, and Chan Trak community forests. The consultation with the engineering team to avoid the construction of the canal confirmed that it is unavoidable due to the elevation inappropriateness if it is changed to any other location. In this regard, the project will move on with the construction of the canal. The consultation with committee members of the community forestry (Figure 7.1 & 7.2) indicated both positive and negative thoughts over the construction. At the positive side, the community expected that the water shortage could be solved giving adequate water for wildlife within the forestry and possibly brought in more vibrant environment for wildlife. On the other hand, construction has sparked a concern regarding the encroachment of community people into the protected area to grasp

the land for agricultural purpose since the community has limited capacity and resources to patrolling as well as the power to stop such kind of illegal activities.

Figure 7.1: Consultation with Toul Samroang community forestry



Figure 7.2: Visiting the forestry area and drone taking photo



- **Mitigation Measures**

- Minimize the negative impact from land clearing on habitat connectivity by minimizing fragmentation and maintaining canopy connectivity across cleared areas.
- Establishing and maintaining guard posts on access roads near residential and biodiversity priority areas.
- Implementing measures such as habitat restoration, creating wildlife corridors, and ensuring that water management practices are sustainable and supportive of biodiversity.
- Creation of fish passageways, wetland restoration, and reforestation of riparian areas to facilitate fish migration and provide suitable habitats for endangered species.
- Installing signage to restrict access and prohibit harmful activities.
- Reporting illegal activities to the appropriate authorities.
- Implementing and enforcing policies against poaching and illegal collection of wildlife by workers and subcontractors, with appropriate penalties.
- Implement erosion control measures to prevent sedimentation in water bodies and downstream impacts.
- Create corridors or buffer zones between fragmented forest.
- Rescuing and properly handling wildlife encountered during land clearing and construction, following SOPs.
- Identify and avoid sensitive areas, such as known habitat for Green Peafowl or other endangered species.
- Implement habitat management measures to improve the quality and suitability of habitats for species.
- Detailed impact mitigation measures are in the Biodiversity Action Plan attached as Annex 1 within the Biodiversity Assessment Report.

Hunting, trading, and consumption of wildlife

During the construction phase of the irrigation infrastructure project, the influx of a new labor force presents a significant risk to hunting, trading, and consumption of wildlife. The arrival of workers from other regions can increase the demand for exotic local foods, including wildlife and endangered species, which are often perceived as interesting delicacies or possessing health-promoting properties. The hunting may be done for relaxation or belief that wildlife is tasty or making people healthy. This heightened demand can drive illegal hunting and trading activities, posing a severe threat to biodiversity and the stability of local ecosystems.

The impact receptors of this risk are primarily aquatic and terrestrial species, particularly those already threatened or endangered. The potential impact on rare and endangered species, as their rarity often increases their market value, further incentivizing unsustainable hunting and trading practices that can lead to their extinction. Several sub-schemes and their surrounding areas are identified as particularly vulnerable:

- Ou Ta Paong: This sub-scheme and its surrounding area, particularly the lower section and adjacent Tonle Sap Zone 3, support diverse EN and CR species: reptiles (Black Marsh Turtle, Elongated Tortoise, Giant Asian Pond Turtle, Southeast Asian Box Turtle), mammals (Indochinese Silvered Langur, Long-tailed Macaque), fish (Siamese Tiger Perch, Striped Catfish), and birds (Greater Adjutant, Milky Stork, Bengal Florican).
- Lum Hach: Construction activities and worker presence pose substantial risks to the endangered Green Peafowl through direct disturbance, habitat degradation, and increased access for illegal hunting and trapping.
- Yutasas: Confirmed sightings of critically endangered Jullien's Golden Carp, Leaping Barb (Flying Minnow), and Mekong Giant Barb are at risk from habitat disturbance and increased illegal fishing.
- Stueng Krang Bat: Supports several EN and CR species of reptiles and fish that face habitat disturbance and increased access for illegal hunting and capture.

The consumption of wild animals also poses health risks to consumers due to the potential transmission of zoonotic diseases. Additionally, it can negatively impact local economies by depleting valuable fish stocks, which can have detrimental effects on communities that rely on these resources for their livelihoods.

The influx of workers, coupled with the potential availability of markets for wild animal products, creates a concerning situation that requires attention and mitigation measures to protect the region's biodiversity.

- **Mitigation Measures**

- Develop and enforce a strict Code of Conduct/ethics against wildlife collection, possession, and trafficking. This includes clear policies and sanctions for employees and subcontractors.
- Conduct thorough biodiversity inspections along access roads and at quarry sites before starting land clearing works to identify habitats or nesting sites of endangered/protected species.
- Provide mandatory training for contractors' management staff and site workers on the Code of Conduct, Standard Operating Procedures (SOP) for wildlife protection and handling, and human-wildlife conflict management.

- Incorporate a policy in the Project Administration Manual (PAM) and Worker's Agreement that prohibits employees and/or subcontractors from possessing, purchasing, trading, or collecting wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List.
- Minimize forest encroachment and wildlife poaching by developing and implementing a community-based management plan. This includes establishing guard posts, conducting surveillance, and installing signage.
- Undertake regular monitoring of all access roads to prevent poaching activities.
- Properly handle and rescue wildlife encountered during land clearing and construction, following the SOP for wildlife protection and handling.
- Establish a rapid response unit to address human-wildlife conflict effectively.
- Educate the community on local wildlife behavior, avoidance techniques, and deterrent methods.
- Report observed/recorded incidents of illegal activities to relevant authorities.
- Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species.
- Implement strict penalties for violating wildlife protection laws.
- Collaborate with local communities to monitor wildlife populations and report any suspicious activities.
- Report incidents of illegal activities to relevant authorities.
- Detailed impact mitigation measures are in the Biodiversity Action Plan attached as Annex 1 within the Biodiversity Assessment Report.

❖ **Loss of fauna and flora**

The primary activity contributing to this risk is the construction of canals and roads, particularly in areas that require clearing vegetation and disrupting natural habitats. This is especially concerning locations like the Lum Hach command area, where the project might involve building a canal across community forestry, potentially leading to substantial changes in the local wildlife. The construction activities can lead to both direct and indirect impacts on fauna and flora:

- Habitat loss and fragmentation due to construction activities like canal and farm road rehabilitation, land use changes, and altered water management practices can affect species survival and connectivity. These activities may involve dredging, excavation, or modification of existing water channels and infrastructure, leading to habitat destruction and disturbance to nesting and foraging sites.
- Habitat Loss and Fragmentation: Clearing vegetation for the main canal construction in the Toul Samroang community forestry within the Lum Hach scheme directly removes habitats, leading to habitat loss, the roughly estimated this impact at about 36,182 m^2. The construction of this linear feature also fragments remaining habitats, isolating populations and hindering their movement, ultimately reducing their chances of survival.

- Construction activities and increased worker presence can lead to forest encroachment, wildlife poaching, and tree cutting.
- Increased vehicle movement increases the chance of collisions with wildlife.

The impact receptors for the loss of fauna and flora are diverse and include various species, particularly those dependent on the Toul Samroang community forestry in the Lum Hach and wetlands areas along each sub-scheme. The biodiversity study has found endangered and critically endangered species in the area, including reptiles (Black Marsh Turtle, Elongated Tortoise, Giant Asian Pond Turtle, Southeast Asian Box Turtle), mammals (Indochinese Silvered Langur, Long-tailed Macaque), fish (Siamese Tiger Perch, Striped Catfish), and birds (Greater Adjutant, Milky Stork, Bengal Florican) in the Ou Ta Poang. The Yutasas has confirmed sightings of the critically endangered Jullien's Golden Carp, Leaping Barb (Flying Minnow), and Mekong Giant Barb. While the Stueng Krang Bat supports several EN and CR species: reptiles (Asian giant softshell turtle, Black Marsh Turtle, Southeast Asian Box Turtle) and fish (Striped catfish, Mekong Giant Barb, Siamese Tiger Perch). So, the construction of canal expansion and restoration will impact these species.

- **Mitigation Measures**

- Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction by relocating them to safer habitats, following the Standard Operating Procedure (SOP) for wildlife protection and handling.
- Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur.
- Train field workers to recognize and avoid wildlife.
- Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur.
- Develop a system in which drivers report locations of wildlife crossings and wildlife sightings.
- Workers will receive training on frequently encountered wildlife.
- The contractor shall install signs to ban hunting or catching wildlife in the area.
- Apply Find Chance Procedure
- Detailed impact mitigation measures are in the Biodiversity Action Plan attached as Annex 1 within the Biodiversity Assessment Report.

7.3.1.6 CLIMATE CHANGE

- **GHG emission**

The main activities that contribute to this risk is the use of heavy machinery and trucks for excavation, transportation, and rehabilitation of irrigation canals and farm roads. The operation of these machineries releases carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O)

into the atmosphere. Waste burning at worker campsites may also contribute to GHG emission.

- **Mitigation Measures**

- Construction vehicles and machinery will be maintained to a high standard to minimize emissions and ensure compliance with the National exhaust emission standards. All mobile equipment should be fitted with catalytic converters.
- Use energy-efficient machinery and equipment during construction to reduce fuel consumption and emissions.
- All open burning of construction and demolition of waste material and refuse will be prohibited.
- Implement proper maintenance programs for equipment and vehicles to ensure they operate efficiently and with lower emissions.
- Engage with local communities and stakeholders to raise awareness of emission reduction practices and encourage their participation in sustainability efforts.

7.3.2 Risks and Impacts at Operation Stage

7.3.2.1 ENVIRONMENTAL, HEALTH AND SAFETY ASPECT/ISSUE

❖ **Water Management**

During the operation phase of the irrigation infrastructure project, alterations to hydrology present potential risks. The main activity that causes these risks is increased irrigation. This can lead to the depletion of water sources if proper management practices are not implemented. The sources emphasize the importance of efficient irrigation practices to mitigate these risks.

The impact receptors for these risks include the Tonle Sap Lake, upstream watersheds, wetlands, aquatic ecosystems, and downstream communities. The assessment of the impact of hydrology changes during operation is moderate. This takes into consideration the potential for both positive and negative impacts of irrigation systems. Poor water management can result in downstream water scarcity, altered hydrology, and damage to aquatic ecosystems. However, well-designed and properly managed irrigation systems can contribute to improved agricultural productivity and water resource management.

- **Mitigation Measures**
- A water user community should be organized prior to construction to participate in identifying key locations and ensure there are caretakers in place.
- Establish detailed water management plans that ensure equitable water distribution and allocation, considering the needs of various users and the environmental flow requirements to maintain healthy aquatic ecosystems.
- Design and construct robust irrigation infrastructure, including canals, ponds, and storage areas, capable of withstanding extreme weather events like floods and droughts. This investment should also include lining canals and refurbishing storage areas to reduce water losses and improve water storage capacity.

- Integrate natural infrastructure, such as wetlands and forests, into water management strategies. Protect and restore degraded habitats to enhance their water regulation capabilities, improve water quality, and support biodiversity.
- Establish and provide training to FWUCs on sustainable water management practices, equitable water rights, and allocation procedures. These communities play a vital role in the operation and maintenance of the irrigation system, ensuring its long-term sustainability.

❖ **Water pollution**

During this phase, the primary activity that causes this risk is the intensification of agricultural production in the command areas as irrigation water becomes readily available. This intensification can lead to an increased use of chemicals, such as fertilizers and pesticides, to enhance crop yields. These chemicals infiltrate the soil and reach groundwater aquifers, leading to long-term contamination. The excessive application of these chemicals can result in contamination of both surface and groundwater resources. Furthermore, changes in water table levels due to extensive irrigation can alter the flow patterns of groundwater, potentially mobilizing contaminants that would otherwise remain contained. The impact receptors for water pollution include:

- Farmers
- Nearby residents who rely on water resources for domestic use
- Aquatic ecosystems within the command areas and downstream, including the Tonle Sap Lake

The assessment of the impact of water pollution during operation is moderate. The sources acknowledge the potential for significant water quality degradation due to the widespread use of chemical fertilizers and pesticides in rice production. High concentrations of these chemicals in water resources can harm biodiversity, not only within the command areas but also in the downstream river systems and the Tonle Sap Lake.

Mitigation Measures

- Implement Simplified Pesticide Management Plan
- Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing.
- Encourage farmers to adopt IPM techniques that minimize pesticide use and rely on biological control methods, thereby reducing the increased risk of chemical contamination of water resources.
- Provide training and extension services to farmers on the judicious use of fertilizers and, ensuring they apply the correct type and amount based on soil nutrient levels.
- Promote the adoption of organic fertilizers and soil amendments, such as cover crops and green manures, which can improve soil fertility and reduce the need for chemical fertilizers.
- Implement a robust water quality monitoring program to track the levels of pesticides, nitrates, and other pollutants in surface and groundwater resources within and around the command areas.

- Encourage the adoption of water-saving irrigation methods, such as alternate wetting and drying (AWD) in rice cultivation, which can reduce water consumption and minimize the leaching of agrochemicals.

❖ **Soil pollution**

During the operation phase of the irrigation infrastructure project, soil pollution/quality reduction poses a considerable risk. The primary activity contributing to this risk is the increased agricultural production facilitated by the improved irrigation infrastructure. This intensification can lead to the overuse of agri-chemicals, such as chemical pesticides and fertilizers, if farmers lack adequate training or support in adopting environmentally friendly practices. The excessive application of these chemicals can lead to various detrimental effects on soil health:

- Nutrient Depletion: Over-reliance on chemical fertilizers can disrupt the natural nutrient cycle in the soil, leading to nutrient imbalances and depletion of essential elements necessary for plant growth.
- Salinization: In areas where irrigation water is not properly managed, the accumulation of salts in the soil can occur, leading to soil salinization. This condition makes it difficult for crops to absorb water and nutrients, reducing productivity.
- Pollution from Chemical Residues: The persistent use of chemical pesticides can result in the accumulation of harmful residues in the soil. These residues can contaminate food crops, pose risks to human health, and disrupt the balance of soil microorganisms essential for soil fertility.
- In the lowland regions, soil erosion is prevalent, and rice yields decrease annually due to rising temperatures and water shortages.

The impact receptors for soil pollution/quality reduction are multifaceted, encompassing such as soil health, water quality, and biodiversity. The sources assess the impact of soil pollution/quality reduction during the operation phase as moderate. This assessment considers the potential for increased agricultural production to lead to the overuse of agri-chemicals if sustainable farming practices are not adopted.

As consultation result, the construction and project activities may cause water and air pollution, soil erosion, waste from workers and machinery, noise pollution, and impacts on residential and commercial lands. Wastewater and debris could enter conservation zones and multi-use areas (Tonle Sap), polluting water and affecting fish in the Tonle Sap area.

▪ **Mitigation Measures**

- Implement Simplified Pesticide Management Plan
- Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing

7.3.2.2 BIODIVERSITY

7.3.2.2.1 Biodiversity

❖ **Habitat loss and fragmentation**

During the operation phase of the irrigation infrastructure project, habitat loss and fragmentation are significant risks to biodiversity. The primary activity that drives this risk is the intensification of farming made possible by the increased availability of irrigation water. This often leads to the conversion of land for agricultural purposes. Flooded forests and wetlands, or Zone 3 in Ou Ta Paong sub-scheme, which provide crucial habitats for various species, may be deforested, drained or filled to create more arable land. This conversion process directly results in the loss of habitat for species that depend on these ecosystems. This would be the same for the case of community forestry land within Lum Hach sub-scheme.

The impact receptors for habitat loss and fragmentation are aquatic and terrestrial species, particularly those that rely on flooded forests and wetlands for their survival. The sources specifically mention the potential for habitat conversion to extend beyond the local level and impact on the region, particularly with the possible expansion of agricultural land into protected areas. In Ou Ta Paong, a mix of paddy fields, rivers, and shrubland provides foraging habitat for avian species such as the Greater Adjutant, Milky Stork, and Bengal Florican. In Lum Hach, community forests are crucial for the conservation of the Green Peafowl.

The assessment of the impact of habitat loss and fragmentation during the operation phase is considered **moderate**. There is also concern that the increased accessibility to water for irrigation provided by the new infrastructure could encourage further encroachment into the protected areas, potentially leading to more extensive habitat loss in the long term.

Consultation results mentioned that the project improves fish habitats, allowing aquatic species to migrate and increasing fish production due to larger waterways. Residents benefit from higher fish catches, reduced costs, expanded agricultural production, and livestock farming. The project also helps clean the environment by reducing unauthorized constructions and indiscriminate waste dumping by the community.

- **Mitigation Measures**

- Identify and protect critical habitats, such as flooded forests and wetlands, ensuring their preservation against conversion for agricultural land.
- Implement measures to restore degraded habitats and improve their suitability for biodiversity.
- Promote sustainable agricultural practices to minimize negative impacts on biodiversity and water quality. This can include encouraging practices that reduce the need for land conversion.
- Implement sustainable water management practices to ensure adequate water availability for both human needs and ecological functions, avoiding excessive water extraction that could harm wetland habitats.
- Involve local communities in decision-making, monitoring, and conservation efforts to build ownership and support for protecting natural habitats.
- Promote sustainable livelihoods that are compatible with biodiversity conservation, offering alternatives to activities that lead to habitat loss.
- Establish a long-term monitoring program to track changes in habitat quality, species populations, and the effectiveness of mitigation measures.

- Minimize forest encroachment and wildlife poaching by developing and implementing a community-based management plan. This includes establishing guard posts, conducting surveillance, and installing signage.
- Implement and enforce policies against poaching and illegal collection of wildlife by workers and subcontractors, with appropriate penalties.
- Raise awareness and educate the community on the importance of protecting fish populations and aquatic ecosystems.
- Detailed impact mitigation measures are in the Biodiversity Action Plan attached as Annex 1 within the Biodiversity Assessment Report.

❖ **Invasive Species**

The activity that causes this risk is the intensification of farming, which can lead to changes in land use and water management practices. The key change in land use is the increased cropping intensity and the introduction of dry-season irrigated crops made possible by the rehabilitated irrigation infrastructure. The project aims to increase the cropping intensity up to 270% in the Ou Ta Paong scheme and introduce a second irrigated rice crop during the dry season in other areas. This shift from rain-fed or flood recession agriculture to irrigated cultivation will significantly alter water management practices and create conditions that may be favorable to invasive species. These changes can create favorable conditions for non-native plant and animal species to establish themselves in the command areas. For instance, altered water flow and flooding patterns due to the new irrigation infrastructure can disrupt the natural balance of wetlands, making them more susceptible to invasion. Moreover, Introduction of invasive species through irrigation canals Irrigation canals may facilitate the introduction of invasive plant or animal species into native aquatic ecosystems. Examples of invasive species mentioned in the Biodiversity Impact Assessment report are Water Hyacinth, Mimosa Pigra, and Tilapia. These invasives can outcompete native species for resources such as food and habitat space. Invasive species can introduce plant and animal species that outcompete native species and alter ecosystem dynamics.

The impact receptors for invasive species are aquatic and terrestrial species, particularly those native to the affected ecosystems. The risk of invasive species spreading through waterways, especially in areas like Ou Ta Paong and Stung Krang Bat, where water flows in both directions from and to the Tonle Sap Lake.

The assessment of the impact of invasive species during the operation phase is considered minor overall. However, the sources note that the scale of the impact can vary depending on the specific location and the types of invasive species introduced. The impact is expected to be more significant in Ou Ta Paong due to the larger scale of the irrigation infrastructure and the increased risk of invasive species spreading through the connected waterways.

▪ **Mitigation Measures**

- Implement a robust monitoring system, including regular surveys of waterways and terrestrial habitats, to detect invasive species early. Train personnel to identify and map invasive species, and establish rapid response protocols for eradication or control, such as manual removal, targeted pesticide application, or biological control agents.

- Implement specific water management practices to minimize the risk of invasive species spreading through waterways.
- Foster collaboration among government agencies, research institutions, local communities, and NGOs for effective invasive species management. Facilitate information sharing, coordinate efforts, and leverage resources for maximum impact.
- Public Awareness and Education: Raise awareness among all stakeholders.
  - Educate farmers, local communities, and other stakeholders about the risks of invasive species, their identification, and prevention measures.
  - Establish a system for reporting suspected invasive species to enable rapid response and prevent spread. Set up a hotline or a reporting mechanism accessible to all stakeholders
  - Collaboration with the Environmental Department.
- Detailed impact mitigation measures are in the Biodiversity Action Plan attached as Annex 1 within the Biodiversity Assessment Report.

7.3.2.3 CLIMATE CHANGE

❖ **GHG emission**

During the operation phase, the intensification of farming activities is expected to result in a rise in greenhouse gas (GHG) emissions. This increase will stem primarily from the greater energy requirements associated with boosting agricultural production. The operation of machinery and equipment for various farming tasks, including tillage, irrigation, harvesting, and transportation, will demand a substantial amount of energy. If this energy comes from fossil fuels, it will lead to higher carbon emissions. The practice of burning rice straw after harvest, a common agricultural method in the region, also releases significant amounts of GHGs, such as carbon dioxide and methane, into the atmosphere. Additionally, the intensification of farming often results in greater use of chemical fertilizers, and the production and application of these fertilizers also contribute to GHG emissions.

The main impact receptor for GHG emissions is the atmosphere. The increase in GHG emissions adds to the problem of global climate change, which can have a wide range of negative consequences. These consequences include rising temperatures, shifts in weather patterns, sea-level rise, and an increase in the frequency and intensity of extreme weather events.

The sources classify the impact of GHG emissions during the operation phase as minor. This evaluation takes into account the relatively limited scale of the project and the short duration of the construction activities. However, it is essential to recognize that even small increases in GHG emissions contribute to the overall effects of climate change.

▪ **Mitigation Measures**

- The project needs to introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production.
- The project needs support training farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution.

- The project promotes the utilization of efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions.
- The project needs to advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.

7.3.2.4 ANNUAL CROP MANAGEMENT PLAN

❖ **Water resource efficiency**

In this phase, inefficient irrigation practices can lead to a reduction in water resource efficiency. Moreover, people in community faced with flooding in wet season and drought in dry season generally. Additionally, farmers also pose with climate change issue which harm to their crop. The increased demand for irrigation, coupled with poor water management practices and lack of infrastructure, can result in the over-extraction of water resources. This over-extraction can have several detrimental effects on the surrounding environment and communities:

- Downstream Water Scarcity: Excessive withdrawal of water for irrigation can deplete water sources downstream, leading to water shortages for other users, such as communities, industries, and ecosystems.
- Altered Hydrology: Over-extraction can disrupt the natural flow patterns of rivers and other water bodies, affecting the balance of aquatic ecosystems and the services they provide.
- Damage to Aquatic Ecosystems: Reduced water flow and altered water levels can harm fish populations, other aquatic organisms, and the overall health of downstream ecosystems.

The impact receptors for inefficient water resource use are downstream communities and aquatic ecosystems, including those in the Tonle Sap Lake and its surrounding watersheds. This assessment highlights the importance of implementing effective water management strategies to ensure the sustainable use of water resources and minimize negative impacts on downstream users and ecosystems.

▪ **Mitigation Measures**

Project need to implement efficient water management practices to prevent over-extraction and ensure equitable water distribution. This can include:

- Water use monitoring system to track consumption and identify areas for improvement.
- implementing appropriate irrigation scheduling based on crop water requirements and weather conditions.
- Utilizing efficient irrigation systems, such as drip irrigation or sprinkler systems, to minimize water loss.
- Exploring opportunities for water reuse, such as capturing and reusing runoff water.

❖ **Soil erosion and soil erosion risk**

The various agricultural activities can elevate the risk of soil erosion and contribute to the degradation of soil health. Land preparation practices, such as tillage and site clearing, along with the use of heavy machinery, can disrupt the soil structure, making it more vulnerable to

erosion by wind and water. Additionally, the intensification of farming can lead to changes in vegetation cover, reducing the natural protection against erosion.

Soil erosion poses significant threats to both the environment and agricultural productivity. The loss of topsoil, the fertile upper layer of soil rich in nutrients and organic matter, is a primary concern. This loss diminishes soil fertility, impacting its ability to retain water and nutrients crucial for plant growth. Consequently, agricultural yields decline, and farmers may experience reduced productivity. Furthermore, eroded soil particles contribute to increased sedimentation in water bodies such as rivers and lakes. This sedimentation can harm aquatic ecosystems and degrade water quality, increasing the costs associated with treating water for human consumption.

The impact receptors for soil erosion are soil health, water quality, and agricultural productivity. The sources assess the impact of soil erosion during the operation phase as high, emphasizing the need for sustainable land management practices to prevent and mitigate soil erosion.

- **Mitigation Measures**

- Minimize soil compaction and disturbance by using appropriate machinery and timing land preparation activities.
- Consider erosion management practices such as contour planting, terracing, and grass barriers.
- Adopt reduced tillage or no-till farming practices to minimize soil disturbance.
- Establish cover crops during fallow periods or in rotation with main crops to protect the soil from erosion.
- Practice contour farming on sloping land to reduce runoff and erosion.
- Construct terraces on steep slopes to prevent soil loss.
- Establish windbreaks or shelterbelts to reduce wind erosion.
- Install erosion control structures, such as grassed waterways or sediment basins, to manage runoff.
- Apply much to the soil surface to protect it from rainfall impact and erosion.

❖ **Nutrient application and management**

The excessive or improper application of fertilizers poses a significant risk to water quality and the health of aquatic ecosystems. The intensification of agricultural production, driven by improved irrigation, can lead to an increased reliance on chemical fertilizers to enhance crop yields. However, if these fertilizers are not applied judiciously and managed effectively, they can have detrimental effects on the environment:

- Nutrient Runoff: When fertilizers are applied in excess or at inappropriate times, such as before heavy rainfall, a significant portion of the nutrients can be washed away from the fields and carried into nearby water bodies.
- Nutrient Leaching: Fertilizers can also leach through the soil and contaminate groundwater resources.

The impact receptors for nutrient runoff and leaching are water quality, aquatic ecosystems, and human health. High levels of nutrients, particularly nitrogen and phosphorus, in water

bodies can lead to eutrophication, a process that causes excessive growth of algae. This algal bloom can deplete oxygen levels in the water, harming fish and other aquatic organisms. Additionally, contaminated water sources can pose risks to human health if used for drinking or recreational purposes.

The sources assess the impact of nutrient application and management during the operation phase as high, emphasizing the urgent need for sustainable farming practices that optimize fertilizer use and minimize the risks of nutrient pollution.

- **Mitigation Measures**

- Conduct periodic soil analysis to determine nutrient needs and avoid over-fertilization.
- Establish buffer zones near watercourses to filter nutrient runoff.
- Consider using green manures and cover crops to replenish soil nutrients and reduce leaching.

❖ **Use and effectiveness of pesticides**

The use of pesticides to protect crops from pests and diseases can pose significant risks to human health, biodiversity, and the environment. The intensification of farming often leads to an increased reliance on pesticides to maintain high crop yields. However, the effectiveness of pesticides can decline over time as pests develop resistance, requiring farmers to apply higher doses or switch to more potent chemicals.

This cycle of pesticide use, and resistance can have several negative consequences. Pesticide exposure can pose health risks to both farmers who handle and apply these chemicals and consumers who ingest pesticide residues on food. Pesticides can harm non-target organisms, including beneficial insects, pollinators, and soil organisms, disrupting the balance of ecosystems. Environmental Contamination: Pesticides can contaminate soil and water resources, potentially affecting water quality and the health of aquatic ecosystems.

The sources assess the risks and impacts associated with pesticide use and effectiveness as high, highlighting the need for integrated pest management strategies that minimize reliance on chemical pesticides.

- **Mitigation Measures**

- Promote Integrated Pest Management (IPM) strategies to minimize pesticide use.
- Implement training and awareness programs for farmers on the safe handling and application of pesticides.
- Providing training materials that are user-friendly and accessible to farmers with varying literacy levels.
- Including climate information and agrometeorology services in training materials when available.
- Preparing training materials for rice and other crops such as vegetables, poultry, and aquaculture.
- Organizing trainings on "climate-informed agriculture decisions and planning" and having trained individuals disseminate information.

❖ **Pesticide residues on site soil**

The repeated application of pesticides, especially persistent pesticides, and the improper disposal of pesticide containers can lead to the accumulation of pesticide residues in the soil. This accumulation can have several detrimental effects on the environment such as contamination of Groundwater and impacts on Soil Organisms.

The impact receptors for pesticide residues on-site soil are soil health, biodiversity, and water quality. The sources assess the risk of pesticide residue accumulation in the soil as high, emphasizing the need for judicious pesticide use, proper disposal of pesticide containers, and integrated pest management strategies to minimize the risks associated with pesticide contamination.

- **Mitigation Measures**

- Promote the use of pesticides with low persistence and mobility in the environment.
- Implement a soil monitoring program to assess pesticide residue levels.
- Consider crop rotation and the use of cover crops to help break down pesticide residues.
- Minimize pesticide use by adopting IPM strategies.
- Conduct soil testing to monitor pesticide residue levels.
- Utilize cover crops to improve soil health and enhance pesticide degradation.

❖ **Pesticide residues on produce**

During the operation phase of the irrigation project, the application of pesticides close to harvest, improper pesticide application techniques, and inadequate pre-harvest intervals can lead to pesticide residues on produce, posing risks to consumer health. Consuming produce with pesticide residues can have adverse effects on human health.

The main impact receptor for pesticide residues on produce is human health, specifically consumers who ingest the contaminated food. The sources assess the impact of pesticide residues on produce as moderate. This assessment highlights the importance of implementing safe pesticide application practices, adhering to pre-harvest intervals, and promoting alternative pest control methods to minimize the risks to consumer health.

- **Mitigation Measures**

- Enforce pre-harvest intervals to allow for pesticide breakdown before harvest.
- Promote the use of pesticides with low toxicity to humans.
- Properly wash and handle produce to remove surface residues.
- Implement a monitoring program to test produce for pesticide residues.
- Ensure compliance with established MRLs for pesticide residues on produce.

7.4 ASSESSMENT OF SOCIAL RISKS AND IMPACTS

A Social Impact Assessment (SIA) is a systematic process used to analyze, monitor, and manage the social consequences of planned interventions, such as policies, programs, plans, or projects. It aims to identify, predict, and mitigate potential negative social impacts while maximizing positive ones.

Methods:

- Participatory Rural Appraisal (PRA): Engage local communities through focus group discussions, interviews, and mapping exercises to identify their concerns, needs, and perceptions of the project.
- Social Surveys: Conduct structured surveys to gather quantitative data on socio-economic conditions, livelihoods, and potential impacts on households.
- Key Informant Interviews: Interview key stakeholders, such as local leaders, government officials, and experts, to gain insights into local dynamics and potential risks.

Data/Information:

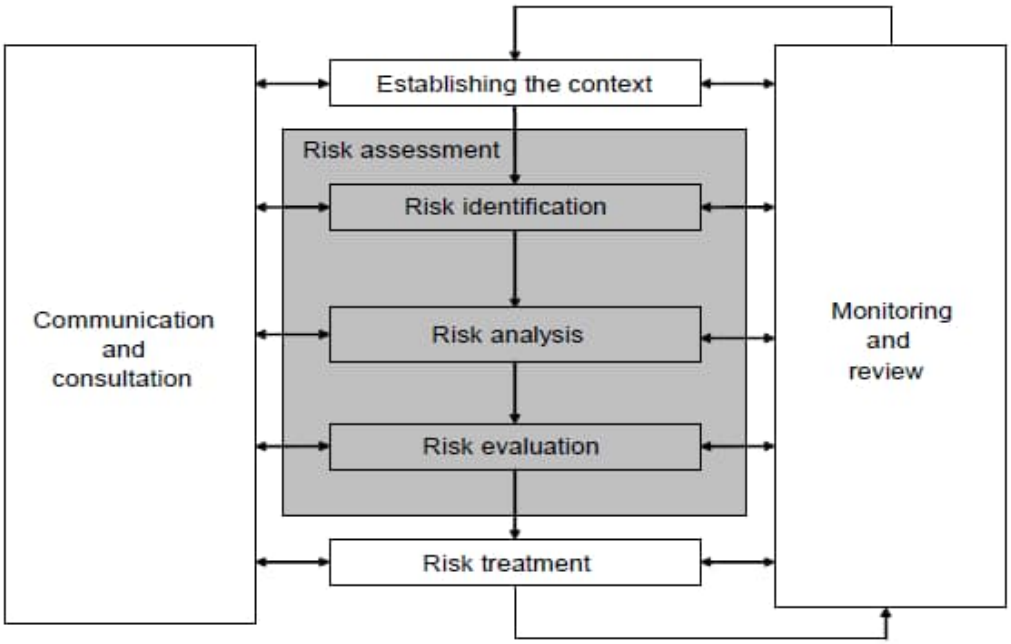
- Baseline Data: Collect baseline data on demographics, land use, water resources, livelihoods, and social indicators.
- Secondary Data: Utilize existing data from government agencies, research institutions, and other relevant sources.
- Primary Data: Gather primary data through field surveys, interviews, and observations.

Consultations:

- Individual Consultations: Conduct one-on-one consultations with key individuals and groups to address specific issues and concerns.

The assessment of environmental and social risks and impacts involves both the identification of risks and the identification of impacts. The identification of risks involves with three (3) steps: the risk identification, risk analysis, and risk evaluation (Figure 7.3) whereas the assessment of impacts involves with five (5) steps: characterizing the impacts, identifying the nature and duration of the impacts, determining the impact significance, determining the level of impact likelihood, determining the impact scale, determining the measures to mitigate the impacts, assessing the residual impacts after mitigation, and determining receptor sensitivity/vulnerability.

Figure 7.3: The process of risk assessment Risk assessment process (shaded) within the overall risk management process



(Source: AS/NZS ISO31000)

The activities in the rehabilitation of irrigation canals and farm roads cause risks and potential impacts prior and during construction, including child labor, forced labor, disease transmission, occupational health and safety, underpaid pay, and unequal treatment.

7.4.1 Risks and Impacts at Preparation Stage

7.4.1.4 LAND ACQUISTION

❖ **Land acquisition and resettlement**

The rough estimate of land acquisition and resettlement were conducted in four steps. Firstly, the assessment was based mainly on the result of the consultations between the AIIB Social Development Specialist and the PMU engineering team to come up with more practical and latest conceptual design options to use as the basis for the land acquisition and land resettlement estimations. Then, rough calculations of the scale of the impacts were conducted using the agreed engineering designs to obtain the impacted figures. At the same time, google earth with the specific types of infrastructure locations were also used to indicatively determine the affected areas at each subproject location along the canals. Thirdly, the estimates were also consulted with relevant Provincial Departments of Land Management Urban Planning and Construction (PDLMUPC) and local authority representatives to confirm the estimated land titling at the impacted project sites. Lastly, the results were then brought back to consult with the PMU engineering team to verify the estimated figures. Although the consultation and the process had covered various aspects, the estimates were considered as a rough figure subjected to the final detailed engineering design (DEDs) outcomes. In addition, the estimation based on the google earth has its limitation on the accuracy, and the impact may differ from the actual impacts resulting from the upcoming DEDs to be carried out at a later stage.

The rough estimation of the land acquisition impacts was encountered mainly at Ou Ta Paong and Lum Hach sub-schemes as there are the canals being planned to expand. The other four

sub-schemes have minimal expansion of the canals across the sub-schemes. Tables below are the summaries of the estimated impacts. Firstly, the rehabilitation of irrigation infrastructure, which would take place mostly at feeder canals, main canals, and occasionally at secondary canals, may require additional land (linear) for canal widening. Canal widening and/or dredging aims to improve water flow leading to better water distribution to areas that have limited irrigation access by farmers. Improved water distribution efficiency aims to increase total cultivation command area and crop intensity per year, crop productivity, and incomes of small households.

Overall, the estimated impacts were mainly found at the Ou Ta Paong and Lum Hach sub-schemes while minor impacts were apparently reported at the other sub-schemes. The practical impacts primarily involve land, houses, crops, and rice fields. A total of 1,553,130 m² of public land and 1,499,233 m² of agricultural land within the right-of-way are affected, with Ou Ta Paong and Lum Hach accounting for the majority. Residential land impacted is limited to 53,897 m² across the same areas. Seven houses in Ou Ta Paong are fully affected and may require resettlement, while 70 households in Ou Ta Paong and Lum Hach face partial building impacts. Additionally, 1,507 trees owned by 164 households are affected. Rice fields totaling 1,031,543 m² are impacted, affecting 4,102 households, predominantly in Ou Ta Poung and Lum Hach. Business disruption may affect 483 households in these two areas as well, based on the estimated assumption

Temporary impacts are limited arising from land acquisition to support contractor operations during the scheme construction phase, affecting 35 households across all areas. These impacts are minimal compared to permanent effects. The data highlights significant disruptions in Ou Ta Paong and Lum Hach, with Brambei Mom, Krapeu Truom, Yutasas, and Stueng Krang Bat experiencing smaller-scale impacts, mainly related to rice fields and minor temporary land acquisitions (Table below).

Table 7.2: Indicative figure of canal expansion at all sub-schemes

Type of Impacts	Ou Ta Paong	Lum Hach	Brambei Mom	Krapeu Truom	Yutasas	Stueng Krang Bat	TOTAL
PERMANENT IMPACT							
Land							
· Public land (m^2)	516,500	971,000	-	15,850	24,180	25,600	1,553,130
· Agricultural land (m2) in the right of ways	505,540	928,063	-	15,850	24,180	25,600	1,499,233
· Residential land (m^2) in the right of ways	10,960	42,937	-	-	-	-	53,897
Houses							
· Number of houses fully affected (located inside the Right of the Way) and potentially need physical resettlement	7	-	-	-	-	-	7
· Number of households with building partially affected	43	27	-	-	-	-	70
Crops							
· Number of affected trees (located inside the Right of the Way)	235	1,272	-	-	-	-	1,507
· Number of households owning the affected trees	72	92	-	-	-	-	164

Type of Impacts	Ou Ta Paong	Lum Hach	Brambei Mom	Krapeu Truom	Yutasas	Stueng Krang Bat	TOTAL
Rice							
· Area of affected rice field (grown inside the Right of the Way	505,540	829,673	-	15,850	24,180	25,600	1,031,543
· Number of households own the affected rice field	1,012	2,333	-	431	439	379	4,102
TEMPORARY IMPACT							
Business							
· Number of shops/ business owners	41	35	-	-	-	-	76
· Due to land acquisition during construction phase (to support contractors' operation)	10	5	5	5	5	5	35

Table 7.3: Indicative estimates of the cost for the land acquisition and land resettlement at all sub-schemes

Type of Impacts	Ou Ta Paong	Lum Hach	Brambei Mom	Krapeu Truom	Yutasas	Stueng Krang Bat	TOTAL
PERMANENT IMPACT							
Land							
. Public land (m^2)	516,500	971,000	-	15,850	24,180	25,600	*1,553,130*
· Agriculture Land (m^2)	505,540	928,063	-	15,850	24,180	25,600	*1,499,233*
. Residential Land (m2)	10,960	42,937	-	-	-	-	*53,897*
· Unit price	-	-	-	-	-	-	
· *Total*	-	-	-	-	-	-	-
Houses							
· Number of houses partially affected (located inside the Right of the Way)	43	*27*					70
· Number of houses fully affected (located inside the Right of the Way) and need physical resettlement	7	-					7
Unit Price	70	70					70
Total	*118,181*	*166,320*					*284,501*
Crops							
· Number of affected trees (located inside the Right of the Way)	235	130	-	-	-	-	*365*
· Unit price	13	13	-	-	-	-	13
· *Total*	*2,938*	*1,625*	-	-	-	-	*4,563*
TEMPORARY IMPACT							
· To be determined based on the actual needs for land of contractors during construction.							
· Compensation will be made by contractors as agreed upon with affected households/ parties							
Total Price	**121,119**	**167,945**	**-**	**-**	**-**	**-**	**289,064**

- **Ou Ta Paong**

The impact of the land acquisition is expected to encounter mostly at the Ou Ta Paong sub-scheme within the proposed Feeder canal 1, feeder canal 2, main canals (mainly from Kbal

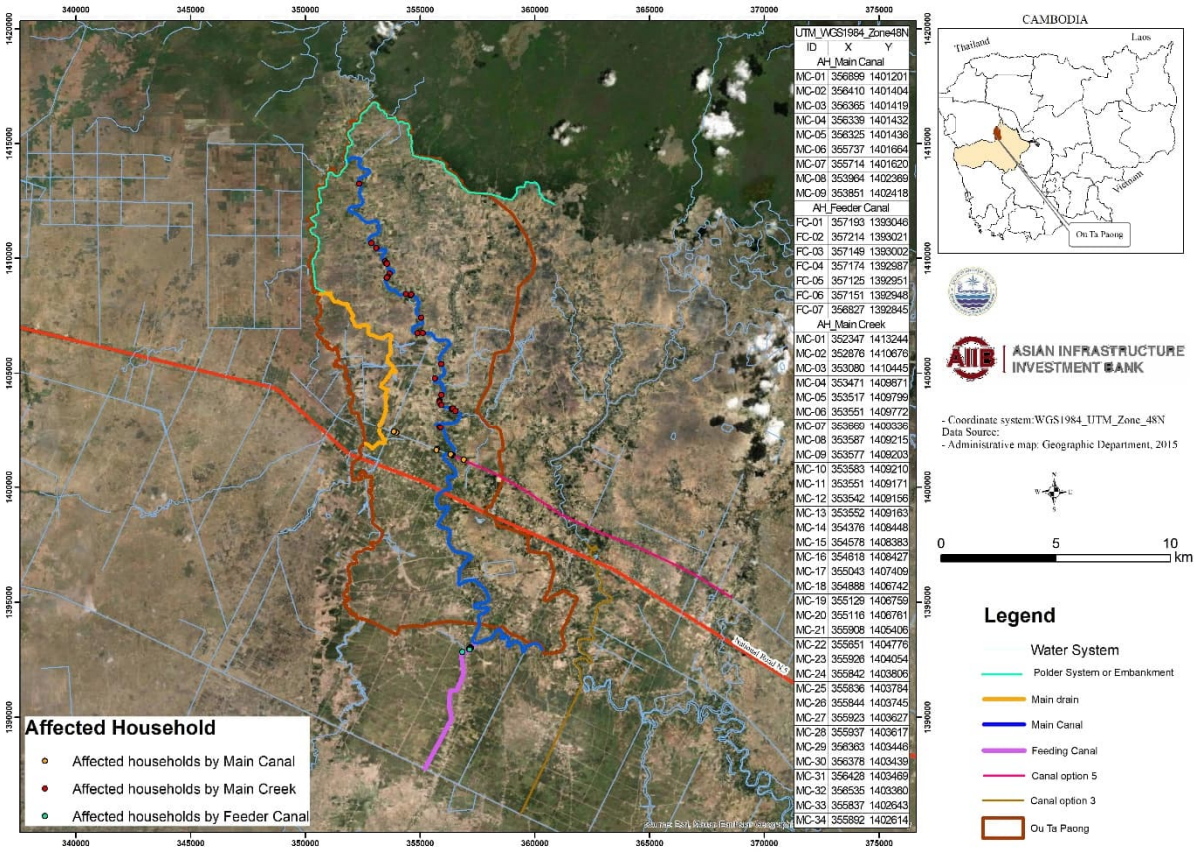
Hong to Ou Ta Paong, and the secondary canals due to possible expansion of the design width in order to adequately provide water distribution and water carrying capacity to feed the entire irrigation system (Table 7.4). The impact includes the expansion of the canal body as well as the rural road along the canals. However, due to limited number of households living along these planned expanding canals, the affected number of households are few.

Table 7.4: Indicative figure of canal expansion at Ou Ta Paong

No	Structures	Designed Length (km)	Existing Width (Average) (m)	Expansion (L) (m)	Expansion (R) (m)	Total Width (m)
1	Feeder 1	8.80	16.00	7.00	7.00	30.00
2	Feeder 2	6.10	29.10	1.50	1.50	32.10
3	Main Canals	37.50	37.10	5.00	5.00	47.10
4	Creek Re-shape	27.60	61.00	0.00	0.00	42.00
5	Main Drainage	11.70	52.00	Reshape	Reshape	42.00

L = Left, R = Right.

Figure 7.4: Locations of the potentially affected households in Ou Ta Paong sub-scheme



(Source: ESCIA Study 2024)

Using this figure, the land acquisition is estimated at 516,500m2. The consultations with Provincial Departments of Land Management, Urban Planning and Construction (PDoLMUPC) indicated that with this size, all of the acquired land are the public land. There are, however, 50 households and 288 trees apparently to be affected due to the irrigation expansion as the households have been located within the expended locations (Figure 7.4). There are seven (7) households along the Ou Ta Poung River observed to be affected entirely which may require displacement or a full resettlement. The cost for compensation to the

affected households are projected at 121,119 USD as per the government rate, derived from official rate at the PDoLMUPC website. The seven (7) entirely affected households may need to be resettled. Specific measures and solutions needed may include reconsideration of the canal design width at the spots (Table 7.5). However, the PMU engineering team confirmed that technical and strategic consideration can only be provided at the time of the DED stage since possible reduction of the irrigation infrastructure design width will result in the reduction of water flow and water carrying capacity of the canal which may affect the required water distribution and requirements to effectively and efficiently deliver the irrigation purpose and project objective.

Table 7.5: Land Acquisition and Asset Impacts in the Ou Ta Paong sub-scheme

No	Structures	Affected public land (m^2)	Affected Assets (Tree)	Affected Households	Physical Displacement (HHs)
1	Feeder 1	123,200	5	7	-
2	Feeder 2	18,300	-	-	-
3	Main Canals	375,000	130	9	-
5	Creek Re-shape	-	100	34	7
6	Main Drainage	-	-	-	-
Total		516,500	235	50	7

HHs = Households.

- **Lum Hach**

The second most affected sub-scheme in terms of land acquisition is anticipated within Lum Hach as the possible expansion is planned at the improvement of the main canal to store the water within the canal itself as well as the roads along the embankment of the canals (Table 7.6).

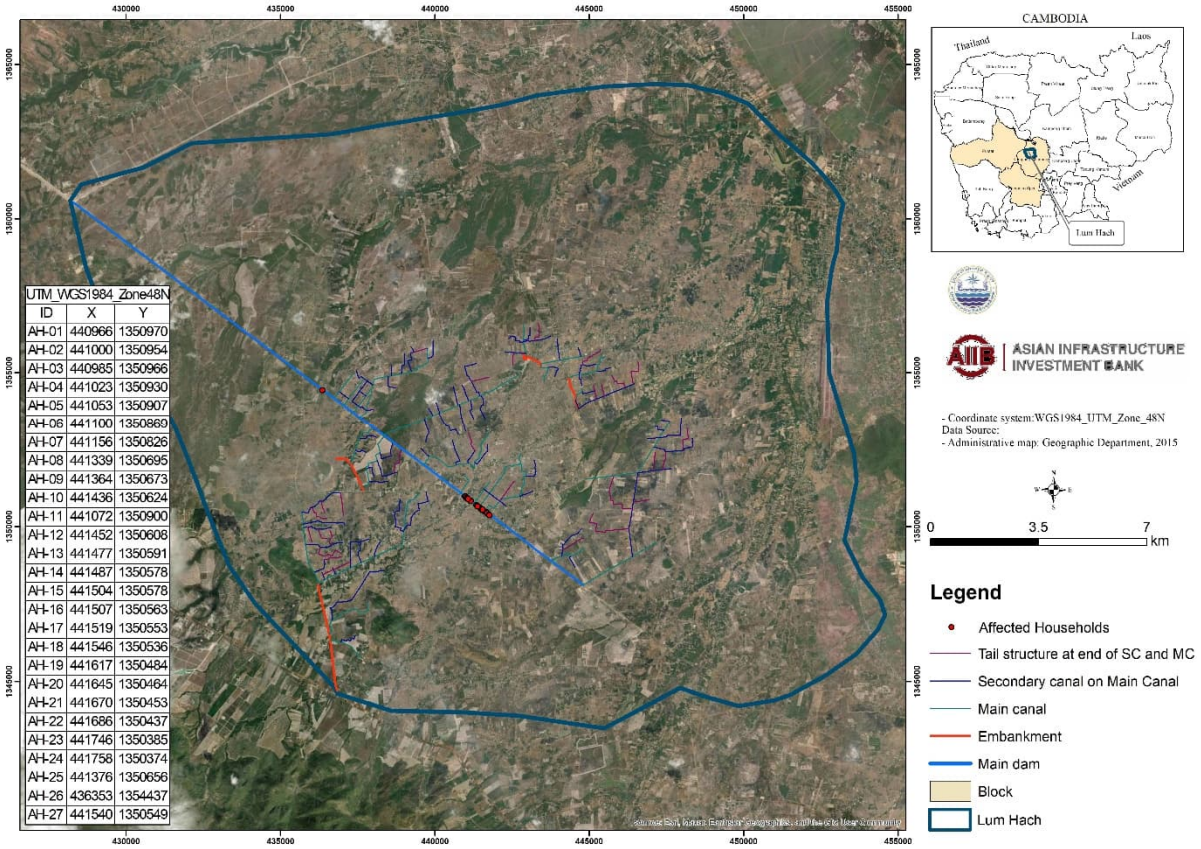
Table 7.6: Indicative figure of canal expansion at Lum Hach

No.	Structures	Designed Length km	Existing Width (Average) m	Expansion (L) m	Expansion (R) m	Total Width (m)
1	Channel Improvements	20.70	80.00	Design of 90 m width (excavation + slopes) with 5 m depth		**90.00**
2	Embankments	7.20	13.10	9.00	9.00	**31.10**
3	Main Canals	48.80	11.30	6.50	6.50	**24.30**

L = Left, R = Right.

The estimate land area to be acquired along the canals is approximately summed at 971,000 m^2, covering all the public land. There are, however, 27 affected households which the design width will may be affected, and the land may need to be partially acquired. The results of the consultation with the engineering team confirmed that the affected households may be able to be avoided by reducing the design width at the affected project locations as the canal purpose is mainly used for storing water not the conveyors. However, the consideration and appropriate approach to address the impacts will need to be properly discussed at the DED phase since there might be the some consequence arising from the subproject civil work., if one house is allowed to continue staying along the canal while the other may not. The locations of the households are illustrated within Figure 7.5 below.

Figure 7.5: Locations of the potentially affected households in Lum Hach sub-scheme



(Source: ESCIA Study 2024)

- **Krang Ponley**

The land acquisition for the construction of the irrigation system within the four sub-schemes has been limitedly anticipated since the construction of the new system has been avoided the most. Very limited expansion of the canal was reported with the decision (Table 7.7).

Table 7.7: Indicative figure of canal expansion at Krang Ponley

No.	Structures	Designed Length km	Existing Width (Average) m	Expansion (L) m	Expansion (R) m	Total Width (m)	Affected Land (m^2)
Brambei Mom Scheme							
1	Main Canals	6.3	51.5	0	0	51.50	0
Krapeu Trom Scheme							
1	Main Canal 1	2.82	30	0	0	30.00	0
2	Main Canal 2	6.8	30	0	0	30.00	0
3	Drainage Canal	6.8	5	1	1	7.00	13,600
4	Carrying Roads (MC2)	6.8	Only one (1) section of 1.5 Km canal's embankment requires expansion to be the rural road. The section of 5.3 km is already large enough to be the rural road.		1.5		2,250
Yutasas Scheme							
1	Embankment	1	18.4	1.6	0.8	20.80	2,400
2	Main canal	6.6	21.3	2.2	1.1	24.60	21,780

No.	Structures	Designed Length km	Existing Width (Average) m	Expansion (L) m	Expansion (R) m	Total Width (m)	Affected Land (m^2)
4	Main Drain	7.4	59	0	0	59.00	0
5	Secondary Drain	2.2	21.3	0	0	21.30	0
Steung Krang Bat Scheme							
1	Feeder Canal	5.12	30	2.5	2.5	35.00	25,600
2	Folder	2.22	18.5	0	0	18.50	0
3	Main canal1	2	51.1	0	0	51.10	0
4	Main canal2	10.3	35	0	0	35.00	0
6	Main Drain	40.2	40	0	0	40.00	0
7	Secondary Drain	7.7	22	0	0	22.00	0

L = Left, R = Right, MC2 = Main Canal 2.

The land acquisition in the Krang Ponley sub-scheme is primarily driven by the construction of infrastructure components such as the Drainage Canal and Carrying Roads (MC2) in Krapeu Troum, Embankment and Main Canal in Yutasas, and Feeder Canal in Steung Krang Bat. These activities are projected to affect a total land area of 65,630 m2 distributed across different locations: Krapeu Trom (approximately 15,850 m2), Yutasas (approximately 24,180 m^2), and Steung Krang Bat (approximately 25,600 m2).

Consultation result addressed that they have concerns of land affected by construction near irrigation systems or the placement of construction projects, with some areas of land that people are using being close to harvest time and potentially rendered unusable but due to the project announcement the project implementation will be inform 6 months in advanced where this issue will be encounter. The affected households will feel not well due to land impact.

Consultation with the Provincial Department of Land Management, Urban Planning and Construction (PDoLMUPC) has revealed that all the land required for this sub-scheme falls under public ownership. Therefore, the land acquisition process is anticipated to proceed without impacting any private property.

- **Mitigation Measures**

- Since the affected households are only 77 (50 in Ou Ta Paong and 27 in Lum Hach, Abbreviated Land Resettlement Plan is required to be prepared.

- **Economic displacement**

The risk of economic displacement is linked to activities like the rehabilitation of irrigation canals and farm roads, and land acquisition. These activities can disrupt existing economic activities and displace households and businesses. The upgrading of irrigation systems may result in the removal of informal farming areas due to dredging, impacting those who rely on these areas for income. Additionally, during the construction phase, local businesses and transportation routes might face disruptions due to construction activities, affecting the community's daily life and economic activities.

The impact receptors for economic displacement include households in Ou Ta Paong and Lum Hach who have production land along the water bodies, informal land users, informal settlers, and nearby construction site business owners. The sources assess the impact of economic

displacement as moderate, recognizing that while it is a significant concern, the scale of the impact is still uncertain. The upgrading of irrigation systems may lead to the removal of informal farming areas, impacting the livelihoods of households who rely on these areas for food and income. The risk of economic displacement of each sub-scheme is reported here.

- **Ou Ta Paong**

The Ou Ta Paong Sub-scheme includes various infrastructure components such as Feeders, Main Canals, Creek Re-shaping, and Main Drainage. These structures span a total length of 91.7 km. A total of 41 households estimated as the shop owners and 1,012 households use the land along these infrastructure components while the other 10 households are estimated to be engaged for land acquiring for contractors' operation. The proper informing to these households is required to ensure that their production and economic activities will not be severely affected (Table 7.8).

Table 7.8: Affected and Vulnerable Households in Ou Ta Paong Sub-scheme

Structures	Number of households own the affected rice field	Vulnerable HHs	Total Households temporarily affected during construction	Land acquisition for contractors' operation
Feeder 1	346	48	3	
Feeder 2	174	24	4	
Main Canals	492	71	6	10
Creek Re-shape	-	6	28	
Main Drainage	-	-	-	
Total	**1,012**	**149**	**41**	**10**

HHs = Households.

The proper informing to these households is required to ensure that their production and economic activities will not be severely affected.

- **Lum Hach**

The Lum Hach Sub-scheme primarily focuses on Channel Improvements, Embankments, and Main Canals. These infrastructure components extend over a total length of 76.7 km and are situated along which 2,333 households are estimated to be the users of the farm land in the rights of way and a total of 35 households estimated as the shop owners while the other 5 households are estimated to be engaged for land acquiring for supporting contractors' operation (Table 7.9).

Table 7.9: Affected and Vulnerable Households in Lum Hach Sub-scheme

Structures	Number of households own the affected rice field	Vulnerable HHs	Total Households temporarily affected during construction	Land acquisition for contractors' operation
Channel Improvements	210	39	23	
Embankments	110	20	2	5
Main Canals	2,013	325	10	
Total	**2,333**	**384**	**35**	**5**

HHs = Households.

- **Krang Ponley**

The Krang Ponley Sub-scheme encompasses various infrastructure components, including Main Canals, Drainage Canals, Carrying Roads (MC2), Embankments, and Feeder Canals. These structures are distributed across different locations within the sub-scheme, such as Brambei Mom, Krapeu Trom, Yutasas, and Steung Krang Bat. Each location features varying lengths of these infrastructure components extend over a total length of 114.26 km. A total of 1,249 households are estimated to be the users of the land situated along these canals and infrastructure elements within the Krang Ponley Sub-scheme. Moreover 20 households across the four sub-schemes are estimated to be engaged in acquiring land for supporting the operations of the constructions (Table 7.10).

Table 7.10: Affected and Vulnerable Households in Krang Ponley Sub-scheme

Structures	Number of households own the affected rice field	Vulnerable HHs	Total Households temporarily affected during construction	Land acquisition for contractors' operation
Drainage Canal	378	11	-	
Carrying Roads (MC2)	53	2	-	
Embankment	58	1	-	20
Main canal	382	6	-	
Feeder Canal	379	23	-	
Total	**1,249**	**43**		**20**

HHs = Households, MC2 = Main Canal 2.

- **Mitigation Measures**

- The households who own the land along the rehabilitated canals which will be expanded at the public land should be properly informed prior to the construction to avoid their crops will be damaged at the time of construction.
- Although the acquired land is the public land, there are a need of a proper consultation and information to be conducted to inform and obtain agreement from the affected households.

7.4.2 Risks and Impacts at Construction Stage

7.4.2.1 *PROTECTING THE WORKFORC*

- **Child Labor**

The risk of child labor emerges due to the demand for unskilled labor in rural areas where the use of child labor is prevalent. Contractors and subcontractors involved in the project's construction activities may employ children or youth under the legal working age due to labor shortages or the drive to minimize costs. This practice exploits vulnerable children, depriving them of education and opportunities, and perpetuates a cycle of poverty.

The risk of child labor, particularly due to the influx of labor and pre-existing societal inequalities. Vulnerable groups, such as poor and near-poor households, female-headed households with dependents. Children from these groups are often driven to work due to economic hardship, and the increased demand for labor during project construction can exacerbate this situation. Migrant workers, often facing precarious working conditions and separated from support systems, are also highly vulnerable to exploitation, including child labor. The project's Gender Assessment identifies the lack of local wage jobs and increasing migration as key challenges that could further heighten the risk of child labor.

- **Mitigation Measures**

- Apply LMP for age check prior to engagement of labor with regular monitoring through proper screening and registering all workforce for the work
- To mitigate the risk of child labor, the project will implement strict measures to ensure compliance with national and international labor laws. Regular monitoring and inspections will be conducted to identify and address any instances of child labor.
- Additionally, awareness-raising campaigns will be implemented to educate communities about the harmful effects of child labor and the importance of sending children to school. The project will also collaborate with local authorities and NGOs to strengthen law enforcement and provide support services to vulnerable children and their families.

❖ **Forced Labor**

In the construction phase, the risk of forced labor is anticipated, especially for vulnerable individuals who may be coerced into working against their will. Forced labor can manifest in various ways, including:

- Economic Coercion: Individuals may be forced to work due to financial pressures, such as the need to repay debts or support their families.
- Exploitation of Young People: Young people, particularly those from impoverished backgrounds, may be forced to work to contribute to family income or due to a lack of educational opportunities.
- Debt Bondage: Workers may be trapped in a cycle of debt by unscrupulous employers who advance them loans with exploitative terms, effectively binding them to work until the debt is repaid.
- The rehabilitation of irrigation canals and farm roads creates a demand for local labor which can be exploited by those who seek to profit from forced labor.

- **Mitigation Measures**

- Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children
- The Project Owner and Sub-Contractors will collaborate with the relevant Government Agency to disseminate information to local communities. This information will include the Contractor's Code of Conduct and the minimum working age as mandated by national laws and international standards.
- The Ministry of Water Resources and Meteorology (MOWRAM) will provide information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.

7.4.2.2 *COMMUNITY HEALTH AND SAFETY*

❖ **Disease transmission**

During construction phase, the risk of disease transmission is anticipated due to the influx of construction workers, the potential for their lack of hygiene in living conditions, and their interaction with local community members. The influx of workers increases the likelihood of spreading and contracting communicable diseases, both among the workers themselves and

between workers and the local community. Workers may experience poor eating habits, homesickness, stress, and unhygiene living conditions which make them susceptible to diseases.

- **Mitigation Measures**

- Conduct public awareness raising activities (IEC) to ensure local people and contractors know about the risks of contracting and spreading communicable diseases such as COVID-19, HIV/AIDS, and water-borne diseases (e.g., amoebiasis, giardiasis, and toxoplasmosis. etc.
- In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising to the risk groups.
- Conduct training to workers on communicable diseases prior to mobilization to construction sites.
- For water-borne diseases that arise due to polluted or contaminated water, mitigations measures may include:
  - Implement filtration, chlorination, or UV disinfection to ensure safe drinking water.
  - Build and maintain proper sewage systems and latrines to prevent water contamination.
  - Promote handwashing, safe food preparation, and proper sanitation practices in communities.
  - Control and properly dispose of waste to prevent water pollution.
  - Test water sources frequently for contamination and take corrective actions promptly.

❖ **Sexual Exploitation and Abuse, Sexual Harassment**

The risk of Sexual Exploitation and Abuse/ Sexual Harassment (SEA/SH) is envisaged due to several factors. The influx of workers estimated to be approximately 735 (Table 7.11), frequent visits by project personnel, and pre-existing SEA/SH issues in the area all contribute to this risk. This risk is primarily associated with the rehabilitation of irrigation canals and farm roads. The influx of labor includes not only construction workers but also individuals who provide logistical services, increasing the potential for exploitation. The sources highlight that approximately 430 workers are estimated to be involved, and their isolation and potential loneliness may increase their vulnerability to SEA/SH. However, the figure varies based on actual arrangement of the contraction companies.

Table 7.11: The estimated influx labor within the sub-schemes

Type of project workers	Characteristics of project workers	Duration of Labor Requirements	Ou Ta Paong	Lum Hach	Krang Ponley	Total Workers
Direct Workers						
PIU's member MoWRAM & NCDDS	Individual consultants (e.g., E&S Specialists, Design Engineers, Construction	From project preparation till project completion				20

	Supervision Engineers, etc.					
Contracted Worker						
Engaged by PIU						
Detailed Design Consultant	National specialists	From project preparation until project completion	15	10	10	35
Construction Supervision consultant	National specialists		15	5	5	25
Independent E&S Monitoring Consultant		One (1) month in very six (6) months	10	5	5	20
Technical Assistance			15	10	10	35
Engaged by construction contractors						
Skilled workers	National specialists	Durations vary, depending on construction stages & needs.	80	40	40	160
Unskilled workers	Local workers (around subproject location)		150	60	60	270
Primary Supply Workers						
Workers producing materials for core project activities	Mostly local workers	Construction stage	30	15	15	60
Other Stakeholders Working in Connection with Project						
Civil servants of MoWRAM, PDWRAM at provincial & district level	SEO safeguard team	The construction stage of the project.	18	8	8	34
Civil servants of NCDDS	Staff of NCDDS	From project preparation until project completion	15	8	8	31
Civil servants of MEF	Staff of GDR	From project preparation until project completion	10	5	5	20
Civil servants of relevant Ministries	Staff	The construction stage of the project.	15	5	5	25
Total						**735**

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, E&S = Environmental and Social, NCDDS = National Committee for sub-National Democratic Development Secretariat, PDWRAM = Provincial Department of Water

Resources and Meteorology, SEO = Social and Environmental Officer, MEF = Ministry of Economy and Finance, GDR = General Department of Resettlement.

People prone to the risk of SEA/SH are anyone but the most vulnerable group are women and children.

- **Mitigation Measures**

- Contractors need to explicitly state zero tolerance for sexual harassment, exploitation, and abuse within the workplace.
- Require Code of Conduct (CoC) to be signed by all construction workers.
- For victims coming forward: referral to qualified SEA/SH service provider. The GRM will include a confidential channel for reporting SEA/SH.
- Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children
- Training to workers on maintaining good community relations, with emphasis on proper conduct around women and children.
- Training on SEA/SH and VAC for community members, in particular women and girls (may be done separately for men and women).
- Ensuring workers' sites are situated (at least 500m) from schools and/or other areas where children congregate.
- Children are prohibited from construction sites and worker's camp.
- Ensure access to grievance redress mechanisms for all project-affected persons, including both stakeholders and workers, to address Sexual Exploitation and Abuse, and Sexual Harassment. Support (in the form of training, awareness raising, etc.) to local law enforcement to act on community complaints regarding SEA/SH and VAC.
- Provision of information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.
- Provide counselling services for male and female workers, wives and other female partners of contractors' workers.
- Build partnerships with local health providers and SEA/SH service providers to conduct community awareness activities, and referrals.
- Implement public awareness campaigns to address sexual harassment in transport services and hubs, and training of police on women's security needs when using transport. This is included on GRM:

  - Accessibility for Workers
  - Multiple Reporting Channels
  - Confidentiality and Support
  - Contractor Accountability

❖ **Traffic safety & Security**

During construction phase, traffic safety is among the local concerns. The rehabilitation of irrigation canals and farm roads necessitates increased transportation of construction materials and equipment, potentially leading to road accidents, especially if safety measures are not strictly enforced. Construction activities can also attract unauthorized individuals seeking to steal or vandalize equipment and materials, further compromising security. The influx of construction workers into the project area may also contribute to a perceived or actual increase in crime rates, impacting the sense of safety among residents.

People subject to risk of traffic accident include anyone which may include project workers and local people who live near the construction sites or travel on transportation routes.

- **Mitigation Measures**

- Arrange security guard or engage local authority to guard the construction sites
- Conduct public awareness raising activities (IEC) to ensure local people and road user are aware of road safety regulations and risks and act accordingly while using road.
- Monitor and observe speed limit.

❖ **Community Health and diseases**

During the construction phase, community health and safety risks extend beyond disease transmission and include the potential for accidents and injuries related to construction activities. Rehabilitation work on canals and ponds poses drowning risks, especially for children and those unfamiliar with the altered water bodies. Trespassing in construction zones, which may contain storage areas, camps, lay down areas for construction materials, vehicles, and machinery, presents further risks of incidents and accidents for community members. Additionally, construction activities can lead to traffic and access disruptions that may cause safety issues for the community. The presence of construction workers and associated activities can also lead to potential conflicts with local communities. Construction sites also pose risks of accidents and exposure to construction related hazards.

- **Mitigation measures:**

- Establish clear and well-marked construction exclusion zones to prevent unauthorized access, especially to areas with open water, heavy machinery, and storage areas.
- Implement fencing and barriers to prevent trespassing and ensure community safety around construction areas.
- Provide warning signs in local languages to inform communities about the dangers and restricted access to construction areas.
- Install safety barriers around construction sites to minimize risks to the community and workers.
- Ensure proper storage of construction materials, with no materials left unsecured and scattered around the site.
- Develop and implement traffic management plans to minimize traffic and access disruptions and ensure pedestrian and vehicle safety.
- Conduct community awareness campaigns to educate the community about the potential risks and safety measures during construction.

- Establish and maintain a grievance mechanism to address community complaints and issues promptly.
- Implement safety measures around canals and ponds to prevent drowning incidents, such as installing safety barriers and providing warning signs in local languages.
- Create and enforce clear rules regarding access to canals and ponds during construction, and post those rules.
- Implement strict health and safety regulations at all construction sites to protect both workers and the nearby communities.
- Provide training to workers on safety protocols, including how to work safely around water, avoid accidents and minimize risks to the community.
- Ensure all workers are provided with necessary personal protective equipment (PPE) and enforce its use.

❖ **Personal Protective Equipment**

The construction or rehabilitation of irrigation canals and farm roads during the construction phase presents significant risks to worker safety and health due to the potential lack of personal protective equipment (PPE). These activities involve Canal Rehabilitation and Construction, Structure Construction and Rehabilitation, and Drainage Improvement, which expose workers to various hazards, such as Falling Debris, Sharp Objects, and Heavy Machinery.

The absence of proper PPE significantly increases the likelihood of injuries, such as cuts, fractures, or head trauma. Workers without respiratory protection may inhale dust, fumes, or toxic substances, potentially leading to respiratory problems. Similarly, inadequate eye and hearing protection can result in vision impairment or hearing loss due to flying particles and high noise levels. Furthermore, the lack of proper footwear and gloves increases the risk of slips, trips, and falls, and exposure to hazardous materials.

The impact receptors for risks associated with the lack of PPE are primarily construction workers but also include inspectors and visitors to the construction sites. The sources assess the risk associated with inadequate PPE as high, particularly in rural construction settings where cost-cutting measures might compromise worker safety. The sources emphasize that the absence of PPE not only jeopardizes individual safety but also reduces productivity and increases liability risks for the project.

▪ **Mitigation Measures**

- Continue and active use of PPE at all time of construction.
- Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual
- Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out.
- Proper use of PPE should be part of the recurrent training programs for employees.

❖ **Working conditions and Management of Worker**

The construction or rehabilitation of irrigation canals and farm roads during the construction phase of the project carries a risk of underpaid pay and unequal treatment for local workers hired by project contractors. This risk is exacerbated by the lack of written contracts for unskilled workers, particularly those recruited locally. Without a formal contract, these workers are vulnerable to being underpaid compared to the demands and scope of their work.

The sources highlight the potential for underpayment to occur based on gender and temporary work status, further marginalizing already vulnerable groups. The absence of clear contractual terms also increases the risk of late wage payments or even non-payment, jeopardizing the workers' livelihoods and potentially delaying the project's progress.

The impact receptors for underpaid pay and unequal treatment are primarily unskilled workers (mostly local people) and construction workers, particularly women. The sources assess the risk associated with these issues as moderate. The sources underscore that gender discrimination in the construction workforce, coupled with the presence of unregistered labor and weak enforcement of labor laws, can lead to exploitation and unfair treatment of workers, especially regarding payments. While the widespread use of social media and access to support systems might mitigate the scale of these issues, the risk remains significant.

- **Mitigation Measures**

- Implement a grievance mechanism for workers where workers can report issues related to underpayment or unequal treatment without fear of retaliation.
- Advise companies to provide equal opportunities for employment and promotions to all workers, regardless of gender, ethnicity, or background, to avoid discrimination.
- Regularly monitor and audit payroll and employment practices to ensure compliance with labor regulations and address any disparities.
- Offer training and capacity-building programs for all workers to enhance their skills and qualify them for higher-paying roles.
- Ensure that subcontractors and suppliers also adhere to fair wage and equal treatment policies.
- Set up worker committees or unions to allow collective bargaining and ensure workers have a voice in addressing wage and treatment issues.
- Provide accessible information to workers about their rights, entitlements, and the proper channels to address grievances through the establishment of the GRM for workers. This includes training on topics such as:
  - Environmental and Social Safeguards
  - Gender Awareness and the Gender Action Plan
  - Sexual Exploitation, Abuse, and Harassment (SEA/SH)
- Labor Rights and the Workers' Code of Conduct Regularly engage with labor rights organizations or third-party auditors to evaluate labor conditions and make improvements where necessary.

7.4.2.3 *CULTURAL HERITAGE*

The potential risk of the project during the construction phase to cultural heritage sites located within the project area. While the initial assessments indicate that the identified cultural sites in Ou Ta Paong and Lum Hach are minimally associated with the construction areas, there is

still a risk that smaller, undocumented sacred places within the command areas could be inadvertently damaged or destroyed during construction.

The sources highlight the case of Stung Krang Bat, where numerous historical and cultural heritage locations exist. Even though construction is expected to focus on existing canals, there is a possibility that construction activities might unearth archaeological artifacts buried deep in the soil. The ancient city of Longvek, once situated in this area, experienced many wars, leading to the possibility that treasures or artifacts of historical significance were hidden underground.

The impact receptors for cultural heritage risks are primarily underground cultural sites, and the sources assess the risk as minor. However, the sources emphasize that the detailed design plans have not yet been released or discussed with the community, leaving a degree of uncertainty about the potential impact on these sites. The lack of detailed information and community consultation underscores the need for careful consideration and mitigation measures to ensure the protection of cultural heritage during the construction phase.

- **Mitigation Measures**

- Conduct archaeological surveys before construction in culturally sensitive areas.
- Implement Find Chance Procedure

7.4.2.4 *CROSS-CUTTING*

- **Loss access to land and other assets**

In the construction phase, activities like upgrading existing reservoirs, constructing new dams, and implementing river training measures, carries a moderate risk of temporarily or permanently restricting access to natural resources for local communities. This restriction will likely affect farmers and fishers along the main streams of Ou Ta Paong and Lum Hach, as well as feeder canals in Ou Ta Paong. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could strain local resources, including water sources and forest products, potentially leading to overexploitation and environmental degradation.

- **Mitigation Measures**

- The project will prioritize avoiding physical resettlement and minimizing land acquisition. Design adjustments will be made to avoid or reduce land requirements, especially on private land. Public land will be prioritized for any necessary acquisition.
- Where land acquisition is unavoidable, the project will employ a negotiated settlement process with affected households. This process, guided by the RGC's Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR), aims to ensure that affected households receive fair and adequate compensation for their losses and maintain or improve their income and livelihood status.
- All individuals with assets within the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation, regardless of their legal status. Compensation will be provided for various losses, including land, structures, crops, trees, and income-generating activities.

- Recognizing the potential disruption of income streams during relocation or construction, the project will provide transitional allowances to affected households. These allowances will help cover living expenses and bridge the gap until they can resume their livelihoods.
- A multi-tiered GRM will be established to address grievances from any project-affected person. The GRM will operate based on the principles of the Green Climate Fund (GCF) and be accessible at no cost to the complainant.

❖ **Loss access to natural resources**

The construction phase of the irrigation project, specifically activities like upgrading existing reservoirs, constructing new dams, and implementing river training measures, carries a moderate risk of temporarily or permanently restricting access to natural resources for local communities. This restriction will likely affect farmers and fishers along the main streams of Ou Ta Paong and Lum Hach, as well as feeder canals in Ou Ta Paong. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could strain local resources, including water sources and forest products, potentially leading to overexploitation and environmental degradation.

▪ **Mitigation Measures**

- Implement efficient water management practices during construction and operation to prevent over-extraction of water resources from reservoirs and rivers and ensure equitable distribution for downstream communities and ecosystems.
- Use environmentally friendly construction materials and techniques to reduce the risk of pollution. Properly manage construction chemicals, fuels, and waste to prevent water pollution and contamination of natural resources. Prepare and implement a waste management plan to handle waste generated from construction activities and worker camps.
- Optimize construction material use and recycle, when possible, to minimize the extraction of new resources. Implement energy-efficient construction practices and use renewable energy sources where possible.
- Maintain ongoing communication with affected communities, including farmers, fishers, and downstream communities, to address concerns about natural resource access. Provide information and education to construction workers about responsible use of local resources and respect for community access rights. This suggestion is informed by the sources but is not directly stated in them.
- Ensure the GRM is accessible to all community members to address complaints related to natural resource access.

❖ **Social inequality**

The engagement and consultation processes during the design and construction phases of the irrigation project present a moderate risk of social inequality. The sources indicate that while landowners in the project areas are mainly from local communities, suggesting relatively equal access to the consultation process, vulnerable groups without farmland may have limited opportunities to participate and benefit from the rehabilitated irrigation system.

This potential for exclusion raises concerns about the fair distribution of project benefits. While the overall impact of social inequality during the construction phase is assessed as moderate, the sources acknowledge the need for targeted efforts to ensure that vulnerable groups are adequately consulted and included in the project's development.

The total number of households and vulnerable individuals in the sub-scheme was reported at 6,863 (25.4%), of which 3,523 are headed by women, 2,048 are classified as poor families (9%), 986 are disabled (1%), 151 are elderly (0.2%), and 155 are living without parents (0.2%). These individuals were thought to have little direct access to the project's benefits. Therefore, the local government should provide for these individuals and assign them to construction projects if they are capable. Project implementation should also take into account avoiding areas where vulnerable homes or land are fully impacted. In line with the project component, this move might enable them to continue receiving water or other benefits from the irrigation system.

- **Mitigation Measures**

- Conduct participatory planning and regular consultations with local communities, particularly marginalized groups (e.g., women, smallholder farmers, indigenous communities).
- Prioritize hiring local labor, with special provisions for disadvantaged groups (e.g., youth, women, minorities) in both skilled and unskilled positions.
- Develop and enforce water allocation plans that ensure fair access to water resources for all users, including small-scale and subsistence farmers, during and after construction.
- Implement fair and transparent compensation or resettlement plans for those displaced or affected by construction activities, especially vulnerable households.
- Establish accessible and responsive grievance redress mechanisms, ensuring all community members can raise concerns or complaints during construction.
- Conduct regular social impact assessments, with a focus on identifying inequality trends, and adjust project strategies to mitigate negative effects.
- Provide support and training for affected communities to diversify their livelihoods, especially for those whose livelihoods may be disrupted by construction (e.g., farmers, traders).
- Ensure transparency in the contracting process, including the selection of subcontractors and suppliers, with opportunities for local businesses, especially those run by marginalized groups.

- **Elite capture**

The risk of elite capture is anticipated given the fact these local elite could potentially influence the project to provide them project benefits. While the majority of landowners within the command areas are from the local community, which reduces the likelihood of large-scale land grabbing by powerful individuals or groups, the sources acknowledge the potential for the wealthy to use their influence, connections, or resources to encroach upon protected areas for personal gain. The risk of elite capture is assessed as moderate.

- **Mitigation Measures**

- Consultation will be conducted farmers in potential command area, focusing on vulnerable/disadvantaged groups
- Alternative livelihoods for vulnerable group are identified based on their needs vis-à-vis project's investment eligibility
- Conduct consultation at community level (in the command area) to achieve a consensus on how water needs are balanced between different groups in one command area.
- During subproject design, water availability, storage capacity, and water needs of upstream and downstream population are calculated to inform design, and water use coordination during project operation.
- Water user groups should be established for upstream and downstream population and should be coordinated by a higher-level committee/group to negotiate and optimize water coordination
- Guidelines/Manual should be developed to provide guideline for upstream and downstream communities at subprojects to meet, discuss, and achieve consensus on how water is distributed for equal use between upstream and downstream population

❖ **Gender inequality**

The risk of gender inequality due to limited access for women to training, resources, and decision-making processes related to irrigation and agriculture. This risk stems from pre-existing gender inequalities in Cambodia, where women often face barriers in accessing resources, technology, and leadership roles. The impact receptors for this risk are women farmers and laborers, who may be excluded from the full benefits of the project.

A gender analysis was conducted. Most income from project target group are generated from rice production, followed by animal husbandry, including chicken, cow, duck, and buffalo. Home-based fish farming and vegetable are rare: 1.7% (n=11) and 0.9% (n=6), respectively. Five key barriers are identified as current gender gap and potential constraint to promoting new technology adoption for improved adaptation. These include: 1) Traditional gender norms, 2) Burden of household chores, 3) Limited education and skills, 4) Lack of local wage jobs and increasing migration. Gender norms shape the gender division of labour in household chores, farming and income generation. Men generally take care of heavy works (physically heavy and poisonous) in farming and participate in social activities. Women bear the primary responsibility for child bearing and domestic works. Yet, they also play an important role in farming including home gardening, animal husbandry and rice production alongside men. Many women take care of rice during cropping season and participate in harvesting in case they do not have access to machinery. This is particularly the case for women headed households who face chronic lack of labour and more limited access to machinery and equipment. From project survey (n=630), Overall, it is estimated that male workers spend, on average, 59.4% of their time for farming vis-à-vis female counterpart who spend 40.5% of their time. However, most women participate jointly with their husband in decision making related to finance and play a dominant role (over their husband) when it comes to daily home expense and child care. However, since rice is mainly considered to be a male crop, this can have negative implication to promoting sustainable adoption of new rice farming techniques for rice farming households for an estimated 40,000 hectare across six irrigation schemes in four project provinces. Indeed, men typically dominate decision making in rice farming such as

selection of rice variety, use of pesticide and fertilizers as well as on-farm irrigation management. For instance, women tend to be under-represented in FWAC where key decisions on water management and irrigation use are made. This also means that extension activities targeting rice production are typically focused on male farmers.

- **Mitigation Measures**

- Implement the Gender Action Plan and measures to promote women beneficiaries' improved participation in project planning and implementation, and their economic empowerment.
- Ensure women have access to training, resources, and decision-making processes related to irrigation and agriculture. This includes providing training in local languages at times and locations convenient for women. Childcare provisions can facilitate women's attendance.
- Set targets for women's participation in all project activities.
- Raise awareness of the importance of sharing household chores and farming workloads. This can give women more time to learn new skills, attend training, and participate in project activities.
- Promote women's access to skills and business development training centered around project target value chains for commodities such as rice, poultry, vegetables, and fish.
- Encourage the use of labor-saving technologies that can help reduce women's workloads in farming and household activities.
- Support women's involvement in off-farm activities, such as processing and value addition as well as investments in green products and women-led green enterprises.

7.4.3 Risks and Impacts at Operation Stage

7.4.3.1 *COMMUNITY HEALTH AND SAFETY*

The potential for water use conflicts during the operation phase, particularly between upstream and downstream users, and recognizes the risk of accidental drowning, especially among children. The introduction of irrigation infrastructure and increased agricultural activity may alter existing water allocation patterns, leading to disputes between upstream and downstream communities. Upstream users may prioritize their own irrigation needs, potentially reducing water availability downstream, affecting livelihoods and ecosystems. For example, the Anlong Chrey reservoir, with a limited capacity of 30 Mm^3, is insufficient to meet the dry season irrigation demands of all four proposed irrigation sub-schemes in the Krang Ponley sub-project. This situation could exacerbate competition for water resources. The construction of new canals and reservoirs introduces open water bodies into the landscape, increasing the risk of accidental drowning, particularly for children.

- **Mitigation Measures:**

- The project will promote IWRM principles to ensure the equitable and sustainable allocation of water resources. This involves considering the needs of all stakeholders, including upstream and downstream communities, as well as environmental flow requirements for maintaining healthy ecosystems.

- Establishing a system for monitoring water use and enforcing water allocation regulations will help prevent over-extraction and ensure a reliable water supply for all users. This may involve installing flow meters, conducting regular water audits, and implementing penalties for non-compliance.
- The project will strengthen the capacity of FWUCs to manage water resources at the local level. This includes training on water allocation, conflict resolution, and operation and maintenance of irrigation infrastructure. Effective FWUCs can play a crucial role in mediating disputes and ensuring fair water distribution within their communities.
- Raising awareness about water safety and the risks associated with open water bodies, especially among children, is essential. Educational campaigns, signage, and community outreach programs can help promote responsible behavior and prevent accidents. This information could be included in the training programs that will be provided to farmers and communities.
- The project will consider incorporating safety features into the design of irrigation infrastructure. This may include fencing around canals and reservoirs, installing safety ladders, and providing designated swimming areas away from irrigation structures.

7.4.3.2 *CROSS-CUTTING*

❖ **Gender inequality**

The sources emphasize that women are less resilient to climate change than men and face unique vulnerabilities in terms of income, housing, and access to information and support systems. Socially defined gender roles can also hinder the adoption of climate-smart technologies among women. As a result, women may experience unequal access to water resources, limited participation in Farmer Water User Communities (FWUCs), and a disproportionate burden of negative impacts on their livelihoods.

Women-led households made up 15% of all sub-schemes, which is seen as a significant percentage. There is still gender disparity, which makes it difficult for them to participate in and profit from the project. Men often overestimate, which diverts women's attention from the involvement. Increased gender-based trainings for men and increased support for all vulnerable groups should be proposed by the local government and project implementer. There are 6,863 households and vulnerable people in the sub-scheme overall (25.4%), 2048 poor families (9%), 986 disabled people (1%), 151 elderly people (0.2%), and 155 parentless people (0.2%).

▪ **Mitigation Measures**

- The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices.
- The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology.
- The project should monitor gender equality indicators and should make adjustments as needed to ensure that women are benefiting from the project.

❖ **Social inequality**

In this phase, the concerning the competition for water resources among different user groups (farmers, communities, industries) and the potential displacement or restricted access to land due to irrigation infrastructure expansion, presents a minor risk of social inequality. Although the project aims to engage and consult with communities during the design and construction phases, vulnerable groups may still face limited access to irrigation water during the operation stage. This risk is especially relevant for farming communities, indigenous populations (if present), landless or land-poor households, and other vulnerable groups.

The vulnerable groups without farmland might have limited opportunities to benefit from the rehabilitated irrigation system. The impact of this social inequality is considered minor due to the relatively small proportion of poor people within the command area. However, it is important to note that the limited access to resources and capacity could hinder the full potential of efforts to support these vulnerable groups.

Approximately one-fourth (25.4%) of the vulnerable groups were included in the total sub-scheme. These groups often face challenges in accessing and participating as project beneficiaries due to limited land ownership, insufficient water-related equipment, and a lack of capital for agricultural production. To address this, local authorities and project managers should provide tailored support based on their needs and actively encourage their involvement in the project to improve their livelihoods.

- **Mitigation Measures**

- Ensure Equitable Water Access: Mechanisms should be in place to support vulnerable and marginalized communities in accessing water resources.
- FWUCs will manage the irrigation systems and ensure sustainability through fee collection. The project will invest in establishing and training FWUCs, emphasizing inclusivity and capacity building for vulnerable groups.
- Implement a Simplified Integrated Pest Management (IPM) Plan.

❖ **Elite capture**

The operation of the irrigation system during the operation phase creates a minor risk of elite capture due to the potential for unequal distribution of project benefits. This could result in powerful individuals or groups gaining a disproportionate share of the benefits at the expense of the intended beneficiaries. This risk is linked to the engagement and consultations conducted during the design and construction phases, as those processes might not fully prevent elite capture during the operational phase.

The main impact receptors are smallholder farmers, marginalized communities, and other vulnerable groups. Despite the project's efforts to ensure equitable access to resources, the sources highlight that wealthy individuals or groups could potentially leverage their power, connections, and resources to secure a larger share of water resources or control over irrigation infrastructure. This situation could further exacerbate existing social disparities and undermine the project's goal of improving livelihoods for all community members. The sources assess the risk of elite capture during the operation phase as minor. This assessment considers factors like the predominance of local landowners within the command areas and the current high land prices, which make large-scale land grabbing economically unfeasible.

- **Mitigation Measures**

- Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress mechanisms are essential to prevent manipulation and ensure equitable water distribution.
- Regular monitoring and evaluation: Continuous monitoring of project impact, especially on vulnerable groups, can identify and address elite capture.
- Strengthened land tenure security: Clarifying land rights can protect smallholder farmers and marginalized communities from land grabbing.
- Community engagement: Active community participation, especially from vulnerable groups, empowers them and ensures their needs are met.

CHAPTER 8 – RAPID CUMULATIVE IMPACT ASSESSMENT

8.1 INTRODUCTION

Cumulative impacts are those that result from the incremental impact of the project when added to other existing, planned and reasonably predictable future projects and developments. Under CAISAR, the implementation of infrastructure investment (Component 2) and non-infrastructure investments to support upscaled crop production (Component 1) under the six (6) sub–schemes are envisaged to result in cumulative impacts over a geographical area that is larger than the identified area of influence, particularly for Ou Ta Paong where other similar project(s) are being planned and there are a number of high biodiversity areas located to the downstream of these projects.

As part of the ESCIA exercise, a rapid assessment will be conducted to identify potential cumulative impacts and the preliminary high-level assessment of how the combined effects of the Project with other projects and activities, and natural environmental drivers, could affect valued environmental and social components (VECs) in the Project's area. As part of the ESCIA prepared for the sub–scheme, the assessment will focus on potential cumulative impacts associated with the sub–scheme, and for both intra-sub–schemes (where VEC are affected by multiple aspects of the sub–scheme) and inter-sub–scheme (where effects are enhanced due to other reasonably foreseeable activities/sub–schemes as well as from past and existing activities. Additionally, the RCIA is to assess the significance of the identified cumulative risks and impacts, evaluate the Project's contribution to these impacts and suggest management measures that could be implemented to prevent unacceptable VEC condition and for which the Project could contribute. The assessment will be conducted within the sub–scheme's area of influence and will be ex-ante[62] by nature.

The identification and management of cumulative impacts will be limited to the effects that are generally recognized as important based on a) scientific concerns and/or b) concerns of communities, including both adversely affected people and project's beneficiary community. In addition, cumulative impacts from other existing or planned projects in the neighboring projects will also be identified.

8.2 STEPS FOR CONDUCTING RCIA (PROJECT LEVEL)

The following six (6) steps, which are proposed by IFC, are adopted for this rapid Cumulative Impact Assessment:

Step 1: Scoping: Identification of Valued Environmental Components (VECs) and Spatial and Temporal Boundaries

[62] Ex-ante effect is assessed based on either modeling of original data collected under the Project, or on secondary data sources that are plausible to make an informed judgement.

The objectives of this step are:

- Identify VEC to include in the RCIA
- Identify the spatial boundary of the RCIA, and
- Identify the temporal boundary of the RCIA

During this step, the following key questions will be answered:

- Whose involvement is key?
- Which VEC resources, ecosystems, or human values are affected?
- What is the temporal boundary of the project?
- What are the spatial boundaries of identified VECs?
- Are there concerns from existing cumulative impacts?

Step 2: Identification of other Projects, Activities and External Stressors

The objectives of this step include:

- Identify other existing and reasonably predictable projects and human activities that do/would affect the VECs to be included in the RCIA.
- Identify natural environmental drivers that also impact the condition VECs

The following key questions would be answered during this step:

- Are there any other existing or planned activities affecting the same VEC?
- Are there any natural forces and/or phenomena affecting the same VEC?

Step 3: Establish Baseline Conditions of VECs

Objectives of this step include:

- Collect available information on the impacts of the other activities and natural drivers on the condition of the VECs.
- Collect available information on trends in VEC condition.
- Collect available information on regional thresholds for VEC condition

Questions to be answered in this step include:

- What is the existing condition of the VEC?
- What are the indicators used to assess such condition?
- What additional data are needed?
- Who may already have this information?

Step 4: Assess Cumulative Impacts on VECs

Objectives:

- Establish indicators for expression of VEC condition.
- Estimate the “future baseline” for condition of the VECs - i.e., the condition of VECs as affected by the other projects, human activities, and natural drivers
- Estimate the project impact on VEC condition. This estimation is done with the effects of planned project mitigation included
- Estimate the cumulative impact on VECs—the total impact on the VECs when the impacts of the development are combined with the future baseline

Questions to answer:

- What are the key potential impacts and risks that could affect the long-term sustainability and/ or viability of each VEC?
- Are there known or predictable cause-effect relationships?
- Can these impacts and risks interact with each other?

Step 5: Assess Significance of Anticipated Cumulative Impacts

Objectives:

- Assess the significance of the foreseen cumulative impacts on the VEC

Questions to answer:

- Do these impacts affect the sustainability and/or viability of the resource and/or VEC?
- What are the consequences and/or trade-offs of taking the action versus no action?

Step 6: Design and Implement Cumulative Impact Management Measures

Objectives:

- Identify, when necessary, additional project mitigation to reduce an estimated unacceptable cumulative impact on a VEC to an acceptable level.
- If necessary, identify the potential, or need for, additional mitigation of other existing or reasonably predictable future projects.
- Identify the potential for other regional strategies that could maintain VECs at acceptable conditions.
- Undertake best efforts to engage, enhance, and contribute to a multistakeholder collaborative approach for the implementation of management actions that are beyond the capacity of the project proponent.

Questions to answer:

- How can cumulative impacts be avoided, minimized, and/or mitigated?
- How can the effectiveness of proposed management measures be assessed?
- What are the triggers for specific adaptive management decisions?

8.3 SOURCES OF INFORMATION AND LIMITATIONS OF RCIA

Rapid Cumulative Impact Assessments (RCIA) rely on diverse sources of information to evaluate combined effects of multiple activities on the environment and society. Key sources include existing Environmental and Social Impact Assessments (ESIAs), scientific research, and government reports, which provide baseline data and insights on potential impacts. Geospatial data, such GIS maps, along with climate data, help analyze land use changes, and vegetation. Stakeholder input through consultations and interviews enriches the understanding of local contexts, while monitoring data from ongoing projects and biodiversity studies contribute to assessing ecological and social systems.

The limitations of the RCIA include unavailable studies being conducted at specific sites as well as relevant information being publicly disclosed. In addition, some information is

incomplete or outdated information. Moreover, stakeholder engagement may be limited or biased, and institutional or regulatory frameworks often lack clear guidance on cumulative assessments, reducing effectiveness.

8.4 RESULTS OF THE RAPID CIA

The nature of this proposed RCIA will be *ex-ante* and will be based on 1) scientific concerns, 2) concerns of affected communities within the sub-scheme's area of influence, or beyond the downstream, 3) consultation with concerned project stakeholders and interested stakeholders. Based on stakeholder consultation, a list of VEC is proposed to define the scope of the proposed RCIA (See next section).

8.4.1 Identification of Valued Environmental and Social Components (VECs) (Step 1)

Based on the ESCIA, stakeholder consultations, and scientific evidence, the following VECs are identified for activities proposed under project component 1 and component 2, as well as for all other existing, planned, or reasonably defined developments that may also affect these VECs (Table 8.1).

Table 8.1: Identification of valued environmental and social components (VECs) under the RCIA

VECs	**Criteria Rating**	**Criteria Rating Rationale**
Water Pollution	Nature	The project has the potential to contribute to water pollution in various ways, including runoff from agricultural fields, utilization of pesticides and fertilizers, construction activities, and industrial discharge.
	Duration: Long term	The impacts of water pollution can persist over extended periods, particularly if not adequately mitigated.
	Livelihood:	Water pollution directly threatens the livelihoods of communities reliant on fishing and clean water resources for domestic use and agriculture.
	Spatial scale:	Water pollution can spread beyond the immediate project area, affecting downstream water quality and potentially impacting ecosystems and communities in neighboring regions.
	Magnitude: Medium	The magnitude of potential water pollution is significant, considering the project's scale, the vulnerability of aquatic ecosystems, and the potential for cumulative impacts from existing pollution sources.
	Receptors	**Ecosystems:** Aquatic life, riparian vegetation, water-dependent species.

VECs	Criteria Rating	Criteria Rating Rationale
		Human communities: Communities reliant on clean water for drinking, sanitation, and irrigation.
	Involved Stakeholders	PMU, Line Ministries (MoWRAM, MEF, Ministry of Environment), Local Authorities, NGOs focusing on water resources and environmental protection, CBOs (FWUCs), Community People, particularly those directly dependent on water resources.
Soil Pollution	Nature	The project can contribute to soil pollution through the use of fertilizers and pesticides, construction activities, and improper waste disposal.
	Duration: Long term	Soil contamination can persist for many years, impacting soil fertility and potentially posing risks to human health and ecosystems.
	Livelihood: Medium	Soil pollution directly affects agricultural productivity and can reduce crop yields, impacting the livelihoods of farmers in the project area.
	Spatial scale:	The impacts of soil pollution are primarily localized to the project area, affecting agricultural land and potentially nearby ecosystems.
	Magnitude: Medium	While the project aims to promote sustainable agricultural practices, the potential for soil pollution from intensified agriculture and construction activities warrants a medium magnitude rating.
	Receptors	**Soil organisms:** Microorganisms, invertebrates, and plants essential for soil health and fertility. **Crops:** Agricultural productivity and food security. **Human health:** Potential risks from contaminated food and water.
	Involved Stakeholders	PMU, Line Ministries (MAFF, Ministry of Environment), Local Authorities, Agricultural Extension Services, NGOs working on sustainable agriculture, CBOs (Farmer Organizations), Community People, particularly farmers and those involved in agricultural production.
Loss of biodiversity and ecosystem services	Nature	The project has the potential to impact biodiversity and ecosystem services through habitat loss, fragmentation, water pollution, and altered flow regimes. For the case of Lum Hach, there will be the division of Toul Samroang community forestry where the irrigation will be broken the protected area into two parts. The total protected land area that will be acquired was estimated at 36,182 m^2, giving the

VECs	Criteria Rating	Criteria Rating Rationale
		length of the main canal across the protected area at 1.49 km and the width the canal at 24.3 meters.
	Duration: Long term	Biodiversity loss and ecosystem degradation can have long-lasting and potentially irreversible impacts on ecological integrity and the provision of ecosystem services.
	Livelihood: Medium	Communities reliant on natural resources, particularly fishing and forest products, will be affected by biodiversity loss and changes in ecosystem services.
	Spatial scale: Local	The impacts on biodiversity are primarily localized to the project area and surrounding ecosystems.
	Magnitude: Medium	Considering the presence of critical ecosystems like the Tonle Sap Lake and its floodplain, the potential for habitat loss and degradation warrants a medium magnitude rating.
	Receptors	**Species:** Plants, animals, fish, and other organisms reliant on the affected ecosystems. **Habitats:** Community Forests in Lum Hach, wetlands, rivers, and other areas providing essential habitat for biodiversity. **Ecosystem services:** Water purification, flood regulation, pollination, and other services essential for human well-being.
	Involved Stakeholders	PMU, Line Ministries (Ministry of Environment, MAFF, MoWRAM), Local Authorities, NGOs focused on biodiversity conservation, Research Institutions, Community People, particularly those dependent on natural resources and ecosystem services.

VECs = Valued Environmental and Social Components, PMU = Project Management Unit, MoWRAM = Ministry of Water Resources and Meteorology, MEF = Ministry of Economy and Finance, NGOs = Non-governmental Organizations, CBOs = Community-Based Organizations, FWUCs = Farmer Water User Communities, MAFF = Ministry of Agriculture, Forestry and Fisheries.

8.4.2 Identification of other Projects, Activities and External Stressors (Step 2)

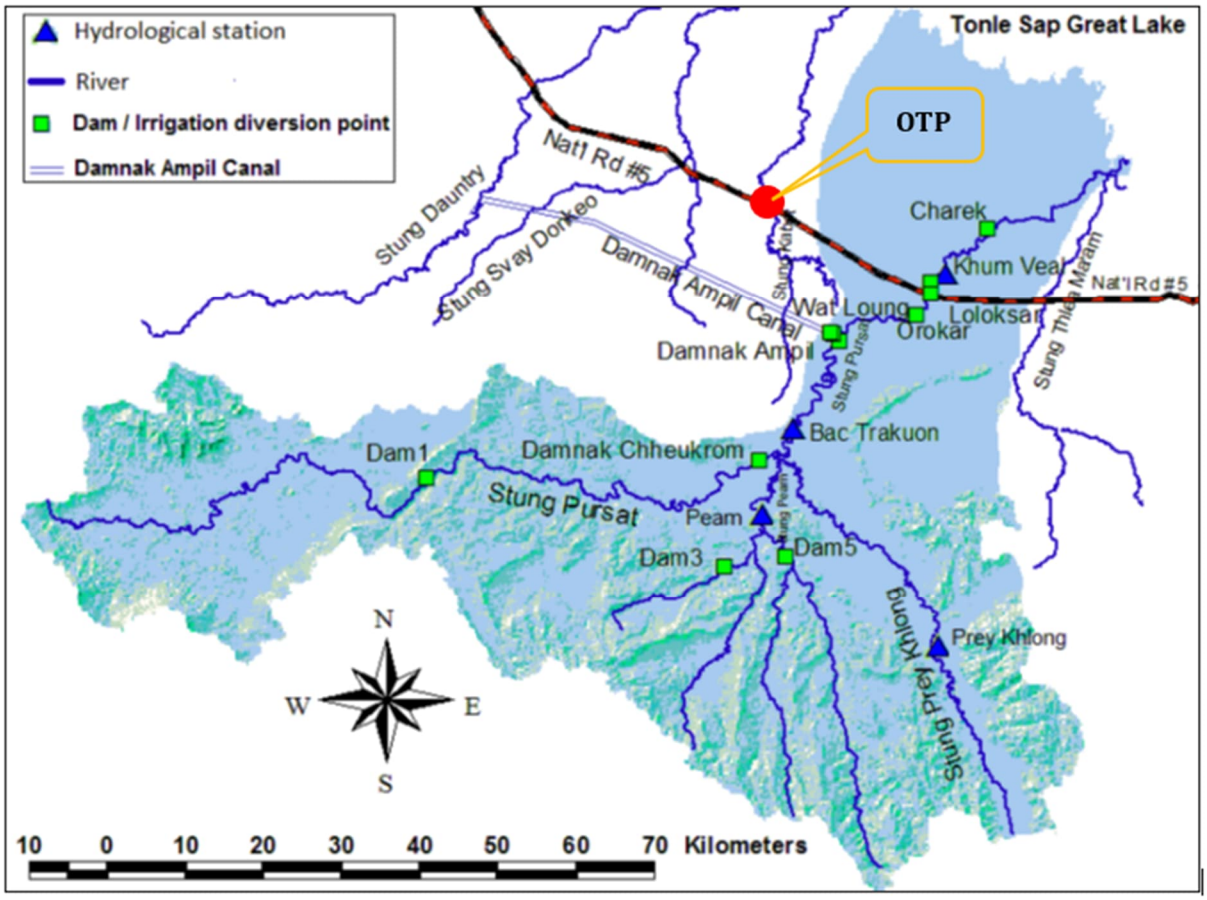
The projects which are considered to accumulatively create the combined impacts with CAISAR project are mainly the irrigation projects which can be the previous, the current and the planned one. The identified projects nearby each sub-scheme are described below:

8.4.2.1 Ou Ta Paong

Pursat province has several significant hydropower and irrigation projects, including the Stung Pursat Hydropower I Dam, Damnak Chheukrom Irrigation Project, Damnak Chheu Krom Dam,

and Domnak Ampil Canal. These projects are currently under construction or have already been operational, playing an important role in energy supply and the province's agricultural development. However, all these projects are located at a considerable distance from the Ou Ta Poang command area, with the exception of the Domnak Ampil canal, which is located upstream and approximately 5 kilometres away from Ou Ta Poang. The commuters along the national roads are part of the air and dust contributors as well which may reduce air quality. On the other hand, the OTP is mostly covered by paddy fields and residential areas.

Figure 8.1: Location of Water resources development in the Pursat river (JICA, 2013)



8.4.2.2 Lum Hach

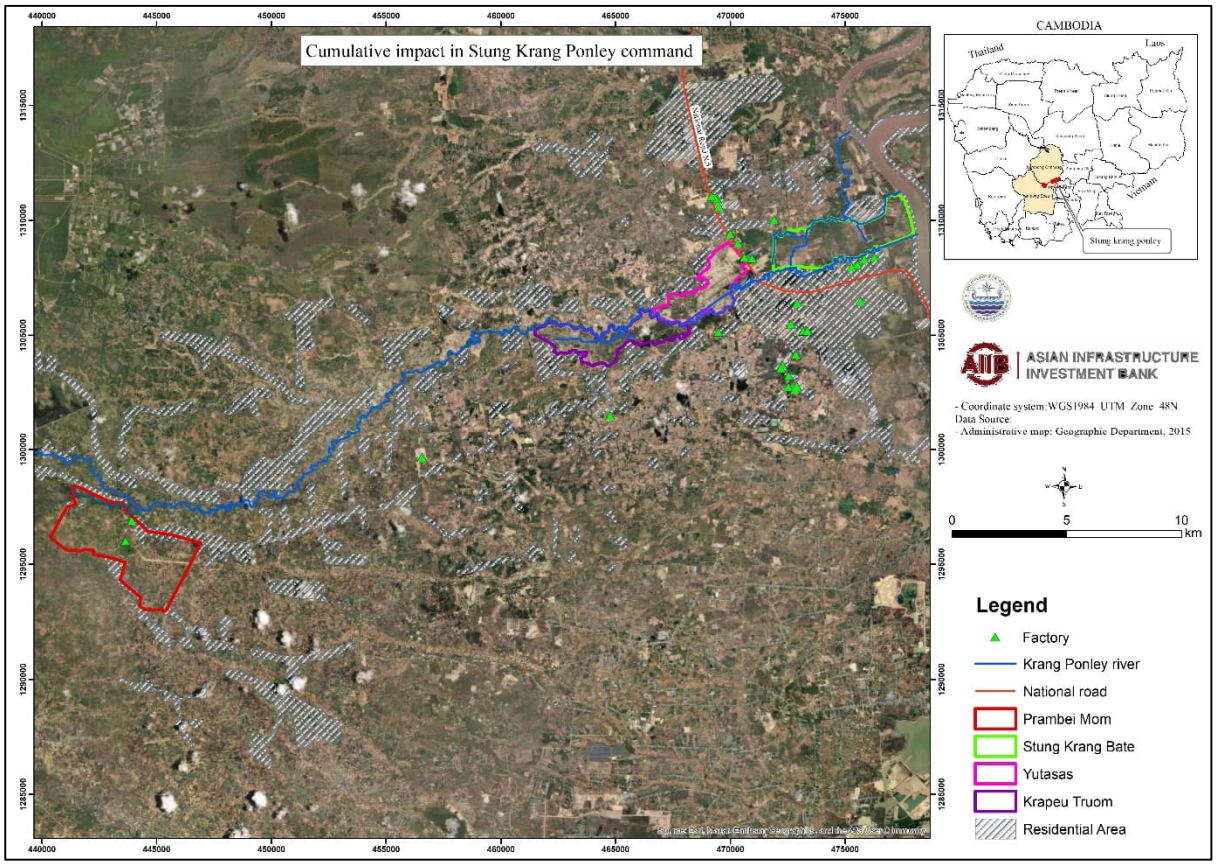
In the Lum Hach irrigation scheme, apart from the existing and rehabilitated irrigation systems, there are no other projects. Additionally, the Lum Hach area is located west and near the Tonle Sap Lake, which is identified as covered by paddy fields and residential areas. Therefore, beside the construction activities in the Lum Hach scheme, there are agriculture activities that are going to have an impact on the environment, community health, and GHG emissions as well.

8.4.2.3 Krang Ponley

The Stung Krang Ponley sub-scheme, identified by a mix of residential areas, paddy fields, and factories, faces a complex interplay of environmental impacts from these diverse activities. Factory operations often contribute to air and water pollution through emissions and discharges, while agricultural activities can lead to water pollution from pesticide runoff and

greenhouse gas emissions. In addition, residential areas can generate waste and contribute to noise pollution.

Figure 8.2: Cumulative impact in Stung Krang Ponley



(Source: ESCIA Study 2024)

8.4.3 Baseline Conditions of VECs (Step 3)

As per the current water pollution monitoring report, the contamination of Tonle Sap Lake (TSL) in Cambodia caused by pesticide runoff from agricultural fields and households, particularly after rainfall. This contamination pathway implies that pesticides can accumulate in the soil, potentially affecting its quality and health. Rainwater then carries these pesticides into rivers, ultimately reaching TSL and polluting the water. The anthropogenic activities, including pesticide use, threaten the lake's water quality including various pesticides such as Chlorfenapyr, Terbcarb, Atrazine, 2-Phenylphenol, Parathion, Dieldrin, Malathion, Methyl parathion, and Biphenyl, in TSL water samples. The detection of these pesticides confirms their use and presence in the lake and its surrounding areas.[63] In addition to the pollution of water and soil, the areas are gradually deteriorated in terms of biodiversity and ecosystem services due to habitat loss, pollution, and hydrological disruptions from upstream dams and climate change. These factors have led to declines in fish diversity, waterbird populations, and wetland habitats, alongside reduced ecosystem services such as fisheries productivity, water quality regulation, and nutrient cycling. The lake's seasonal flood-pulse system, essential for

[63] Meas, Mardi, May Phue Wai, Nimol Vat, Senghong Kin, Si Chheng Im, Sopheak Trerm, Sreynith Lis, and Rina Heu. "Monitoring of Pesticide Residues in Tonle Sap Lake, Cambodia."

maintaining its ecological balance, is increasingly disrupted.[64&65] The identified VECs conditions at the period are described here (Table 8.2).

Table 8.2: Baseline conditions of the identified valued environmental and social components (VECs) under the RCIA

VECs	Ou Ta Paong	Lum Hach	Stueng Krang Ponley
Water pollution and soil pollution	• Potential for water contamination due to the existing use of agricultural chemicals in the OTP sub-scheme and neighboring areas. • Runoff from agricultural fields could carry pollutants into water bodies and groundwater.	• Potential for water contamination from agricultural runoff and industrial discharge.	• Potential for water pollution from both agricultural and industrial sources. • Water quality in the Stueng Krang Bat sub-scheme could be impacted by runoff from upstream areas and potential industrial discharge.
Loss of Biodiversity and ecosystem services	• Degradation of flooded forest habitats due to land encroachment and conversion to rice cultivation. • Fragmentation of the Ou Ta Paong Stream/canal by earth dams, roads, and ponds, impacting its natural flow. - Presence of several Endangered and Critically Endangered reptile and fish species.	• Habitat loss and degradation due to agricultural expansion and other land use changes. • Potential impacts on endangered and critically endangered species, as identified through IBAT screening. • The division of the Toul Samroang community forestry, where the irrigation system will divide the protected area into two parts, was estimated at 36,182 m^2.	• The Stueng Krang Bat sub-scheme is in an ecologically important area with a diverse range of habitats, including flooded forests, grasslands, and scrublands. • Potential for habitat loss and degradation due to irrigation infrastructure development and agricultural intensification. • Presence of Endangered and Critically Endangered reptile and fish species, including the Black Marsh Turtle, Elongated Tortoise, and Mekong Giant Catfish.

VECs = Valued Environmental and Social Components, OTP = Ou Ta Paong.

8.4.4 Assessment of the Cumulative Impacts of VECs (Step 4)

The assessment of the cumulative impacts on the identified VECs is presented in Table 8.3 below.

[64] Chen, Aifang, Anping Chen, Olli Varis, and Deliang Chen. "Large net forest loss in Cambodia's Tonle Sap Lake protected areas during 1992–2019." *Ambio* 51, no. 8 (2022): 1889-1903.
[65] Lindsay, Joey, Keida Gaba, Lindsay Harmon, and Susan Jarvis. "Tonlé Sap Food Security & Agriculture III: Evaluating Changes in Ecosystem Vitality and Freshwater Health in the Tonlé Sap Basin using Remotely Sensed Data." (2021).

Table 8.3: Analysis result of the identified valued environmental and social components under the RCIA

VECs	Potential and Assessment of Impacts on the VECs	Key activities that cause risks and impacts			Potential Receptors		Supporting evidence	
		CURRENT PROJECT (CAISAR Project)	**PAST PROJECTS** (active command areas in the larger area)	**PLANNED PROJECT**	**Within current estimated area of influence**	**Beyond current estimated area of influence**	Scientific concerns	Affected Stakeholders
Water pollution & Soil pollution	- The increased use of agricultural chemicals under the OTP sub–scheme (about 14,000 ha), existing neighboring schemes, and the planned ADB financed project (IWRM), and various active command areas (See picture below). - Intensifying crop production may affect the quality of water (both surface and underground water). - Factories located along the Stung Krang Ponley command area also contribute to pollution of surface and groundwater, exacerbating the overall water quality issues	Increased crop production during operation phase (indicative of increased cultivated area per year)	Dannak Chheu Krom and Damnak Ampil irrigation schemes at the upstream of Ou Ta Paong. JICA-led Lum Hach 1 Irrigation Scheme upstream of Lum Hach sub-scheme and Achang irrigation Scheme downstream. No past projects being reported within Krang Ponley schemes which are additional the rehabilitated activities. The present of these projects are accumulated in terms of pesticide application along the irrigated areas within their command areas, especially in Ou Ta Paong while limited connected in Lum Hach.	IWRM Project upstream along the Kbal Hong main canal will lead to the increased crop production during operation phase of the project.	Soil and water sources within the project targeted command area	Soil and water sources outside the project targeted command area and to the downstream (e.g. Ou Tapaong,	X	X

VECs	Potential and Assessment of Impacts on the VECs	Key activities that cause risks and impacts			Potential Receptors		Supporting evidence	
		CURRENT PROJECT (CAISAR Project)	**PAST PROJECTS** (active command areas in the larger area)	**PLANNED PROJECT**	**Within current estimated area of influence**	**Beyond current estimated area of influence**	Scientific concerns	Affected Stakeholders
	Biodiversity							
Loss of Biodiversity and ecosystem services	- Critical habitats important to EN and CN species are potentially affected due to polluted surface, food poisoning, and decreased sources of food essential to EN and CN species due to water and soil pollution. - Disruption of Ecosystem Services: The loss of biodiversity can disrupt ecosystem services such as water purification, flood control, and carbon storage, slightly contributing to the long-term impact. - Industrial activities along the Stung Krang Ponley command further contribute to biodiversity loss through the release of solid and liquid waste into water resources - Agricultural activities, including the use of fertilizers, pesticides, and machinery in paddy fields, can disturb water quality and disrupt aquatic and terrestrial ecosystems.	Construction of the irrigation systems Farming activities Factory activities	Construction of the past irrigation systems have already led to the expansion of the production areas and this will be likely to accumulated with the current systems.	Construction of the irrigation systems Farming activities Factory activities	Aquatic and terrestrial species	Potentially the protected area at the downstream of Ou Ta Paong and at the upstream of Lum Hach	X	X

VECs = Valued Environmental and Social Components, IWRM = Integrated Water Resources Management, OTP = Ou Ta Paong, ADB = Asian Development Bank, CAISAR = Climate Adaptive Irrigation and Sustainable Agriculture for Resilience, EN = Endangered, CN = Critically Endangered.

8.4.5 Assessing the Impacts Significance (Step 5) and Management Measures (Step 6)

The assessment of the impact significance and management measures are provided in table 8.4 below:

Table 8.4: Analysis of the Identified VECs Baseline Condition, Impacts Significance and Management Measures, and Responsible Stakeholders

VECs	Existing Conditions and Trends of VECs	Cumulative Impacts Expected from the Other Project Activities	Significance of Cumulative Impacts	Suggested Management Actions for Cumulative Impacts	Responsible Stakeholders
Water pollution & Soil pollution	▪ Existing agricultural practices, including fertilizer and pesticide use, contribute to water and soil pollution. ▪ Industrial activities along the Stung Krang Ponley command area release waste into water resources. ▪ Soil quality varies across sub-schemes, with some areas facing low fertility and high hydraulic conductivity.	▪ Increased fertilizer and pesticide use associated with intensified crop production can exacerbate water and soil pollution. ▪ Construction activities can contribute to soil contamination through the release of oils and chemicals. ▪ Waste disposal from industrial activities can further impact water and soil quality.	▪ Potentially high significance, as water and soil pollution can impact human health, agricultural productivity, and ecosystem health. ▪ Cumulative impacts from multiple sources can lead to long-term degradation.	- Promote sustainable agricultural practices, including integrated pest management (IPM) and reduced fertilizer use, to minimize pollution from agricultural activities. - Implement strict measures for the handling, storage, and disposal of chemicals and waste during construction and operation. - Develop and enforce regulations for industrial waste discharge to protect water and soil quality. - Monitor water and soil quality regularly to assess impacts and identify necessary mitigation measures. - Remediate contaminated sites to restore soil health and prevent further pollution.	- CAISAR PMU and Involved executing agencies and - PMU of the IWRM, Agriculture, Environment Department, local Authorities, Farmers Water Users Community to monitor the impacts.
Loss of Biodiversity and ecosystem services	▪ Existing industrial and agricultural activities have already contributed to biodiversity loss and habitat degradation. ▪ Tonle Sap Lake and its floodplain are a critical ecosystem supporting diverse species and livelihoods. ▪ Community fish refuges and key biodiversity areas	▪ Micro-habitat loss and fragmentation due to construction activities and expansion of agricultural land. ▪ Water pollution and altered flow regimes can impact aquatic ecosystems and fish populations. ▪ Increased pesticide use can negatively affect	Potentially moderate to high significance, as biodiversity loss and ecosystem degradation can undermine long-term ecological resilience and the provision of ecosystem services essential for livelihoods and well-being.	- Avoid sensitive habitats and critical areas during project siting and design. - Minimize habitat disturbance and fragmentation during construction activities. - Establish buffer zones around water bodies and sensitive areas to protect biodiversity. - Restore degraded habitats and create ecological corridors to enhance connectivity.	- CAISAR PMU and Involved executing agencies and - PMU of the IWRM, Agriculture, Environment Department, local Authorities, Farmers Water Users Community to monitor the impacts.

VECs	Existing Conditions and Trends of VECs	Cumulative Impacts Expected from the Other Project Activities	Significance of Cumulative Impacts	Suggested Management Actions for Cumulative Impacts	Responsible Stakeholders
	(KBAs) are present in the project region.	pollinators and other beneficial insects.		- Implement monitoring programs to assess impacts on biodiversity and ecosystem services and adapt management practices accordingly. - Engage local communities in biodiversity conservation efforts and promote sustainable land management practices.	

VECs = Valued Environmental and Social Components, IPM = Integrated Pest Management.

8.5 CONCLUSION

The cumulative impact assessment for the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project. This project aims to improve irrigation systems in three (3) sub-schemes: Ou Ta Paong, Lum Hach, and Stung Krang Ponley. The assessment identifies potential environmental and social impacts associated with the project, including air, water, and soil pollution, waste disposal, biodiversity loss, GHG emissions, and economic displacement. This assessment has analyzed that, besides the CAISAR project, there are existing activities, such as agricultural practices and industrial activities, in the surrounding project areas. These activities, when combined with the projected activities, had cumulative impacts on the environment and society in certain areas.

CHAPTER 9 − ENVIRONMENTAL & SOCIAL MANAGEMENT

9.1 INTRODUCTION

This chapter outlines the purpose, roles, and responsibilities related to the management of environmental and social impacts associated with the project. The primary purpose of the chapter is to present a structured framework for mitigating and monitoring potential environmental and social risks throughout the project lifecycle. It highlights the importance of integrating environmental and social considerations into project planning and implementation to ensure compliance with national regulations, international best practices, and the project's sustainability goals.

Key institutions involved in the environmental and social management process include government agencies, local authorities, and specialized environmental and social monitoring bodies. These institutions are responsible for ensuring adherence to environmental laws, assessing the project's social impacts, and overseeing the implementation of mitigation measures. Their roles also involve collaborating with stakeholders, including affected communities, to address concerns and facilitate transparent project execution.

Furthermore, the proposed monitoring program is designed to track the effectiveness of mitigation measures and ensure that environmental and social risks are managed proactively. This program involves regular assessments of key indicators such as air and water quality, biodiversity conservation, community health, and socio-economic conditions. Continuous monitoring ensures that any negative impacts are identified early, allowing for timely interventions to minimize adverse effects on both the environment and surrounding communities.

9.2 ENVIRONMENTAL, SOCIAL AND CLIMATE MANAGEMENT MEASURES

Based on the ESC risks and impacts identified and assessed (in Chapter 06), a summary of proposed mitigations measures is presented below.

9.2.1 Mitigation Measures for the Environmental and Climate Risks and Impacts

Table 9.1: Preconstruction, Construction, and Operation Phase Environmental Mitigation Measures

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
Preconstruction phase				
1	Unexploded Ordnance (UXO) survey & removal			
	Risk of injuries or fatalities among workers or members of the public	• Carry out UXO screening/assessment by certified UXO experts before any physical/ construction activities are allowed. • In case UXOs are found by certified experts during on-site screening, removal of UXO will be carried out by certified experts. • A UXO clearance certificate shall be obtained from related authority for each sub-project prior to commencing any subproject activities. • As part of site-specific ESCMP, conduct training and awareness activities for local community with regards to UXO risks and chance finds.	PMU Contractor	Before construction
Construction phase				
ENVIRONMENTAL, HEALTH, AND SAFETY				
1	Noise and Vibration			
	• Earthmoving activities and operation of machineries at construction sites will generate dusts and exhaust fumes. • Construction activities, operation of vehicular movement, excavation machineries, concrete mixing, and other construction activities will generate noise and vibration and will be a nuisance to workers and residents near the site. • Noise may be generated from workers' camp, particularly during living activities or entertainment at nighttime, or due to certain maintenance /repair of equipment, machinery, vehicles.	• Maintain all exhaust systems in good working order and undertake regular equipment maintenance to ensure compliance with applicable regulations and manufacturers' instructions. • Implementation of operating and maintenance practices of equipment and machinery to ensure that they are well-maintained. • Ensure that noise control options such as silencers and mufflers are fitted to exhausts, compressors and fans for construction equipment (such as hydraulic excavator, bulldozer, front loader, backhoe and trucks). • Provide advance warning to the community on timing of noisy activities. Seeking suggestions from community members to reduce noise annoyance and notify the communities about how to raise their concerns (if any) through the Grievance Redress Mechanism. • Undertake noise monitoring at the closest residential area and other noise sensitive receptor during times with ongoing construction work to ensure compliance with the relevant noise standards. • The contractor shall provide all construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80 dB(A)), or any construction personnel who requests hearing protection, with hearing protection equipment. • A speed limit of 30 km/h for construction related traffic through inhabited areas. • The contractor shall conduct noise testing at the sensitive locations as per the detail engineering design comparing to the IFC EHS Guideline • Avoid night-time construction in populated/village areas.	• PMU • Contractor	Daily/ Every 06 months

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• No noisy construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and during religious or cultural events near the subproject • Provide temporary noise barriers (3–5-meter-high barrier can reduce 5–10 dB(A)), as necessary, if site works will generate high noise levels that could disturb nearby households, hospital, school and other sensitive receptors. • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.		
2	**Air pollution**			
	• Dust and particulate matter (PM10 and PM2.5) generation from soil disturbances, stockpiles, and road works • Exhaust emissions from trucks and heavy machinery (NOx, CO, SO2, VOCs) • Waste disposal, particularly through burning	• Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition. • Select Borrow sites located as close as possible to the construction to reduce distances. • If Concrete batching facilities are in need, it will be located at least 500 m (0.5 km) downwind from the nearest dwellings to reduce the impact of dust and fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions. • Water will be regularly sprayed to suppress fugitive dust at construction sites, material handling areas, access road and borrow pits. • Trucks carrying dry construction materials such as earth or waste will be covered with tarpaulins or other suitable cover. • Construction vehicles and machinery will be maintained to a high standard to minimize emissions and ensure compliance with the National exhaust emission standards. All mobile equipment should be fitted with catalytic converters. • A speed limit of 30 km/h for construction related traffic through inhabited areas and on the access road will be enforced. • All open burning of construction and demolition waste material and refuse will be prohibited. • Testing air quality (NO2, SO2, CO, TSP, PM10, PM2.5)	• SEO • E&S specialist consultants • PMU	Daily/ Every 06 months
3	**Impact on Water**			
	• Dredging and excavation can significantly increase sedimentation in water bodies. • Disturbed soil can enter rivers and lakes, potentially polluting domestic water sources. • Large-scale dredging projects, like the 30km Ou Ta Paong dredging, pose a	• Installation of temporary non-erodible ditches or bunds at the construction site to divert clean runoff away from exposed areas, and convey potentially dirty runoff to sediment control devises. • Stockpiles and materials will be stored at least 50 m from surface waters with drainage directed away from the canals and streams or water sources. • The sediment quality of the dredge spoil will need to be tested and assessed against an appropriate standard before re-use in the structure of embankments. The sediment testing results will confirm safe re-use of the material	• SEO • E&S specialist consultants • PMU	Daily/ Every 06 months

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	significant risk to water quality throughout the excavation period. • Sedimentation can reach downstream areas, including the Tonle Sap Lake, if not properly mitigated. • Infiltration of wastewater from workers' camps can contaminate groundwater. • Leakage of hazardous materials like oil and diesel from machinery and vehicles can pollute both surface and groundwater.	• No washing or repair of machinery within 50 m of surface waters. • Construction working areas will be clearly demarcated and encroachment onto adjacent areas avoided. • Portable toilets and small wastewater treatment units will be provided at the construction site and labour camps. All sanitary facilities will be located at least 50 m from surface water bodies. All workers must be instructed to use these facilities, which shall be kept clean at all times. • Pit latrines and septic tanks should be placed at least 2 m above the groundwater table must be located at least 50 m from surface water bodies and water wells and in areas of suitable soil profiles. • All hazardous materials including hazardous waste will be stored on an impervious surface, under cover, in adequate tanks or containers and within secondary containment. A bund will be provided around any above ground fuel storage tank with capacity of 110% of the largest single tank. Storage of hazardous materials shall be at least 50 m from surface water bodies with no direct drainage to surface water. • Areas where spills of fuel or oil may occur will be equipped with easily accessible spill control kits to assist in prompt and effective spill control. • Refueling of machineries by service vehicles will be conducted with measures preventing oil spillage during refueling including placement of buckets under refueling nozzles. • Runoff accumulating at the bottom of excavation pits during construction will be pumped out, reused where practicable or otherwise conveyed to appropriate sediment retention devises before being discharged to the environment. • Hazardous waste (oil waste) shall be properly collected and stored in closed containers under shelter for recycling or disposal by a duly authorizes enterprise. • Regularly inspect and maintain construction equipment to prevent leaks and spills. • Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform) and pesticide residues in water (to be conducted overseas).		
4	**Solid and Hazardous Waste**			
	• Hazardous wastewater, such as oil or fuel, polluting materials used for machinery and construction process at the construction site.	• Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations; • Vehicles and equipment shall be properly staged in designated areas to prevent contamination of soil and surface water; • Vehicles, machinery, and equipment maintenance and re-fueling will be carried out in such a way that spilled materials do not seep into the soil;	• PMU • Contractor	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Oil traps will be provided for service areas and parking areas; • Fuel storage and refilling areas will be located at least 50m from canals and channels and will be protected by temporary drainage bunds to contain spills.		
5	**Waste and Wastewater**			
	• Domestic wastewater comes from workers/staff's water consumption daily.	• Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum). • Safe temporary storage of hazardous waste as required • To the extent possible, a duly authorized waste company will be contracted to recycle hazardous waste. • Non-hazardous, non-recyclable solid waste will be temporarily deposited and managed together at existing landfill/dumpsite. • All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering. • The Contractor will be required to train the workers in proper waste management.	• PMU • Contractor	Daily
6	**OCCUPATIONAL HEALTH AND SAFETY**			
		• Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines; • Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements; • Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks; • Install appropriate fencing and control access to the site; • Install appropriate safety signage and markings; • Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m; • Ensure there are safe ways to enter and exit the excavation; • Keep excavations dry; • Provide safety precautions when using high voltage electric power tools; • Carry out daily toolbox meetings (safety briefings); • Maintain an accident record book where all major or minor accidents and incidents are recorded with actions taken; • Educate the workers on construction hazards; • Train drivers on safe driving skills and traffic regulations; • Appoint an Environment, Health and Safety Officer who is a qualified engineer; • Make adequate first aid equipment available on site; • Carry out training and awareness of the workers on HIV-AIDS prevention; • implement emergency preparedness and response procedures Response Plan as planned in the CEMP.	• PMU • Contractor	Daily/Weekly

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Ensure that all workers are equipped with and use Personal Protective Equipment (PPE). • The Contractor will set out an Emergency Response Plan		
7	**COMMUNITY HEALTH AND SAFETY**			
		• Prior to the start of construction work, the contractor in cooperation with the PIU will consult with the local authorities and potentially affected residents/private landowner. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM). • The contractor shall fence off the construction area and control access to the site. • A speed limit of 30 km/h for construction related traffic through inhabited areas. • The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities. • The contractor, in cooperation with the local authorities shall implement traffic management to ensure a smooth traffic and prevent congestion.	• PMU • Contractor	Daily/Weekly
BIODIVERSITY				
1	**Habitat Loss and Fragmentation:**			
	• Conversion of forests and wetlands at micro or large may be needed for canal construction such as Lum Hach community forestry leading to broken down of the habitat. • The remaining natural habitats may become isolated patches, making it difficult for species to migrate, find mates, and maintain healthy populations. • In Lum Hach, there will be the division of Toul Samroang community forestry where the irrigation will be broken the protected area into two parts.	• Minimize the negative impact from land clearing on habitat connectivity by minimizing fragmentation and maintaining canopy connectivity across cleared areas. • Establishing and maintaining guard posts on access roads near residential and biodiversity priority areas. • Implementing measures such as habitat restoration, creating wildlife corridors, and ensuring that water management practices are sustainable and supportive of biodiversity. • Rescuing and properly handling wildlife encountered during land clearing and construction, following SOPs. • Identify and avoid sensitive areas, such as known habitat for Green Peafowl or other endangered species. • Implement habitat management measures to improve the quality and suitability of habitats for species.	• SEO • PMU • Contractor	Daily/Weekly
2	**Hunting and trading, and consumption of wildlife**			
	• The influx of a new labour force can increase demand for exotic local foods, including wildlife and endangered species, which are often seen as interesting and delicious. This may be	• Develop and enforce a strict Code of Conduct/ethics against wildlife collection, possession, and trafficking. This includes clear policies and sanctions for employees and subcontractors.	• SEO • PMU • Contractor	Daily/Weekly

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	done for relaxation or belief that wildlife is tasty or making people healthy.	• Provide mandatory training for contractors' management staff and site workers on the Code of Conduct, Standard Operating Procedures (SOP) for wildlife protection and handling, and human-wildlife conflict management. • Incorporate a policy in the Project Administration Manual (PAM) and Worker's Agreement that prohibits employees and/or subcontractors from possessing, purchasing, trading, or collecting wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List. • Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species. • Implement strict penalties for violating wildlife protection laws. • Collaborate with local communities to monitor wildlife populations and report any suspicious activities.		
3	**Loss of fauna and flora**			
	• Construction activities, particularly in areas like Lum Hach with community forestry, can significantly impact wildlife habitats. • New canals and roads require vegetation clearance, further fragmenting habitats. • Habitat loss poses a serious threat to endangered species like the Elongated Tortoise, Giant Asian Pond Turtle, and Hairy-nosed Otter.	• Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction by relocating them to safer habitats, following the Standard Operating Procedure (SOP) for wildlife protection and handling. • Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur. • Train field workers to recognize and avoid wildlife. • Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur. • Develop a system in which drivers report locations of wildlife crossings and wildlife sightings. • Workers will receive training on frequently encountered wildlife. • The contractor shall install signs to ban hunting or catching wildlife in the area. • Apply Find Chance Procedure	• SEO • E&S specialist consultants • PMU	Daily/Weekly
	• The activity contributing to this risk is the rehabilitation of irrigation canals and farm roads.	• Implement Biodiversity Action Plan • Apply Find Chance Procedure	• PMU • Contractor	Daily/Weekly
4	**GHG emission**			
	• The construction and operation of heavy machinery, such as excavators and bulldozers, during these projects release carbon dioxide (CO2) into the atmosphere, i.e. the energy	• Use energy-efficient machinery and equipment during construction to reduce fuel consumption and emissions. • Optimize construction logistics to reduce the number of vehicle trips and machinery usage, minimizing fuel use and emissions. • Implement proper maintenance programs for equipment and vehicles to ensure they operate efficiently and with lower emissions.	• SEO • E&S specialist consultants • PMU	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	requirements for construction works can result in increased carbon emissions • At the time of construction, there are possibility of smoke generated by burning of straw in the rice field.	• Reduce deforestation and land-use changes that contribute to carbon emissions by preserving vegetation and replanting trees in affected areas. • Use low-carbon materials and construction techniques that reduce the embodied carbon in construction materials. • Offset unavoidable GHG emissions by investing in carbon offset projects, such as reforestation or renewable energy initiatives. • Engage with local communities and stakeholders to raise awareness of emission reduction practices and encourage their participation in sustainability efforts.		
DURING OPERATION				
ENVIRONMENTAL				
1	**Water Management**			
	• Irrigation systems have both benefits and drawbacks. • Proper design and management are crucial. • Minimizing negative impacts on the natural water cycle is essential.	• Implement water-saving irrigation technologies like drip irrigation and sprinkler systems to reduce water consumption and minimize the strain on water resources. • Encourage the adoption of the AWD technique in rice cultivation to optimize water use and reduce water withdrawals for irrigation. • Establish detailed water management plans that ensure equitable water distribution and allocation, considering the needs of various users and the environmental flow requirements to maintain healthy aquatic ecosystems. • Design and construct robust irrigation infrastructure, including canals, ponds, and storage areas, capable of withstanding extreme weather events like floods and droughts. This investment should also include lining canals and refurbishing storage areas to reduce water losses and improve water storage capacity. • Integrate natural infrastructure, such as wetlands and forests, into water management strategies. Protect and restore degraded habitats to enhance their water regulation capabilities, improve water quality, and support biodiversity. • Establish and provide training to FWUCs on sustainable water management practices, equitable water rights, and allocation procedures. These communities play a vital role in the operation and maintenance of the irrigation system, ensuring its long-term sustainability.	• PMU	Annually
2	**Water Pollution**			
	• Increased use of chemicals, such as fertilizers and pesticides, to enhance crop yields. The excessive application of these chemicals can result in contamination of both surface and groundwater resources.	• Implement Simplified Pesticide Management Plan • Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing. • Encourage farmers to adopt IPM techniques that minimize pesticide use and rely on biological control methods, thereby reducing the risk of chemical contamination of water resources.	• PMU	Annually

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Provide training and extension services to farmers on the judicious use of fertilizers, ensuring they apply the correct type and amount based on soil nutrient levels. • Promote the adoption of organic fertilizers and soil amendments, such as cover crops and green manures, which can improve soil fertility and reduce the need for chemical fertilizers. • Implement a robust water quality monitoring program to track the levels of pesticides, nitrates, and other pollutants in surface and groundwater resources within and around the command areas. • Encourage the adoption of water-saving irrigation methods, such as alternate wetting and drying (AWD) in rice cultivation, which can reduce water consumption and minimize the leaching of agrochemicals.		
3	**Soil Pollution**			
	• Increased production could lead to overuse of agri-chemicals if farmers are not adequately trained or supported in adopting environmentally friendly practices.	• Implement Simplified Pesticide Management Plan • Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing	• PMU	Annually
BIODIVERSITY				
1	**Habitat Loss and Fragmentation**			
	• Conversion of land: Flooded forests and wetlands may be drained or filled to create more arable land for agriculture, leading to significant loss of habitat. • Fragmentation: Remaining natural habitats may become isolated patches, making it difficult for species to migrate, find mates, and maintain healthy populations. • However, key biodiversity areas/species/habitats are not affected by the project but have been improved instead. Biodiversity areas are primarily located in the Tonle Sap region, which could face impacts if construction workers improperly dispose of waste.	• Identify and protect critical habitats, such as flooded forests and wetlands, ensuring their preservation against conversion for agricultural land. • Implement measures to restore degraded habitats and improve their suitability for biodiversity. • Promote sustainable agricultural practices to minimize negative impacts on biodiversity and water quality. This can include encouraging practices that reduce the need for land conversion. • Implement sustainable water management practices to ensure adequate water availability for both human needs and ecological functions, avoiding excessive water extraction that could harm wetland habitats. • Involve local communities in decision-making, monitoring, and conservation efforts to build ownership and support for protecting natural habitats. • Promote sustainable livelihoods that are compatible with biodiversity conservation, offering alternatives to activities that lead to habitat loss. • Establish a long-term monitoring program to track changes in habitat quality, species populations, and the effectiveness of mitigation measures. • Minimize forest encroachment and wildlife poaching by developing and implementing a community-based management plan. This includes establishing guard posts, conducting surveillance, and installing signage. • Implement and enforce policies against poaching and illegal collection of wildlife by workers and subcontractors, with appropriate penalties.	• PMU	Annually

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Raise awareness and educate the community on the importance of protecting fish populations and aquatic ecosystems.		
2	**Invasive Species**			
	• Changes in land use and water management can introduce invasive plant and animal species that outcompete native species and alter ecosystem dynamics	• Implement a robust monitoring system, including regular surveys of waterways and terrestrial habitats, to detect invasive species early. Train personnel to identify and map invasive species, and establish rapid response protocols for eradication or control, such as manual removal, targeted pesticide application, or biological control agents. • Implement specific water management practices to minimize the risk of invasive species spreading through waterways. • Foster collaboration among government agencies, research institutions, local communities, and NGOs for effective invasive species management. Facilitate information sharing, coordinate efforts, and leverage resources for maximum impact. • Public Awareness and Education: Raise awareness among all stakeholders. • Educate farmers, local communities, and other stakeholders about the risks of invasive species, their identification, and prevention measures. • Establish a system for reporting suspected invasive species to enable rapid response and prevent spread. Set up a hotline or a reporting mechanism accessible to all stakeholders.	• **PMU**	Annually
3	**GHG emission**			
	• Increased GHG emissions from farming activities: - Fertilizer use - Livestock production - Rice cultivation • Increased energy requirements: - Rice field preparation - Flood control systems - Other infrastructure	• The project is to promote sustainable practices like crop rotation and agroforestry to reduce energy consumption and improve soil health. • The project needs to introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production. • The project needs to support on training farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution. • The project promotes the utilization of efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions. • The project needs to advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.	• PMU • Farmer	Daily
ANNUAL CROP MANAGEMENT PLAN				
	❖ **WATER**			
1	**Water resource efficiency**			
	• Over-extraction of water resources can lead to downstream water scarcity, altered hydrology, and damage to aquatic ecosystems.	• Project need to implement efficient water management practices to prevent over-extraction and ensure equitable water distribution. This can include: • water use monitoring system to track consumption and identify areas for improvement.	• PMU • FWUC	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• implementing appropriate irrigation scheduling based on crop water requirements and weather conditions. • Utilizing efficient irrigation systems, such as drip irrigation or sprinkler systems, to minimize water loss. • Exploring opportunities for water reuse, such as capturing and reusing runoff water.		
	❖ **SOIL AND SOIL MANAGEMENT**			
2	**Soil erosion and soil erosion risk**			
	• Soil erosion can lead to loss of topsoil, reduced soil fertility, and increased sedimentation in water bodies.	• Minimize soil compaction and disturbance by using appropriate machinery and timing land preparation activities. • Consider erosion management practices such as contour planting, terracing, and grass barriers. • Adopt reduced tillage or no-till farming practices to minimize soil disturbance. • Establish cover crops during fallow periods or in rotation with main crops to protect the soil from erosion. • Practice contour farming on sloping land to reduce runoff and erosion. • Construct terraces on steep slopes to prevent soil loss. • Establish windbreaks or shelterbelts to reduce wind erosion. • Install erosion control structures, such as grassed waterways or sediment basins, to manage runoff. • Apply mulch to the soil surface to protect it from rainfall impact and erosion.	• PMU • Agricultural extension officers	After significant rainfall events Annually
3	**Nutrient application and management**			
	• Over-fertilization and nutrient runoff can contaminate water resources, negatively impacting aquatic ecosystems and potentially leading to eutrophication.	• Conduct periodic soil analysis to determine nutrient needs and avoid over-fertilization. • Establish buffer zones near watercourses to filter nutrient runoff. • Consider using green manures and cover crops to replenish soil nutrients and reduce leaching.	• PMU • Farmers	Before and after fertilizer application Regularly during the growing season
	❖ **PESTICIDE**			
4	**Use and effectiveness of pesticides:**			
	• Pesticide use can have adverse effects on human health, non-target organisms, and the environment. Pesticide resistance can develop, requiring increased application rates.	• Promote Integrated Pest Management (IPM) strategies to minimize pesticide use. • Implement training programs for farmers on the safe handling and application of pesticides. • Ensure proper disposal of pesticide containers and leftover products.	• PMU • Agricultural extension officers	Regularly during the growing season
5	**Pesticide residues on site soil**			
	• Pesticide residues can accumulate in the soil, potentially harming soil organisms and affecting water quality.	• Promote the use of pesticides with low persistence and mobility in the environment. • Implement a soil monitoring program to assess pesticide residue levels. • Consider crop rotation and the use of cover crops to help break down pesticide residues.	• PMU • Third-party laboratories	Periodically (e.g., annually or before planting sensitive crops)

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Minimize pesticide use by adopting IPM strategies. • Conduct soil testing to monitor pesticide residue levels. • Rotate crops to break pest cycles and reduce the need for repeated pesticide applications. • Utilize cover crops to improve soil health and enhance pesticide degradation. • Consider bioremediation techniques to remove pesticide residues from contaminated soil.		
6	**Pesticide residues on produce**			
	• Pesticide residues on produce can pose a risk to consumer health.	• Enforce pre-harvest intervals to allow for pesticide breakdown before harvest. • Promote the use of pesticides with low toxicity to humans. • Properly wash and handle produce to remove surface residues. • Implement a monitoring program to test produce for pesticide residues. • Ensure compliance with established MRLs for pesticide residues on produce.	• PMU • Third-party laboratories	Before harvest

UXO = Unexploded Ordnance, PMU = Project Management Unit, SEO = Social and Environmental Officer, E&S = Environmental and Social, IFC = International Finance Corporation, EHS = Environmental, Health, and Safety, GHG = Green House Gas, FWUC = Farmer Water User Communities, ESCMP = Environmental, Social, and Climate Management Plans.

9.2.2 Mitigation Measures for the Social Risks and Impacts

Table 9.2: Social Risks, Impacts and Mitigation Measures

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
BEFORE CONSTRUCTION				
LAND ACQUISITION				
1	**Land acquisition and resettlement**			
	• Land acquisition requirements differ significantly across the six sub-schemes. • Ou Tapaong and Lum Hach are projected to have the highest land acquisition needs. • Brambei Mom, Krapeau Trom, and Yutasas are expected to require minimal land acquisition due to their smaller scale and lack of planned canal system expansion.	• Since the affected households are only 77 (50 in Ou Ta Paong and 27 in Lum Hach, Abbreviated Land Resettlement Plan is required to be prepared.	PMU Contractor	Before construction

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• The specific land acquisition needs for each scheme will be determined by the final concept design.			
2	**Economic displacement**			
	• The potentially disrupting existing economic activities and displacing households and businesses, including informal farmers and businesses. In Ou Ta Paong, 1,012 households using land along the infrastructure and 41 shop owners may be affected, with 10 households facing land acquisition. In Lum Hach, 2,333 households using farmland and 35 shop owners may be affected, with 5 households facing land acquisition. In Krang Ponley, 1,249 households using land along the infrastructure may be affected, with 20 households across all sub-schemes facing land acquisition.	• The households who own the land along the rehabilitated canals which will be expanded at the public land should be properly informed prior to the construction to avoid their crops will be damaged at the time of construction. • Although the acquired land are the public land, there are a need of a proper consultation and information to be conducted to inform and obtain agreement from the affected households.	PMU Contractor	Before construction
DURING CONSTRUCTION				
	CHILD LABOR & FORCED LABOR			
1	**Child Labor**			
	• Project activities will occur in rural areas where child labor is prevalent. • Construction contractors and subcontractors may employ children under 18 years old for unskilled labor. • Local children may be particularly vulnerable to exploitation due to poverty and limited educational opportunities.	• Apply LMP for age check prior to engagement of labor with regular monitoring through proper screening and registering all workforce for the work • To mitigate the risk of child labor, the project will implement strict measures to ensure compliance with national and international labor laws. Regular monitoring and inspections will be conducted to identify and address any instances of child labor. • Additionally, awareness-raising campaigns will be implemented to educate communities about the harmful effects of child labor and the importance of sending children to school. The project will also collaborate with local authorities and NGOs to strengthen law enforcement and provide support services to vulnerable children and their families.	• Contractors • PMU	Daily Screening prior to engaging services of primary supplier
2	**Forced Labor**			
	• The risk of forced labor, particularly for vulnerable individuals, due to economic coercion, exploitation of	• Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children	• Contractors • Primary supplier • PMU	Daily Screening prior to engaging services of primary supplier

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	young people, and debt bondage. The increased demand for local labor during irrigation and road rehabilitation could exacerbate this risk.	• The Project Owner and Sub-Contractors will collaborate with the relevant Government Agency to disseminate information to local communities. This information will include the Contractor's Code of Conduct and the minimum working age as mandated by national laws and international standards. • The Ministry of Water Resources and Meteorology (MOWRAM) will provide information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.		
COMMUNITY HEALTH AND SAFETY				
3	**Disease transmission**			
	• Disease transmission risks are anticipated due to the influx of construction workers, potentially exacerbated by unhygienic living conditions and interaction with the local community. This influx increases the risk of spreading communicable diseases among workers and between workers and residents, with workers' susceptibility potentially increased by factors like poor diet, stress, and unhygienic conditions.	• Conduct public awareness raising activities (IEC) to ensure local people and contractors know about the risks of contracting and spreading communicable diseases such as COVID-19, HIV/AIDS, and water-borne diseases (e.g., amoebiasis, giardiasis, and toxoplasmosis. etc. • In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising to the risk groups. • Conduct training to workers on communicable diseases prior to mobilization to construction sites. • For water-borne diseases that arise due to polluted or contaminated water, mitigations measures may include: o Implement filtration, chlorination, or UV disinfection to ensure safe drinking water. o Build and maintain proper sewage systems and latrines to prevent water contamination. o Promote handwashing, safe food preparation, and proper sanitation practices in communities. o Control and properly dispose of waste to prevent water pollution. o Test water sources frequently for contamination and take corrective actions promptly. o Provide access to clean water supplies, such as bottled water or tankers, during outbreaks or disasters. o Promote immunizations against water-borne diseases like cholera and typhoid in high-risk areas.	• PMU • Contractors • Local health authorities	• Monthly • During outbreaks • Periodic community health awareness campaigns
4	**Sexual Exploitation and Abuse, Sexual Harassment**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• The project's influx of approximately 735 workers, including construction and logistical personnel, along with frequent project staff visits and pre-existing SEA/SH issues, creates a risk of sexual exploitation and abuse/harassment, particularly during irrigation and road rehabilitation. An estimated 430 of these workers may be especially vulnerable due to potential isolation.	• Contractors need to explicitly state zero tolerance for sexual harassment, exploitation, and abuse within the workplace. • Require Code of Conduct (CoC) to be signed by all construction workers. • For victims coming forward: referral to qualified SEA/SH service provider. The GRM will include a confidential channel for reporting SEA/SH. • Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children • Training to workers on maintaining good community relations, with emphasis on proper conduct around women and children. • Training on SEA/SH and VAC for community members, in particular women and girls (may be done separately for men and women). • Ensuring workers' sites are situated (at least 500m) from schools and/or other areas where children congregate. • Children are prohibited from construction sites and worker's camp. • Ensure access to grievance redress mechanisms for all project-affected persons, including both stakeholders and workers, to address Sexual Exploitation and Abuse, and Sexual Harassment. Support (in the form of training, awareness raising, etc.) to local law enforcement to act on community complaints regarding SEA/SH and VAC. • Provision of information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age. • Provide counselling services for male and female workers, wives and other female partners of contractors' workers. • Build partnerships with local health providers and SEA/SH service providers to conduct community awareness activities, and referrals. • Implement public awareness campaigns to address sexual harassment in transport services and hubs, and training of police on women's security needs when using transport. This is included on GRM: - Accessibility for Workers - Multiple Reporting Channels - Confidentiality and Support - Contractor Accountability	• Contractors • PMU	• Monthly and during subproject cycle • Reported to PMU within 48 hours if occurred

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• It is necessary to consider deploying specialists to educate and raise awareness about issues of violence. • Project should provide budget support to women affair provincial department during the project activities for sexual exploitation and abuse, sexual harassment monitoring.		
5	**Traffic safety & Security**			
	• Increased transport of materials and equipment in the construction stage raises the risk of road accidents, theft, vandalism, and a perceived or actual increase in crime, affecting project workers, community members, and those living or traveling near construction sites.	• Arrange security guard or engage local authority to guard the construction sites • Conduct public awareness raising activities (IEC) to ensure local people and road user are aware of road safety regulations and risks and act accordingly while using road. • Monitor and observe speed limit.	• PMU • Contractors	• Daily during construction • Weekly during construction • Monthly during operation
6	**Community Health and diseases**			
	• Construction activities, including canal and pond rehabilitation, pose community health and safety risks beyond disease transmission, encompassing drowning, accidents from trespassing in construction zones (including storage and laydown areas), traffic disruptions, potential community conflicts, and general construction site hazards.	• Establish clear and well-marked construction exclusion zones to prevent unauthorized access, especially to areas with open water, heavy machinery, and storage areas. • Implement fencing and barriers to prevent trespassing and ensure community safety around construction areas. • Provide warning signs in local languages to inform communities about the dangers and restricted access to construction areas. • Install safety barriers around construction sites to minimize risks to the community and workers. • Ensure proper storage of construction materials, with no materials left unsecured and scattered around the site. • Develop and implement traffic management plans to minimize traffic and access disruptions and ensure pedestrian and vehicle safety. • Conduct community awareness campaigns to educate the community about the potential risks and safety measures during construction. • Establish and maintain a grievance mechanism to address community complaints and issues promptly. • Implement safety measures around canals and ponds to prevent drowning incidents, such as installing safety barriers and providing warning signs in local languages. • Create and enforce clear rules regarding access to canals and ponds during construction, and post those rules. • Implement strict health and safety regulations at all construction sites to protect both workers and the nearby communities.	• PMU • Contractors	• Monthly • During outbreaks • Periodic community health awareness campaigns

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Provide training to workers on safety protocols, including how to work safely around water, avoid accidents and minimize risks to the community. • Ensure all workers are provided with necessary personal protective equipment (PPE) and enforce its use.		
7	**Personal Protective Equipment**			
	• The activities involve Canal Rehabilitation and Construction , Structure Construction and Rehabilitation, and Drainage Improvement , which expose workers to various hazards, such as Falling Debris, Sharp Objects, and Heavy Machinery.	• Continue and active use of PPE at all time of construction. • Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual • Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out. • Proper use of PPE should be part of the recurrent training programs for employees.	• Contractors • PMU	• Regular inspections/training
8	**Working conditions and Management of Worker**			
	• The lack of written contracts for unskilled, especially locally recruited, workers increases their vulnerability to underpayment, unequal treatment based on gender and temporary status, and late or non-payment of wages, impacting their livelihoods and potentially hindering project progress.	- Implement a grievance mechanism for workers where workers can report issues related to underpayment or unequal treatment without fear of retaliation. - Advise companies to provide equal opportunities for employment and promotions to all workers, regardless of gender, ethnicity, or background, to avoid discrimination. - Regularly monitor and audit payroll and employment practices to ensure compliance with labor regulations and address any disparities. - Offer training and capacity-building programs for all workers to enhance their skills and qualify them for higher-paying roles. - Ensure that subcontractors and suppliers also adhere to fair wage and equal treatment policies. - Set up worker committees or unions to allow collective bargaining and ensure workers have a voice in addressing wage and treatment issues. - Provide accessible information to workers about their rights, entitlements, and the proper channels to address grievances	• Contractors • PMU	• Regular payroll audits • Periodic worker satisfaction surveys • Prompt investigation of any reported grievances

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		through the establishment of the GRM for workers. This includes training on topics such as: • Environmental and Social Safeguards • Gender Awareness and the Gender Action Plan • Sexual Exploitation, Abuse, and Harassment (SEA/SH) - Labor Rights and the Workers' Code of Conduct Regularly engage with labor rights organizations or third-party auditors to evaluate labor conditions and make improvements where necessary.		
9	**CULTURAL HERITAGE**			
	Ou Ta Paong: • Some cultural sites may be minimally impacted. • Risk of overlooking and destroying smaller sacred places. • Detailed design is crucial to assess the full impact. Lum Hach: • Two identified sites are outside the current construction area. • Confirmation of the final design is still needed. Stung Krang Bat: • Rich in historical and cultural heritage. • Potential for encountering archaeological artifacts during construction due to the history of the ancient city of Longvek.	• Conduct archaeological surveys before construction in culturally sensitive areas. • Implement Find Chance Procedure	• Contractors • PMU	• Daily • Reported to PMU within 48 hours
CROSS-CUTTING				
10	**Gender inequality**			
	• Women are more vulnerable to climate change impacts due to unequal access to resources, information, and decision-making power, often hindered by social gender roles. While women-led households represent a significant portion of project sub-schemes, they	• The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices. • The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology.	• Contractors • PMU	• Daily/ weekly

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	still face barriers to participation and benefits. The project area includes a substantial number of vulnerable individuals, including the poor, disabled, elderly, and parentless, highlighting the need for targeted support.	• The project should monitor gender equality indicators and should make adjustments as needed to ensure that women are benefiting from the project.		
11	**Social inequality**			
	• Risk of being unequally engaged and treated, during the design phase and construction. The vulnerable are likely to be limitedly consulted and having limited access to available irrigation water.	• Conduct participatory planning and regular consultations with local communities, particularly marginalized groups (e.g., women, smallholder farmers, indigenous communities). • Prioritize hiring local labor, with special provisions for disadvantaged groups (e.g., youth, women, minorities) in both skilled and unskilled positions. • Develop and enforce water allocation plans that ensure fair access to water resources for all users, including small-scale and subsistence farmers, during and after construction. • Implement fair and transparent compensation or resettlement plans for those displaced or affected by construction activities, especially vulnerable households. • Establish accessible and responsive grievance redress mechanisms, ensuring all community members can raise concerns or complaints during construction. • Conduct regular social impact assessments, with a focus on identifying inequality trends, and adjust project strategies to mitigate negative effects. • Provide support and training for affected communities to diversify their livelihoods, especially for those whose livelihoods may be disrupted by construction (e.g., farmers, traders). • Ensure transparency in the contracting process, including the selection of subcontractors and suppliers, with opportunities for local businesses, especially those run by marginalized groups.	• Contractors • PMU	• Continuously
12	Elite capture			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• The rich have the resources to grab both available land and water resources, creating greater social disparities	• Consultation will be conducted farmers in potential command area, focusing on vulnerable/disadvantaged groups • Alternative livelihoods for vulnerable group are identified based on their needs vis-à-vis project's investment eligibility • Conduct consultation at community level (in the command area) to achieve a consensus on how water needs are balanced between different groups in one command area. • During subproject design, water availability, storage capacity, and water needs of upstream and downstream population are calculated to inform design, and water use coordination during project operation. • Water user groups should be established for upstream and downstream population and should be coordinated by a higher-level committee/group to negotiate and optimize water coordination • Guidelines/Manual should be developed to provide guideline for upstream and downstream communities at subprojects to meet, discuss, and achieve consensus on how water is distributed for equal use between upstream and downstream population	• PMU • Contractors	• Throughout project implementation • Regular community meetings and consultations
13	**Loss access to land and other assets**			
	• Construction activities, particularly land acquisition for canals and roads, can displace communities or restrict their access to land, homes, and other assets. • Temporary restriction of irrigation access during construction may occur in some areas, potentially impacting livelihoods, even though the project area is mainly rainfed.	• The project will prioritize avoiding physical resettlement and minimizing land acquisition. Design adjustments will be made to avoid or reduce land requirements, especially on private land. Public land will be prioritized for any necessary acquisition. • Where land acquisition is unavoidable, the project will employ a negotiated settlement process with affected households. This process, guided by the RGC's Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR), aims to ensure that affected households receive fair and adequate compensation for their losses and maintain or improve their income and livelihood status. • All individuals with assets within the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation, regardless of their legal status. Compensation will be provided for	• Contractors • PMU	• Before land acquisition • During land • After resettlement

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		various losses, including land, structures, crops, trees, and income-generating activities. • Recognizing the potential disruption of income streams during relocation or construction, the project will provide transitional allowances to affected households. These allowances will help cover living expenses and bridge the gap until they can resume their livelihoods. • A multi-tiered GRM will be established to address grievances from any project-affected person. The GRM will operate based on the principles of the Green Climate Fund (GCF) and be accessible at no cost to the complainant.		
14	**Loss access to natural resources**			
	• Construction activities and project operations can restrict communities' access to forests, fishing grounds, water sources, or other natural resources they depend on for livelihoods	• Implement efficient water management practices during construction and operation to prevent over-extraction of water resources from reservoirs and rivers and ensure equitable distribution for downstream communities and ecosystems. • Establish construction exclusion zones around sensitive habitats, such as wetlands and forests, to prevent disturbance and minimize impacts on fishing grounds and biodiversity. Implement habitat restoration programs in areas where construction has occurred. • Use environmentally friendly construction materials and techniques to reduce the risk of pollution. Properly manage construction chemicals, fuels, and waste to prevent water pollution and contamination of natural resources. Prepare and implement a waste management plan to handle waste generated from construction activities and worker camps. • Optimize construction material use and recycle when possible, to minimize the extraction of new resources. Implement energy-efficient construction practices and use renewable energy sources where possible. • Maintain ongoing communication with affected communities, including farmers, fishers, and downstream communities, to address concerns about natural resource access. Provide information and education to construction workers about responsible use of local resources and respect for community access rights. This suggestion is informed by the sources but is not directly stated in them. • Ensure the GRM is accessible to all community members to address complaints related to natural resource access.	• PMU • Contractors	• Regular water quality and quantity monitoring • During project implementation: Monitor the effectiveness of mitigation measures.
DURING OPERATION				

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
1	**COMMUNITY HEALTH AND SAFETY**			
	• Water use conflicts, especially between upstream and downstream users, are a potential risk due to altered water allocation from new irrigation infrastructure, exemplified by the Anlong Chrey reservoir's limited capacity, and increased drowning risk, particularly for children, due to new canals.	• The project will promote IWRM principles to ensure the equitable and sustainable allocation of water resources. This involves considering the needs of all stakeholders, including upstream and downstream communities, as well as environmental flow requirements for maintaining healthy ecosystems. • Establishing a system for monitoring water use and enforcing water allocation regulations will help prevent over-extraction and ensure a reliable water supply for all users. This may involve installing flow meters, conducting regular water audits, and implementing penalties for non-compliance. • The project will strengthen the capacity of FWUCs to manage water resources at the local level. This includes training on water allocation, conflict resolution, and operation and maintenance of irrigation infrastructure. Effective FWUCs can play a crucial role in mediating disputes and ensuring fair water distribution within their communities. • Raising awareness about water safety and the risks associated with open water bodies, especially among children, is essential. Educational campaigns, signage, and community outreach programs can help promote responsible behavior and prevent accidents. This information could be included in the training programs that will be provided to farmers and communities. • The project will consider incorporating safety features into the design of irrigation infrastructure. This may include fencing around canals and reservoirs, installing safety ladders, and providing designated swimming areas away from irrigation structures.	• PMU • PDWRAM	• Daily for site inspections • Monthly for reports and consultations • Within 48 hours for reporting accidents, disease outbreaks.
CROSS-CUTTING				
2	**Gender inequality**			
	• Women are more vulnerable to climate change due to limited access to resources, information, and decision-making power, often exacerbated by gender roles, resulting in unequal access to water, limited participation in water management, and disproportionately negative impacts on their livelihoods.	• The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices. • The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology.	• PMU • PDWRAM	• Monthly for data collection and reporting

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• The project should monitor gender equality indicators and should make adjustments as needed to ensure that women are benefiting from the project.		
3	**Social inequality**			
	• The competition for water and land displacement, and despite project consultations, vulnerable groups, particularly landless or land-poor households, may still experience limited access to irrigation benefits, though the impact is lessened by the relatively small proportion of poor within the area.	• Ensure Equitable Water Access: Mechanisms should be in place to support vulnerable and marginalized communities in accessing water resources. • FWUCs will manage the irrigation systems and ensure sustainability through fee collection. The project will invest in establishing and training FWUCs, emphasizing inclusivity and capacity building for vulnerable groups. • Implement a Simplified Integrated Pest Management (IPM) Plan.	• PMU • PDWRAM	• Monthly for data collection and reporting
4	**Elite capture**			
	• The rich have the resources to grab both available land and water resources, creating greater social disparities	• Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress mechanisms are essential to prevent manipulation and ensure equitable water distribution. • Regular monitoring and evaluation: Continuous monitoring of project impact, especially on vulnerable groups, can identify and address elite capture. • Strengthened land tenure security: Clarifying land rights can protect smallholder farmers and marginalized communities from land grabbing. • Community engagement: Active community participation, especially from vulnerable groups, empowers them and ensures their needs are met.	• PMU • PDWRAM	• Regularly during FWUC meetings and project implementation • Continuously through the GRM.

PMU = Project Management Unit, LMP = Labour Management Plan, NGOs = Non-governmental Organizations, HIV/AIDS = Human immunodeficiency virus/Acquired immunodeficiency syndrome, UV = Ultraviolet, GRM = Grievance Redress Mechanism, SEA = Sexual Exploitation and Abuse, SH = Sexual Harassment, VAC = Violence Against Children, ESHS = Environmental Social Health and Safety, STDs = Sexually transmitted diseases, PPE = Personal Protective Equipment, IPM = Integrated Pest Management, PDWRAM = Provincial Department of Water Resources and Meteorology, FWUCs = Farmer Water User Communities.

9.2.3 Environmental Monitoring Program

Table 9.3: Environmental monitoring plan

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Pre-construction phase					
UNEXPLODED ORDNANCES (UXO)	• UXO screening by certified experts required before any construction. • Found UXOs to be removed by certified experts. • UXO clearance certificate required before subproject activities. • UXO risk training and awareness for the local community.	Along the canales (construction site)	• Confirm all relevant areas are clear from UXO by consulting national military. • Obtain a certificate of UXO clearance	Before construction	PMU Contractor
During construction phase					
	ENVIRONMENTAL				
Noise and Vibration	• Avoid working during night-time from 21:00 hours to 06:00 hours • Provide ear sets for workers to prevent noise if the noise level exceeds the standard • Check and maintain construction machinery regularly to avoid noisy and high vibration • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures	Construction site Nearby sensitive structures	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
	Measuring noise and vibration level	Construction site, there are 8 locations for noise and vibration level sampling. ANV1 X: 356908 Y: 1395649 ANV2 X: 355879 Y: 1404046	Measuring equipment and/or appropriate monitoring methods	Every 06 months	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
		ANV 3 X: 444325 Y: 1355032 ANV 4 X: 450811 Y: 1357200 ANV 5 X: 47381 Y: 1311192 ANV 6 X: 470186 Y: 1305388 ANV 7 X: 465547 Y: 1304414 ANV 8 X: 443191 Y: 1297797			
Air quality	• Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition • Solid waste or construction waste activities • Construction machinery operation and maintenance • Distance of sitting concrete mixing plants, crushing • plants, quarries and other facilities to settle and other sensitive receptors • Transportation of construction materials	Construction site	Site inspection Visual observation Monitoring equipment and/or appropriate monitoring methods	Daily	SEO E&S specialist consultants PMU
	Testing air quality (NO2, SO2, CO, TSP, PM10, PM2.5)	There are 8 locations for air quality sampling. ANV1 X: 356908 Y: 1395649 ANV2 X: 355879 Y: 1404046 ANV 3 X: 444325 Y:	Air quality monitoring equipment	Every 06 months	

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
		1355032 ANV 4 X: 450811 Y: 1357200 ANV 5 X: 47381 Y: 1311192 ANV 6 X: 470186 Y: 1305388 ANV 7 X: 465547 Y: 1304414 ANV 8 X: 443191 Y: 1297797			
Impact to Water	• Wastewater management • Design and capacity of septic tank • Digging of side drain at campsite • Construction of retaining structures	Construction site	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
	• Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform).	There are 8 locations for surface water quality sampling. SW1X:356706 Y:1396198 SW2 X:355668 Y:1404018 SW3 X:352153 Y:1414410 SW4 X:440785 Y:1356041 SW5 X:474697 Y:1308844	Water quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
		SW6 X:469642 Y:1306016 SW7 X:465456 Y:1307467 SW8 X:442600 Y:1296842			
	• Testing of soil quality is going to be analyzed in the agriculture context: - Soil classification or particle size, - Soil moisture, - Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na), - Organic Metter - Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio), - Total phosphorus (P), - Cation exchange capacity (CEC), - pH, - Electrode Conductivity.	There are 5 locations for soil quality sampling. SS1 X:355662 Y:1399063 SS2 X: 354509 Y:1406852 SS3 X: 441471 Y:1355655 SS4 X: 465450 Y:1304887 SS5 X: 469602 Y: 1306117	Soil quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU
Solid and hazardous waste	• Solid and liquid waste management plan in the project construction sites. • Install septic tanks at the construction camp to prevent the discharge of polluted sewage into the outside. • Implement waste segregation of reusable construction materials, biodegradable, and non-biodegradable wastes. • Orient workers on the solid waste segregation system and prohibit them from indiscriminate throwing wastes outside of waste bins in the	Construction site	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	construction sites. • Provide sufficient waste bin and proper storage before transportation to dispose at an authorized landfill. • Fuel storage tank will be provided with retention areas to contain accidental spills.				
Wastewater	• Establishment of proper wastewater management systems, including adequate sanitation facilities for workers.	Construction site/Camp	• Monitoring wastewater discharge for parameters such as temperature, pH, TSS, DO, COD, BOD_5. • Regular checks for leaks or spills from sanitation facilities.	Daily	PMU, Contractor
Physical Hazards	• Incidence of worker injuries due to physical hazards (e.g., falls, cuts, being struck by objects) • Unsafe working conditions (e.g., inadequate lighting, lack of proper safety equipment, slippery surfaces) • Compliance with safety regulations and use of personal protective equipment (PPE)	• Construction sites • Worker camps • Access roads	• Site inspections • Incident reports • Safety audits.	• Daily during construction Weekly safety meetings	Contractors PMU
Chemical hazards	• Exposure of workers and communities to hazardous chemicals (e.g., pesticides, fuels, solvents) • Improper storage, handling, and disposal of chemicals • Air and water quality monitoring to detect chemical contamination	• Construction sites • Worker camps • Areas surrounding construction sites	• Site inspections • Training for workers	Regular inspections of chemical storage and handling areas	Contractors PMU
Heat Stress	• Implementation of safety measures and provision of break times for workers during extreme weather events. • Provision of adequate drinking water and	Construction site/Worker camps	• Monitoring weather conditions, including temperature and humidity. • Observation of worker	Daily	Contractors PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	shelter.		breaks and access to shade and drinking water. • Records of any heat-related incidents.		
	BIODIVERSITY				
Habitat Loss and Fragmentation	• Area of habitat lost or fragmented. • Changes in vegetation cover. • Number of isolated habitat patches • Presence of wildlife corridors.	Construction site	Site inspection Visual observation GIS analysis (if available) Drone surveys (if available)	Daily/Weekly	SEO E&S specialist consultants PMU
Loss of biodiversity and ecosystem services	• Changes in species abundance and diversity • Decline in water quality • Changes in soil fertility • Reduced pollination services • Alterations in hydrological processes	Construction site	Site inspection Visual observation Biodiversity surveys	Daily/Weekly	SEO E&S specialist consultants PMU
Hunting and trading, and consumption of wildlife	• Avoid cutting of trees or destruction of vegetation • No hunting, fishing, or collection of animal and plant materials • Revegetation success will be monitored, particularly surrounding riparian vegetation along area where levee is installed for flood protection and for increased water retention.	Construction site	Site inspection Visual observation Community interviews	Daily/Weekly	SEO E&S specialist consultants PMU
Loss of fauna and flora	• Number of individuals of each species observed • Presence of endangered or threatened species • Changes in plant community composition	Construction site	Site inspection Visual observation Biodiversity surveys	Daily/Weekly	SEO E&S specialist consultants PMU
Destruction of farming ecosystem	• Area of farmland affected • Changes in crop yields • Impacts on livestock • Pollution of water sources used for irrigation	Construction site	Site inspection Visual observation Interviews with farmers	Daily/Weekly	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Landscape and biodiversity	• Adopting good housekeeping and good construction practices. • Ensuring proper lining of canals and adequate assembling of pipes • Adopting slope stabilization techniques. • Implementing Biodiversity Action Plan (BAP)	Construction sites	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Protected Areas	• Exclude a subproject located in the community forestry, and Zone 3 of the protected area.	Construction sites	Site inspection	Daily	SEO
GHG emission	• Monitor the amount of fuel used by construction vehicles, heavy machinery, and generators. • Track the fuel efficiency of these machines to identify opportunities for improvement. • Assess the effectiveness of measures to control dust emissions from construction sites. • Monitor the types and quantities of waste generated and their disposal methods. • Track the amount of waste recycled or reused to reduce emissions associated with landfill disposal. • Monitor the number and types of vehicles entering and leaving the construction site. • Track the efficiency of transportation methods used to deliver materials and equipment.	Construction site Nearby sensitive structures	Site inspection Visual observation Consultation	Daily	SEO E&S specialist consultants PMU
During operation phase					
Water Quality	Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform) and pesticide residues in water.	There are 8 locations for surface water quality sampling. SW1 X:356706 Y:1396198 SW2 X:355668	Site inspection Visual observation	Annually	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
		Y:1404018 SW3 X:352153 Y:1414410 SW4 X:440785 Y:1356041 SW5 X:474697 Y:1308844 SW6 X:469642 Y:1306016 SW7 X:465456 Y:1307467 SW8 X:442600 Y:1296842			
Soil Pollution	• Testing of soil quality is going to be analyzed in the agriculture context: - Soil classification or particle size, - Soil moisture, - Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na), - Organic Metter - Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio), - Total phosphorus (P), - Cation exchange capacity (CEC), - pH,	There are 5 locations for soil quality sampling. SS1 X:355662 Y:1399063 SS2 X: 354509 Y:1406852 SS3 X: 441471 Y:1355655 SS4 X: 465450 Y:1304887 SS5	Soil quality monitoring equipment	Annually	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	- Electrode Conductivity.	X: 469602 Y: 1306117			
Biodiversity and Ecosystem Services	• Implementing Biodiversity Action Plan (BAP)	The entire sub-scheme	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Habitat Loss and Fragmentation	• Area of habitat converted for agricultural use • Changes in the size and connectivity of habitat patches • Number of isolated habitat fragments	The entire sub-scheme	Site inspection Visual observation	Annually	SEO E&S specialist consultants PMU
Invasive Species	• Presence and abundance of invasive species • Area affected by invasive species • Effectiveness of control measures	The entire sub-scheme	Site inspection Visual observation Vegetation surveys	Annually	SEO E&S specialist consultants PMU
GHG emission	• Monitor the Knowledge, Attitude and Practices of farmers in farming activities that cause GHG emission	The entire sub-scheme	Site inspection Visual observation Consultation	Daily	SEO E&S specialist consultants PMU
	ANNUAL CROP MANAGEMENT PLAN				
Water resource efficiency	• Monitor water extraction rates from surface and groundwater sources. • Assess irrigation efficiency by measuring the amount of water applied versus the amount of water actually used by crops. • Monitor the implementation and effectiveness of water-saving irrigation methods (drip irrigation, sprinkler irrigation, AWD for rice). • Track water consumption per unit of crop yield (e.g., cubic meters of water per ton of rice produced).	Irrigation intake points Representative fields within the sub-scheme	Water flow measurements Soil moisture monitoring Crop water use assessments	Daily	PMU FWUC

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Soil erosion and soil erosion risk	• Monitor soil erosion rates in different parts of the sub-scheme, particularly in sloping areas. • Assess the effectiveness of erosion control measures (contour planting, terracing, grass barriers). • Monitor soil organic matter content as an indicator of soil health and erosion resistance.	Representative fields Areas with different slopes and soil types	• Visual assessments of erosion features (gullies, rills) • Soil loss measurements using erosion plots or sediment traps • Soil organic matter analysis	After significant rainfall events Annually	PMU Agricultural extension officers
Nutrient application and management	• Monitor the types and amounts of fertilizers applied to different crops. • Conduct regular soil testing to assess nutrient levels and guide fertilizer application rates. • Monitor nutrient runoff from fields, especially near watercourses.	Representative fields Water sampling points near fields	• Fertilizer application records • Soil nutrient analysis • Water quality testing for nutrients (nitrogen, phosphorus)	Before and after fertilizer application Regularly during the growing season	PMU Farmers
Use and effectiveness of pesticides	• Monitor the types and amounts of pesticides used for different crops and pests. • Assess the effectiveness of pest control measures by monitoring pest populations and crop damage. • Track the incidence of pesticide-related health issues among farmers and workers.	Representative fields Pesticide storage facilities	• Pesticide application records • Pest scouting and monitoring data • Health records	Regularly during the growing season	PMU Agricultural extension officers
Pesticide residues on site soil	• Conduct soil sampling and analysis to measure pesticide residue levels in representative fields.	Representative fields Areas near pesticide storage facilities	• Soil residue analysis	Periodically (e.g., annually or before planting sensitive crops)	PMU Third-party laboratories
Pesticide residues on produce	• Collect and analyze samples of produce to determine pesticide residue levels. • Ensure that produce meets national and international standards for maximum residue	Representative fields at harvest time	• Laboratory analysis of produce samples	Before harvest	PMU Third-party laboratories

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	limits (MRLs).				

SEO = Social and Environmental Officer, E&S = Environmental and Social, PMU = Project Management Unit, ANV = Air, Noise and Vibration, SW = Surface Water, SS = Soil Samples, GIS = Geographic Information System, GHG = Green House Gas, FWUC = Farmer Water User Communities, AWD = Alternate Wetting and Drying.

9.2.4 Social Monitoring Program

To ensure the effectiveness of social management, the social monitoring program is prepared to monitor social issues. Contractor and/or sub-contractor is responsible for monitoring using appropriate method, equipment and system. Details on monitoring parameters are shown in the table below:

Table 9.4: Social monitoring plan during preconstruction, construction, and operational phase

Monitoring Parameters	Monitoring Indicators	Locations	Measurements	Frequency	Responsibility
Preconstruction phase					
Land acquisition/ Economic displacement	• Track the process of acquiring land for the project, ensuring fair compensation is provided to affected landowners. • Implement programs to help displaced individuals and communities restore their livelihoods. • Establish effective grievance mechanisms to address complaints and concerns related to economic displacement.	Construction sites	• Monitor the distribution of compensation payments and address any disputes or concerns. • Monitor the effectiveness of these programs.	• Daily • Reported to PMU within 48 hours	• PMU
During construction phase					
PROTECTING THE WORKFORC					

Child Labor/ Forced Labor	• Involvement of child labor/ forced labor in main contractor and subcontractors' workforce • Involvement of child labor/ forced labor among primarily supply workers	• Construction sites • Worksite of primary supplier	• Site inspection • Observation	• Daily • Screening prior to engaging services of primary supplier	
COMMUNITY HEALTH AND SAFETY					
Community Health and diseases	• Incidence of waterborne diseases • Prevalence of vector-borne diseases (e.g., malaria, dengue fever) • Respiratory illnesses related to dust and air pollution • Availability and accessibility of healthcare services • Community awareness of health risks and preventative measures	• Construction sites • Worker camps • Community and neighboring areas	• Health data collection • Site inspections • Health surveys and interviews • Consultation with workers and community members	• Monthly • During outbreaks • Periodic community health awareness campaigns	• PMU • Contractors • Local health authorities
SEA/SH	• Before mobilizing workers to construction site, conduct orientation/training on SEA/SH (using sample Code of Conduct as a minimum) for all Contractors' managers and workers mobilized to construction site • As part of the above training/orientation, ensure all workers understand SEA/SH risks, disciplines and penalty, and understand project's grievance procedures related to SEA/SH • As part of the workers and manager's work contract, require all workers engaged for project (both workers mobilized to site or work in contractors' office) to peruse and sign Workers' CoC • Ensure Contractors appoint a focal point in charge of ESHS and grievance reception, processing and resolution • Apply all measures related to management of work camps	• Construction sites • Relevant local communities	• Number and percentage of workers trained on SEA/SH prior to mobilization to subproject site • Number and percentage of workers signing Code of Conduct as part of Work Contract • Percentage of workers perpetrating SEA/SH and percentage of cases reported to PMU and resolved	• Monthly and during subproject cycle • Reported to PMU within 48 hours if occurred	• Contractors • PMU

			• Name and contact of ESHS and grievance focal report reported in Contractor's ESMP.		
Traffic safety and Security	• Security cautions • General disease prevalence • Worker health • Communicable diseases	• Construction sites • Access roads to construction sites • Newly constructed/rehabilitated roads	• Site inspections • Incident reports • Data collection • Consultation with workers and community members • Review of contractor safety plans	• Daily during construction • Weekly during construction • Monthly during operation	• Contractors • PMU • Local authorities
Community Health and diseases	• Consultations with target communities to assess the current social situation and social impacts of sub-projects. • Recommendations and solutions from communities obtained regarding negative social impacts.	• Target communities • Workers	• Assessment of social situation and social impacts. • Collection of community recommendations and solutions.	• During consultations	• Contractors • PMU
Personal Protective Equipment	• Health and safety regulations enforced at construction sites. • Appropriate training and personal protective equipment (PPE) provided to workers.	• Construction sites and worker camps	• Monitoring that contractors provide appropriate PPE and enforce its use. • Observation of training sessions. • Review records of PPE distribution and training.	• Monthly monitoring during construction	• Contractors • PMU
Working conditions and Management of Worker	• Worker wages and benefits compared to legal requirements and industry standards • Instances of discrimination or unfair treatment based on gender, ethnicity, or other factors	• Construction sites • Worker camps	• Payroll records review: Verify worker wages and benefits. • Worker interviews:	• Regular payroll audits • Periodic	• Contractors • PMU

	• Access to grievance mechanisms for workers to report unfair labor practices		Confidential interviews to gather feedback on labor conditions and treatment. • Observation of worker interactions: Monitor for signs of discrimination or unfair treatment. • Review of contractor labor policies and practices: Ensure compliance with labor laws and ethical standards.	worker satisfaction surveys • Prompt investigation of any reported grievances	
Cultural heritage	• Unexpected impacts on heritage resources	• Construction sites	• Site inspection • Observation • Report by local people/local authority	• Daily • Reported to PMU within 48 hours	• PMU • Contractors
CROSS-CUTTING					
Loss access to land and other assets	• Number of households affected by land acquisition or temporary restrictions on land use • Types of assets affected (e.g., land, houses, crops, trees) • Adequacy of compensation and resettlement measures for affected households	• Project areas where land acquisition is required • Areas affected by temporary restrictions on land use	• Land surveys and asset inventories • Consultations with affected households • Review of compensation and resettlement plans • Monitoring of resettlement implementation	• Before land acquisition • During land • After resettlement	• Contractors • PMU

Loss access to natural resources:	• Impacts on community access to water resources (e.g., for drinking, irrigation, fishing) • Impacts on access to forests and other natural resources • Measures to mitigate impacts and provide alternative access to resources	• Areas downstream of irrigation schemes • Areas surrounding project activities that may affect natural resources	• Water quality and quantity monitoring: Assess impacts on water resources downstream of project activities. • Consultations with communities: Gather feedback on impacts on natural resource access and use. • Development and implementation of mitigation plans: Address impacts and provide alternative access to resources.	• Regular water quality and quantity monitoring • During project implementation: Monitor the effectiveness of mitigation measures.	• PMU • Relevant government agencies • Contractors
Social inequality	• Any actions on the part of Contractors' workers or community member that cause social conflicts (e.g. SEA/SH, the way construction activities are carried out [pollution, restricted access, loss of local income/livelihoods, accidents…)	• Construction sites • Relevant local communities	• Number of social conflicts arising and nature and scope of conflict • Number of social conflicts resolved by contractors within 7 days • Number of social conflicts resolved by local authorities • Number of serious cases that have happened and reported to PMU within 48 hours	• Daily • Monthly	• Contractors • PMU
	• Conflicts between upstream farmers who prioritize water storage for their crops and downstream farmers who require a consistent water supply for their agricultural needs.	• Local communities are living downstream and upstream.			

Elite capture	• Equitable distribution of project benefits among community members • Transparency and accountability in decision-making processes • Mechanisms for community participation and feedback	• Project implementation areas • Community meetings and consultations	• Monitoring of benefit distribution: Track who is receiving project benefits and ensure fairness. • Observation of decision-making processes: Assess inclusivity and transparency. • Community feedback mechanisms: Establish channels for communities to voice concerns and provide input.	• Throughout project implementation • Regular community meetings and consultations	• PMU • Contractors • Community representatives
Gender inequality	• Percentage of female beneficiaries • Percentage of beneficiaries who are youth • Average percentage women consulted • Number of action plans integrating specific women's • Average percentage FWUC with women in leadership positions • Women/youth trained in O&M • Number of training on gender and social inclusion delivered to MOWRAM staff	• Project sites • Community level	• Data collected through surveys and consultations • Review of project documents, training plans, and meeting minutes	• Monthly monitoring • Quarterly • Semi-annually • Annually	• PMU • Contractors •
During operation phase					
COMMUNITY HEALTH AND SAFETY	• Number of accidents and fatalities related to construction activities • Number of disease outbreaks and environmental pollution incidents • Number of reported cases of worker health issues	• Construction sites • Camp site and Worker camps • Nearby community	• Site inspection reports • Accident/Incident reports • Medical records/reports • Consultation minutes/reports	• Daily for site inspections • Monthly for reports and consultations • Within 48 hours for	• PMU • PDWRAM

				reporting accidents, disease outbreaks.	
CROSS-CUTTING					
Gender inequality	• Percentage of female workers in different roles (skilled, unskilled) • Number of reported cases of gender-based violence or discrimination • Participation of women in FWUCs and decision-making processes related to water management.	• Construction sites • FWUC meetings • Community consultations	• Observation of worker roles and interactions. • Records of complaints and their resolution. • Attendance records and meeting minutes.	• Monthly for data collection and reporting	• PMU • PDWRAM
Social inequality	• Employment rates of vulnerable groups (poor, ethnic minorities, people with disabilities) in project activities. • Access to project benefits (training, information, resources) among different social groups.	• Construction sites • Training sessions • Community consultations	• Employment records and beneficiary lists. • Attendance records and feedback surveys. • Consultations with community members and representatives of vulnerable groups.	• Monthly for data collection and reporting	• PMU • PDWRAM
Elite capture	• Participation and representation of different social groups in decision-making bodies (FWUCs, committees). • Transparency and accountability in the allocation of project resources and benefits. • Monitoring of complaints related to favoritism or exclusion in decision-making.	• FWUC meetings • Community consultations • Project implementation records	• Observation of meeting dynamics and representation • Analysis of resource allocation records. • Records of complaints and their resolution.	• Regularly during FWUC meetings and project implementation • Continuously through the GRM.	• PMU • PDWRAM

PMU = Project Management Unit, ESMP = Environmental and Social Management Plan, IP = Indigenous Peoples, SEA = Sexual Exploitation and Abuse, SH = Sexual Harassment, ESHS = Environmental Social Health and Safety, CoC = Code of Conduct, PDWRAM = Provincial Department of Water Resources and Meteorology, FWUC = Farmer Water User Communities, GRM = Grievance Redress Mechanism.

9.2.5 E&S Auditing

Auditing is a critical requirement for Category A projects, necessitating the engagement of an Independent Environmental and Social (ES) Monitoring Agency to ensure compliance during both construction and operation phases, as mandated by the AIIB Environmental and Social Framework (ESF). During the construction phase, audits must be conducted at regular intervals aligned with the lenders' requirements, typically quarterly, to monitor adherence to environmental and social safeguards, including waste management, pollution control, and worker safety. In the operation phase, annual audits are required to assess the long-term impacts on the environment and community, ensuring mitigation measures remain effective and operational standards are upheld. This dual-phase auditing approach ensures comprehensive monitoring and accountability throughout the project lifecycle.

9.3 ROLES AND RESPONSIBILITIES FOR IMPLEMENTATION OF SUB-SCHEME ESCMP

The feasibility study for the CAISAR Project provides key recommendations for implementation, focusing on climate and poverty goals. The project will be managed by the Ministry of Water Resources and Meteorology (MOWRAM) under the oversight of the Ministry of Economy and Finance (MEF) through the country program steering committee. MOWRAM will lead the project's overall management and implementation of Component 2 (Infrastructure), while the National Committee for Sub-National Democratic Development (NCDD) will handle Component 1, which includes farm support, capacity building, and climate-resilient farming practices. The International Fund for Agricultural Development (IFAD) will assist NCDD in leading Component 1 and will manage project communications.

The Project Management Unit (PMU) will include personnel from MOWRAM, the Department of Hydrology and River Works (DHRW), and Provincial Departments of Water Resources and Meteorology (PDWRAM) from four (4) provinces. Key phases include a program for solar pumping to improve infrastructure resilience and climate resilient infrastructure.

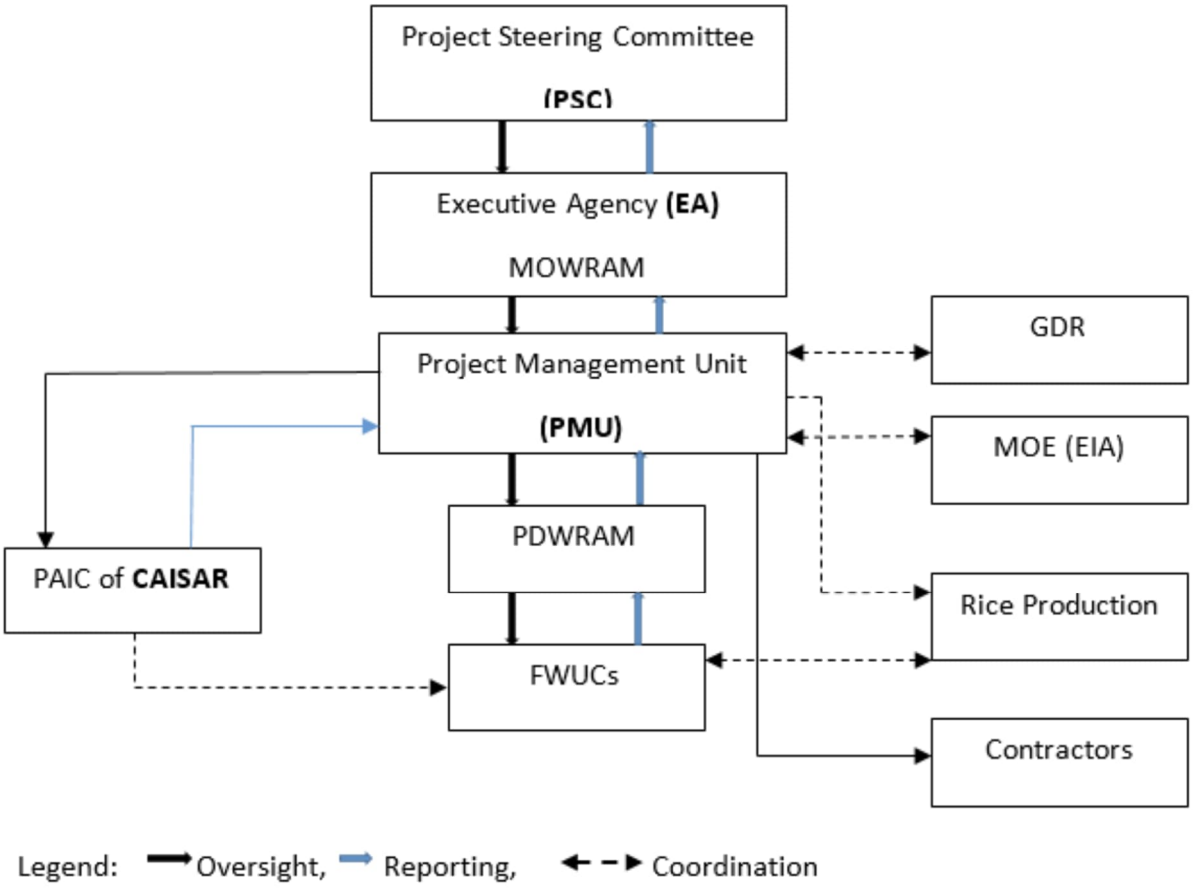
Monitoring and evaluation will focus on increasing capacity at the FWUC level, ensuring the project meets its long-term goals. MOWRAM will oversee project supervision, while PDWRAM and the Ministry of Agriculture, Forestry and Fisheries will handle resettlement and agricultural support. The project steering committee, chaired by the Minister of MOWRAM, will guide policy and implementation, with resettlement managed by an Inter-Ministerial Resettlement Committee led by MEF. Through these arrangements, the CAISAR project aims to enhance water management and agricultural productivity in Cambodia.

9.4 ENVIRONMENTAL AND SOCIAL COMPLIANCE FRAMEWORK

9.4.1 Institutional Arrangement and Capacity Development

MOWRAM is the Executing Agency for implementation of the Project. However, successful implementation of the Project requires the cooperation of several ministries. The project steering committee (PSC) was established to achieve the inter-ministerial coordination and chaired by the Minister of MOWRAM and comprising of senior officials from MOWRAM, MOI (NCDD), MAFF, Ministry of Environment (MOE), Ministry of Economy and Finance (MEF), and the Provincial Governor's Offices of Pursat, Kampong Chhnang, Kandal, and Kampong Speu provinces will oversee project implementation and provide support to the project. Figure 9.1 below shows the Project organization Structure.

Figure 9.1: CAISAR Project (Component 1) Structure Chart



PAIC = Project Appraisal and Implementation Committee, CAISAR = Climate Adaptive Irrigation and Sustainable Agriculture for Resilience, PDWRAM = Provincial Department of Water Resources and Meteorology, FWUCs = Farmer Water User Communities, GDR = General Department of Resettlement, MOE = Ministry of Environment, EIA = Environmental Impact Assessment.

(Source: Feasibility report structure chart)

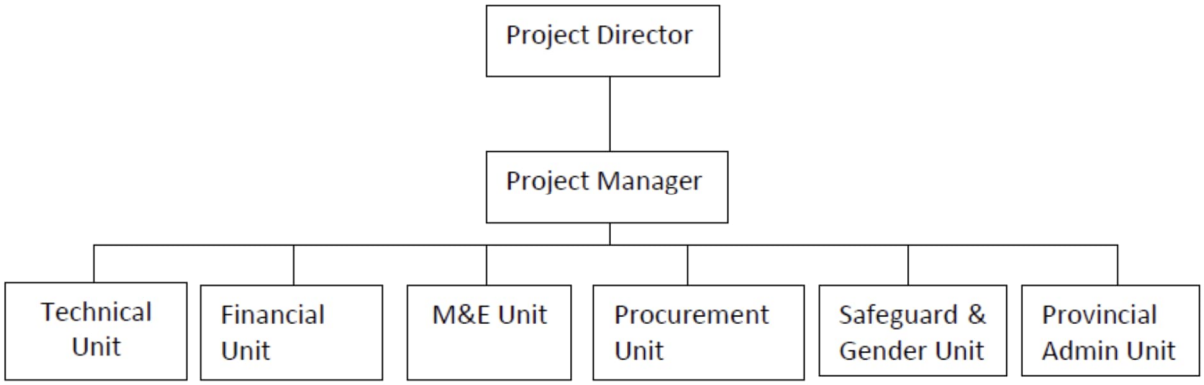
A project management unit (PMU) has been established establish for the CAISAR project. The PMU will be headed by the Secretary of State of MOWRAM as Project Director, with assistance from the DFWUC Director as Project Manager. The PMU will be fully involved in the preparation and implementation of the project. The PMU is composed of designated personnel from MOWRAM, the Department of Hydrology and River Works (DHRW) of

MOWRAM, and the PDWRAMs of Pursat, Kampong Chhnang, Kampong Speu, and Kandal provinces.

The PDWRAMs are responsible for coordinating all field activities with FWUCs and DFWUC and implementing O&M activities.

The PMU is supported by the Project Management Implementation Consulting (PMIC) and consists of Project Director, Project Manager, Technical Unit, M&E Unit, Financial Unit, Procurement Unit, Safeguard & Gender Unit and Provincial Administration Unit as show in Figure 9.2 below.

Figure 9.2: CAISAR Project PMU structure chart



M&E = Monitoring and Evaluation.

9.4.2 Environmental and Social Duties of the PMU/Detail Design Consultants

9.4.2.1 MOWRAM'S PMU

MOWRAM's PMU will work closely with PDWRAM in planning and implementing subprojects located within their province. The PDWRAMs will also supervise project officers at the district-level Department of Water Resource and Meteorology, and are responsible for:

- Coordinating effectively with all project stakeholders, including MOWRAM's SEO, consultants, contractors, local authorities, provincial departments, and project communities.
- Supporting provincial and district-level project officers in monitoring and evaluating progress and performance of consultants and contractors.
- Supporting MOWRAM'S SEO to conduct training on labor, gender, SEA, SH, VAC, and HIV/AIDS.
- Supporting MOWRAM'S SEO to disseminate project information and conduct consultation activities, as well as ensuring effective grievance redress resolution within their province.
- Supporting MOWRAM'S SEO to conduct screening and scoping of the subprojects, and identifying environment, social, land acquisition impacts and screening for presence of IPs in the subproject area.

- Liaising with village authorities in subproject area to encourage vulnerable groups to apply for jobs that may be offered by project contractors.
- Collaborating with relevant departments involved in land acquisition and/or other environment or social mitigation measures.

9.4.2.2 NCDD'S PMU

NCDD's PMU will work closely with Provincial Cabinet in planning and implementing subproject located within their province. NCDD PMU will be responsible for day-to-day project implementation, monitoring and evaluation of Project Component 1, 2.1 and 2.2 in collaboration with MAFF. PMU will work under the oversight and guidance of NCDDS and will be responsible for all aspects of environmental and social performance, including E&S monitoring and evaluation, reporting of E&S performance, and relevant incidence during project implementation.

9.4.2.3 Provincial Department of Water Resources and Meteorology

PDWRAM's main responsibility includes:

During subproject preparation and construction:

- Support design parties in their surveys and consultation to prepare Feasibility Study and Detailed Design for sub-scheme.
- Oversee construction activities under Component 2, particularly construction of the new irrigation canal in the command area

During operation:

- Collaborate with other relevant technical departments, especially PDAFF at provincial level, farmer water user groups (FWUG) to ensure its regulators (located within the water distribution network) are operated effectively, and in a manner that minimizes water use conflicts among target water user community in the command area.
- Conduct regular maintenance of the reservoir and irrigation canals during subproject operation and maintenance stage.

9.4.2.4 Provincial Department of Agriculture, Forestry and Fisheries

PDAFF is responsible for implementing activities under Component 1, 2.1 & 2.2. Under this subproject, PDAFF is responsible for developing and implementing agricultural techniques that make full use of improved water access (under Component 1) to enable farmers in the command area to produce more food in a sustainable manner which improves farmers' income and livelihoods. PDAFF will focus on the following:

- Promoting crop diversification for farmers in the command area (e.g. crop rotation for rice and horticulture production improves soil conditions whereas enhancing vegetation production for household's better nutrition and income.
- Introducing to farmers new agricultural engineering techniques to promote a) mechanization to increase productivity in crop production (e.g. mechanization in soil

preparation using laser land leveling, use of combine harvester to save labor and reduce production costs, b) save water by applying alternate wet and dry (AWD) and drip irrigation for horticultural activities, c) reduce GHG.

- Scaling up Crop Production and engaging Private Sector in value chain development for specific farm product (e.g. rice, bean, and other cash crops such as vegetables…) and relevant agricultural services through agricultural cooperatives, producer groups, etc.

9.4.3 Environmental and Social Duties of the Contractor

The contractor and its subcontractors, if any, shall comply with the ESMP. In particular, the Contractor must prepare a Contractor's ESMP (C-ESMP) to elaborate this ESMP based on a) site condition, b) capacity of the Contractors and their subcontractors (if any), c) national regulations that are active by the time of subproject implementation.

To ensure that necessary action has been undertaken and that steps to avoid adverse impacts and/or reoccurrence have been implemented, the Project Manager, the Safeguard Focal Persons, and/or contractor must report to PMU within 48 hours of any serious incidents of non-compliance that may have serious consequence. In the event of working practices being deemed dangerous either by the subproject, the local authorities, or the other concerned agencies, immediate remedial action must be taken by the contractors. The contractor must keep records of any incidents and any corrective action taken. The records of non-compliance that could be practically addressed (not cause serious impacts) will be reported to the DDIS with a copy to PMU monthly.

The contractor will be responsible for dealing with any reports/grievance forwarded by the local communities, authorities, police or other agencies as soon as practicable, preferably within one (1) hour but always within 48 hours. The Project Manager/Safeguard Focal Persons will monitor and ensure that the contractor has taken appropriate action. Where appropriate, approval of remedial actions may require an agreement from the local authorities and/or other government agencies. Procedures should be put in place to ensure, as far as is reasonably practical, that necessary actions can be undertaken to avoid recurrence and/or serious damage.

9.4.4 Contractor's Environmental and Social Management Plan (C-ESCMP)

The civil works contractor is responsible for implementing the Environmental and Social (E&S) mitigation measures outlined in this ESMP for Component 2, which involves constructing the irrigation canal and related structures like gates and regulators. Based on the ESMP and the project's Labour Management Plan (LMP), the contractor will:

- Prepare and submit a Contractor's Environmental and Social Management Plan (C-ESMP) for each contract, detailing how E&S risks related to construction activities, workers, camps, machinery, and vehicles will be mitigated. The C-ESMP must also include a labor management plan (C-LMP) and be site-specific, addressing risks based on the contractor's capacity and site conditions.

- If subcontractors are engaged, they must prepare their own E&S plan aligned with the ESMP and LMP, outlining how they will manage identified risks and impacts. Reporting arrangements between the subcontractor and the main contractor must be detailed, with the main contractor consolidating subcontractor reports into monthly E&S performance reports to the PMU, with quarterly reporting potentially required.
- If changes occur to the proposed works and activities during the contract period, the contractor must update the C-ESMP to reflect these changes, including relevant subcontractor plans. The C-ESMP should include:
    - A policy statement outlining the contractor's commitment to the site-specific ESMP.
    - Document details (issue date, revision status, distribution list, and signatures).
    - Applicable laws, regulations, and required permits.
    - Plans to manage E&S risks, including mitigation measures, a Workers' Code of Conduct, and a Contractor's LMP.
    - A list of required environmental and social training for all personnel, including occupational health and safety, SEA/SH/VAC risks, and emergency response.
    - Financial resources and responsibilities for implementing the C-ESMP, including subcontractor responsibilities and training for local workers.
    - Monthly environmental reports, covering accident/incident reporting within 48 hours to MoWRAM, compliance with the C-ESMP, challenges, non-compliance issues, subcontractor activities, and meeting minutes with MoWRAM.

The contractor must ensure timely funding, human resources, and implementation of pre-construction and construction mitigation measures, along with any additional E&S mitigation required.

9.4.5 Safety, Social and Environmental Officer (SSEO)

Under the PMU, the consultant must be competent on-site Safety, Social, and Environment, trained in environmental management, to oversee contractors and subcontractor personnel. The SSEO's responsibilities include:

- Supervising subcontractor compliance with the Contractor's LMP and C-ESMP.
- Submit the LMP and C-ESMP to the PMU/DDIS for approval before mobilizing staff.
- Conducting site inspections and audits to ensure compliance with environmental and social mitigation measures.
- Monitoring and reporting on E&S compliance and preparing audit reports.
- Investigating complaints, recommending corrective actions, and addressing non-compliance.
- Informing the contractor, PMU, and DDIS of any E&S issues, and maintaining detailed records.

- Collaborating on labor issues and preparing the Contractor's LMP and C-ESMP, including OHS regulations.
- Maintaining employment records, verifying minimum working age, and ensuring signed Workers' Codes of Conduct.
- Providing regular training on occupational safety, SEA/SH/VAC, and community relations.
- Ensuring primary suppliers address SEA/SH/VAC, child labor, forced labor, and OHS risks.
- Developing and implementing a grievance mechanism for contracted workers, resolving grievances promptly, and reporting to the PMU.
- Ensuring all workers sign the Code of Conduct and implement measures to prevent SEA/SH.
- Developing and enforcing COVID-19 prevention and mitigation plans.

Incident reporting

The contractors are required to inform DDIS and PMU any incidents listed below within agreed timeframe (e.g. 48 hours):

- Any violations to national laws, regulations, or international agreements.
- Any serious accidents or fatalities,
- Significant impacts that cause losses to personal property such as traffic accidents, damages to local houses/roads and other incidents.
- Serious surface/ground water pollution.
- Failures of embankments at disposal sites that cause serious pollutions to the surroundings,
- Fire related to worker's behaviours,
- Any claims related to SEA/SH/VAC, or any other incidents related to children, and
- Receive a complaint about pollution or damages.

9.4.6 Reporting Arrangements

E&S performance will be included in both subproject and overall project progress reports. Safeguard specialists in each PPMU, with support from CSC/field engineers, will monitor and report on E&S performance. These specialists will submit monthly E&S reports at the subproject level to the CPMU. At the central level, the CPMU will prepare biannual E&S monitoring reports for submission to IFAD and the GCF, outlining project progress and compliance with SECAP/GCF safeguards (See also Table 9.6).

The progress report to CPMU must provide sufficient details on subproject implementation and E&S issues related to ESCMF. The flow in reporting of the project is depicted in Figure 9.3. The overall report from CPMU to IFAD and GCF will include: (i) preparation and disclosure

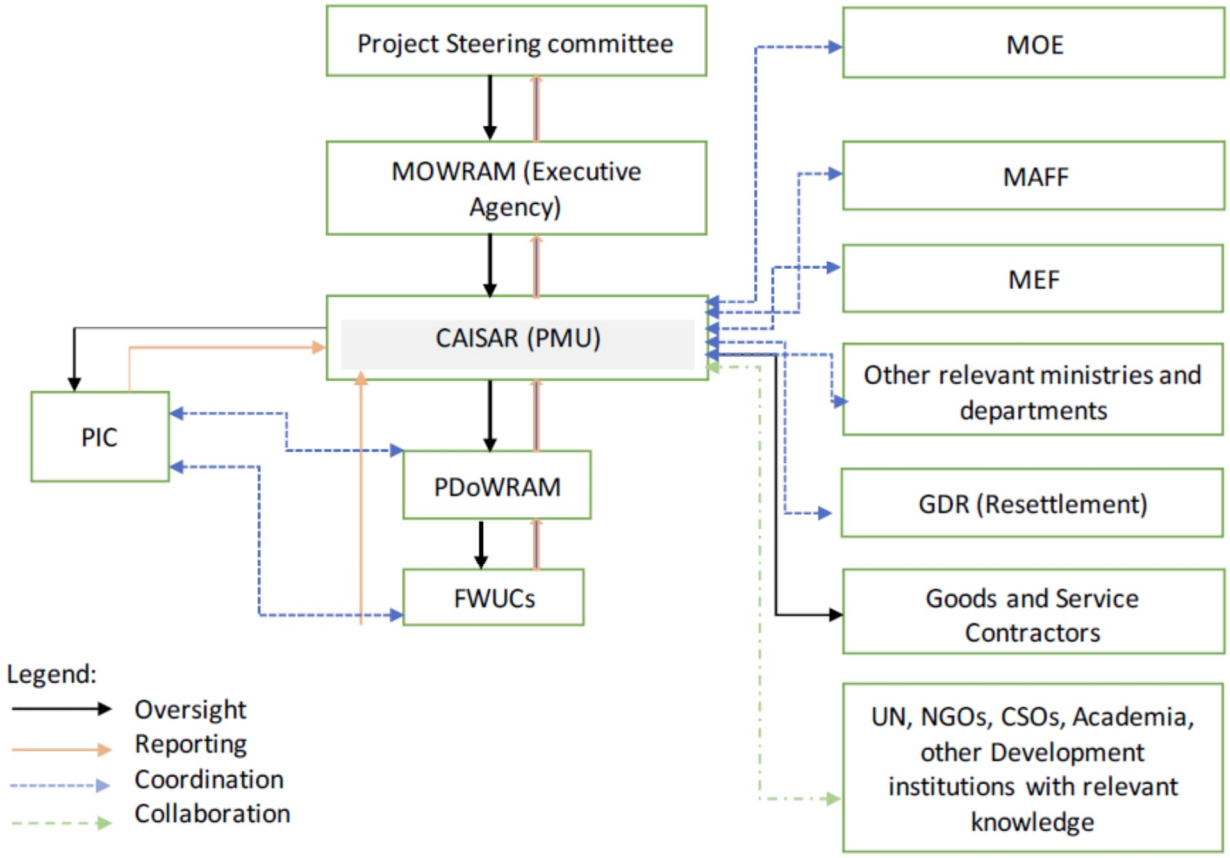
of E&S instruments for subprojects; (ii) progress on ESCMP implementation, including ECOP/COC on SEA requirements in bidding documents; (iii) monitoring of contractor, CSC, and PPMU performance under ESCMP, ECOP, and COC on SEA; and (iv) challenges, solutions, and lessons learned during implementation. Table 9.6 summarizes reporting procedures.

Table 9.5: Report procedure

	Report Prepared by	Types of Report	Project Com.	Submitted to	Frequency of Reporting
1	Contractor to the Employer	Progress Report: Progress, issues and challenges, and suggestions	1, 2	PPMUs	Once before construction commences and monthly thereafter
2	Construction Supervision Consultant (CSC)	Monitoring report: Testing, inspection and observation results, status of construction: quality, conflict, compliance.	1, 2	PPMUs	Weekly and monthly
3	Community Monitoring	Monitoring report: Observation, complaints, solutions, challenges, and suggestion	1, 2	PPMUs	When the community has any complaint about the subproject E&S/ESCMF implementation
4	PPMUs	Progress Report: Progress, issues and challenges, and suggestions	1, 2, 3	CPMUs	Monthly
5	CPMUs	Progress Report: Progress, issues and challenges, and suggestions	1,	IFAD and GCF	Once every six (6)-months, in accordance with any signed legal agreements.

PPMUs = Provincial Project Management Unit, E&S = Environmental and Social, ESCMF = Environment, Social, Climate Management Framework, CPMUs = Central Project Management Unit, IFAD = International Fund for Agricultural Development's, GCF = Green Climate Fund.

Figure 9.3: Stakeholder and flow in reporting of CAISAR project



PIC = Project Implementation Committee, MOWRAM = Ministry of Water Resources and Meteorology, CAISAR = Climate Adaptive Irrigation and Sustainable Agriculture for Resilience, PMU = Project Management Unit, PDoWRAM = Provincial Department of Water Resources and Meteorology, FWUCs = Farmer Water User Communities, MOE = Ministry of Environment, MAFF = Ministry of Agriculture, Forestry and Fisheries, MEF = Ministry of Economy and Finance, GDR = General Department of Resettlement, UN = United Nations, NGOs = Non-governmental Organizations, CSOs = Civil Society Organizations.

(Source: Feasibility study report of CAISAR project)

CHAPTER 10 – PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

10.1 INTRODUCTION

This chapter, "Public Consultation and Information Disclosure," focuses on the consultation process and the dissemination of project-related information to ensure transparency and stakeholder engagement. It outlines the steps taken to involve local communities, relevant authorities, and other stakeholders in the consultation process, providing them with opportunities to voice their concerns, feedback, and suggestions. The chapter also details how information was disclosed to the public, ensuring that all parties had access to accurate and timely project data. The consultation involved a diverse group of people, including community members, local leaders, government representatives, and civil society organisations. The results of these consultations are critical in shaping the project's direction, addressing potential impacts, and fostering a more inclusive and collaborative decision-making process.

10.2 SUMMARY OF PUBLIC CONSULTATION PROCESS & RESULTS

10.2.1 The Consultation

10.2.1.1 Periods, Stakeholders and Purposes

Public consultation is a key component of CAISAR, and it was pivotal in preparation of the Environmental, Social, Climate Impact Assessment report (ESCA) Report and the Environmental, Social, Climate Management (ESCM) Plan. The consultations were conducted with relevant institutions, non-governmental organizations, local authorities, and local people during the preparation of ESCIA and ESCMP for CAISAR project. The data collection and consultations were conducted in four (4) periods:

- The first consultation was conducted between 26 and 28 July 2024 to capture information regarding biodiversity and environmental condition in the project area.
- The second consultation was conducted to consult with forestry and fishery communities, local authorities and key informants to understand the situation and concerns related to the presence of the project. The consultation was conducted between 03 and 09 August 2024.
- The third consultation was conducted at household, village, and commune level stakeholders focusing on status, concerns and feedback regarding the project implementation. This consultation was conducted between 10 and 18 August 2024.

- The last consultation was conducted between 21 and 23 August 2024 with the district and provincial stakeholders, mainly focusing on the opinion, and feedback regarding the implementation of the project.

In addition to the stated consultations, there are also continuous consultations being conducted with AIIB, IFAD, and CAISAR PMU including the PMU management, SECAP team, and engineering team to ensure that the disclosed information being aligned with the most updated information of the project.

Table 10.1: Number of participants being consulted for the ESCIA

Levels	**Household survey (Beneficiaries and Potentially Affected)**	**Focus Group Discussions**	**Key Informant Interviews**	**Total**
Village level	272 (134 Females)	309 (180 Females)	32 (3 Females)	613 (317 females)
Commune level			35 (11 Females)	35 (11 Females)
District level			28 (10 Females)	28 (10 Females)
Provincial level			51 (12 Females)	51 (12 Females)
			Total	**727 (350 Females)**

Table 10.2: Types of stakeholders, and topics of the consultations is shown below:

No.	Levels	Key topics	Methods	Timeframe	Participants	Concerns
1	Village	Beneficiary Households	Household Survey	10 - 18 August 2024	A household survey was carried out to gather information from local people living in the 31 villages neighbouring the ESCIA project area.	Refer to concerns and suggestions from consulted people in section 9.2.2.
		Potentially Affected Households				
		Rice farmers	FGDs	10 - 18 August 2024	309 persons (129 male and 180 female)	
		Vegetable producers				
		Chicken raisers				
		Duck raisers				
2	Commune	Commune Committee for Women and Children	Key Informant Interviews	26 - 28 July 2024 03 - 09 August 2024	31 persons (20 male and 11 female)	
		Agricultural Cooperatives				
		Water Farmer User Community				
		Fishermen				
		Community Forestry				
		Community Fishery				
3	District	Offices of Development and Planning, Agriculture, Environment, Women Affairs,	Key Informant Interviews	21 - 23 August 2024	28 persons (18 male and 10 female)	
4	Province	Provincial Hall,				

No.	Levels	Key topics	Methods	Timeframe	Participants	Concerns
		Departments of Land, Water, Agriculture, Environment, Women Affairs, Labour, and Culture	Key Informant Interviews	26 - 28 July 2024 21 - 23 August 2024	51 persons (39 male and 12 female)	
		Non-Governmental Organizations				
		Biodiversity Expert				

FGDs = Focus Group Discussions.

10.2.1.2 Consultation Process

The purposes of the consultation were to:

- Inform local people and interested stakeholders of the purpose of the rehabilitation and construction of the irrigation system,
- Share the project information and the design options from the draft engineering design,
- Highlight subproject's key activities that potentially associated with them, and
- Collect their opinion, concern and feedback on the project focusing on background information, project potential impacts (positive and negative), suggestions for impact mitigations, and consultation mechanism.

The consultation agenda with stakeholders included (i) the introduction of the study team, (ii) sharing project information using illustration materials, (iii) discussion and consultation on potential benefits and impacts of the project, (iv) suggestions on the mitigation measures, (v) grievance process and concerns, and (vi) final wrap up for the consultation. The study team were trained to introduce themselves about the purpose of the consultation, followed by the introduction about the project's component and activities expected to be implemented within the area. Materials including leaflet on project information and map of the command area were shared and explained to stakeholder prior to the consultation. Lastly, the consultation began with an overall discussion and specific questions as per the relevant aspect to the stakeholder. Opinions, concerns and suggestions were gathered and confirmed prior to the end of the consultation.

10.2.2 Results of the Consultations

The result of the consultation is presented below summarizing what the consulted stakeholders perceived about the project, their concerns on the risks and impacts, and their feedback and suggestions to which the project should be taken care of. The results of the consultations include general opinions, concerns and feedback on the project of stakeholders from focus group discussion, village leaders, commune councils, district authorities, provincial line departments, and provincial governments. The results from the consultations were also included in Chapter 06, and Chapter 08 to which they have been responded in the mitigation measures of the project. The synthesized results of the consultation are presented as per the identified VECs below.

10.2.2.1 Ou Ta Paong

10.2.2.1.1 Environment and Biodiversity Component

a. Pollution prevention and resource efficiency

Concerns

- The rehabilitation of irrigation canals and farm roads can disturb environmental effects.
- Large machines can generate noise and vibration pollution, which can disturb nearby residents and wildlife.
- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site can negatively impact local air quality and surface water.

Suggestions from the consulted people

- Avoid construction at night.
- Install garbage bins and waste storage areas in the construction sites and conduct orientation workers to put the waste in the garbage bins.
- Government institutions and stakeholders should regularly conduct site inspections to inspect project activities that harm the environment and local community.

b. Biodiversity

Concerns

- CAISAR project may cause negative impacts on the environment, including changes in water quality, dust generation, air pollution, soil erosion, improper waste disposal, and hazardous waste from machinery.
- The project could disrupt the natural flow of water from upstream to Tonle Sap Lake, potentially harming the lake's biodiversity.
- Fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the irrigation infrastructure and canal upgrading.

Suggestions from the consulted people

- The contractors and relevant parties should conduct water quality and air quality monitoring during construction.
- Contractors must regularly monitor and inspect the living conditions of the workers, manage waste effectively, and provide adequate housing and sanitation facilities to them.
- Providing comprehensive training to workers on proper waste and oil management procedures.
- Activities such as fishing and hunting should be strictly prohibited to minimize environmental impact.
- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.

- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.

c. GHG Emission

Concerns

- Climate change is negatively impacting rice production, causing problems such as insect infestations, and extended dry seasons,
- Waste and pollution may contribute to the emission of GHG

Suggestions from the consulted people

- The contractors should ensure that garbage bins are conveniently placed throughout the workers' camp and collaborates with a waste collection company to guarantee regular and efficient removal of waste.
- To minimize emissions, contractors are advised to refrain from using outdated machinery.

10.2.2.1.2 Social Component

a. Labor and Working Conditions

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.

Suggestions from the consulted people

- The construction companies should hire local workers to offer them jobs and strictly abide by laws and reduce the concerns about gender-based violence or sexual violence.
- Construction companies and relevant departments should provide training on gender issues, violence, labour laws, and social protections to their staff and workers.
- The project should allocate budget for relevant line departments to conduct relevant trainings to the companies and workers, and to monitor the construction sites

b. Community Health and Safety

Concerns

- Participants remain concerned that the presence of workers could result in sexual abuse of women and children living near the project site,
- Drug trafficking and consuming among workers may cause unsafe environment for both workers and surrounded residents,
- The construction activities may generate dust and slippery road conditions which may lead to traffic incidents,
- Waste generated from worker camps and construction activities during the project could degrade water quality, negatively impacting human health, livestock, and crops.

Suggestions from the consulted people

- The construction companies should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community,
- The project should promote gender awareness, enforce stricter punishments for offenders, and prevent drug trafficking in the workplace,
- The construction companies must collaborate with local authorities in all activities to make a proper management, control and monitoring during construction, and
- The project should conduct gender education at the district to prevent and address gender-based violence,

c. Land acquisition, economic and physical displacement

Concerns

- Conflicts between the project and affected families may arise, often driven by external influences rather than the families themselves.
- Land-owning farmers might lose their land for agriculture, which could compel them to migrate.

Suggestions from the consulted people

- The project should conduct a preliminary study on land issues before construction is going to be implemented, addressing specific aspects of land impact and conducting evaluations for each affected property,
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project,
- Farmers who own land may lose it for farming, which could force them to migrate, heightening their vulnerability to exploitation.

d. Cross–cutting risks and impacts

Concerns

- Unequal water distribution among farmers leads to conflicts.
- Institutions or companies responsible for establishing FWUCs are typically based at the national level, resulting in limited quality implementation weakening the FWUCs as PDWRAM is sidelined.
- The FWUCs struggle to generate income, making water management challenging, as there is no budget for repairs, leading to improper system operations.
- Farmers face various challenges such as pests, diseases, labor shortages, lack of capital, limited production techniques, flooding, unstable prices for vegetables and livestock, and high agricultural input costs.
- The provincial department lacks the budget to support the resolution of water user conflicts.
- Some farmers are absent from the rice fields during water distribution periods.

- Tensions between upstream and downstream villages arise when excess water released upstream during the wet season causes downstream flooding, while in the dry season, insufficient upstream water flow impacts downstream areas.
- High agricultural input costs continue to reduce farmers' profitability.
- Farmers do not follow official guidance on the size of rice fields to be cultivated, leading to inadequate water for irrigation.

Suggestions from the consulted people

- PDWRAM should be the leader in formulating the FWUCs with the support from national level,
- Water use and maintenance support should be provided including technical and management training, along with problem-solving techniques, to effectively control and manage water distribution,
- The project should thoroughly examine the water availability, technical and situational aspects of the sub-scheme before construction to prevent water shortages or flooding,
- Ensure transparent water supply to prevent disputes by holding meetings to plan water use and distribution, involving the district governor, commune council, and relevant stakeholders,
- All parties should also participate in the maintenance of the irrigation system and provide training or education on water conservation to farmers.
- Prior to starting irrigation rehabilitation, disseminate project information to people and stakeholders, and announce the construction period in advance.
- The water consumption fee should be gathered from farmers which could be used later to support caretakers and maintain the irrigation system.
- Increase the number of commune agricultural technical officers to provide training and monitor farmers' cultivation techniques.
- Build more water storages, and reservoirs such as ponds or wells and conduct training on water-saving techniques to adapt to actual water availability.
- Installing and upgrading the damaged sluice gates to improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Facilitate the development of additional agricultural markets.
- Providing modern equipment and new techniques to department officers can enhance agricultural production efficiency and yield.

10.2.2.2 Lum Hach

10.2.2.2.1 Environment and Biodiversity Component

a. Pollution prevention and resource efficiency

Concerns

- During the construction stage, such as the rehabilitation of irrigation canals and farm roads, can have disturbing environmental effects.
- The disposal of liquid waste from the workers at the irrigation construction site will negatively impact local air quality and surface water.

Suggestions from the consulted people

- Government institutions and stakeholders should regularly conduct site inspections to reduce project activities that harm the environment and local community.
- Relevant ministries should conduct a visit to evaluate and address the issue of liquid waste from the construction activities in the commune.

b. Biodiversity

Concerns

- CAISAR project may cause negative impacts on the environment, including changes in water quality, and hazardous waste from machinery.
- The fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the irrigation infrastructure and canal upgrading.

Suggestions from consulted people

- To ensure the well-being of workers, contractors must regularly monitor and inspect the living conditions of the workers, manage waste effectively, and provide adequate housing and sanitation facilities to them.
- The contractor is responsible for providing comprehensive training to workers on proper waste management procedures.

c. GHG emission

Concerns

- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons,
- Waste and pollution may contribute to the emission of GHG

Suggestions from the consulted people

- Installing solar water pumps in agriculture processing facilities can reduce fuel consumption, which causes greenhouse gas emissions.

10.2.2.2.2 Social Component

a. Labor and Working Conditions

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.

- At the construction sites, some men may undervalue women's work. The gender disparities continue to exist, with some men holding the belief that women are not capable or willing to work.

Suggestions from the consulted people

- Construction companies should prioritize hiring local workers, comply strictly with laws, and take steps to mitigate concerns about gender-based and sexual violence.
- Construction companies and relevant departments should provide training on gender issues, violence prevention, labor laws, and social protections to their staff and workers.
- Additional support and monitoring measures should be put in place to prevent abuse, with any incidents being promptly addressed to avoid recurrence.
- Local authorities should regularly inspect construction sites to ensure no children are employed, taking immediate action if any issues are identified.
- The project should allocate funds to support relevant departments in providing training to companies and workers, as well as monitoring construction sites.

b. Community Health and Safety

Concerns

- The presence of workers could lead to the sexual abuse of women and children living near the project site.
- Drug trafficking and use among workers could create an unsafe environment for both workers and nearby residents.
- After construction is completed, there may be risks of people and animals falling into the canals, potentially leading to drowning incidents.
- Waste generated from worker camps and construction activities during the project could degrade water quality, negatively impacting human health, livestock, and crops.

Suggestions from the consulted people

- Construction companies should regularly place warning signs, water the roads, and schedule construction activities to minimize noise pollution that could disrupt the community.
- The project should promote gender awareness, enforce stricter penalties for offenders, and prevent drug trafficking in the workplace.
- Separate accommodations for men and women should be provided.
- Construction companies must collaborate with local authorities to ensure proper management, control, and monitoring throughout the construction phase.
- The project should conduct gender education at the district level to prevent and address gender-based violence.

- The project should establish gender outreach committees at the commune and village levels to monitor gender-related issues within the project areas, particularly during construction.

c. Land acquisition, economic and physical displacement

Concerns

- Landowners along the irrigation system without proper land registration are concerned they may not receive compensation due to the lack of title deeds.
- While the project supports agricultural production, it may not benefit poor families who do not own land for farming.
- Conflicts between the project and affected families may arise, often instigated by external parties rather than the families themselves.
- Land-owning farmers could lose their land, potentially forcing them to migrate, increasing their vulnerability to exploitation and potentially causing their children to drop out of school.

Suggestions from the consulted people

- The project should conduct a preliminary study on land issues before starting construction, addressing specific land impacts and evaluating each affected property.
- The project or construction company must work closely with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project.

d. Cross–cutting risks and impacts

Concerns

- Construction companies might disregard concerns raised by local authorities and communities regarding the actual conditions of the area.
- The high cost of agricultural inputs continues to reduce farmers' profits,
- Farmers do not follow the guidance from authorities regarding the size of rice land areas that should be cultivated causing inadequate water for irrigation,
- Manure for fertilizer is declining due to reduced animal raising and lower cattle prices are prompting farmers to reduce livestock raising
- Besides water issues, farmers also struggle with pests, diseases, inadequate labour, lack of capital, limited production technique, flooding, unstable sale price (vegetable and animal) and high agricultural input costs,
- The provincial department lacks budget to support water user conflict resolution,

Suggestions from the consulted people

- A proper handover to local authorities upon project completion should be conducted to avoid quiet handovers,

- Women should be engaged and be promoted as the members of Water User Community to promote water distribution equality regarding water allocation from the system,
- Closed monitoring and support to FWUCs are critical and should be conducted regularly by all levels,
- Water use and maintenance support should be provided including technical and management training, along with problem-solving techniques, to effectively control and manage water distribution,
- Ensure transparent water supply to prevent disputes by holding meetings to plan water use and distribution, involving the district governor, commune council, and relevant stakeholders,
- All parties should also participate in the maintenance of the irrigation system and provide training or education on water conservation to farmers.
- Prior to starting irrigation rehabilitation, organize a public forum to gather feedback from local residents, disseminate project information to people and stakeholders, and announce the construction period in advance.
- The water consumption fee should be gathered from farmers which could be used later to support caretakers and maintain the irrigation system.
- Build more water storages, and reservoirs such as ponds or wells and conduct training on water-saving techniques to adapt to actual water availability.
- Installing and upgrading the damaged sluice gates to improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Facilitate the development of additional agricultural markets.

10.2.2.3 Brambei Mom

10.2.2.3.1 Environment and Biodiversity Component

a. Pollution prevention and resource efficiency

Concerns

- Stakeholders did not express concern about the pollution caused by the rehabilitation and construction of the irrigation system.
- The construction process can release dust, which will disturb the local community and surface water quality.

Suggestions from the consulted people

- Regularly watering on the road transports construction materials and soil to reduce dust that may disturb nearby residents.

b. Biodiversity

Concerns

- Participants did not address the concerns related to the impact of construction activities on local biodiversity; instead, they highlighted the positive effects on fish and aquaculture habitant and movement.

Suggestions from the consulted people

- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.

c. GHG emission

Concerns

- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons,

Suggestions from the consulted people

- Installing solar water pumps in agriculture processing facilities can reduce fuel consumption, which causes greenhouse gas emissions.

10.2.2.3.2 Social Component

a. Labor and Working Conditions

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.

Suggestions from the consulted people

- The construction companies should hire local workers to offer them jobs and strictly abide by laws and reduce the concerns about gender-based violence or sexual violence.
- Construction companies and relevant departments should provide training on gender issues, violence, labour laws, and social protections to their staff and workers.
- Additional support and monitoring measures should be implemented to prevent abuse, and any incidents should be promptly addressed to prevent recurrence.
- The project should allocate budget for relevant line departments to conduct relevant trainings to the companies and workers, and to monitor the construction sites

b. Community Health and Safety

Concerns

- Participants remain concerned that the presence of workers could result in sexual abuse of women and children living near the project site,
- Drug trafficking and consuming among workers may cause unsafe environment for both workers and surrounded residents,
- The construction activities may generate dust and slippery road conditions which may lead to traffic incidents,

Suggestions from the consulted people

- The construction companies should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community,
- The project should promote gender awareness, enforce stricter punishments for offenders, and prevent drug trafficking in the workplace,
- The construction companies must collaborate with local authorities in all activities to make a proper management, control and monitoring during construction, and
- The project should conduct gender education at the district to prevent and address gender-based violence,
- Separate accommodations for men and women should be provided,
- The project should establish gender outreach committees at the commune and village levels to monitor the gender related issues within the project areas, especially during construction,

c. Land acquisition, economic and physical displacement

Concerns

- Conflicts between the project and affected families could emerge, often fuelled by external instigators rather than the families themselves,

Suggestions from the consulted people

- Preliminary study on land issues before construction is recommended, with each sector addressing specific aspects of land impact and conducting evaluations for each affected property.
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project.
- The government is requested to assist in issuing land titles to farmers with land adjacent to streams and canals.

d. Cross–cutting risks and impacts

Concerns

- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons,
- The high cost of agricultural inputs continues to reduce farmers' profits,
- Manure for fertilizer is declining due to reduced animal raising and lower cattle prices are prompting farmers to reduce livestock raising.
- Farmer Water User Group (FWUG) is not well-functioning.

Suggestions from the consulted people

- Providing technical and management training, materials supported to existing Farmer Water User Group (FWUG) to oversee water use and maintenance effectively control and manage water distribution.
- Restore the Brambei Mom dam to its original height to improve water storage capacity and Stueng Krang Ponley with its sub-canal to improve water distribution.
- Improving the Anlong Chrey Reservoir and upgrading the sluice gate can help prevent flooding and better manage water resources.
- Request to produce more water sources, and reservoirs which are able to store more water due to the previous canals and dams are narrow and shallow, limited effective water distribution and set up quickly which can improve agricultural production.
- Utilizing durable concrete for the canal system can improve the efficiency and longevity of the irrigation infrastructure.
- Installing and upgrading damaged sluice gates in both main and secondary canals can improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Construct both side roads along the canal to enhance transportation for farmers and traders.
- The project should thoroughly examine the technical and situational aspects of the sub-scheme before construction to prevent water shortages or flooding post-construction, and it should be implemented promptly.

10.2.2.4 Krapeu Truom

10.2.2.4.1 Environment and Biodiversity Component

a. Pollution prevention and resource efficiency

Concerns

- The construction process can release dust, which will disturb the local community and surface water quality.
- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site will negatively impact local air quality and surface water.

Suggestions from the consulted people

- Regularly watering on the road transports construction materials and soil to reduce dust that may disturb nearby residents.
- Install garbage bins and waste storage areas in the construction sites and conduct orientation workers to put the waste in the garbage bins.

b. Biodiversity

Concerns

- The fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the reirrigation infrastructure and canal upgrading.

Suggestions from the consulted people

- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.
- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.
- Maintain existing large trees along the dam and canal within the sub-schemes during the irrigation and upgrading process.

c. GHG emission

Concerns

- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons,

Suggestions from the consulted people

- Installing solar water pumps in agriculture processing facilities can reduce fuel consumption, which causes greenhouse gas emissions.

10.2.2.4.2 Social Component

a. Labor and Working Conditions

Concerns

- The presence of construction staff and workers could lead to gender-based violence affecting women workers, women and children in the community.

Suggestions from the consulted people

- Should offer training to their staff and workers on gender issues, violence, and legal protections.
- Preventive support measures should also be put in place to stop abuse, and any incidents must be swiftly handled to avoid repetition. The training should be conducted by technical officers.

b. Community Health and Safety

Concerns

- Concerns about the presence of workers could cause sexual abuse of women and children living near the project site

Suggestions from the consulted people

- To prevent incidents, construction staff should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community and notify authorities upon project completion to avoid quiet handovers.

c. Land acquisition, economic and physical displacement

Concerns

- Landowners along the irrigation system without land registration are concerned they may not receive compensation due to the lack of title deeds.
- Conflicts between the project and affected families could emerge, often fuelled by external instigators rather than the families themselves.

Suggestions from the consulted people

- A preliminary study on land issues before construction is recommended, with each sector addressing specific aspects of land impact and conducting evaluations for each affected property.
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project.
- The construction company should submit quarterly monitoring reports on implementation activities to the provincial department to identify and quickly resolve any issues.
- The government is requested to assist in issuing land titles to farmers with land adjacent to streams and canals.

d. Cross–cutting risks and impacts

Concerns

- Provincial department facing of limited budget to develop and rehabilitate the existing irrigation system

Suggestions from the consulted people

- The project should thoroughly examine the technical and situational aspects of the sub-scheme before construction to prevent water shortages or flooding post-construction, and it should be implemented promptly.
- Establish a Farmer Water User Group (FWUG) to oversee water use and maintenance by providing technical and management training, materials supported to effectively control and manage water distribution.
- The water consumption fee should be gathered from farmers which could be used later to support caretakers and maintain the irrigation system.

e. Agricultural Production

Concerns

- The high cost of agricultural inputs continues to reduce farmers' profits.
- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons.
- Manure for fertiliser is declining due to reduced animal raising and lower cattle prices are prompting farmers to reduce livestock raising.

Suggestions from the consulted people

- Build more water storage and reservoir which able to store more water

- The irrigation should be constructed based on technical and water conditions in the area.
- Utilizing durable concrete for the canal system can improve the efficiency and longevity of the irrigation infrastructure.
- Installing and upgrading damaged sluice gates in both main and secondary canals can improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Construct both side roads along the canal to enhance transportation for farmers and traders.

10.2.2.5 Yutasas

10.2.2.5.1 Environment and Biodiversity Component

a. Pollution prevention and resource efficiency

Concerns

- The construction process can release dust, which will disturb the local community and surface water quality.
- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site will negatively impact local air quality and surface water.

Suggestions from the consulted people

- Regularly watering on the road transports construction materials and soil to reduce dust that may disturb nearby residents.
- Relevant ministries should conduct a visit to evaluate and address the issue of liquid waste from the construction activities in the commune.

b. Biodiversity

Concerns

- CAISAR project may cause changes in water quality, dust generation, air pollution, soil erosion, improper waste disposal, and hazardous waste from machinery.
- The fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the irrigation infrastructure and canal upgrading.

Suggestions from the consulted people

- Contractors must regularly monitor and inspect the living conditions of the workers, manage waste effectively, and provide adequate housing and sanitation facilities to them.
- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.
- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.

c. GHG emission

Concerns

- Waste and pollution may contribute to the emission of GHG

Suggestions

- Contractors are advised to refrain from using outdated machinery.

10.2.2.5.2 Social Component

a. Labor and Working Conditions

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.
- Under 18 years old workers may be involved for the construction phase as they are eligible to work in factories or other companies that adhere to laws,
- At the construction sites, some men may undervalue women's work. The gender disparities continue to exist, with some men holding the belief that women are not capable or willing to work.

Suggestions from the consulted people

- The construction companies should hire local workers to offer them jobs and strictly abide by laws and reduce the concerns about gender-based violence or sexual violence.
- Construction companies and relevant departments should provide training on gender issues, violence, labour laws, and social protections to their staff and workers.
- Additional support and monitoring measures should be implemented to prevent abuse, and any incidents should be promptly addressed to prevent recurrence.
- Local authorities should regularly monitor and inspect construction sites to ensure no children are working there, taking immediate action if any issues arise.

b. Community Health and Safety

Concerns

- The presence of workers could result in sexual abuse of women and children living near the project site,
- Drug trafficking and consuming among workers may cause unsafe environment for both workers and surrounded residents,
- After the construction complete, there may also be the risks of humans and animals falling into the canals causing drowning,
- Waste generated from worker camps and construction activities during the project could degrade water quality, negatively impacting human health, livestock, and crops.

Suggestions from the consulted people

- The construction companies should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community,
- The project should promote gender awareness, enforce stricter punishments for offenders, and prevent drug trafficking in the workplace,
- Separate accommodations for men and women should be provided,
- The construction companies must collaborate with local authorities in all activities to make a proper management, control and monitoring during construction, and
- The project should conduct gender education at the district to prevent and address gender-based violence,
- The project should establish gender outreach committees at the commune and village levels to monitor the gender related issues within the project areas, especially during construction,
- The project should equip the solar lights along the roads to promote the safety of travellers during nighttime,

c. Land acquisition, economic and physical displacement

Concerns

- While the project supports agricultural production, it may not benefit poor families who do not have land for farming,
- Conflicts between the project and affected families could emerge, often fuelled by external instigators rather than the families themselves, and
- Farmers who own land may lose it for farming, which could force them to migrate, heightening their vulnerability to exploitation and potentially causing their children to drop out of school.

Suggestions from the consulted people

- The project should conduct a preliminary study on land issues before construction is going to be implemented, addressing specific aspects of land impact and conducting evaluations for each affected property,
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project,
- If business land is impacted, the government or provincial authorities should provide temporary business premises,
- Advocacy for voluntary land contributions should be encouraged, as the project benefits both the community and individuals, and the restoration of old canals is supported to improve agricultural activities, and
- The construction company should submit quarterly monitoring reports on implementation activities to the provincial department to identify and quickly resolve any issues which affect the livelihood of the community people.

d. Cross–cutting risks and impacts

Concerns

- Unequal water distribution among farmers leads to partisanship and disputes, often because farmers do not adhere to water distribution instructions or announcements from authorities,
- The FWUC could not generate income, causing the management of the water being difficult such as having no budget for repair, resulting in improper operation of the system,
- Besides water issues, farmers also struggle with pests, diseases, inadequate labour, lack of capital, limited production technique, flooding, unstable sale price (vegetable and animal) and high agricultural input costs,
- The provincial department lacks budget to support water user conflict resolution,
- Tensions arise between upstream and downstream villages when water use upstream results in flooding downstream due to excess water being released during the wet season. Conversely, during the dry season, upstream water flow to downstream areas is insufficient.
- Manure for fertiliser is declining due to reduced animal raising and lower cattle prices are prompting farmers to reduce livestock raising.

Suggestions from the consulted people

- A proper handover to local authorities upon project completion should be conducted to avoid quiet handovers,
- Women should be engaged and be promoted as the members of Water User Community to promote water distribution equality regarding water allocation from the system,
- Closed monitoring and support to FWUCs are critical and should be conducted regularly by all levels,
- Water use and maintenance support should be provided including technical and management training, along with problem-solving techniques, to effectively control and manage water distribution,
- Ensure transparent water supply to prevent disputes by holding meetings to plan water use and distribution, involving the district governor, commune council, and relevant stakeholders,
- Prior to starting irrigation rehabilitation, organize a public forum to gather feedback from local residents, disseminate project information to people and stakeholders, and announce the construction period in advance.
- Increase the number of commune agricultural technical officers to provide training and monitor farmers' cultivation techniques.
- Build more water storages, and reservoir such as ponds or wells and conduct training on water-saving techniques to adapt to actual water availability.

- Installing and upgrading the damaged sluice gates to improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Facilitate the development of additional agricultural markets.

10.2.2.6 Steung Krang Bat

10.2.2.6.1 Environment and Biodiversity Component

a. Pollution prevention and resource efficiency

Concerns

- The construction process may generate dust that could disturb the local community.
- Waste from solid, liquid, and domestic sources produced by workers at the irrigation construction site may have adverse effects on local air quality and surface water.

Suggestions from the consulted people

- Regularly watering roads used for transporting construction materials and soil is recommended to minimize dust disturbance to nearby residents.
- Conduct site visits to assess and address issues related to liquid waste from construction activities within the commune.

b. Biodiversity

Concerns

- The CAISAR project may have negative environmental impacts, such as dust generation and air pollution.
- Construction activities could potentially affect fish habitats and aquaculture.

Suggestions from the consulted people

- Measures should be taken to prevent damage to biodiversity, habitats, and other environmental components due to construction activities.

c. GHG emission

Overall Opinion

- Minor greenhouse gas (GHG) emissions could contribute to global GHG levels due to activities like transportation, agricultural practices, the decomposition of agricultural waste, and its burning.

Concerns

- Waste and pollution may also contribute to GHG emissions.

Suggestions from the consulted people

- Participants did not provide any suggestion for greenhouse gas emissions.

10.2.2.6.2 Social Component

a. Labor and Working Conditions

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.
- Under 18 years old workers may be involved for the construction phase as they are illegible to work in factories or other companies that adhere to laws,
- At the construction sites, some men may undervalue women's work. The gender disparities continue to exist, with some men holding the belief that women are not capable or willing to work.

Suggestions from the consulted people

- The construction companies should hire local workers to offer them jobs and strictly abide by laws and reduce the concerns about gender-based violence or sexual violence.
- Construction companies and relevant departments should provide training on gender issues, violence, labour laws, and social protections to their staff and workers.
- Local authorities should regularly monitor and inspect construction sites to ensure no children are working there, taking immediate action if any issues arise.

b. Community Health and Safety

Concerns

- The presence of workers could result in sexual abuse of women and children living near the project site,
- Drug trafficking and consuming among workers may cause unsafe environment for both workers and surrounded residents,

Suggestions from the consulted people

- The project should promote gender awareness, enforce stricter punishments for offenders, and prevent drug trafficking in the workplace,
- Separate accommodations for men and women should be provided,
- The construction companies must collaborate with local authorities in all activities to make a proper management, control and monitoring during construction, and
- The project should conduct gender education at the district to prevent and address gender-based violence.

c. Land acquisition, economic and physical displacement

Concerns

- Conflicts between the project and affected families could emerge, often fuelled by external instigators rather than the families themselves
- Farmers who own land may lose it for farming, which could force them to migrate, heightening their vulnerability to exploitation.

Suggestions from the consulted people

- The project should conduct a preliminary study on land issues before construction is going to be implemented, addressing specific aspects of land impact and conducting evaluations for each affected property,
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project.
- The construction company should submit quarterly monitoring reports on implementation activities to the provincial department to identify and quickly resolve any issues which affect the livelihood of the community people.

d. Cross–cutting risks and impacts

Concerns

- Unequal water distribution among farmers leads to partisanship and disputes, often because farmers do not adhere to water distribution instructions or announcements from authorities,
- The FWUC could not generate income, causing the management of the water being difficult such as having no budget for repair, resulting in improper operation of the system,
- Besides water issues, farmers also struggle with pests, diseases, inadequate labour, lack of capital, limited production technique, flooding, unstable sale price (vegetable and animal) and high agricultural input costs,
- Construction companies might disregard concerns raised by local authorities and communities regarding the actual conditions of the area.
- The construction of the system may cause water shortages downstream of the Stung Krang Ponley area.
- Agricultural production in the Stueng Krang Bat command area is not a potential sector where land is infertile and expensive, and a garment factory is preferable.
- The provincial department lacks budget to support water user conflict resolution,

Suggestions from the consulted people

- A proper handover to local authorities upon project completion should be conducted to avoid quiet handovers,
- Women should be engaged and be promoted as the members of Water User Community to promote water distribution equality regarding water allocation from the system,
- Closed monitoring and support to FWUCs are critical and should be conducted regularly by all levels,
- Water use and maintenance support should be provided including technical and management training, along with problem-solving techniques, to effectively control and manage water distribution,

- Ensure transparent water distribution to prevent disputes by holding meetings to plan water use and distribution, involving the district governor, commune council, and relevant stakeholders,
- Prior to starting irrigation rehabilitation, organize a public forum to gather feedback from residents, disseminate project information to people and stakeholders, and announce the construction period in advance.
- Build more water storages, and reservoirs such as ponds or wells and conduct training on water-saving techniques to adapt to actual water availability.
- Installing and upgrading the damaged sluice gates to improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.

10.3 INFORMATION DISCLOSURE

The ESCIA Report and ESCMPs are required to be disclosed to the public as per respective requirements of the AIIB, IFAD and GCF. Under CAISAR, the ESCIA Report and ESCMPs will be disclosed in full text in English, and in the form of executive summary in Khmer language. In addition, a Non-Technical Summary will be prepared for the ESCIA in Khmer and will be disclosed in both English and Khmer language. The Non-Technical Summary will present briefly the meaningful information on the Project. Language will be easy to understand. The NTS may include:

a) A summary of project descriptions (purpose, project components and activities.
b) Key project implementation approach (including use of mitigation hierarchy)
c) E&S baselines;
d) E&E methods and monitoring report;
e) Key E&S risks and impacts (both positive and adverse impacts);
f) Key mitigation measures and recommended actions;
g) A summary of the stakeholder engagement process and results.
h) A summary of key Environmental and Social (E&S) instruments and monitoring reports.

10.4 GRIEVANCE REDRESS MECHANISM (GRM)

The environmental and social policies of AIIB, IFAD, and GCF require the Lead Agency to establish a Grievance Redress Mechanism (GRM) for project-affected parties. The GRM should address concerns regarding environmental and social performance and must include:

- Multiple ways to submit grievances (in person, by phone, email, etc.).
- A system to log grievances and maintain them in a database.
- Clear, publicly available procedures for acknowledging, responding to, and resolving grievances.
- Transparency about the process, decision makers, and an appeals process, including judicial options if needed.

- Mediation may be offered if users are unsatisfied with the resolution.

Contracted workers can also use the GRM for workplace-related concerns, and they will be informed about it during recruitment with assurances of protection from reprisals.

The GRM will be set up by implementing agencies before project activities begin and will provide quick resolutions at the lowest necessary level. Complaints can be lodged verbally, in writing, or electronically, and the process includes detailed logging of complaint details, actions taken, contact points, and final resolution with the complainant's acknowledgment.

The project Stakeholder Engagement Plan has prepared the GRM which will be used as the basis for the project implementation. The following is the adopted mechanism to be applied under the project.

10.4.1 Objectives of the Project GRMs

The objective of the GRM is to provide affected persons with redress procedures that can be conveniently used to raise a project related concern or grievance. The GRM guides how a complaint can be lodged, including forms and channels through which a complaint can be submitted. To facilitate the grievance resolution process, grievances received will be acknowledged in writing and solved within a specified timeframe. During the resolution process, where necessary, dialogue will be held with aggrieved people for mutual understanding and effective resolution. Once a complaint is resolved, the aggrieved person will be notified of the resolution results.

The GRM has sequential steps that an aggrieved person can use. If the aggrieved person is not satisfied with the grievance resolution result, or if their complaint is not resolved within the timeframe specified for a particular step, the aggrieved person can move on to the next step which is higher in resolution hierarchy. The project has an appeal process where complainants can resort if they are not satisfied with a resolution decision at a particular step, or their complaints are not resolved within a specified timeframe.

10.4.2 Summary of National Legislation Related to Grievance and Complaint

The RGC has various laws and sub-decrees that have been in place to guide the implementation of the complaint resolution process. These documents specify the right of the complainants as well as the responsibilities of concerned governmental agencies as to complaint resolution. Relevant legal documents include:

- Law on Expropriation (dated 26 February 2010)
- Labor Law (dated 13 March 1997, amended on 20 July 2007 and 26 June 2018)
- Law on Prevention of Domestic Violence and Protection of Victims (dated 24 October 2005)

- Sub-decree No. 22 ANK/BK (2018) on Standard Operating Procedures for Land Acquisition and Involuntary Resettlement for Externally Financed Projects in Cambodia. Guidelines for Grievance Redress Mechanism (Appendix 8)
- Law on Administrative Management of Capital, Provinces, Municipalities, Districts and Khans (dated 22 May 2008) – Section 6 on Solution of Local Conflicts
- Sub-decree No. 22 (25 March 2002) on Decentralization of Roles, Functions, and Power to Commune Councils (Article 61: duty to promote the role of conciliating disputes between citizens)
- Sub decree No 47 ANK.BK (31 May 2002) on Organization and Functioning of the Cadastral Commission (Chapter 4 – District/Khan Level Conciliation).

10.4.3 Principles of the Project GRMs

Under CAISAR, the following principles will be applied:

- **Channels.** Different channels are established to enable affected persons to submit their grievances, including submission to village committee, as well as district and provincial levels.
- **Forms.** Grievances can be submitted in writing and verbally, and either directly by the affected households, or by a person delegated by the complainant.
- **Complainant can delegate a representative who acts on their behalf. A** person lodging a grievance can ask assistance from their family or from an individual to act as their representative.
- **Disclosure.** GRM procedures are disclosed in public domain (e.g., websites of PMU, public notice board at village hall, and in front of substation).
- **Documentation.** A grievance logbook will be maintained at substation (subproject level) and at PMU level (through PMU GRM focal point).
- **Transparency.** Grievance procedures include steps, time frame for grievance resolution for each step, notification to affected person, how decision is made.
- **Acknowledgement.** The unit in charge of complaint resolution will notify the complainant upon complaint receipt and will initiate the complaint resolution process.
- **Appeal.** If the agency in charge does not resolve a grievance in a manner that is satisfactory to the affected person, a multi stakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for the affected person going to court.
- **Monitoring.** All grievances received are recorded by PMU and relevant substations, and are processed/resolved in a given timeframe, and are monitored by PMU GRM focal point.
- **Time-limit.** Time-limit is specified for each step in the grievance resolution process.

- **Complainants bear no costs.** Complaint resolution is free of charge to aggrieved persons. However, if the complaints bring their case to court, they will bear the costs associated with their lawsuit.
- Any grievance concerning urgent health and safety issues shall be resolved immediately.

10.4.4 Project's Redress Procedures

The project has in place complaint handling procedures for three (3) types of potential grievances, including grievances related to 1) land acquisition, 2) labour and working conditions, and 3) sexual exploitation and abuse and sexual harassment (SEA/SH/GBV/GBV), and 3) general complaints. These procedures are established based on the above GRM principles and are in accordance with pertinent national legislation. The GRM for complaints related to land acquisition is provided in the project's Resettlement and Policy Framework (RPF) and that for IPs is provided in the project's IPPF. Summary for the above four (4) procedures is provided below:

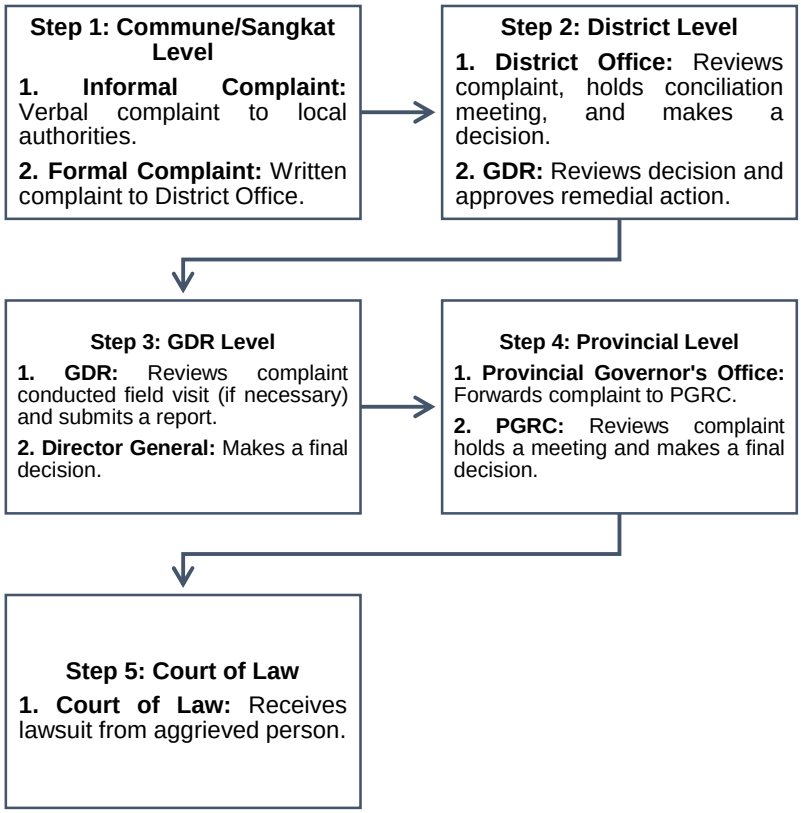
10.4.4.1 Redress Procedure for Complaints related to Land Acquisition

Under this project, to facilitate the grievance redress, the informal and formal steps are combined for convenient use of affected people, as follows:

- Step 1 – Commune/Sangkat level. APs will seek assistance from commune/Sangkat chief or community elders who will discuss with the leader of the PRSC-WG to find a solution. Verbal grievances can be provided to the commune/Sangkat chief or community elders. So, no written complaint is required. It is noted that even if the complaint is made verbally, the complaint will be registered in the project's logbook, including resolution process and result for such verbal grievance for monitoring purposes. Upon receipt of the verbal complaint, the PRSC-WG will consult with the IRC-WG to ensure the complaint is addressed timely. If the grievance is not resolved to the satisfaction of the AP, or if the AP prefers, s/he may lodge their complaint through the formal route which includes the steps below.
- Step 2 – District level. AH can lodge a written complaint to the Head of the District Office (where the subproject is located). The AH can bring a community elderly or their representative to discuss their grievance at the District Office. A conciliation meeting shall be held, and a decision be made within 15 working days from the date of complaint is received by the District Office. If the complaint is resolved to the satisfaction of the AH, the IRC-WG will inform GDR's Department of Internal Monitoring and Data Management (DIMDM) who will review and seek the approval of the Director General of GDR for appropriate remedial action. GDR will inform the AF of the decision/ remedial action within 15 working days from the receipt of the grievance by the District Office. If the complaint is rejected at this step, the District Office will inform the AH of the rejection in writing. If the complainant is not satisfied with the decision/resolution result, s/he can proceed to step 3 (below).
- Step 3 – GDR level. The complainant who is not satisfied with the proposed resolution from Step 2 shall lodge a written complaint to the GDR for resolution. The

GDR, through its DIMDM, will carry out a holistic review of the complaint and submit a report on its findings with the relevant recommendations, if any, to the Director General of GDR for review and decision. GDR may conduct a field visit to meet the complaint and the IRC-WG to gather relevant information. The final report must be completed within 30 working days from the date of receipt of the complaint by GDR for submission to the Director General of GDR who will make a final decision within 5 working days of receipt of the final report. In the event that the subject matter requires a policy level intervention, it will be referred to the IRC for a decision which may require that an additional 10 working days be extended from the original deadline for final decision.

Figure 10.1: Redress Procedure for Complaints related to Land Acquisition



GDR = General Department of Resettlement, PGRC = Provincial Grievance Redress Committee.

- Step 4 – Provincial level. AH will submit a written complaint to the PGRC through the Provincial Governor's Office. The complainant or a representative will be given an opportunity to present its case during a meeting and the PGRC may consider any compelling and special circumstances of the AH to inform their decision. The GDR will send a representative, as a non-voting member, to provide an explanation to the rejection of the complaint at Step 3 with the GDR. The decision of the PGRC must be made on a consensus basis and will be final and binding except when the matter relates to the government's policy. Decisions related to government's policy matters on land acquisition and resettlement are decided by the IRC. The PGRC will have 40 working days from the date of receipt of the complaint to reach a final decision. The decision of the PGRC will be sent to the IRC (through the GDR) for endorsement before

any remedial action is taken. There are no fees or charges levied on the AH for their lodgement of complaint and for complaint resolution for the above 4 steps.

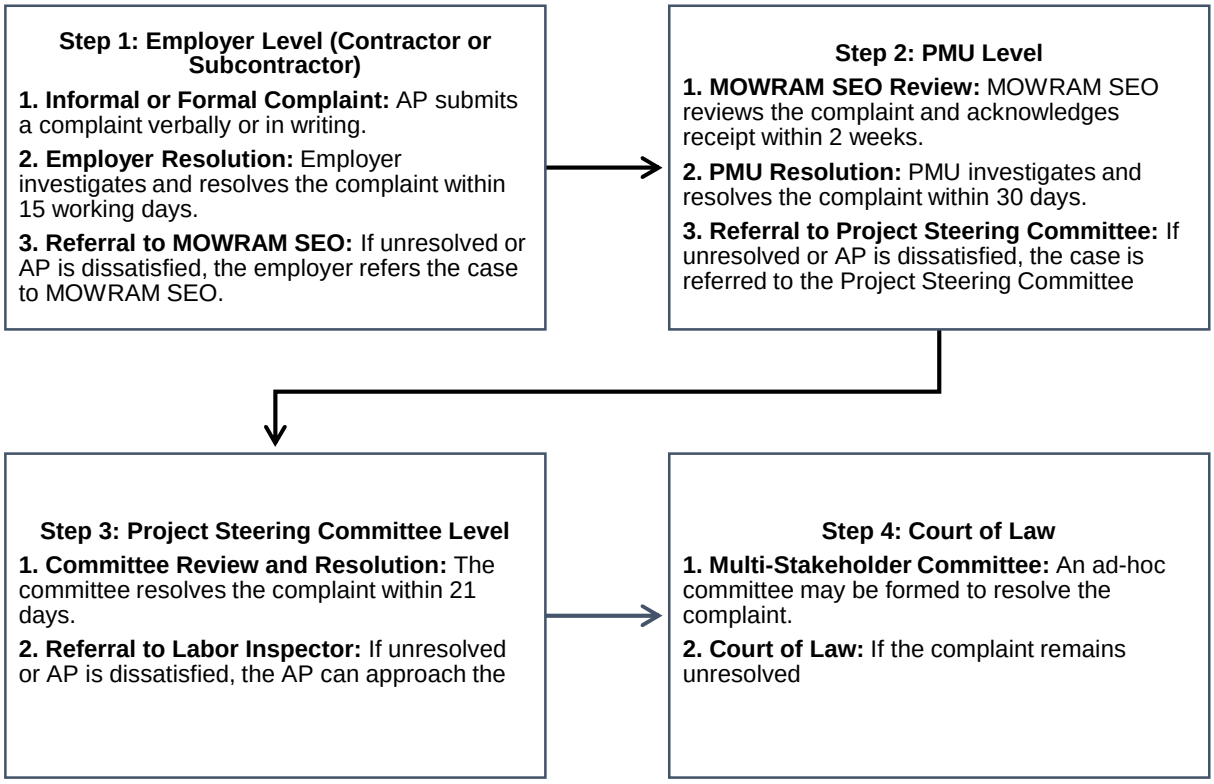
- Step 5 – Court of Law. If the aggrieved person prefers filing a lawsuit at the Provincial/Municipal Courts, as applicable, to seek a resolution, AP can do so but will bear cost related to the lawsuit as per the Expropriation Law. When the case is brought to a Court of Law, there is no involvement of the GDR, PRSC or IRC-WG unless there is a judicial order from the competent courts.

10.4.4.2 Redress Procedure for Complaints Related to Labor and Working Conditions

Project workers can lodge their grievance/complaint as follows:

- **Step 1 – Employer Level (Contractor and Subcontractor).** Aggrieved person (AP) can submit their grievance to their Employer who serves as the first focal point for receiving and resolving grievances. Grievance can be lodged verbally or in writing, in person or by phone, text message, mail or email (anonymous complaint is accepted). The Employer involved will resolve the case no later than 15 working days. Once resolved and the AP is satisfactory, the Employer will report the case, including resolution process and results, to the SEO of the MOWRAM for information and record. If the AP is not satisfied with the resolution of their Employer, the Employer will refer the AP to the SEO of MOWRAM, if needed and inform the AP of this referral. It is noted that if a complaint concerns the safety and health of one (1) or several individuals, such a complaint shall be resolved as soon as possible – depending on the nature and urgency of the grievance.
- **Step 2 – PMU level.** MOWRAM SEO will resolve the complaint referred to by the Employer (Step 1) and acknowledge receipt of the AP's complaints within two (2) weeks from the date of complaint receipt. If the SEO of MOWRAM cannot resolve the complaint, the SEO Team will consult with the Project Manager/Director for resolution. The SEO of the MOWRAM will inform the AP (in writing) of the PMU's resolution result within 30 days from the date of complaint receipt. If the AP is not satisfied with the resolution result proposed by PMU, PMU will refer the case to the Project Steering Committee of the project and shall inform the AP (in writing) of this referral.
- **Step 3 – Project Steering Committee level.** At this level, the case will be resolved no later than 21 days. The AP will be informed of the resolution decision in writing. In case the grievance has not been solved within the specified timeframe, or the AP does not agree with the proposed resolution, the AP can approach the Labor Inspector of his/her province or municipality.
- **Step 4 – Court of Law.** If the AP is not satisfied with the resolution proposed above, a multi stakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for the affected person going to court. If the grievance could not be resolved satisfactorily by the multistakeholder committee, the affected person may resort to the court of law. The cost associated with the lawsuit shall be borne by the AP. The decision of the Court will be final.

Figure 10.2: Redress Procedure for Complaints Related to Labor and Working Conditions



AP = Action Plan, MOWRAM = Ministry of Water Resources and Meteorology, SEO = Social and Environmental Officer, PMU = Project Management Unit.

10.4.4.3 Redress Procedure for Complaints Related to SEA/SH/GBV

Under the project, the GRM for SEA/SH/GBV mainly serves to: (i) refer complainants to a local GBV service provider; and (ii) record resolution of the complaint. In line with the above, the following principles apply to recognize SEA/SH/GBV victim as principal decision makers in their own care, and treat them with agency, dignity and respect for their needs and wishes:

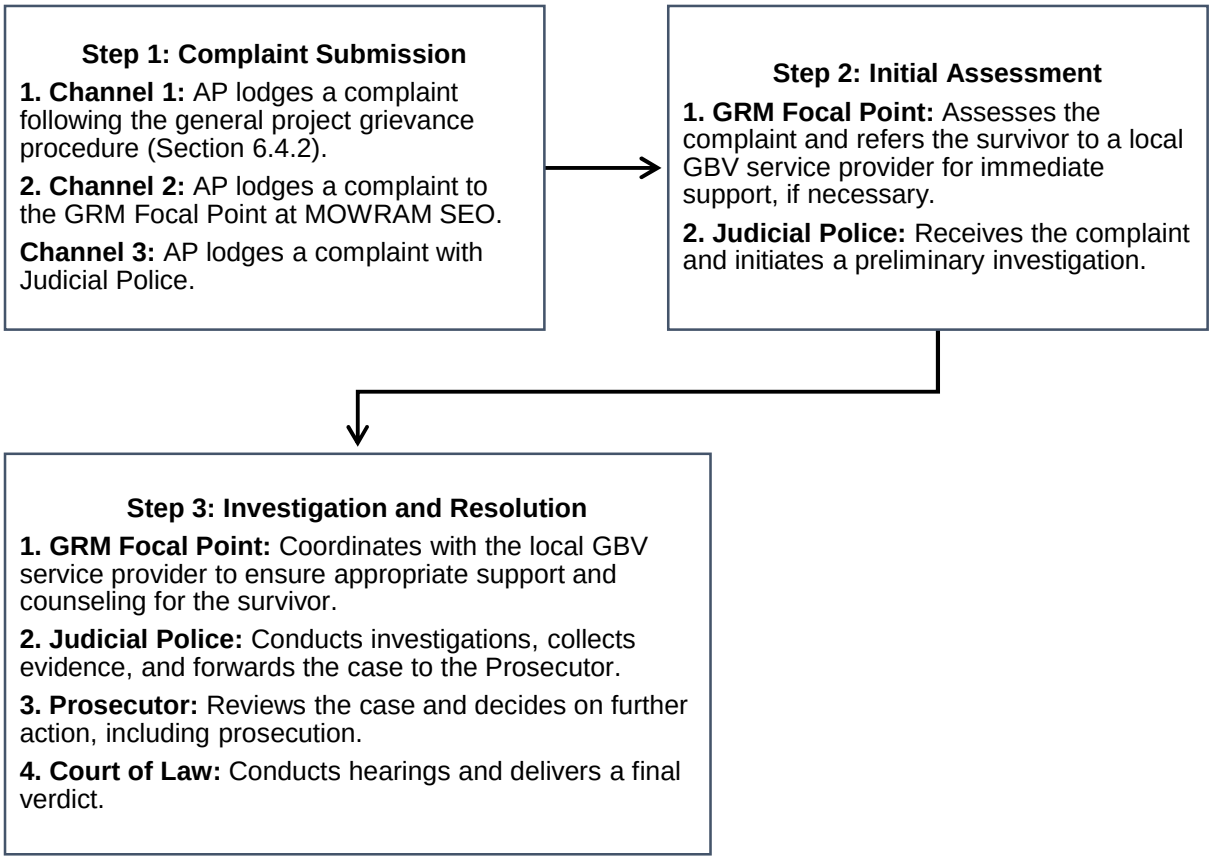
- **Multiple channels** are in place for easy access and lodge complaints.
- **SEA/SH/GBV survivors will be referred to a local GBV service provider** for immediate support if they make a complaint directly to PMU.
- **Confidentiality of survivors is protected.** GM operators (at PMU and local GBV service providers) will keep confidential for SEA/SH/GBV allegation report.
- **No identifiable information on the survivor shall be collected and stored** in Project Grievance Logbook.
- **Costs of operating the SEA/SH/GBV GRM will be covered by the project.**

It is noted that under this project, GBV service provider will be engaged for subprojects that are rated “High” or “Substantial” for SEA/SH/GBV risks − as part of site-specific ESMP. based on SEA/SH/GBV risk assessment The following channels can be used to submit a grievance related to SEA/SH/GBV:

- **Channel 1 –** AP who believe the SEA/SH/GBV incidence is related to project workers can follow steps outlined in Section 6.4.2 (above) to lodge a SEA/SH/GBV complaint.

- **Channel 2** – Alternatively, AP can lodge their complaint, verbally or in writing, to the GRM's Focal Point within the SEO of MOWRAM for advice and resolution (contact of GRM Focal Point is provided in Section 5.1 (Resources).
- **Channel 3** – If AP wants to bring the case to the Court of Law, AP can follow steps below for prosecution. Prosecution related to SEA/SH/GBV is administered under the Criminal Code and the Code of Criminal Procedure and is as follows:

Figure 10.3: Redress Procedure for Complaints Related to SEA/SH/GBV



AP = Action Plan, GRM = Grievance Redress Mechanism, MOWRAM = Ministry of Water Resources and Meteorology, SEO = Social and Environmental Officer, GBV = Gender-Based Violence.

- **Step 1 – Judicial Police.** SEA/SH/GBV victim or a representative can submit their grievance to a local Judicial Police (JP) Officer. JPs include a) Commune/ Sangkat Chief, b) Commune/ Sangkat/ District/ Provincial/ National Police, and c) District/ Provincial/ National Military Police. The JP is responsible for receiving, recording complaints, and may conduct preliminary investigations to identify and arrest the perpetrator. The JP will also collect evidence to support the prosecutors. If the SEA/SH/GBV happens at home and/or falls under the domain of domestic violence (as per Law on the Prevention of Domestic Violence and Protection of Victims), the SEA/SH/GBV survivor may seek support from a local qualified Judiciary Police Officer (appointed by the Ministry of Women's Affairs) who can act as a complaining party on behalf of the SEA/SH/GBV survivor15.

- **Step 2 – Prosecutor.** Upon receiving the completed written record from the JP, the prosecutor can decide on if the prosecutor will hold a file without processing it further or conduct proceedings against the perpetrator. The prosecutor may bring the case to the Court of Law and present the evidence in Court hearings.
- **Step 3 – Investigation by Judge.** During this step, the investigating Judge will conduct interrogation of the charged person and perform other required investigation procedures.
- **Step 4 – Hearing.** After issuing an order of indictment, the investigating Judge will submit the case to the trial court president who shall arrange a date for the trial. The decision of the Court on the SEA/SH/GBV resolution is final.

10.4.4.4 Redress Procedure for General Complaints

In case individuals, households, or communities are affected by any other aspects, for instance, environmental impacts such as increased dust, noise, or lack of safety measures that increase risks of traffic accidents to road users or to local EM, various channels will be established for convenient use by affected parties, including IPs. These include:

- **PMU GRM focal point's telephone (**See Section on Resources) to Local EM leaders (in case affected individual/households are EM)
- **Contractor's hotline:** to report cases that they think contractors can solve timely (contact detail of Contractors will be posted at construction sites, and distributed to IPs (through Subproject Information Booklet) during consultation, and post at public billboard of Commune/Sangkat offices, pagodas, etc.
- Commune/Sangkat offices

10.4.5 Registration of Project Grievance

The SEO, Project 6. Managers within MOWRAM are responsible for establishing and maintaining the project grievance logbook (PGL). The PGL will be established by the SEO to record all concerns/ grievances that are submitted by project stakeholders during project implementation. In case there is a serious complaint, the World Bank should be notified of these complaints within 24 hours of complaint receipt.

The GRM is an integral project management element that intends to seek feedback from beneficiaries and resolve of complaints on project activities and performance. The GRMs for the project are based on AIIB IFAD, UN, and GCF requirements and, most importantly, national requirements for solving potential problems between project owners and residents/persons affected by the subproject(s).

CHAPTER 11 – COSTS AND BUDGET

11.1 INTRODUCTION

The chapter on Cost and Budget of the Environmental and Social Impact Assessment (ESCIA) provides a detailed breakdown of the financial requirements associated with mitigating the environmental and social impacts of the project. It outlines the projected costs for implementing mitigation measures, monitoring activities, capacity-building initiatives, and community engagement programs. The chapter also emphasizes the importance of financial planning in ensuring that resources are efficiently allocated to minimize negative impacts on the environment and affected communities while maximizing the project's long-term benefits. By presenting a clear and transparent budget, this chapter aims to guide stakeholders in understanding the financial commitments necessary to uphold environmental and social safeguards throughout the project lifecycle.

11.2 ESTIMATED COSTS FOR ESCMP IMPLEMENTATION

The costs of implementing the ESCMP listed below are related to PMU costs in addition to the dedicated safeguards PMU personnel budget line item. The main costs of implementing this ESCMP are the additional cost which have not been budgeted within the project. For example, the project component 1 focus on establishment, capacity building and strengthening the FWUCs, therefore the concern regarding water management and water distribution inequality have already covered. Moreover, the sustainable agricultural practices and agricultural value chain is the project actions. In this regard, the concern regarding GHG emission from the farming activities have been already addressed. The proposed budget therefore is the additional cost which are added to the existing (please see in table 11.1).

Table 11.1: Estimated Additional Costs for Environmental Social and Climate Change Monitoring Plan (ESCMP) Implementation

No.	Items	Unit	Instruments	Qty	Cost	Total	Sources
1	Preparation of Resettlement Plans for relevant sub-scheme(s)		Abbreviated Resettlement Plan	2	100,000	**200,000**	GDR
2	Resettlement Cost	Lumpsum	Abbreviated Resettlement Plan	1	289,064	**289,064**	GDR
3	ESCMP Implementation		ESCMP			**2,505,000**	MOWRAM
a	UXO clearance		ESCMP	1	250,000	250,000	
b	Preparation of the National EIA for each sub-scheme	Sub-scheme	EIA	6	100,000	600,000	
c	Consultation outreach	Sub-scheme		6	10,000	60,000	

No.	Items	Unit	Instruments	Qty	Cost	Total	Sources
d	Awareness raising (E&S risks and impacts) (5 times for OTP, the rest 2 times each)			15	3,000	45,000	
e	Implementing Biodiversity Plan		ESCMP			**1,550,000**	
	• Supporting protected areas in Ou Ta Paong	Year		5	200,000	1,000,000	
	• Supporting Lum Hach	Lum-sump		5	80,000	400,000	
	• Supporting biodiversity actions in Stung Krang Ponley (5 years)	Lum-sump		5	30,000	150,000	
4	E&S Monitoring Program	Lum sump				**330,000**	MOWRAM
	• Soil quality monitoring (every six (6) months* 10 locations (3 in OTP, 3 in Lum Hach, 4 in Stung Krang Ponley) * 3 years)			60	1,500	90,000	
	• Air quality, noise and vibration quality monitoring (every six (6) months* 10 locations (3 in OTP, 3 in Lum Hach, 4 in Stung Krang Ponley) * 3 years)			60	2,000	120,000	
	• Water Quality monitoring (every six (6) months* 10 locations (3 in OTP, 3 in Lum Hach, 4 in Stung Krang Ponley) * 3 years)			60	2,000	120,000	
	Total					**3,324,064**	

Qty = Quantity, GDR = General Department of Resettlement, ESCMP = Environmental, Social, and Climate Management Plans, MOWRAM = Ministry of Water Resources and Meteorology, UXO = Unexploded Ordnance, E&S = Environmental and Social, OTP = OU Ta Paong.

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 14. d. ESCMP

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CLIMATE ADAPTIVE IRRIGATION AND SUSTAINABLE AGRICULTURE FOR RESILIENCE (CAISAR) AIIB PPSF GRANT S0452A, CODE 00-452-PPSF-DTA

ENVIRONMENTAL, SOCIAL, AND CLIMATE MANAGEMENT PLAN FOR KRAPEU TRUOM SUB-SCHEME

FINAL

Submitted To:

Project Management Unit
Ministry of Water Resources and Meteorology,
AIIB and IFAD

Submitted By:

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24TH FEBRUARY 2025

EXECUTIVE SUMMARY

This document is an Environmental, Social, and Climate Management Plan (ESCMP) for the Krapeu Troum Sub-scheme, a part of the Stung Krang Ponley subproject within the larger Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project in Cambodia. This sub-scheme, covering 690 hectares, is designed to provide a reliable irrigation system to support agricultural activities. The Krapeu Troum ESCMP specifically addresses investments under Component 1, focusing on farm-level climate adaptation, resilience, and water use efficiency, and Component 2, aimed at rehabilitating and modernizing irrigation systems for increased agricultural production.

The ESCMP is vital for ensuring the project's sustainability by addressing potential environmental and social risks and impacts associated with infrastructure development and intensified agricultural practices. It focuses on the responsible management of water resources, crucial for both agriculture and local livelihoods. The plan promotes efficient irrigation to optimize water use, minimize water shortages, and prevent potential conflicts between upstream and downstream users. By incorporating social considerations, the ESCMP ensures that communities are actively involved in the project's planning and implementation, addressing concerns through consultations and providing fair compensation when necessary. This inclusive approach minimizes social disruptions and fosters community support. The ESCMP also ensures compliance with national and international environmental and social standards, crucial for securing funding and aligning with sustainable development best practices. By adhering to these standards, the project mitigates both environmental and social risks while promoting long-term sustainability, ensuring that the natural environment and local communities benefit from the project's outcomes.

The Krapeu Troum sub-scheme is located in Veal Pung commune, Oudong district, Kampong Speu province, and borders Thbeng Khpos and Svay communes in the Sameakki Meanchey district of Kampong Chhnang province, impacting a total of 13 villages. The sub-scheme draws water primarily from Anlong Chrey reservoir, with Kdol Dam as a secondary source. The current irrigation system faces challenges including inadequate reservoir capacity, damaged infrastructure, and inconsistent water availability. The area has experienced frequent droughts and floods, impacting agricultural productivity.

The proposed project involves rehabilitating existing irrigation canals, constructing new tertiary canals, and implementing a pilot solar-powered pumping system. Key activities under Component 1 include introducing climate-resilient agricultural practices, strengthening mechanization service providers, and promoting market-led agricultural investments. Component 2 focuses on modernizing the irrigation system with improved water regulation structures, enhanced drainage, and training for Farmer Water User Communities (FWUCs). These improvements aim to optimize water use, increase cropping intensity, and enhance resilience to climate change impacts.

The project's implementation is planned to start with a detailed design in January 2025. Procurement will follow, and construction is expected to begin after the rainy season in 2026, aiming for completion by mid-2030.

The ESCMP identifies and assesses potential environmental and social risks during various project stages. Mitigation measures are proposed to address these risks effectively.

Before and during construction:

- Unexploded Ordnance (UXO): Requires a clearance plan using certified experts before any construction.
- Air and Noise Pollution: Dust suppression, reduced machinery hours, and regular maintenance are crucial.
- Water Pollution: Construction diversion control, proper waste disposal, and water quality monitoring are essential.
- Soil Pollution: Preventing oil and chemical spills, covering restored areas with topsoil, and re-vegetation are necessary.
- Solid and Hazardous Waste: Waste management plans, including designated dump sites and proper handling procedures for hazardous waste, are needed.
- Wastewater: Proper treatment and disposal of wastewater from construction sites and worker camps are essential.
- Biodiversity Impacts: Avoiding critical habitats, minimizing vegetation clearing, and implementing a Biodiversity Action Plan are crucial.
- GHG Emissions: Using low-carbon materials and techniques, reducing waste burning, and offsetting emissions are recommended.
- Labor influx and Potential for SEA/SH: Labor management plans, worker codes of conduct, awareness campaigns, and grievance mechanisms are crucial to mitigate social risks associated with labor influx.
- Community health and safety: Safety training, traffic management plans, and health education campaigns are needed to minimize risks to community health and safety.
- Elite Capture: Transparent and inclusive consultation processes are necessary to prevent elite capture of resources, ensuring that benefits reach vulnerable groups.
- Annual or perennial crop: Promoting and monitoring water use and energy efficiency, and promote proper soil management.

During operation:

- Water Pollution: Sustainable agricultural practices, including Integrated Pest Management (IPM), are vital to minimize agricultural runoff.
- Biodiversity Impacts: Continuous monitoring and management are needed to address potential habitat loss and fragmentation.
- GHG Emissions: Promoting energy-efficient irrigation, reducing fossil fuel reliance, and adopting climate-smart agriculture are crucial.

- Social Inequality and Water Use Conflicts: Participatory planning, equitable water allocation plans, and continued community engagement are essential to prevent social inequalities and manage potential water use conflicts.
- Community Health and Safety: Promoting sustainable agricultural practices, such as IPM, and safe pesticide use will help protect community health.

The ESCMP emphasizes a comprehensive stakeholder engagement plan, with consultations conducted at national, provincial, district, commune, and village levels. This plan ensures that communities and stakeholders are informed about the project and have opportunities to share their concerns and suggestions. The consultation process included community meetings, focus group discussions, and key informant interviews. The ESCMP will be publicly disclosed in English and Khmer, available on the websites of the Ministry of Water Resources and Meteorology (MOWRAM) as the Project Implementing Unit, as well as on the websites of AIIB, IFAD, and GCF before project appraisal and approval.

A robust grievance redress mechanism (GRM) is in place to address complaints from affected people. It outlines a structured process for resolving issues related to land acquisition, labor, SEA/SH, and other project-related concerns. Different channels are available for submitting grievances, including verbal and written complaints. The GRM ensures that all grievances are documented, acknowledged, and resolved within specific timeframes. An appeal process is available if complainants are dissatisfied with the initial resolution.

The ESCMP outlines the roles and responsibilities of various stakeholders, including government agencies, contractors, and consultants, in implementing and monitoring its provisions. This includes responsibilities related to environmental and social safeguards, labor management, community engagement, and grievance redress. Contractors are required to prepare their own environmental and social management plans (C-ESMPs) outlining how they will mitigate risks and impacts. The monitoring program includes regular assessment of soil, air, and water quality, biodiversity, and social impacts, ensuring compliance with the ESCMP and identifying any necessary corrective actions.

The estimated cost for implementing the ESCMP is USD 237,000, covering expenses such as UXO clearance, preparing national EIA report, biodiversity management, community engagement, and monitoring activities. The Executive Summary of the ESCMP will be publicly disclosed in both English and Khmer, ensuring transparency and accountability throughout the project's lifecycle.

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii

TABLE OF CONTENTS v

LIST OF TABLES viii

LIST OF FIGURES ix

1. INTRODUCTION 1

1.1 Rationale 1

1.2 Objectives of the ESCMP 1

2. PROJECT DESCIPTION 2

2.1 Geographical Area of the Sub–scheme 2

2.2 Characteristics of the Existing Sub–scheme ..... **Error! Bookmark not defined.**

2.2.1 Water Availability 7

2.2.2 Irrigation Management 8

2.2.3 Natural challenges 8

2.3 PROPOSED INFRASTRUCTURE 9

2.3.1 Tentative Schedule for Sub–scheme Implementation 9

2.3.2 Preferred Technical Design Option 9

2.4 Analysis of Alternatives 21

2.4.1 "Without" Project Alternative 21

2.4.2 "With" Project Alternatives ..... **Error! Bookmark not defined.**

2.5 Proposed Investment under Krapeu Truom Sub–scheme ..... **Error! Bookmark not defined.**

2.5.1 Key activities by Project Component ..... **Error! Bookmark not defined.**

2.6 Project Area of Influence ..... **Error! Bookmark not defined.**

2.6.1 Definitions ..... **Error! Bookmark not defined.**

2.6.2 Areas of Influence of Krapeu Truom Sub–scheme ..... **Error! Bookmark not defined.**

3. LEGAL AND INSTITUTIONAL FRAMEWORK 29

3.1 Royal Government of Cambodia's Legal Framework 29

3.1.1 National legal framework 30

3.1.1.1 The Constitution of the Kingdom of Cambodia (1993) 30

3.1.1.3 Legal Framework related to Labour, Public Well-Being, and Safety 33

3.1.1.4 Legal Framework related to Governance and Social Inclusion 34

3.1.2 International Conventions and Treaties. Error! Bookmark not defined.
3.2 AIIB'S Environmental and Social Framework (ESF) 38
3.3 IFADs' SECAP 38
3.4 GEF'S Environmental and Social Policies 39
3.5 Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF 42
4. BASELINE CONDITIONS 47
4.1 Physical Conditions ..... Error! Bookmark not defined.
4.1.1 Existing Infrastructure 50
4.2 Environmental Conditions ..... Error! Bookmark not defined.
4.2.1 Air Quality and Noise ..... Error! Bookmark not defined.
4.2.2 Soil Quality ..... Error! Bookmark not defined.
4.2.3 Surface Water Quality 64
4.2.4 Groundwater Quality 66
4.3 Biological Resources 68
4.3.1 Existing Species ..... Error! Bookmark not defined.
4.3.2 The EN and CR Species ..... Error! Bookmark not defined.
4.4 Socio-Economic and Cultural Conditions 70
4.4.1 Demographic and Facilities 70
4.4.2 Socio–economic Conditions of the Beneficiaries 74
4.4.3 Gender 75
4.4.3.1 Labor Division 77
4.4.3.2 Income 79
4.4.3.3 Decision Making 79
4.4.4 Agricultural Production ..... Error! Bookmark not defined.
4.4.4.1 Rice Production ..... Error! Bookmark not defined.
4.4.4.2 Vegetable Production ..... Error! Bookmark not defined.
4.4.4.3 Animal Production ..... Error! Bookmark not defined.
5. ENVIRONMENTAL & SOCIAL RISKS, IMPACTS, AND MITIGATION 80
6. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE 126
6.1 Purpose and Process of Stakeholder Engagement 126
6.2 Consultation Process 127
6.3 Results of Consultation 127

6.3.1 Environment and Biodiversity Component 127
6.3.1.1 Pollution prevention and resource efficiency 127
6.3.1.2 Biodiversity 127
6.3.1.3 GHG emission 128
6.3.2 Social Component 128
6.3.2.1 Labor and Working Conditions 128
6.3.2.2 Community Health and Safety 128
6.3.2.3 Land acquisition, economic and physical displacement 128
6.3.2.4 Cross–cutting risks and impacts 129
6.3.2.5 Agricultural Production 129
6.4 Stakeholder Engagement during Sub–Scheme Implementation 130
6.5 Information disclosure 130
7. GRIEVANCE REDRESS PROCEDURES 130
7.1 Objectives of the Project GRMs 130
7.2 Summary of National Legislation Related to Grievance and Complaint 130
7.3 Principles of the Project GRMs 131
7.4 Project's Redress Procedures 132
7.4.1 Redress Procedure for Complaints related to Land Acquisition 132
7.4.2 Redress Procedure for Complaints Related to Labor and Working Conditions 134
7.4.3 Redress Procedure for Complaints Related to SEA/SH/GBV 135
7.4.4 Redress Procedure for General Complaints 137
7.5 Registration of Project Grievance 137
8. IMPLEMENTATION ARRANGEMENTS 137
8.1 Environmental and Social Duties of the PMU/Detail Design Consultants 137
8.1.1 MOWRAM'S PMU 137
8.1.2 NCDD'S PMU 138
8.1.3 Provincial Department of Water Resources and Meteorology 138
8.1.4 Provincial Department of Agriculture, Forestry and Fisheries 138
8.2 Contractor's Environmental and Social Management Plan (C-ESMP) 139
8.3 Contractor's Safety, Social and Environmental Officer (SSEO) 140
8.4 Contractor's obligation as to contractual requirements 141

9. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM 141
9.1 Environmental Monitoring Program 141
10. ESTIMATED COSTS 156
10.1 Estimated Costs for ESCMP Implementation 156
10.2 Estimated Costs for ESMCP Monitoring Program 156
Annex 157
Annex 1 – Screening checklist for E&S impacts for each sub-scheme 157
Annex 2: Layout of Krapeu Trom sub-scheme 167
Annex 3 – Grievance Monitoring Logbook 173
Annex 4 – Worker's Code of Conducts 181
Annex 5 – Simplified Pest Management Plan 186

LIST OF TABLES

Table 1: Administrative and population coverage of Krapeu Truom sub-scheme 5
Table 2: Water sources for the Krapeu Truom sub-schemes 7
Table 3: Frequency and seriousness of natural disasters in Krapeu Truom sub-scheme 9
Table 4: Tentative implementation schedule of Krapeu Truom sub-scheme. 9
Table 5: Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF 43
Table 7: Soil analysis results in an agricultural context 62
Table 8. Result of surface water quality 64
Table 9. Groundwater sampling locations 66
Table 10. Result of groundwater quality 66
Table 11: Screening list of Endangered and Critically Endangered Species in Krapeu Truom ..... **Error! Bookmark not defined.**
Table 12. Demographic information of the HH living within and the vicinity of the command areas 73
Table 13. Access to energy and water and sanitation facilities 73
Table 14. Occupation of the HHs living within and the vicinity of the command areas 74
Table 15. Migration and vulnerability of the people within the sub-schemes 74
Table 16. Houses and Assets of the HHs within the Sub-Schemes 75
Table 17. Rice production during wet and dry season ..... **Error! Bookmark not defined.**

Table 18. Vegetable production during wet and dry season..... **Error! Bookmark not defined.**

Table 19: Environmental Risks, Impacts, and proposed Mitigation Measures... **Error! Bookmark not defined.**

Table 20: Social Risks, Impacts, and proposed Mitigation Measures..... **Error! Bookmark not defined.**

Table 21: Environmental monitoring plan during construction phase 142

Table 22: Social monitoring plan during construction and operational phase.....149

Table 23: Estimated cost for ESCMP implementation.....156

Table 24: Estimated cost for ESCMP monitoring program 156

LIST OF FIGURES

Figure 1: Administrative map of Krapeu Truom sub-command area 6
Figure 2: Length from Sub-Scheme to Another of Krang Ponley . **Error! Bookmark not defined.**
Figure 3: Concept design of Krapeu Truom irrigation scheme. 10
Figure 4: Length from Sub-Scheme to another of Krang Ponley 62
Figure 10: Location of soil sample selection.....63
Figure 11: Location of surface water sample selection 64
Figure 12. Map of groundwater sampling location in Krapeu Truom sub-scheme.....67
Figure 13. Division of Roles in Household Chores (n=67) 78
Figure 14. Share of Roles in Crop Cultivation (n=67) 78
Figure 15. Share of roles in Animal Husbandry (n=67) 79
Figure 16. Type of animal in Krapeu Truom command area ..... **Error! Bookmark not defined.**

1. INTRODUCTION

1.1 Rationale

Krapeu Truom is one of the four sub-schemes located within the larger Stung Krang Ponley subproject, covering a relatively small area of 690 hectares. The sub-scheme is designed as an irrigation system aimed at supporting agricultural activities by providing a reliable source of water for crop production. It plays a crucial role in boosting agricultural productivity in the region by ensuring that farmers have consistent access to water, especially during dry seasons. This system is an essential component of local water management, contributing to improved crop yields and enhancing the livelihoods of the farming communities dependent on it.

The primary function of the Krapeu Truom sub-scheme is to regulate and distribute surface water from nearby rivers or reservoirs to irrigate agricultural lands. The system is structured to maximize water efficiency by delivering water directly to the fields, minimizing wastage, and conserving valuable water resources. This approach is particularly important in regions prone to water shortages, ensuring that crops receive the necessary water to thrive, which ultimately contributes to food security and agricultural sustainability.

Social impacts are also a critical consideration in the preparation of the ESCMP. The irrigation system is vital to the livelihoods of local communities, particularly those engaged in farming and fishing. Infrastructure development without proper social safeguards could disrupt these livelihoods, leading to economic challenges and potential social conflict. The ESCMP ensures that communities are actively engaged in the project's planning and implementation, addressing their concerns through consultations and fair compensation where necessary. This inclusive approach minimizes social disruption and fosters stronger community support for the project.

Additionally, the ESCMP is crucial for ensuring that the CAISAR Project meets both national and international environmental and social standards. Compliance with these standards is necessary for securing funding and aligning with global best practices in sustainable development. By preparing a comprehensive ESCMP, the project mitigates both environmental and social risks while promoting long-term sustainability, ensuring that both the natural environment and local communities benefit from the project’s outcomes.

1.2 Objectives of the ESCMP

The objectives of the ESCMP for Krapeu Truom sub-scheme are:

- Identify and assess environmental and social (E&S) risks and impacts that are potentially associated with investment activities proposed under Component 1 and Component 2.
- Ensure the identification and assessment of E&S risks and impacts are in accordance with the requirements of the laws and regulation of the Royal Government of Cambodia, AIIB’s Environmental and Social Framework, IFAD’s Social, Environmental and Climate Assessment Procedures (SECAP), and GEF’s Safeguard Policies.

- Apply a mitigation hierarchy to: (a) anticipate and avoid risks and impacts; (b) where avoidance is not feasible, minimize or reduce risks and impacts to acceptable levels; (c) once risks and impacts have been minimized or reduced, mitigate them; and (d) where residual risks or impacts remain, compensate for or offset them, where technically and financially feasible.
- As part of the risk and impact identification and assessment, engage a) people potentially affected by project activities (including both project beneficiaries and those potentially affected adversely, and parties interested in project implementation and operations.
- Conduct consultation, particularly with affected people who are disadvantaged/ vulnerable.
- Propose measures to avoid/ minimize/ mitigate E&S risks and impacts and compensate for adverse impacts where residual risks or impacts remain, compensate for impacts that remain, or offset residual risks, where technically and financially feasible.

Coverage of the ESCMP Krapeu Truom

This site–specific ESCMP cover project activities proposed under Component 1 and Component 2 (See brief description of investment activities in Section 2.3 below).

2. PROJECT DESCIPTION

2.1 Background

The project has three Components (summarized below). However, the ESCMP Yutasas will covers investment activities proposed under only Component 1 and Component 2.

Component 1. *Improving farm-level climate adaptation, resilience, and water use efficiency*

The objective of this component is to build climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. This component is designed to address the lack of knowledge and skills to deploy technologies and practices at farm level by farmers and the lack of appropriate extension services to propagate them. It will introduce farmers with various climate resilient technologies and practices for both rice and non-rice activities such as vegetable production, poultry and aquaculture.

Sub-component 1.1 Deployment of farm-level climate adaptation and water use efficiency measures

Output 1.1: Increased capacity of farmers to deploy climate resilient (CR) practices at farm level

This output will focus on developing farmers' capacity in deploying CR technologies and practices to transform the agricultural production system to adapt to the changing climate context. Farmer's will be trained to first develop Action Plans (AP) to re-orient farmer behavior

and assist them in transforming the agriculture production system in a manner that is better adapted to factoring in the agro-ecological context and expected climate change impacts.

- Activity 1.1.1 Preparation of community-based action plans (AP) to transform agriculture with CR practices.
- Activity 1.1.2 Preparation of training materials to support implementation of the AP.
- Activity 1.1.3 Conduct trainings to create a pool of expertise to demonstrate and propagate the CR technologies and practices.
- Activity 1.1.4 Train farmers on applying CR technologies using the FFS approach.
- Activity 1.1.5 Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery.
- Activity 1.1.6 community-based monitoring and evaluation (CBME) of implementation

Sub-Component 1.2 Climate adapted, value added, and market led agricultural investments

Output 1.2 CR value added, and market led agriculture investments secured.

This output involves improving and enhancing some value chains that are key for the project area and include rice, vegetable, chicken and aquaculture value chains, through the use of Public Private Producer Partnerships (4Ps) and increased access to finance, which will improve market access, climate adaptability, and ensure increased income for smallholders in the value chains.

- Activity 1.2.1 Value chain study and planning
- Activity 1.2.2 Establish District Multi-Stakeholder Platforms (MSPs)
- Activity 1.2.3 Public Private Producer Partnership Facility (4PF)

Sub-component 1.3 Improve enabling conditions, capacities and disaster risk management strategies

Output 1.3. Increased access to and use of climate information and advisory services for climate responsive agriculture planning

This sub-component will strengthen the production and dissemination of tailored agro-meteorological information to inform climate responsive management and planning of agriculture in the project target areas through ICT technologies. The aim is to ensure that agro-meteorological services are accessible and useful to farmers to manage climate risks, access to and use of water and efficient cropping systems.

- Activity 1.3.1 Establish ICT based multi-disciplinary platform at provincial level.
- Activity 1.3.2 Building the capacities of the platform to deliver services.
- Activity 1.3.3. Establish the agromet information systems and the outreach mechanisms.
- Activity 1.3.4 Awareness raising and capacity building of farmers and stakeholders in applying the *services.*

Sub-component 1.4 Rural roads

Output 1.4: Increased resilience of farm road infrastructure to climate change

- Activity 1.4.1 Initial planning and identification
- Activity 1.4.2 Technical survey and design considerations, preparation of cost estimation
- Activity 1.4.3 Improve 50 Kilometers of farm roads.
- Activity 1.4.4 Handing over of the completed works.

Component 2: Irrigation Infrastructure for increased resilience

Component 2 will focus on rehabilitating/creating and modernizing hydraulic infrastructure, including canals, ponds, flood-proof infrastructure (river, drain) and to provide high-efficiency climate-resilient irrigation systems for adapting to both increasing flood and drought conditions. It will include support and capacity building to O&M operators at both, Provincial (PdoWRAM) and scheme (FWUC) level, to ensure the sustainability of the scheme. The output will secure and increase farmer's agricultural production by improving the irrigation supply and protect crops from water-related disasters.

Component 2 is linked with Component 1 such that it facilitates the implementation of CR on farm crop and water management practices through improved field level water supply delivery and drainage. It will focus on rehabilitating and modernizing of irrigation and flood protection/drainage infrastructure in the six sub-projects, including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions.

Sub-Component 2.1: Modernization of irrigation scheme and ponds

- Activity 2.1.1 Technical analysis, field surveys and preparation of plans for system upgrading.
- Activity 2.1.2 Implementation of infrastructure upgrading.
- Activity 2.1.3 Preparation of canal O&M plans including application of ICT and SCADA for operation

Sub-Component 2.2: Flood-proofing and Drainage improvements

- Activity 2.2.1 Establish flood monitoring, information, and early warning systems.
- Activity 2.2.2 Strengthening and construction of flood control and drainage infrastructures.

Sub-Component 2.3: Establishments and training of Farmers Water User Communities (FWUC)

- Activity 2.3.1 Formation of institutional strengthening of the FWUC
- Activity 2.3.2 Build technical capacities of FWCU for canal structure O&M
- Activity 2.3.3 prepare long term financing plan for O&M of the systems including the WUAS.

Sub-Component 2.4: Water information and Management (SCADA)

Component 3. Institutional Strengthening

Sub-Component 3.1 MOWRAM capacity Support.

Output 3.1 Strengthened MOWRAM Capacity

Sub-Component 3.2 Strengthening of NDA and NCDD.

Output 3.2 Improved capacities for climate action monitoring

- Activity 3.2.1 Preparation of Loss and Damage Strategy
- Activity 3.2.2 Strengthen national M&E process for climate action
- Activity 3.2.3 Enhancing Capacity of NDA and other stakeholders.

2.2 Geographical Area of the Sub–scheme

The Krapeu Truom sub-scheme is situated in Preah Sre and Veal Pong communes within Odoung Maechey district of Kampong Speu province and positioned near the boundary of Thbeng Khpos and Svay communes, in the Sameakki Meanchey district of Kampong Chhnang province. The sub-scheme can be described as located in the boundary of 3 communes: Veal Pong, Thbeng Khpos, and Svay communes, making a total of 13 villages which are home to a total household of 2,430, making a total population of 10,535 people (out of which 5,483 are females). Geographically, it is part of the Krang Ponley sub-project, which also includes the Brambei Mom, Yutasast, and Stung Krang Bat irrigation schemes. The Krang Ponley sub-project spans across Kampong Speu, Kampong Chhnang, and Kandal provinces.

The Krapeu Truom scheme is situated along the Krang Ponley River and receives its water supply from the Anlong Chrey Dam (primary source) and the Kdol dam and river (secondary sources). The proposed target command area for the Krapeu Troum sub-scheme is 690 hectares. The Krapeu Troum sub-scheme is surrounded by the communes of Svay and Thbeng Khpos.

The Krapeu Truom sub-scheme, like other schemes within the Krang Ponley sub-project, is part of the Krang Ponley River Basin. The basin is characterized by its floodplain, situated approximately 10 meters above sea level, and is known for its low permeability due to fine soil particles, making it highly prone to flooding. The Krang Ponley River plays a vital role as the primary water source for these irrigation schemes.

Table 1: Administrative and population coverage of Krapeu Truom sub-scheme

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
	Krapeu Truom					
1	Kampong Speu / Odoung Maechey	Veal Pong	8	932	4,165	2,201

2	Kampong Chhnang /Sameakki Meanchey	Thbeng Khpos	4	1,281	5,207	2,688
		Svay	1	217	1,163	594
	Total	**3**	**13**	**2,430**	**10,535**	**5,483**

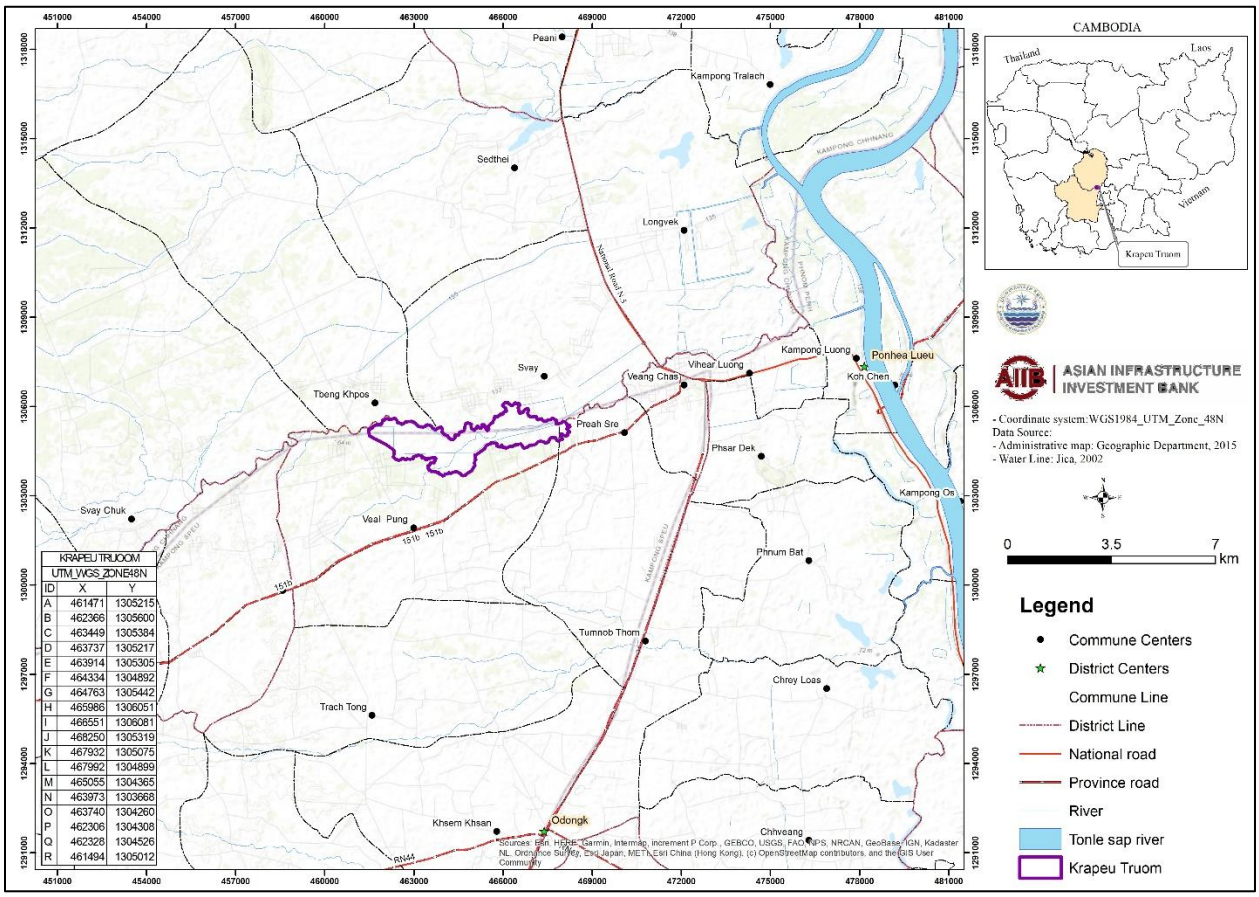
(Source: Ministry of Planning, Commune Database, 2023)

Table 2: Krapeu Troum sub-scheme under CAISAR project

No.	Scheme Name	Component 2						Beneficiaries	
		Irrigation		Rainfed area		Total			
		Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	HH*	Ratio
3	Krapeu Truom	690	3%	400	5%	1,090	4	1,100	3%

*HH = Household

Figure 1: Administrative map of Krapeu Truom sub-command area



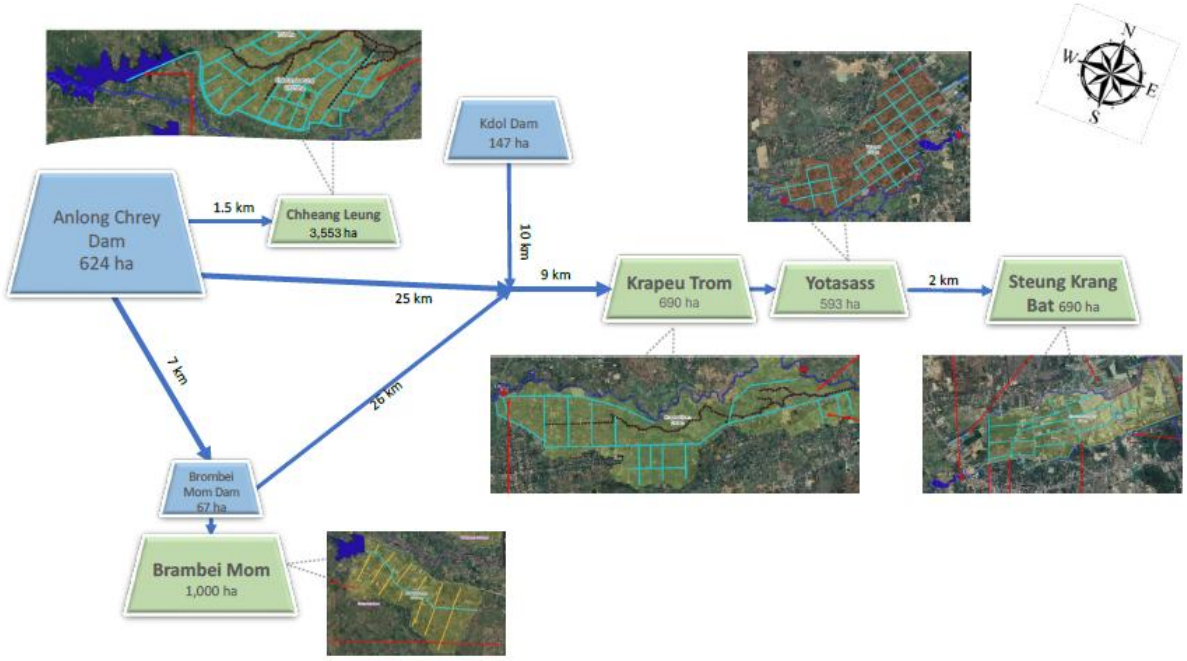
2.3 Description of the Sub-Schemes

2.3.1 Location and Coverage

Krapeu Truom is part of the larger Stung Krang Ponley basin, which serves as the main water source for several irrigation sub-schemes. The basin contains three major reservoirs—Anlong

Chrey, Brambei Mom, and Kdol dam— that have improved downstream water availability for irrigation and play a key role in flood control. However, the Anlong Chrey reservoir, with a capacity of just 30 million cubic meters (Mm³), is small relative to the annual inflow of 123 Mm³ and the irrigation needs of the region. A small hydropower station was installed at the site but remains unused due to an insufficient water supply.

Figure 2: Length from Sub-Scheme to another of Krang Ponley



2.3.2 Water Availability

The Krapeu Truom sub-scheme, located within the Krang Ponley River Basin, relies primarily on the Anlong Chrey Reservoir as its principal water source. The Kdol Dam and River serve as secondary sources, supplementing water supply when needed. This integrated system is crucial for ensuring reliable irrigation for the sub-scheme's target command area of 690 hectares.

The Anlong Chrey Reservoir, while essential for the Krang Ponley sub-project's water needs, has a relatively small capacity of 30 million cubic meters (Mm³). This poses a challenge as the estimated annual inflow into the reservoir is 123 Mm³, significantly exceeding its storage capacity. This discrepancy highlights the need for efficient water management strategies to balance irrigation demands with the reservoir's limitations.

Despite efforts to manage water release for optimal crop planting during both early and late wet seasons, the reservoir's limited capacity may struggle to meet full irrigation demands, particularly during the dry season. Factors like inconsistent runoff, which could prevent the reservoir from reaching full capacity, further complicate water availability.

Table 3: Water sources for the Krapeu Truom sub-schemes

No	Irrigation scheme	Proposed target command area (ha)	Main Water source	Secondary water source
2	Kropeau Truom	690	Anlong Chrey Dam (30 MCM)	Kdol dam (4.7 MCM), Kdol river

Anlong Chrey and Kdol Dam are the main water sources for Krapeu Truom sub-scheme. Given its closed location to the two dams, the sub-scheme is at an advantageous position compared to the other sub-scheme downstream of Krang Ponley River basin.

Table 4. Water source of Krapeu Troum sub-scheme

Resource	Description
Anlong Chrey Reservoir	Primary water source for the Krang Ponley scheme
Kdol Dam	Secondary water source, providing additional water supply
Ponley River	Connects the four separate scheme areas, facilitating water transfer

2.3.3 Irrigation Management

The Kropeau Troum Irrigation Project was constructed by PDWRAM with Korean Support. By operating gates on the main canal, water can be raised and brought onto some of the fields by gravity; other fields need to pump water from the canals. The FWUC was established in 2016 and is referred to by PDWRAM as a very successful one. The main management strategy focuses on releasing water early in the wet season (May and June) to support the timely planting of Early Wet Season crops, followed by a Late Wet Season rice crop. Despite these efforts, challenges persist, including potential conflicts between hydropower and irrigation needs, unclear reservoir operating rules, and inconsistent runoff that may prevent the reservoir from reaching full capacity in some years.

2.3.4 Natural challenges

Over the past 10 years, the Krapeu Truom irrigation sub-scheme has encountered several natural challenges. Drought was the most frequently reported, affecting 58% of respondents, with an average of three occurrences over the decade. However, two of these occurrences were considered serious. Floods were the second most reported issue, noted by 36% of respondents, with an average of three events, of which one was deemed serious. Storms were the third most common natural disaster, reported by 31% of respondents and occurring three times, with one of these events considered serious. Insect outbreaks were experienced by 27% of respondents, with an average of two occurrences over the last decade, but only one event was considered serious.

Table 5: Frequency and seriousness of natural disasters in Krapeu Truom sub-scheme

Types	Figures	Percent	Times	Number of Seriousness
Drought	39	58%	3	2
Flood	24	36%	3	1
Storms	21	31%	3	1
Insect outbreak	18	27%	2	1

2.4 PROPOSED INFRASTRUCTURE

2.4.1 Activities and Timeline

Should the feasibility study for the Stung Krang Ponley subproject proceed to detailed design, then allowing for the design process, procurement process and approvals, it has been assumed the following planning as displayed in the below Table.

The following assumptions have been made:

- The detailed design will start in January 2025.
- The procurement process will not take more than three quarters.
- The work construction will start after the rainy season in Cambodia with a mobilization period (last quarter of the year);
- The work construction duration will not last more two dry seasons.

Hence the construction would be able to commence at the last quarter 2026 for the sub-schemes in Stung Krang Ponley with total completion by mid-2030 for Krapeu Truom.

Table 6: Tentative implementation schedule of Krapeu Truom sub-scheme.

COMPONENTS, SUB-COMPONENTS, OUTPUTS AND ACTIVITIES	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
2.1.4 - Kropeu Trom	●	●	●	●	●	●	●	●	●	●	●	●	●	●										
Activity 2.1.4.1 - Detailed design	●	●	●	●																				
Activity 2.1.4.2 - Procurement					●	●	●																	
Activity 2.1.4.3 - Work construction and supervision								●	●	●	●	●	●	●										

2.4.2 Design Concept and Options

The rehabilitation, construction and activities of CAISAR project in Krapeu Truom sub-scheme consist of canals, river training and drainage, improvement of water regulation and structure and tertiary systems, and installation of solar power systems.

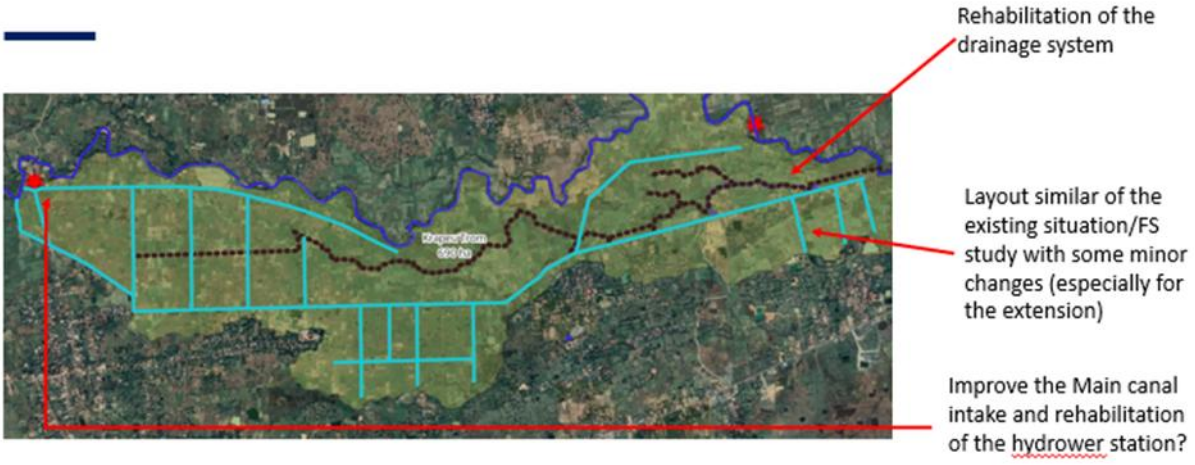
Canal. The design of the canal system aims to serve both irrigation and drainage functions, considering the topography, limited water resources, and potential land resettlement issues. Where possible, the canals will follow existing paths to minimize social impacts. The size of the canals will be adjusted based on the irrigated area and the local topography. To ensure long-term sustainability and reduce water loss through percolation, it is recommended to construct the main canals using concrete linings or suitable alternatives. This approach will help maintain water distribution efficiency and improve the durability of the infrastructure.

River Training and Drainage: A well-designed drainage system will be a critical component of the project, intended to manage excess runoff during the rainy season and prevent waterlogging in the command area. This system will also serve as the outlet for the on-farm drainage network, which is designed to control groundwater levels and drain surplus irrigation water. The layout of the drainage system will be based on the main natural drainage channels, upstream watersheds, rainfall over the command area, and changes in water levels in the Tonle Sap. It will also consider land use, crop types, and the planned irrigation systems to ensure efficient water management.

Water Regulation and Structures: Water will be diverted from multiple sources into the main canals according to water availability and a demand schedule prepared by the FWUC and PDoWRAM, based on crop needs. Various cross structures will be installed to maintain the full supply level in the main and secondary canals where necessary. The flow of water into each canal will be controlled by operating the gates of the head regulators, ensuring efficient delivery to the tertiary canals, which will distribute water to individual fields. Farmers will have the option to irrigate their plots either through plot-to-plot irrigation or by constructing field ditches.

Tertiary System: The irrigation system design extends to the tertiary canal level, which is the final distribution point before water reaches individual plots. Two options are considered for the tertiary canals. The first option involves creating traditional tertiary canals through excavation, where farmers will individually pump water using diesel pumps based on their needs. However, this requires significant cooperation from beneficiaries, as canal alignment must be accepted without land compensation. The second option is to install collective solar pumping stations, a more sustainable and cost-effective solution that eliminates the need for diesel pumps and reduces CO_2 emissions.

Figure 2: Concept design of Krapeu Truom irrigation scheme.



Collective Solar Pumping System: The project aims to implement a solar-powered pumping system as a low-tech, sustainable alternative to diesel pumps, with a pilot test covering 30-50 hectares in each irrigation block. The solar pumping system requires minimal maintenance and has no fuel costs, making it an environmentally friendly and cost-effective solution for farmers. The southern part of Block A is particularly suitable for the implementation of this system due to

its proximity to villages and protection from floods. The solar pumping system could cover 4,198 hectares with 80-90 units, improving water efficiency by 20% and reducing the risk of land conflicts along the canal alignment. This system would ensure reliable water delivery and support sustainable agricultural practices.

2.4.3 Project Activities

The infrastructure investment of the project, as outlined in the previous section, involves several key activities during the pre-construction phase. These activities set the foundation for the successful implementation of the project's construction work and ensure that resources and personnel are well-prepared for the task.

The project is divided into two (2) key components. Component 1 focuses on improving farm-level climate adaptation, resilience, and water use efficiency. This involves planning and training activities to develop community-based action plans and build capacity among farmers. Additionally, mechanization efforts and farm road improvements will enhance agricultural productivity and accessibility. Component 2 aims to strengthen irrigation infrastructure for increased resilience. This includes a range of activities such as river dredging, canal rehabilitation, construction of small-scale structures, river training, polder system development, solar pumping system installation, feeder canal construction, and pond construction or rehabilitation. These interventions will improve water management, increase water storage capacity, and ensure efficient water distribution to agricultural fields.

2.1.1.1 Pre-construction Phase

At the pre-construction phase, there are several activities that need to be done where disturbance to local people as well as natural resources may occur. These activities are:

1. Land and Right of Way Negotiation: This initial step focuses on securing the necessary land and access rights for the construction. Negotiations with local authorities, landowners, and other stakeholders ensure that all legal and logistical requirements are met, minimizing potential delays or disputes that could arise during the project.
2. Contracting and Training of Staff: The project then engages in the recruitment and contracting of skilled personnel, including construction teams, engineers, and project management staff. This step is critical to ensure that the workforce has the necessary expertise and experience. Alongside recruitment, training programs are provided to align staff with the project's goals, safety standards, and technical requirements.
3. Mine and UXO Clearance: In areas with potential unexploded ordnance (UXO), safety is the highest priority. Before any construction begins, the project undertakes mine and UXO clearance to ensure that the site is free of hazardous materials, creating a safe environment for workers and preventing accidents.

These pre-construction activities are integral to establishing a strong foundation for the project, ensuring that the necessary infrastructure, workforce, and materials are in place to proceed smoothly with the subsequent phases of construction.

2.1.1.2 Construction Phase

The construction phase of the project involves a comprehensive set of activities aimed at establishing the required infrastructure while ensuring safety, environmental management, and efficient use of resources. Key construction activities include:

1. Mobilization of Construction Materials, Consumables, Machinery, Equipment, and Staff: Once the team is in place, the project moves into the mobilization phase, where all essential materials, machinery, and equipment are transported to the construction site. This also includes the deployment of consumables and other resources required for ongoing construction. Ensuring the timely arrival and organization of these assets is crucial for avoiding disruptions in the construction timeline. Similarly, staff are mobilized to ensure a coordinated start to the construction activities.
2. Installation and Operation of Temporary Infrastructure: Temporary facilities, such as worker camps, asphalt plants, concrete mixing stations, and ground material processing plants, are set up to support the construction process. These facilities are critical for providing on-site accommodation for workers and ensuring the continuous supply of construction materials.
3. Site Clearing and Cleaning: This phase involves clearing the construction site of any obstructions such as vegetation, debris, and existing infrastructure. It ensures that the land is prepared and ready for subsequent construction activities.
4. Demolition and Removal of Existing Infrastructure: In areas where existing structures need to be replaced or upgraded, demolition and removal are necessary. This ensures that the site is clear for the installation of new infrastructure and allows for efficient use of the available land.
5. Land Movements (Excavations, Dredging, and Fills): Major land movements, including excavations and dredging, are conducted to reshape the land and prepare it for new infrastructure. These activities also involve filling areas to achieve the required ground levels for construction stability and support.
6. Construction of Hydraulic Works (Including Occupation of Waterways): Hydraulic works, such as dams, levees, or irrigation systems, are constructed to manage water resources effectively. This stage often requires temporary occupation of waterways, making careful planning and environmental considerations critical.
7. River Training: As part of managing water flow and preventing erosion, river training is conducted to stabilize riverbanks and direct water movement, which is essential for protecting both the construction site and surrounding ecosystems.
8. Dismantling of Temporary Facilities and Camps: Once the primary construction activities are completed, temporary infrastructure such as camps and material plants are dismantled. This marks the transition toward the final stages of the construction process.

9. Final Cleanup of Intervened Areas: A thorough cleanup of the construction site is conducted to remove debris, materials, and any temporary installations.
10. Site Retoration: To ensure the aesthetic and environmental sustainability of the project, landscaping efforts are undertaken, including replanting vegetation, managing drainage, and shaping the landscape to blend with the natural surroundings.

This series of construction activities ensures that the project is completed according to design specifications, with an emphasis on safety, environmental responsibility, and efficient resource management.

2.1.1.3 Operation and Maintenance

The post-construction phase of the project involves the transition from infrastructure development to its operational use, with a focus on agricultural intensification, resource management, and long-term maintenance. The key activities during this phase include:

1. Intensifying Agricultural Production: Following the completion of the infrastructure, there is a focus on enhancing agricultural productivity. The improved infrastructure allows for more efficient farming practices, increased crop yields, and the introduction of advanced agricultural techniques. This intensification contributes to greater food security and economic development in the region.
2. Increased Use of Energy and Fuel for Agriculture Production: With the intensification of agricultural activities, there is a corresponding rise in the use of energy and fuel to power farming machinery, irrigation systems, and other agricultural equipment. This increased demand for energy supports the scaling up of production but also requires careful management to ensure sustainability and minimize environmental impacts.
3. Operation and Maintenance: To ensure the long-term functionality and durability of the newly constructed infrastructure, regular operation and maintenance activities are critical. This includes monitoring the condition of the infrastructure, performing repairs, and ensuring that the systems in place continue to function as designed. Routine maintenance helps prevent deterioration and ensures that agricultural productivity remains high.
4. Water Management: Effective water management becomes a priority in this phase, especially with the new hydraulic infrastructure in place. This includes controlling irrigation systems, managing water levels in reservoirs, and ensuring that water resources are used efficiently to support agricultural activities. Sustainable water management is crucial for balancing agricultural demands with environmental conservation.

These post-construction activities ensure the long-term success of the project, contributing to sustainable agricultural growth, resource efficiency, and the ongoing maintenance of infrastructure to support continued productivity in the agricultural sector. Summary of the project activities is provided in Table 2.20.

Table 7: Summary of the Project Activities in relation to the infrastructure investment

No.	Stage	Activities

1	Pre-Construction	Land and right of way negotiation
		Contracting and training of staff
		Mobilization of construction materials, consumables, machinery, equipment and staff
2	Construction	Mine and UXO clearance
		Installation and operation of temporary infrastructure (camps, asphalt, concrete and ground material plants)
		Site clearing and cleaning
		Demolition and removal of existing infrastructure in areas to be intervened
		Land movements (excavations, dredging and fills)
		Construction of hydraulic works (includes occupation of waterways)
		River training
		Dismantling of temporary facilities and camps
		Final cleanup of intervened areas
		Landscaping management
	After Construction	Intensifying agricultural production
		Increased use of energy and fuel for agriculture production
		Operation and maintenance
		Water management

UXO = Unexploded Ordnance.

2.4.4 Construction Equipment

To support the construction activities, the project will require a variety of construction equipment and machinery. Below is the potentially used equipment for different stages of the project:

- Earthworks and Land Preparation
  - Excavators – For digging canals, ponds, and trenches.
  - Backhoe Loaders – For smaller excavation and loading tasks.
  - Bulldozers – For clearing and leveling land.
  - Motor Graders – For grading and leveling road and embankment surfaces.
  - Scrapers – For removing and transporting soil over short distances.
  - Soil Compactors/Rollers – For compacting soil before construction.
- Water Infrastructure Construction
  - Dredgers – For clearing and deepening irrigation canals and reservoirs.
  - Trenchers – For laying underground pipelines.
  - Pipe Layers – For positioning and installing large-diameter water pipes.

    - Concrete Pumps – For pumping concrete into irrigation structures.
    - Concrete Mixers (Stationary & Mobile) – For mixing and delivering concrete.
    - Cranes – For lifting heavy pipes, gates, and pre-cast structures.
    - Pile Driving Machines – For driving piles into the ground for dam or levee construction.
- Road and Pathway Construction
    - Asphalt Pavers – For paving roads within the project.
    - Dump Trucks – For transporting materials such as gravel, sand, and asphalt.
    - Bitumen Sprayers – For road surfacing.
    - Road Rollers – For compacting asphalt or gravel surfaces.
- Drainage and Irrigation System Development
    - Water Pumps (Diesel & Electric) – For water transfer and dewatering.
    - Drilling Rigs – For well construction and deep-water extraction.
    - Channel Forming Machines – For shaping and lining irrigation channels.
    - Concrete Pipe Making Machines – For on-site production of irrigation pipes.
- Structural and Facility Construction
    - Tower Cranes – For lifting heavy materials in building sites.
    - Scaffolding Systems – For workers' access and safety.
    - Rebar Cutters and Benders – For reinforcing concrete structures.
    - Shotcrete Machines – For spraying concrete onto embankments.
- Environmental and Erosion Control
    - Hydroseeding Equipment – For erosion control and vegetation replanting.
    - Rock Crushers – For breaking stones for embankment protection.
    - Geotextile Laying Machines – For soil stabilization in embankments and canal lining.
- Power and Electrical Systems
    - Generators – For power supply in remote project sites.
    - Transformers & Substations – For irrigation pumping stations.
    - Solar Panel Installation Equipment – If renewable energy is incorporated.
- Monitoring and Surveying Equipment
    - Total Stations & GPS Survey Equipment – For site mapping and project layout.
    - Drones – For aerial surveys and project monitoring.

- Water Flow Meters – For irrigation system performance assessment.

2.5 ASSOCIATED FACILITIES

Under CAISAR, the screening for potential Associated Facilties (AF) was conducted by SECAP team. The definition for "Associated facilities" (AF) in the AIIB's Environmental and Social Framework (May 2021 version) are activities that are not included in the description of the Project set out in the Legal Agreements governing the Project, but they are qualified to the following criteria:

(a) **directly** and **materially** related to the Project.

(b) **carried** out, or **planned to be carried out**, **contemporaneously** with the Project; and

(c) necessary for the Project to be **viable** and would **not be carried out if the Project did not exist**".

Below is the summary of a) methods that was used by the team to screen for AF, and b) the results of the AF screening.

Methods

Interpretation of AF definition in the context of CAISAR project

Under CAISAR project, the key terms used in the above definition are interpreted as follows:

- **Project**: refers to CAISAR project
- **Direct**, in the context of environmental and social risk and impact assessment, refers to the **impact, which is caused by the project**, and **occurs contemporaneously in the location of the project**. This is to differentiate with an indirect impact which is an impact which is caused by the project and is later in time or farther removed in distance than a direct impact, but is still reasonably foreseeable, and will not include induced impacts. "Direct", in the context of AIIB's ESF refers to the "direct" relationship between a potential associated facilities (e.g. dam, reservoir, barrage) and its impact on the achievement of the intended project development.
- **Material**: significant, important, substantive. In the context of CAISAR, "material" refers to the strength of the above "direct" relationship between the impact of a potential AF on the intended outcome for each subproject which is indicative of **reliable and increased water access** for the target project groups – as per project plan, to achieve expected development outcome.
- **Contemporaneous**: at the same time, which is the relative overlap of time with regards to planning and actual implementation of potential AF and CAISAR project activities (defined by project planning period and project implementation life).
- **Viable**: for CAISAR sub–schemes to **achieve** mostly the **intended impacts** (expected outcome, i.e. increased irrigated area and/or number of crops per year/reliable irrigation

access).

- **Not be carried out if the Project did not exist.** Indicates the functional interdependency between the AF and CAISAR project.

Findings

As per the consultation with the CAISAR PMU and SECAP team, the document regarding the AF had already been approved. Therefore, the result from the assessment were used in this report. Further assessment will be conducted on any emerging facilities after the consultation and agreement being provided by the PMU. Based on the screening by the SECAP team, five (5) existing works have been screened and assessed if they are associated facilities (See table below). The screening results indicates that the water resources facilities met the definition of AIIB's Environmental and Social Framework on Associated Facilities. Therefore, no further actions are required in connection with the works (please see in table 7).

Table 8: Screening of potential Associated Facilities under CAISAR*

Assessment criteria	Kropeau Truom diversion work
a) **directly** and **materially** related to the Project; and	Directly and materially (substantially) related to Kropeau Truom sub–scheme
b) **carried out**, or **planned to be carried out**, **contemporaneously** with the Project; and	The Kropeau Truom Dam construction was completed in 2015 **Not carried out contemporaneously** with Kropeau Truom sub–scheme
c) **necessary** for the Project to be **viable** and **would not be carried out** if the Project did not exist.	**Necessary** for the Kropeau Truom sub–scheme to be **viable** and **still carried out** even if Kropeau Truom sub–scheme did not exist.
Initial screening	NOT AF

* Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project

Source: Report on Screening of potential Associated Facilties under CAISAR (prepared by SECAP team)

2.6 IMPLEMENTATION RESOURCES REQUIREMENT

2.6.1 Labour and Workforce

Table 8 outlines the estimated labor requirements for the construction of the irrigation system under the CAISAR project. Four main groups of the labor forces include: Direct Workers, Contracted Workers, Primary Supply Workers, and Other Stakeholders. The Direct Workers include individual consultants and members of the Project Implementation Unit (PIU), who are essential from the project preparation phase through to completion. The Contracted Workers, engaged by the PIU and construction contractors, consist of national specialists such as Detailed Design Consultants and Construction Supervision Consultants, as well as skilled and unskilled laborers. This group is engaged on intermittent basis. The Primary Supply Workers are mostly local workers involved in providing services to the project at local level during construction, while Other Stakeholders include civil servants from various government ministries and departments,

such as MoWRAM, NCDDS, and MEF are technical support. Krang Ponley require 40 skilled and 60 unskilled workers for implementation.

The involvement of local workers and civil servants is a key feature of the labor requirements. Local workers are heavily engaged as unskilled laborers and primary supply workers, emphasizing the project's reliance on local resources and its potential to create employment opportunities in the region. Additionally, civil servants from ministries such as MoWRAM, NCDDS, and MEF play a significant role, particularly during the construction phase, ensuring compliance with safeguards and providing technical and administrative support. The CAISAR project, requiring careful coordination among consultants, contractors, government agencies, and local communities to ensure successful implementation.

Table 9: The estimated influx labor within the sub-schemes

Type of project workers	Characteristics of project workers	Duration of Labor Requirements	Krapeu Troum
PIU's member MoWRAM & NCDDS	Individual consultants (e.g., E&S Specialists, Design Engineers, Construction Supervision Engineers, etc.	From project preparation till project completion	20
Engaged by PIU			
Detailed Design Consultant	National specialists	From project preparation until project completion	3
Construction Supervision consultant	National specialists		1
Independent E&S Monitoring Consultant		One (1) month in very six (6) months	1
Technical Assistance			3
Skilled workers	National specialists	Durations vary, depending on construction stages & needs.	10
Unskilled workers	Local workers (around subproject location)		15
Primary Supply Workers			
Workers producing materials for core project activities	Mostly local workers	Construction stage	4
Other Stakeholders Working in Connection with Project			
Civil servants of MoWRAM, PDWRAM at provincial & district level	SEO safeguard team	The construction stage of the project.	2
Civil servants of NCDDS	Staff of NCDDS	From project preparation until project completion	2
Civil servants of MEF	Staff of GDR	From project preparation until project completion	1
Civil servants of relevant Ministries	Staff	The construction stage of the project.	1

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, E&S = Environmental and Social, NCDDS = National Committee for sub-National Democratic Development Secretariat, PDWRAM = Provincial Department of Water Resources and Meteorology, SEO = Social and Environmental Officer, MEF = Ministry of Economy and Finance, GDR = General Department of Resettlement.

2.6.2 Power Usage

During the construction, the project requires a reliable and sufficient power supply to support various construction activities including equipment operation, worker facilities, and site management. A significant portion of power consumption will be allocated to heavy machinery and equipment, including concrete mixers, cranes, drilling rigs, welding machines, water pumps, and earthmoving equipment such as excavators and bulldozers. These machines require high-power supply mainly from the self-propel engine using diesel or gasoline as the fuel whereas the power for lighting and security systems for general visibility on the construction site could be from the power grid as the location is accessible to power grid. Apart from machinery, electricity for worker facilities and site infrastructure can be the power grid or diesel generators. Worker camps will require power for lighting, cooking, air circulation, and mobile charging.

The overall power demand will vary based on the project's phase, the number of workers, and the type of equipment used. However, the estimate of the demand is far from actual since many information is lacking. The engineering team recommended to wait until the DED stage. A hybrid power system using a combination of grid electricity, and diesel generators. Efficient energy management strategies will help optimize power use, reduce costs, and minimize environmental impact.

2.6.3 Supporting Facilities

Several supporting facilities that are required for the construction activities include site offices and administrative facilities, worker accommodation and welfare facilities such as worker camps containing toilets, showers, handwashing stations, and kitchens to ensure proper hygiene and nutrition. A stable power supply is needed for machinery operation, lighting, and worker facilities, sourced from grid electricity, diesel generators, or solar panels can be the options. Additionally, wastewater treatment facilities are need to manage sewage and reduce environmental pollution for the camp sites.

Proper storage and material handling facilities is needed to protect construction materials such as cement, steel, and gravel. Transportation infrastructure and access roads is used to facilitate the movement of materials and personnel, with designated loading and unloading zones to streamline logistics. To ensure safety, security measures such as perimeter fencing, guard posts, and fire safety stations is needed. Furthermore, environmental management facilities such as waste segregation units, drainage systems, and recycling bins are also needed to minimize environmental impact. The specific layout and location of the facilities can only be projected at after obtaining the final design layout plan of the engineering team during the construction stage after the contract award.

2.6.4 Water Consumption

Water is needed for construction activities and domestic uses of workers. Water is essential for various activities, including material preparation, earthworks, equipment operation, worker sanitation, and site maintenance. A significant portion of water use is allocated to concrete and material preparation, where it is needed for mixing concrete, mortar preparation, curing, and soaking bricks or blocks to prevent rapid water absorption. Additionally, earthworks and dust control require water for soil compaction, suppressing dust on unpaved roads, and softening the ground during grading and levelling. Water is also crucial for equipment and machinery operations, including cooling construction machinery, cleaning tools and formworks, and conducting hydraulic testing of pipelines to check for leaks and pressure integrity. In road construction and asphalt work, water is required for wetting base layers before compaction, mixing with bitumen, and cooling asphalt equipment. Estimate the quantity of water for such activities need the figure of the facilities. As per the consultation with the engineering team, it is not feasible to make an estimate on the water need for such a work since the scope of work including volume of excavated soil, volume of concrete to be used, and so on are not available.

The estimate of water needs for domestic use of the project associated workforce use the 70 liters per day as the basis for the calculation. As the duration of engagement of staff and officials, workers, civil servants over the project life time are varied from one to another. The PMU staff engagement at the field is estimated at 3 days per month over the period of 6 years. The DED Consultant is estimated at 100 days per year for one year, following by construction supervision consultant at 250 days per year for 2.5 year, independent E&S Monitoring Consultant at 25 days per year for 3 years, technical consultant at 50 days per year for 3 years, skilled and unskilled workers at 250 days per year for 2 years, primary supply workers at 50 days per year for 2 years, officials for MOWRAM and PDoWRAM at 50 days per year for 6 years, and other officials at 40 days per year for 6 years. The result of the estimate for water demand is provided below:

Table 10: The estimated quantity of water for domestic use of the project

No.	Type of Workers	Total Workers	Number of Days at Field	Total Water Demand (liters/day)	Total Water Demand (m3)
1	PIU member MoWRAM & NCDDS	20	4,320	1,400	6,048
2	Detailed Design Consultant	3	250	175	44
3	Construction Supervision consultant	1	781	88	68
4	Independent E&S Monitoring Consultant	1	94	88	8
5	Technical Assistance	3	375	175	66
6	Skilled workers	10	5,000	700	3,500
7	Unskilled workers	15	7,500	1,050	7,875
8	Primary Supply Workers	4	469	263	123
9	Civil servants of MoWRAM, PDWRAM	2	600	140	84
10	Civil servants of NCDDS	2	480	140	67
11	Civil servants of MEF	1	300	88	26
12	Civil servants of relevant Ministries	1	300	88	26
	Total				17,936

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, NCDDS = National Committee for sub–National Democratic Development Secretariat, E&S = Environmental and Social, PDWRAM = Provincial Department of Water Resources and Meteorology, MEF = Ministry of Economy and Finance.

The estimated water demand is mainly for needed during the construction period, given less than 1% of the estimated water is required for pre-construction stage

2.6.5 Expected GHG Emission and Discharge

During construction, the construction activities will generate Greenhouse Gas (GHG) emissions from various activities, primarily due to the use of fossil fuels, electricity consumption, and material production. One of the major contributors to emissions is fuel combustion in heavy machinery and construction equipment, such as excavators, bulldozers, cranes, and trucks. These machines rely mainly on diesel fuel, which releases carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) into the atmosphere. Additionally, transportation of materials such as sand, gravel, cement, and steel to the construction site will also contribute to emissions through fuel consumption by trucks and other vehicles.

Another significant source of GHG emissions is the production and use of construction materials, particularly cement, steel, and asphalt. Cement manufacturing is known for high CO_2 emissions due to the chemical process of calcination, while steel production requires significant energy, leading to further emissions. The use of electricity for site operations, including lighting, worker accommodations, water pumping, and equipment, will also add to the overall carbon footprint, depending on the energy mix used. However, the exact amount of GHG emissions can only be determined after the detailed engineering design is completed, which will provide specific information on construction scope, number and size of equipment usage, and material requirements. Future calculations should take into account project-specific data to ensure a more accurate estimation of the environmental impact.

2.6.6 Land Acquisition for Material Storage

To support construction activities, contractors will need to rent land or engage local households to store materials and vehicles. This land will be used for essential contractor facilities, such as temporary storage areas, worker accommodations, and machinery stations. Securing this land is critical for ensuring efficient operational logistics and smooth construction management throughout the project. Overall, it is projected that a total of 5 households or land units will be needed for Krapeu Truom.

2.7 ANALYSIS OF ALTERNATIVES

2.7.1 Site Selection

The Krapeu sub-project is located with Brambei Mom, Yutasas and Krang Bat in Krang Ponly catchment, covering a total area of 3,277 hectares.

2.7.2 Project Layout and Design

Rehabilitation and enhancement of the existing irrigation system is the main design option under the project opting out from the feasibility design stage as huge land area acquisition found to be critical and generate high social impacts on community people (please see in table 3.8).

Table 11: Irrigation System Options in Krapeu Truom

No.	Structures	Designed Length (km)	Existing Width (Average) m	Expansion (L) m	Expansion (R) m	Total Width (m)
Krapeu Troum						
1	Main Canal 1	2.82	30	0	0	30.00
2	Main Canal 2	6.8	30	0	0	30.00
3	Drainage Canal	6.8	5	1	1	7.00
4	Carrying Roads (MC2)	6.8	Only one (1) section of 1.5 Km canal's embankment requires expansion to be the rural road. The section of 5.3 km is already large enough to be the rural road.		1.5	

L = Left, R = Right, MC2 = Main Canal 2

Secondary Canals. The construction of new secondary canal is expected to acquire huge land areas of farmers which may result in disruption of household economy. To avoid the negative impact, the construction of the canal was agreed to remove the newly plan secondary canal while off-take structure (culverts) will be used to allow farmers to abstract water from the system as per their block command areas. Farmers who own the land within the block need to discuss and agree whether they are going to build their own water canal or use plot by plot irrigation. The risk as per this option is when farmers could come up with the agreement on the construction of a small canal on their own, they have to continue irrigating their farm through deploying plot-to-plot irrigation or using long range pumping which involve with high cost and limited water use efficiency. Since the design is trying to avoid land acquisition, this will be the option for the system which is also applied to the quaternary and fourth-level canal as well.

River Training. River training methods are designed to regulate and stabilize river flows for various purposes, including irrigation, flood control, and erosion prevention. Below are three common types of river training, along with their respective advantages and disadvantages adopted from online source to provide general overview regarding the design and possible options which should be considered for the actual practices. However, it is up to the DED team to decide as per the consultation with Social Safeguard consultant (Table 3.2).

Table 12: River Training Design Options

River Training	Description

Embankments (Levees)	Embankments are artificially raised banks made of earth, concrete, or stone along the sides of a river to prevent water from overflowing into adjacent lands.
Advantages:	• **Flood Control:** Protects agricultural lands and infrastructure from river flooding. • **Irrigation Water Regulation:** Helps direct water flow into irrigation channels efficiently. • **Erosion Prevention:** Reduces bank erosion, safeguarding nearby farmlands and structures. • **Cost-Effective:** Generally, less expensive compared to more complex river training structures.
Disadvantages:	• **Sediment Deposition Issues:** Can lead to sediment buildup within the riverbed, raising water levels and increasing flood risks over time. • **Breaching Risk:** If poorly maintained, embankments can break during extreme floods, leading to catastrophic damage. • **Ecological Impact:** Alters natural river dynamics, affecting aquatic ecosystems and wetlands.
Spurs (Groynes)	Spurs (also called groynes) are structures extending perpendicularly from the riverbank into the river. They help deflect and slow down water flow to prevent erosion and sediment deposition in key areas.
Advantages:	• **Bank Protection:** Reduces erosion by redirecting strong currents away from vulnerable banks. • **Sediment Control:** Helps accumulate sediments in specific areas, aiding in land reclamation or creating stable riverbanks. • **Improves Water Availability:** Can be strategically placed to direct water flow into irrigation systems.
Disadvantages:	• **Local Scouring:** Can cause deep erosion near the structure, affecting nearby irrigation headworks or riverbanks. • **Periodic Maintenance Required:** Sediment accumulation may require periodic dredging to maintain functionality. • **High Initial Cost:** Construction and material costs can be relatively high compared to natural erosion control measures.

Weirs and Barrages	Weirs are low dams built across a river to regulate water flow, while barrages are adjustable structures with gates that control water levels for irrigation and flood management.
Advantages:	• **Water Level Control:** Maintains steady water levels in irrigation channels, ensuring consistent supply to farmlands. • **Hydropower Potential:** Some barrages can integrate small-scale hydroelectric generation. • **Prevents Saltwater Intrusion:** Useful in coastal areas where tidal effects can introduce salinity into freshwater irrigation systems.
Disadvantages:	• **Disrupts Natural River Flow:** Can impact fish migration and aquatic ecosystems if fish passages are not incorporated. • **Expensive to Build and Maintain:** High initial investment and ongoing maintenance are required for long-term functionality. • **Flooding Risk Upstream:** Can cause water accumulation upstream, leading to potential flooding in extreme weather conditions.

Design Slope. As per the confirmation of the Engineering Team, canal slopes will either be protected or left as earthen slopes based on their condition and the available budget, which will be determined during the detailed design phase. For weak slopes, concrete lining and geosynthetic materials will be recommended for reinforcement. The feasibility of bio-engineering solutions will be assessed based on the specific site conditions of the project. The following is the comparison between the vegetated and concretized design slope:

Table 13: Slope Design Options Comparison

Concretized Canal Slopes	• Erosion Control: Concretized canal slopes provide strong erosion resistance, reducing sedimentation in water bodies downstream. This helps maintain water quality and prevents sediment-related ecological degradation. • Maintenance Needs: Concretized slopes generally require less maintenance compared to vegetated banks. They are easier to inspect and repair, reducing ongoing operational costs. • Habitat Impact: Concretized slopes typically offer limited habitat for aquatic organisms and vegetation compared to natural or vegetated banks. This can reduce biodiversity and ecological resilience in the waterway.

	• Heat Absorption: Concrete can absorb and retain heat, leading to higher water temperatures in the canal. This can affect aquatic life, especially sensitive species, and alter ecosystem dynamics. • Aesthetics: Concretized slopes may be perceived as less visually appealing compared to natural or vegetated banks. This could impact recreational use and community engagement with the water resource.
Vegetated Banks	• Erosion Control: Vegetated banks provide natural stabilization, reducing erosion by absorbing water, slowing runoff, and binding soil with root systems. They contribute to maintaining soil structure and preventing sedimentation downstream. • Biodiversity: Vegetated banks offer diverse habitats for aquatic and terrestrial species, promoting biodiversity and supporting ecological balance. They can serve as wildlife corridors and provide nesting sites for birds. • Water Quality: Vegetated banks act as buffers, filtering pollutants, and absorbing excess nutrients from runoff. This improves water quality and supports healthier aquatic ecosystems. • Temperature Regulation: Vegetation provides shade, helping to regulate water temperature and mitigate thermal pollution. This is particularly important for species sensitive to temperature fluctuations. • Community Benefits: Vegetated banks enhance the aesthetic value of the waterway, offering green spaces for recreation, relaxation, and cultural activities. They can also contribute to community engagement and ownership of the water resource.

Cross-Regulator/Off-Take Structure. The structure is required for all sub-schemes and specific size, number, and locations need to be assessed during DED stage. The calculation regarding the design specification need to consider the water requirement in each block of the sub-command areas.

Fish Passes/Sliding Gate. There is practice using fish passage in barrage or headworks across the river where environmental flow is available. The engineering team indicated that the option is not practical at the field level canal because the water flow at the hydraulic structures along the canal system need to be fully closed for some time for farmers to irrigate their system. However, the fish passage may be practical for OTP river and Svay Doun Keo river which needs to be assessed at the DED stage. Two fish passes are provided below:

Table 14: Slope Design Option Comparison

Vertical Slot Fish Passway:	• Biodiversity Risks:
	  ○ Habitat Fragmentation: Vertical slot fish passways can contribute to habitat fragmentation by interrupting the natural flow of rivers. This interruption can create barriers to fish migration, leading to isolated populations and reduced gene flow between different sections of the river.
	  ○ Species-Specific Challenges: Some fish species may face difficulties navigating through the narrow, vertical slots of the passway. Species with limited jumping abilities or specific habitat preferences may struggle to ascend or descend through the structure, limiting their access to essential spawning or feeding areas.
	• Environmental Risks:
	  ○ Sedimentation: Improperly designed vertical slot fish passways can alter flow patterns, leading to increased sedimentation downstream. Changes in flow velocity and direction can cause erosion of riverbanks and streambeds, resulting in sediment accumulation in downstream habitats. Excessive sedimentation can degrade water quality, smother benthic habitats, and reduce oxygen levels, harming aquatic life.
	  ○ Hydraulic Impacts: Vertical slot fish passways may create hydraulic conditions that are unsuitable for fish passage. High velocities and turbulent flows within the passway can impede fish movement and cause physical stress or injury. Additionally, rapid changes in water level or flow rate can disorient fish and hinder their ability to navigate through the structure.

Cone Fishway	• Biodiversity Risks
	  ○ Selective Passage: Cone fishways may not provide equal passage opportunities for all fish species. Some species may have difficulty navigating through the structure due to factors such as water depth, flow velocity, or hydraulic complexity. This selective passage can create barriers to migration for certain species, leading to reduced genetic exchange and population fragmentation.
	  ○ Altered Hydrology: Cone fishways can modify natural flow patterns within river systems, potentially altering habitat availability and quality for aquatic organisms. Changes in flow

	velocity, turbulence, and water depth can influence the distribution and abundance of fish and other aquatic species, impacting ecosystem dynamics and biodiversity.
	• Environmental Risks
	  ○ Habitat Modification: Construction of cone fishways may require alterations to river channels and banks to accommodate the structure. Channel dredging, bank stabilization, and other habitat modifications can disrupt natural riverine habitats and alter ecosystem processes. Changes in habitat structure and composition can affect the distribution of aquatic flora and fauna, leading to shifts in community composition and trophic interactions.
	  ○ Sediment Transport: Cone fishways can affect sediment transport dynamics within river systems, with potential implications for downstream habitats. Changes in flow velocity and turbulence induced by the structure can influence sediment deposition and erosion patterns, altering habitat availability and quality for benthic organisms and other aquatic life.

2.7.3 Project Technology

The feasibility study has assessed the climate vulnerabilities of the Command Areas and their communities to design suitable, sustainable, and climate-resilient irrigation systems. The scheme will make use of nature-based, adaptive, and data-driven technologies to ensure its resilience to extreme floods and climate change. Smart SCADA technology will be installed to monitor the system for leaks and flood damages, while drainage systems will also be installed to reduce waterlogging, flood impacts, and crop failures.

Solar pumping will be employed in place of costly and high-carbon diesel alternatives to create a self-sustaining system. The lining of canals is an important feature of the system's climate resilience, and a range of investment options exist depending on the extent of lining in the new network. Concrete will be used for certain sections to reduce the carbon footprint.

There are different technological options being proposed for the project activities. The key technological options are provided here:

Table 15: Irrigation System Options

Options	Component	Options	Description
Pumping	1	Diesel water pump	Traditional water pumping systems powered by diesel engines. These are commonly used in areas where electricity is unavailable but it has higher operational cost and environmental impacts.

			However, it can be used anywhere in the sub-scheme.
		Solar pumps	Sustainable and cost-effective water pumping systems that harness solar energy, suitable for remote areas with abundant sunlight. They offer lower long-term costs but may require higher initial investment.
		Electric pumps	Powered by electricity from the grid or other sources, these pumps are efficient but depend on the availability of consistent electrical supply which maybe inapplicable at farm level in most of the sub-scheme
IPM	1	Pesticide application	A conventional approach involving chemical pesticides to manage pests, often leading to quick results but with potential risks to health, environment, and biodiversity. The times of application without IPM will be up to 6 times as per the reported from the field survey.
		With IPM*	The application of pesticides will be reduced to only around 3 times, minimizing the impacts on the quality and health of water, environment, wildlife, fauna and flora, human and animal
Agromet	1	Without Agromet	Farming practices carried out without the use of weather and climate data, potentially leading to inefficiencies and higher vulnerability to climate risks.
		Agromet	Incorporates meteorological data and forecasts into agricultural decision-making, enhancing productivity, resource optimization, and resilience to climate variability. However, the major challenge is mainly the operational cost of the system.
SCADA**	2	Convention	Manual or semi-automated control systems for monitoring and managing operations, which may be labour-intensive and less efficient in handling complex systems.
		SCADA	Advanced digital systems that provide real-time monitoring, data analysis, and remote-control capabilities for improved efficiency and operational oversight.

*. IPM = Integrated Pest Management

**. SCADA = Supervisory Control and Data Acquisition

For pumping, there is a need to be case specific to each of the option. Applying these technological options are important since the technologies will facilitate the agricultural production and complimenting each other is needed. The promotion of only one (1) option would decrease

the effective farming activities. Regarding the IPM, it is quite important to promote the technologies as it will reduce the negative impacts which will be caused by the farming activities. The application of agromet will require technical skill and management capacity

2.7.4 Project Scenario Analysis

Without-project scenario, the net command area of 690 has will continue to be cultivated with a crop intensity of 100% whereas the 15% of command area (73 ha) will continue to produce vegetables with limited water sources, facing the risk of crop failure even during rainy season.

In the with-project scenario, although the net command area will remain unchanged, improvements in water availability, management, transmission efficiency, and drainage will increase cropping intensity to 115% (covering 793 hectares). This will consist of 69 hectares of late wet-season paddy, 276 hectares of medium wet-season paddy, 345 hectares of early wet-season paddy, and 103 hectares of high-value crops, including fruits and vegetables.

The project is expected to bring the following agricultural benefits for the 2,430 farming households in the Kropeau Truom scheme: i) improved yields for wet-season rice, ii) expanded cultivation area and higher yields for dry-season rice, and iii) the introduction of high-value crops like leafy vegetables and fruit vegetables for dry-season cultivation. These changes are expected to increase agricultural productivity, raise farmer incomes, and enhance farmer resilience to drought, pests, diseases, and market risks through crop diversification.

In contrast, the without-project scenario would maintain current agricultural practices, resulting in suboptimal rice yields, poor crop diversification, lower farmer incomes, and heightened vulnerability to climate risks.

The proposed Kropeau Truom sub-scheme aims to install secondary and tertiary irrigation canals and related infrastructure within the existing system, enhancing dry-season water availability for 690 hectares of nearby farmland. Additionally, the project will establish and train Farmer Water User Communities (FWUCs) to manage and maintain the irrigation infrastructure, ensuring long-term sustainability. Further agricultural extension services will be provided to local farmers, focusing on improved agricultural techniques, value chain optimization, the use of improved seed varieties, cover crop application, and optimal fertilizer and pesticide use.

3. LEGAL AND INSTITUTIONAL FRAMEWORK

Following a framework for effective project development as well as environmental sustainability, the project owner shall comply with the national legal framework and protocols ratified by the Kingdom of Cambodia. For CAISAR Project, there are national laws, agreements, guidelines and relevant legal instruments as described below:

3.1 Royal Government of Cambodia's Legal Framework

3.1.1 National legal framework

3.1.1.1 The Constitution of the Kingdom of Cambodia (1993)

The Constitution is the highest legal authority in Cambodia and establishes the fundamental rights and duties of citizens and the state. It sets the groundwork for environmental protection, governance, social inclusion, and public well-being, ensuring that environmental and social rights are integrated into national laws.

3.1.1.2 Legal Framework related to the Management and Conservation of Natural Resources and Biodiversity

This framework aims to ensure sustainable use and conservation of Cambodia's natural resources, including water, land, biodiversity, and ecosystems. Laws under this framework help guide ESCIA processes to minimize environmental degradation.

- **Royal Decree on Protected Areas (2008)** sets the standard for managing Cambodia's protected areas. It categorizes these areas into **National Parks**, **Wildlife Sanctuaries**, **Protected Landscapes**, and **Multiple-Use Areas** to conserve biodiversity, ecosystems, and cultural heritage while supporting sustainable development.
- **Law on Environmental Protection and Natural Resource Management (1996)**: Establishes principles for sustainable development and environmental protection, requiring environmental assessments for projects impacting natural resources.
- **Environmental and Natural Resources Code 2023**: Provides a comprehensive approach to natural resource governance, setting standards for the sustainable management of resources.
- **Law on Land Management, Urban Planning and Construction (1994)**: Governs land use, urban development, and construction to ensure that environmental and social impacts are mitigated.
- **Law on Water Resource Management (2007)**: Regulates water usage, conservation, and management, ensuring that development projects do not negatively impact water resources.
- **Law on Fisheries (2006)**: Focuses on sustainable fisheries management and biodiversity conservation in aquatic ecosystems, crucial for ESCIA in projects affecting water bodies.
- **Protected Areas Law (2008)**: Establishes protected areas to conserve biodiversity and natural resources, ensuring that development projects respect protected regions.
- **Land Law (2001)**: Regulates land ownership and management to promote sustainable land use practices.
- **Sub-Decree on Water Pollution Control (1999)**: Sets standards for water quality and pollution control in development projects.
- **Sub-Decree on Water Quality Standard for Public Waters for the Purpose of Biodiversity Conservation (1999):** These standards aim to maintain conditions suitable

for aquatic ecosystems by limiting pollutants, ensuring water remains safe for the survival and reproduction of aquatic life, and preventing ecological degradation.

- **Sub-Decree on Environmental Impact Assessment (1999)**: Requires EIA for development projects, ensuring environmental impacts are assessed and mitigated.
- **Sub-Decree on Air Pollution Control and Sound Disturbance (2000)**: Provides standards to control air pollution and noise disturbances from development projects.
- **Sub-Decree on Solid Waste Management (1999)**: Governs solid waste management in projects, preventing environmental harm from improper waste disposal.
- **Prakas on Environmental Impact Assessment Reports (1999)**: Offers guidelines for preparing EIA reports to ensure thorough assessment of environmental impacts.
- **Prakas on Hazardous Substances (2015)**: Sets limits on the disposal of toxic substances, preventing environmental contamination from hazardous materials.
- **Biodiversity Convention (1994)**: Focuses on conserving ecosystems, species, and genetic diversity. Promotes sustainable use of resources, establishment of protected areas, and fair benefit-sharing from genetic resources.
- **Ramsar Convention (1999)**: Aims to conserve wetlands of international importance for biodiversity, water management, and climate resilience. Encourages sustainable use and designation of Ramsar sites.
- **UNFCCC (1994)**: Provides a framework to combat climate change impacts on ecosystems. Supports sustainable land use, forest conservation, and integration of climate adaptation into conservation strategies.
- **Kyoto Protocol (1997, entered into force 2005, Cambodia accessed 2002):** Strengthens the UNFCCC by setting legally binding targets for reducing greenhouse gas emissions, promoting sustainable development and renewable energy.
- **Vienna Convention for the Protection of the Ozone Layer (1988, Cambodia accessed 2001):** Aims to protect the ozone layer through global cooperation, encouraging research, monitoring, and measures to phase out harmful substances.
- **Montreal Protocol on Substances that Deplete the Ozone Layer (1987, entered into force 1989, Cambodia accessed 2001):** A legally binding treaty to phase out ozone-depleting substances. Contributes to environmental and climate protection.
- **Basel Convention (1992, Cambodia accessed 2001**): Controls the transboundary movement of hazardous wastes and their disposal, emphasizing waste reduction and environmentally sound management.
- **United Nations Convention to Combat Desertification (1996, Cambodia ratified 1997):** Addresses land degradation and desertification through sustainable land management, conservation of soil and water resources, and restoration of degraded land.

- **CITES (1975, Cambodia ratified 1997):** Regulates trade in endangered species to ensure their survival, focusing on sustainable management and combatting illegal wildlife trade.
- **UNESCO Network of Biosphere Reserves (Cambodia joined in 1997):** Promotes the sustainable management of biodiversity, ecosystems, and cultural heritage through conservation and sustainable development practices.
- **Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs):** Cambodia committed to global goals for environmental sustainability, including biodiversity conservation, climate action, and ecosystem protection.
- **ASEAN Agreement on Transboundary Haze Pollution (2006):** Focuses on preventing and mitigating air pollution caused by forest fires through regional cooperation and sustainable forest management.
- **ASEAN Agreement on Disaster Management and Emergency Response (2009):** Strengthens disaster preparedness, risk reduction, and environmental resilience in the ASEAN region.
- **Mekong Agreement (1995):** Promotes sustainable development, equitable water use, and conservation of the Mekong River Basin’s ecosystems and resources.
- **Biodiversity Law (2009):** This foundational law provides a comprehensive legal structure for the sustainable management of biodiversity resources. It addresses habitat protection, species conservation, genetic resource management, and the sustainable use of biodiversity, outlining the government's responsibilities and promoting public participation.
- **Environmental Protection Law (1995):** This law sets general principles for environmental protection and outlines the government's role in environmental management, including pollution control, waste management, and natural resource conservation. It complements the Biodiversity Law by providing a broader environmental governance framework.
- **Forest Law (1994):** Regulating the management, use, protection, and restoration of Cambodia's forests, this law is crucial for balancing economic development with environmental conservation, particularly in biodiversity-rich ecosystems.
- **Wildlife Sanctuary and Protection Law (1993):** This law establishes wildlife sanctuaries and offers protection to wildlife species by prohibiting hunting, trapping, and other activities that threaten wildlife and their habitats.
- **Fisheries Law (1991):** This law governs the management of Cambodia's fisheries resources, setting rules for sustainable fishing practices, protecting aquatic habitats, and ensuring the long-term health of aquatic ecosystems.
- **Environmental Code (2023):** The newly introduced Environmental Code consolidates and updates Cambodia's environmental laws, introducing stricter regulations on pollution control, natural resource management, and biodiversity conservation. It emphasizes

climate change adaptation and mitigation and enhances public participation and transparency in environmental decision-making.

- **Nagoya Protocol (2010):** As a party to the Nagoya Protocol under the Convention on Biological Diversity (CBD), Cambodia commits to the fair and equitable sharing of benefits arising from the utilization of genetic resources. This protocol supports Cambodia's efforts to protect its biodiversity while ensuring that the benefits of its genetic resources are shared with local communities and stakeholders.

3.1.1.3 Legal Framework related to Labour, Public Well-Being, and Safety

This framework emphasizes the protection of workers' rights, public safety, and well-being in project development. It ensures that development projects comply with labor laws and safety standards.

- **Labor Law (1997)**: Protects workers' rights, ensuring safe and fair working conditions during project implementation.
- **Law on Roads (2014)**: Governs the construction and maintenance of roads, with provisions for minimizing environmental and social impacts.
- **Law on Road Traffic (2014)**: Addresses traffic management and safety measures to prevent accidents and disruptions during development.
- **Law on Suppression of Human Trafficking and Sexual Exploitation (2008)**: Protects vulnerable populations during project implementation from exploitation and trafficking.
- Government Occupational and Community Safety and Health (OHS) guidelines follow the OHS Program for Cambodia (2010-2013) developed by the International Labor Organization (ILO). The draft guidelines provide the framework for instituting OHS at the workplace and in the community.
- The Ministry of Labor and Vocational Training (MLVT) has the following guidelines which will be implemented during the construction phase of the Project:
    - MLVT Prakas on Sanitation at the Construction Site (March 2011). The Prakas sets to ensure that the sanitation and safety conditions are fulfilled for workers at construction sites by owners, directors, contractors or subcontractors of construction establishments or construction companies. Articles 3 and 4 ensure that workers are provided with shelter, sanitation facilities and safe potable water for drinking and washing.
    - MLVT Prakas on The Protection of Risk Resulting from Climate Change at Construction Sites (March 2011). Articles of this Prakas require safety measures and break times for workers at the construction site during extreme weather events.
    - MLVT Prakas on Providing of Information at the Construction Site (March 2011). This Prakas states requirements for owners or responsible persons of a construction site to provide information, i.e. name and address of the owner of enterprise, construction establishment, Construction Company, name and address of architect, nature of

construction, date for the start of the construction, estimated time to finish the construction works, and estimated number of workers to be employed for construction activities.

- MLVT Prakas on Stock of Materials, Waste Disposal and Clearance at Construction Site (March 2011). This Prakas provides safety guidelines and requirements for the safe storage of construction of materials and waste.

3.1.1.4 Legal Framework related to Governance and Social Inclusion

This framework ensures that development projects promote inclusive governance, respect cultural heritage, and safeguard social rights. It includes provisions for tax obligations, land acquisition, resettlement, and social protection schemes.

- **Law on Taxation (1997)**: Governs the taxation of development projects, ensuring they contribute to national revenue and economic sustainability.
- **Sub-Decree on Construction Permit (1993)**: Requires permits for construction activities, ensuring they comply with environmental standards and social safeguards.
- **Law on Protection of the Rights of Persons with Disabilities (2009)**: Ensures that development projects consider the needs and rights of people with disabilities.
- **Law on Social Security Schemes (2002)**: Provides social protection for workers, ensuring their well-being during project execution.
- **Sub-Decree on Health Care Scheme (2016)**: Extends social security and health care protection to workers involved in development projects.
- **Law on the Protection of Cultural Heritage (1996)**: Safeguards cultural heritage sites, ensuring that development projects do not damage or destroy culturally significant areas.
- **Expropriation Law (2010)**: Regulates land acquisition for public purposes, ensuring fair compensation and minimizing the impact on affected populations.
- **Sub-Decree on Land Acquisition and Resettlement (2018)**: Provides procedures for land acquisition and involuntary resettlement, particularly for externally financed projects.
- **Sub-Decree on Social Land Concession (2003)**: Allows for the allocation of state land to landless citizens, particularly when development projects displace communities.
- **Sub-Decree on State Land Management (2005)**: Regulates the management of state land, ensuring its sustainable use in development.
- **Sub-Decree on River Basin Management (2015)**: Promotes sustainable management of river basins, ensuring that development projects do not harm water systems and dependent ecosystems.

3.2 EIA Classification

In order to provide guidelines on effective implementation of sub-decree No 72 ANRK.BK on environmental impact assessment Procedures for development projects, MoE promulgated sub-decree No. 21 on Environmental Impact Assessment Classification for Development Projects.

According to this sub-decree, environmental impact assessment for projects is classified into three categories.

- Appendix 1: Projects requiring full environmental impact assessment (full ESIA)
- Appendix 2: Projects that require initial environmental impact assessment (IEIA)
- Appendix 3: Projects requiring the Contract on Environmental Protection (EPC)

The sub-decree includes an annex listing projects under various sectors and their categorization on the basis of their nature, type and size. The sector and EIA classification for irrigation project is summarized in Table 11 below.

Table 16: ESIA Classification for Development Projects relevant

No	Project Type	ESIA (Equiv. to ADB's A)	ESIA (Equiv. to ADB's B)	Env. Protection Contract	Apply to CAISAR Project
1	Irrigation systems		≥5000ha	1000-5000ha	√
2	Water diversion systems		≥5000ha	1000-5000ha	√
3	All building construction	>45000m2	15000 – 45000m2	3000-15000m2	
4	Road construction (new)	>100km	≥ 30 – 100km	10-<30km	√
5	Railroad and road expansion	>100km	≥50 – 100km	10-<50km	√
6	Road in protected areas	>30km	≥ 10-30 Km	10km	
7	Road widens or rehabilitation in protected area	>50km	≥ 10-50 km	10km	

Source: Prakas No. 021 PRK.BST dated 03 February 2020.

3.3 Applicable Ambient Quality Standards

3.3.1 Water quality standards for public health protection

Water quality standards in public water areas for biodiversity conservation are shown in Table 12 below. These are applied as the national standards on surface water quality.

Table 17: Water quality standards in public water areas for bio-diversity conservation

No	Parameter	Unit	Surface water Standard	
			River	Lake etc

1	pH	mg/l	6.5-8.5	6.5-8.5
2	Total suspended solids (TSS	mg/l	25-100	1-15
3	Dissolved oxygen (DO)	mg/l	7.5-2.0	7.5-2.0
4	Biochemical oxygen demand (BOD5)	mg/l	1-10	<30
5	Chemical oxygen demand (COD)	mg/l	<50	1-8
6	Total Nitrate (TN)	mg/l	0.1-0.6	0.1-0.6
7	Total phosphorous (TP)	mg/l	0.005-0.05	0.005-0.05
8	Arsenic (As)	mg/l	<0.01	<0.01
9	Iron (Fe)	mg/l	<1	<1
10	Total Coliform	MPN/100ml	<5,000	<1,000

Note: Standard* = Surface water quality standards for lake, reservoirs and river of the MoE's Prakas on the adoption of terms of references for infrastructure and tourism sectors (2018).

The Royal Government of Cambodia has established a comprehensive policy on National Water Supply and Sanitation for both urban and rural water supplies. Based on this policy, and to ensure access to safe drinking water to all people, quality standards for both drinking water and groundwater are developed by an inter-ministerial process initiated by the Ministry of Industry, the Mines and Energy, and other concerned ministries with support from the World Health Organization.

Table 18: Groundwater and Drinking Water Quality Standards.

No.	**Parameters**	**Unit**	**Standard**		
			River	**Lake and reservoir**	**CDWQS***
1	Depth				
2	pH	-	6.5-8.5	6.5-8.5	6.5-8.8
3	Electrode Conductivity (EC)	mg/l	500-1500	500-1500	-
4	Arsenic (AS)	mg/l	<0.01	<0.01	0.05
5	Cadmium (Cd)	mg/l	<0.003	<0.003	<0.003
6	Lead (Pb)	mg/l	<0.01	<0.01	0.01
7	Total Nitrogen (TN)	mg/l	<3	<2	-
8	Total Phosphorus (TP)	mg/l	<0.25	<0.15	-
9	Total Dissolved Solid (TDS)	mg/l	<1000	<1000	<800
10	Total Suspended Solid (TSS)	mg/l	<100	<100	-
11	Dissolved Oxygen (DO)	mg/l	>3	>4	-
12	Total Coliform	MPN/100ml	<1000	<1000	0

*. Cambodia Drinking Water Quality Standard

Ambient Air Quality Standards are presented in Table 14. Maximum permitted noise levels in public and residential areas are shown in Table 14.

Table 18. Ambient Air Quality Standards.

Parameters	Cambodia				WHO Air Quality Guideline 2021
	Period 1h Average mg/m^3	**Period 8h Average mg/m^3**	**Period 24h Average mg/m^3**	**Period 1year Average mg/m^3**	
Carbon monoxide (CO)	40	20	-	-	4mg/m^3 (24h Average)
Nitrogen dioxide (NO2)	0.3	-	0.1	-	10 ug/m^3(1 year average) 25 ug/ m^3 (24h average)
Sulfur dioxide (SO2)	0.5	-	0.3	0.1	40 ug/ m^3 (24 h average)
Ozone (O3)	0.2	-	-	-	100 ug/ m^3 (8h average)
Lead (Pb)	-	-	0.005	-	-
Particulates	-	-	0.33	0.1	5 ug/m^3 (PM2.5, 1year) 15 ug/m^3 (PM2.5, 24h average)

Note: 1. Sub-decree N0 42 ANRK.BK on Air Pollution Control and Noise Disturbance. Source: https://www.who.int/news-room/feature-stories/detail/what-are-the-who-air-quality-guidelines.

Table 19. Maximum permitted noise levels in public and residential areas (dB (A))

Location	Cambodia Standard			IFC-EHS Guideline	
	06:00 to 18:00	**18:00 to 22:00**	**22 to 6:00**	**Day 7:00 to 22:00**	**22:00 to 7:00**
Silence Area Hospital; Library, School, Nursery	45	40	35	55	45
Resident Area Hotel; Administration place, House	60	50	45	-	-
Commercial, Services Areas and mix	70	65	50	70	70
Small Industrial factories intermingling in residential areas	75	70	50		

Note: This is permitted noise level of any source of activity at the public and residential areas. Source: Sub-Decree on Air Pollution Control and Noise Disturbance, 2000.

3.4 AIIB'S Environmental and Social Framework (ESF)

The Asian Infrastructure Investment Bank's (AIIB) Environmental and Social Framework (ESF) (2022) outlines the principles and standards to ensure environmentally and socially sustainable development practices for projects it finances. The framework consists of several Environmental and Social Standards (ESS) that provide comprehensive guidance on managing potential impacts and risks associated with AIIB-financed projects. AIIB's Environmental and Social Framework (ESF) (2022) are summarised here.

- **Environmental and Social Standard 1: Environmental and Social Assessment and Management**: These standard guides the assessment and management of environmental and social risks, requiring projects to evaluate alternatives, mitigate impacts, and disclose information. It emphasizes protecting the natural environment, particularly biodiversity and critical habitats, while addressing pollution, resource efficiency, and climate change. Social risks, including impacts on vulnerable groups, gender, and access to resources, must be considered. The standard also covers labor conditions, community health and safety, child labor, and security, ensuring proper grievance mechanisms, monitoring, and implementation plans.
- **Environmental and Social Standard 2: Land Acquisition and Involuntary Resettlement.** The standard provides guidance to avoid Involuntary Resettlement where possible. The requirements under the standard contain 18 points of action to which the executing agency needs to follow.
- **Environmental and Social Standard 3: Indigenous Peoples.** The standard aims to design and carry out projects in a way that fully respects Indigenous Peoples' identity, dignity, human rights, economies, and cultures. This ensures that Indigenous Peoples: (a) receive social and economic benefits that are culturally appropriate; (b) do not experience negative impacts from the projects; and (c) can actively participate in projects that affect them. The standard contains 15 points to follow.

3.5 IFADs' SECAP

The International Fund for Agricultural Development's (IFAD) Social, Environmental, and Climate Assessment Procedures (SECAP) provides a framework to ensure that IFAD-financed projects are sustainable, socially inclusive, and environmentally sound. SECAP is composed of several standards that address various environmental and social considerations. Listed in the ToR, here is the summary of the applied standards:

- **Standard 1: Biodiversity Conservation**: This standard ensures the protection of biodiversity by requiring projects to assess and mitigate biodiversity risks, avoid critical habitats, and provide compensation for unavoidable damages. It promotes sustainable use of genetic resources, discourages invasive species, and emphasizes expert advice and adherence to protected area laws.

- **Standard 2: Resource Efficiency and Pollution Prevention**: Focuses on efficient use of resources and pollution control. It requires projects to reduce energy, water, and material use, manage hazardous materials safely, and prevent pollution, with an emphasis on sustainable natural resource management, including water, soil, fisheries, and forests.
- **Standard 3: Cultural Heritage**: This standard ensures the protection of tangible and intangible cultural heritage by screening and managing impacts, consulting local communities, and preserving access to cultural sites. Projects must avoid, minimize, or mitigate damage and follow legal requirements in protected areas.
- **Standard 4: Indigenous Peoples**: Supports and empowers indigenous communities by requiring free, prior, and informed consent (FPIC), promoting equitable resource access, and protecting cultural heritage. Projects must involve indigenous peoples in decision-making, ensure fair benefits, and avoid involuntary resettlement.
- **Standard 5: Labor and Working Conditions**: Sets requirements for safe, non-discriminatory workplaces, prohibiting forced and child labor. It requires the establishment of grievance mechanisms, safety protocols, and equal opportunities, with contractors and suppliers adhering to these standards.
- **Standard 6: Community Health and Safety**: Requires projects to assess and manage health risks, prevent exposure to hazards, and ensure infrastructure safety. It includes emergency preparedness, traffic and security management, and protection against gender-based violence.
- **Standard 7: Physical and Economic Resettlement**: Ensures resettlement is conducted legally and fairly, avoiding forced evictions. It requires special consideration for vulnerable groups, economic displacement, and establishing grievance mechanisms for affected communities.
- **Standard 9: Climate Change**: Ensures projects address climate risks and reduce GHG emissions. It mandates climate risk screening, adoption of climate-smart practices, and GHG accounting to guide project design towards reducing environmental impacts.

3.6 GEF'S Environmental and Social Policies

GEF adopts the interim environmental and social safeguards to identify, measure, and mitigate environmental and social risks based on IFC Performance Standards (PS). Under CAISAR, the following PSs are applied:

- Performance Standard 1 – Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2 – Labor and Working Conditions
- Performance Standard 3 – Resource Efficiency and Pollution Prevention

- Performance Standard 4 – Community Health, Safety, and Security
- Performance Standard 5 – Land Acquisition and Involuntary Resettlement
- Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7 – Indigenous Peoples
- Performance Standard 8 – Cultural Heritage.

3.6.1 International Conventions and Treaties

Cambodia has ratified all eight of the ILO's fundamental conventions, which cover core labour standards recognized as human rights. These conventions focus on issues such as freedom of association, elimination of forced labour, abolition of child labour, and elimination of discrimination in employment.

- **Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)**: Ratified by Cambodia in 1999, this convention protects workers' and employers' rights to freely form and join organizations without interference, ensuring autonomy and safeguarding against dissolution by authorities.
- **Right to Organise and Collective Bargaining Convention, 1949 (No. 98)**: Ratified in 1999, it protects workers' rights to organize, engage in collective bargaining, and prevents discrimination for union activities, promoting fair wage negotiations and just working conditions.
- **Forced Labour Convention, 1930 (No. 29)**: Ratified in 1969, this convention aims to eliminate all forms of forced labour, including coercive work for public works or political purposes, protecting workers' rights and dignity.
- **Abolition of Forced Labour Convention, 1957 (No. 105)**: Ratified in 1999, it strengthens the prohibition of forced labour for political coercion, discipline, or discrimination, ensuring freedom and justice in the workplace.
- **Minimum Age Convention, 1973 (No. 138)**: Ratified in 1999, it sets a minimum age for employment (usually 15) to prevent child labour, promoting access to education and protection from hazardous work.
- **Worst Forms of Child Labour Convention, 1999 (No. 182)**: Ratified in 2006, this convention seeks to eliminate extreme forms of child labour like slavery, trafficking, and hazardous work, prioritizing children's safety and rehabilitation.
- **Equal Remuneration Convention, 1951 (No. 100)**: Ratified in 1999, it promotes equal pay for men and women for work of equal value, combating gender-based wage discrimination and fostering economic justice.
- **Discrimination (Employment and Occupation) Convention, 1958 (No. 111)**: Ratified in 1999, this convention addresses workplace discrimination based on race, gender, religion, and other factors, promoting equal treatment and opportunities for all workers.

- **Employment Policy Convention, 1964 (No. 122)**: Ratified in 1971, it requires active employment policies to promote full, freely chosen employment, aiming to reduce unemployment and support economic and social development.
- **Weekly Rest (Industry) Convention, 1921 (No. 14)**: Ratified in 1969, this convention guarantees a weekly rest period of at least 24 consecutive hours for workers, helping protect their health and well-being.
- **Labour Inspection Convention, 1947 (No. 81)**: Ratified by Cambodia in 1974, this convention establishes labour inspections in industrial and commercial workplaces to ensure compliance with national labour laws, promoting safe, fair, and decent working conditions.
- **Labour Inspection (Agriculture) Convention, 1969 (No. 129)**: Ratified in 1999, it extends labour inspection to agriculture, ensuring workers in this sector, including migrant and seasonal labourers, are protected by labour laws and safe working conditions are maintained.
- **Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)**: Ratified by Cambodia in 2009, this convention promotes consultation between governments, employers, and workers on international labour standards. It ensures that all stakeholders are involved in the implementation of labour policies, enhancing social dialogue and cooperation for fair labour practices.

3.7 Good International Industry Practices (GIIP)

3.7.1 WBG General EHS Guidelines (2007)

The World Bank Group (WBG) General Environmental, Health, and Safety (EHS) Guidelines (2007) provide internationally recognized technical guidance on managing environmental, health, and safety risks. These guidelines are designed to support project developers and operators, particularly in emerging markets, by outlining best practices for environmental sustainability, worker health and safety, and community well-being.

Key sections include:

- **Environmental Guidelines:** Focus on pollution prevention and control, resource efficiency, and managing air, water, and soil impacts.
- **Occupational Health and Safety (OHS):** Address workplace hazards, accident prevention, and worker welfare.
- **Community Health and Safety:** Cover topics like traffic safety, emergency preparedness, and protecting communities from project-related risks.
- **Construction and Decommissioning:** Provide guidance on managing risks during the life cycle of a project.

The guidelines emphasize compliance with local regulations and international standards and are intended to be applied alongside sector-specific EHS guidelines.

3.7.2 WBG EHS Guidelines for Annual Crop Production (2016)

The World Bank Group (WBG) Environmental, Health, and Safety (EHS) Guidelines for Annual Crop Production (2016) provide technical guidance on sustainable practices for cultivating annual crops, such as grains, legumes, and vegetables. These guidelines aim to minimize environmental impacts, ensure worker safety, and promote efficient resource use.

Key focus areas include:

- **Environmental Management:** Guidance on soil conservation, water use efficiency, pest management, and biodiversity preservation.
- **Occupational Health and Safety (OHS):** Measures to prevent injuries, promote safe pesticide handling, and protect workers from physical and chemical hazards.
- **Community Health and Safety:** Recommendations to prevent risks like pesticide drift, water contamination, and traffic safety concerns related to agricultural operations.
- **Sustainable Practices:** Emphasis on integrated pest management (IPM), crop rotation, and efficient irrigation techniques to maintain productivity and environmental health.

These guidelines align with international standards and are designed to support sustainable agricultural development.

3.8 Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF

The study and analysis of the national legal framework against the requirements under the policies of AIIB, IFAD and GCF can be summarised as Table 5.

Overall, the Royal Government of Cambodia (RGC) has established various legal documents ranging from royal decrees, sub-decrees, and circulars framing the management, and implementation of all types of development projects and activities within the country at the pre-construction, construction and implementation periods. The laws cover the management and protection of the natural resources, and biodiversity including underground, inland and water bodies. These legal frameworks also contain the standards that are applicable to the country context including water quality, soil quality, air, noise quality and vibration. Regarding human well-being including health, safety, labour and sexual exploitation, the country has made significant progress over the past years promoting the working environment of workers and labour forces embracing various laws and policies for ensuring the well-being of workers as well as the compliances that employers must comply. Laws to protect sexual exploitation, and social protection guarded the public, especially the vulnerable including the poor, and people with disability. Although the country's legal frameworks cover the requirements, there are still limited report in terms of actual enforcement which need to be taken care where a proper implementation plan and resources are needed.

Table 20: Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
1	ESS1		PS1	Environmental and Social Assessment and Management	• Environmental Code and Natural Resource Management (2023), • Law on Water Resource Management (2007), • Law on fisheries (2026), • Sub-Decree on Water Pollution Control (1999), • Sub-Decree on Environmental Impact Assessment (1999), • Sub-Decree on Air Pollution Control and Sound Disturbance (2000), • Sub-Decree on Solid Waste Management (1999), • Prakas on the General Guideline for Preparing the Initial and Full Environmental Impact Assessment Reports (1999), • Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed (2015)	The RGC has established a wide range of regulations especially in the recent Environmental Code and Natural Resource Management (2023) that aim to environmental protection and natural resource management are well aligned to the provisions of the AIIB ESS1.	This ESCIA covers both direct, indirect, and cumulative impacts and mitigation measures, taking a holistic approach to the project and looking at impacts in an integrated way.
2	ESS2	S7	PS5	Land Acquisition and Involuntary Resettlement	• Law on Land Management, Urban Planning and Construction (1994), • Land Law (2001), • The Expropriation Law (2010), • RGC's Sub-Decree No. 22 ANK/BK (2018) on the Promulgation of the Standard Operating Procedures for Land Acquisition and Involuntary Resettlement (SOP-LAR) for Externally Financed Projects in Cambodia, • Sub-Decree No.19 on Social Land Concession of March 2003, • RGC's Sub-Decree No.118 ANK/BK (2005) on State Land Management, • RGC's Sub-Decree No.98 ANK/BK (2015) on River Basin Management	The RGC has the SOP-LAR which is well aligned with the provisions in the AIIB ESS 2. The AIIB ESS 2 on land acquisition and involuntary resettlement recognizes that project related land acquisition and land use can have impacts on communities. The RGC's SOP-LAR is consistent with the specific requirements under the AIIB ESS 2 on consultation, grievance redress, social support, resettlement assistance, standard of living of poor and vulnerable, entitlements for persons without title or legal rights except for land, information disclosure, payment of compensation and entitlements prior to	According the RGC's SOP-LAR, an income restoration program would be provided in order to re-estalbish sources of livelihoods for those affected households who have permanently lost their sources of livelihood. In this CAISAR project, the DRPs will include provisions to ensure livelihood restoration program are robust and can accurately meet the aim of livelihood restoration in line the AIIB ESS2.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
						physical displacement, and the supervision and monitoring of implementation of resettlement plans. However, there are gaps on negotiated settlement and livelihood restoration. The SOP-LAR does not describe procedures for negotiated settlement and lack of clear benchmark to assist monitoring and evaluation to confirm if the affected households restore their livelihood to the level prevailing prior to the beginning of the project implementation.	
3	ESS3	S4	PS7	Indigenous Peoples	• The Constitution of Cambodia (1993) • Land Law (2001)	No detailed regulations on how to avoid impacts to Indigenous Peoples or how to include them in project benefits. Lack of requirement to consult IP(s) in a manner that is culturally appropriate and special disclosure and consultation requirements as described in the AIIB ESS3.	An IPPF has been prepared on the basis of the AIIB ESS3. The IPPF details procedures on the preparation of IPP(s) and how to conduct meaningful consultation and disclose that is culturally appropriate.
4	ESS1	S1	PS6	Biodiversity conservation	• Environmental Code and Natural Resource Management (2023),	The code requires a proper consideration of biodiversity resources and payment of ecosystem services which support the conservation process. There is limited guidance on how to compensate in the ecosystem services once its pristine condition is affected.	This ESCIA include the biodiversity assessment and management plan.
5	ESS1	S2	PS3	Resource efficiency and pollution prevention	• Environmental Code and Natural Resource Management (2023), • Sub-Decree on Environmental Impact Assessment (1999), • Sub-Decree on Air Pollution Control and Sound Disturbance (2000),	The RGC has in place a set of separate provision and requirements for pollution prevention and management that are well align with the AIIB ESS 1 that aims to promote the sustainable use of	This ESCIA has included all relevant national laws and regulation as well as the requirement for AIIB ESS1.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
					• Sub-Decree on Solid Waste Management (1999), • Prakas on the General Guideline for Preparing the Initial and Full Environmental Impact Assessment Reports (1999), • Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed (2015)	resources and avoid or minimize the pollution from sources/project activities.	
6	ESS1	S3	PS8	Cultural heritage	• Environmental Code and Natural Resource Management (2023), • Law on the Protection of Cultural Heritage (1996)	The RGC has in place the law on protection of cultural heritage aligns with the requirement of the AIIB ESS1. However, there is lack of detail procedures for protection of the intangible cultural heritage.	This ESCIA provided details procedures and requirement to protect both tangible and intangible cultural heritage through Chance Find Procedure (Annex xx).
7	ESS1	S5	PS2	Labor and working conditions	• Labor Law (1997), • Law on Taxation (1997), • Sub-Decree on Construction Permit (1993), • Law on Social Security Schemes for Persons defined by the Provision of the Labor Law (2002), • Sub-Decree on Establishment of Social Security Scheme "Health Care Scheme" for Persons Defined by the Provisions of the Labor Law (2016)	The RGC has in place a set of law and regulations on labour and working conditions which is consistent with the requirement of the AIIB ESS1. However, the enforcement of these law and regulation is still limited. For example, regulation against forced labor and using child labor are not strictly enforced.	The ESCIA provides provisions to monitor compliance by contractor and of their primary suppliers in bidding documents and supervision contracts in order to prohibit using forced labour and child labour.
8	ESS1	S6	PS4	Community health and safety	• Law on Road Traffic (2014), • The Law on Suppression of Human Trafficking and Sexual Exploitation 2008, • Law on the Protection and the Promotion of the Rights of Persons with Disabilities 2009,	The RGC has established Labor Law the protect the health and safety of the workers. However, the concern and mitigation are more on individual rather than community as a whole. The AIIB ESS1 aims on protection of both individual and community for health and safety.	The ESCIA provides provisions to monitor compliance by contractor on community and health safety in bidding documents and supervision contracts. The requirement on raising awareness to local community on health and safety are also included in the bidding documents.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
9	ESS1	S9	PS1	Climate change	• Environmental Code and Natural Resource Management 2023	The newly adopted code requires all relevant sectors to integrate climate resilient concepts into their strategic action plan along with different measures to tackle the issues. No gap being identified.	

4. Project Area of Influence

Under CAISAR, since project design is still ongoing, area of influence is anticipated based on: a) target command area of each scheme (where most proposed project activities will take place during project construction, and later during project operation), and b) the environmental footprint that are likely caused by project activities during project construction (as direct and indirect impacts due to activities under Component 2), and by project activities (mainly cumulative impacts due to intenstified crop production activities under component 1).

These above anticipated areas of influence need to be updated when more information becomes available to allow a more reliable assessment, particularly when project detailed design is completed, and construction measures proposed by construction constractors are identified. Future update on area of influence (at respective sub-scheme) will be made on the basis of updated environmental and social assessments once a) locations of construction sites, auxiliary facilities (such as borrow pits), and logistics operations are confirmed, and b) the full scope of the project's impacts (direct, indirect, and cumulative) is firmed up based on detailed engineering design (for Component 2) and project implementation approach (for Component 1).

It is noted that while direct and indirect impacts could be reasonably anticipated based on currently proposed scope of works and prior experience for similar works, cumulative impacts, particularly their spatial extent and severity (over the time) require collection of supporting scientific evidence from data collected under project's environmental and social monitoring program.

4.1 Description of Key Components that Potentially Cause the Influential Impact

4.1.1 Air, Noise and Vibration

The area of influence for air quality, noise, and vibration during the construction and rehabilitation of irrigation systems extends beyond the construction site, affecting nearby communities and the environment. Dust, emissions from machinery, and material handling can temporarily increase particulate matter and pollutants in the air. Noise from heavy equipment may disturb residents and wildlife, while vibrations from activities like dredging and excavation can affect nearby structures, potentially causing discomfort or minor damage. These impacts, though short-term, typically extend up to 100 meters from the site, with heavier activities affecting a larger area. Post-construction, greenhouse gas emissions from farming activities could have minimal long-term impacts at a global scale. Each of the sub-scheme the area of influence include:

- Surrounding the sites of the rehabilitated/dredged rivers/stream
- Surrounding the rehabilitated main and tertiary canals, and
- Surrounding the rehabilitated/upgraded structure
- Along the road used for transporting materials by the construction activities

These effects occur only during the construction period while the emission of greenhouse gas emission from farming activities. The following are maps indicating the area of influence at each sub-scheme.

4.1.2 Water Quality

The construction and operation of irrigation systems can significantly impact water quality, both in terms of surface water and groundwater.

Construction Phase:

- **Surface Water:** During the construction phase, sedimentation due to excavation, dredging, and earthworks is a primary cause of water quality degradation. Loose soil can be washed into nearby water bodies, increasing turbidity, reducing light penetration, and altering the aquatic habitat. Additionally, the use of machinery and equipment introduces risks of oil spills, fuel leaks, and chemical contamination, which can enter water sources through surface runoff, affecting aquatic life and water usability downstream.
- **Groundwater:** Construction activities, such as drilling and excavation, can disrupt the soil and rock layers, potentially allowing contaminants from surface activities, such as chemicals, to infiltrate groundwater. Chemical spills or leaching from construction materials can further degrade groundwater quality. Additionally, the disruption of natural flow patterns in the subsurface may allow pollutants to spread more easily, threatening water quality over a wide area.

Operation Phase:

- **Surface Water:** Once the irrigation system is in operation, water quality can be affected by the increased use of fertilizers and pesticides in the command areas. Runoff from agricultural fields may carry these chemicals into nearby rivers, streams, and lakes, causing nutrient pollution, algal blooms, and eutrophication, which can lead to oxygen depletion and harm aquatic ecosystems. Over-irrigation can also lead to increased runoff, carrying sediments and pollutants into surface water bodies.
- **Groundwater:** The operation of irrigation systems may result in groundwater contamination, particularly through leaching of agricultural chemicals such as nitrates and phosphates. Excessive irrigation can cause these chemicals to infiltrate the soil and reach groundwater aquifers, leading to long-term contamination. Furthermore, changes in water table levels due to extensive irrigation can alter the flow patterns of groundwater, potentially mobilizing contaminants that would otherwise remain contained.

In both phases, the key impacts on water quality include contamination of water resources with sediments, nutrients, chemicals, and reduced ecosystem health in the affected water bodies. These impacts can lead to long-term environmental damage and human health effects downstream along Stung Krang Ponley due the reduction of the availability of clean water for agricultural, and domestic uses.

4.1.3 Soil Quality

The area of influence for soil quality during the construction and operation of irrigation systems extends well beyond the immediate project site, affecting surrounding agricultural land, natural habitats, and downstream regions impacted by runoff and water movement. In both phases, the area of influence extends beyond the construction site, impacting nearby agricultural land, natural habitats, and drainage systems. Proper management is essential to minimize long-term soil degradation across the broader irrigation zone.

Construction Phase:

- **Soil Erosion:** The area of influence for soil erosion encompasses not just the construction site but also adjacent areas, as excavation, grading, and vegetation removal expose large sections of land to wind and water erosion. This can lead to topsoil loss, affecting soil fertility on-site and causing sedimentation in nearby fields and water bodies.
- **Soil Compaction:** The influence of soil compaction extends several meters beyond the worksites, particularly where heavy machinery is used for construction or access. Compacted soil reduces water infiltration and root penetration, impacting surrounding agricultural land and natural ecosystems.
- **Soil Contamination:** While soil contamination from fuel spills and construction debris is often localized, it can spread through surface runoff during rainfall or irrigation, affecting nearby fields and watercourses, potentially degrading soil quality in those areas.

Operation Phase:

- **Salinization:** The area of influence for soil salinization covers the entire irrigated zone. Poor drainage and excessive irrigation can lead to salt buildup, particularly in low-lying areas, reducing soil productivity across large sections of the command area.
- **Nutrient Imbalance:** Nutrient leaching or accumulation affects the entire irrigated region and nearby fields. Over-irrigation can cause essential nutrients to wash away, while poor management of fertilizers can lead to nutrient buildup, creating imbalances that degrade soil quality.
- **Waterlogging:** The impact of waterlogging is concentrated in the irrigated fields but can extend to neighboring areas due to the movement of water through the soil layers. Prolonged waterlogging reduces soil aeration and affects soil structure, ultimately diminishing productivity.

4.1.4 Biodiversity

Potential areas of influence might include:

- **Downstream areas:** The lower reaches of the Stoeung Krang Ponley River and the Tonle Sap Lake, which may be affected by water quality, sediment loads, and fish migration from Krapeu Trom.
- **Upstream areas:** The upper reaches of the Stoeung Krang Ponley River and its tributaries, which may be influenced by water flow regulation and sediment transport from Krapeu Trom.

- **Adjacent ecosystems:** Forests, wetlands, and agricultural areas that are connected to Krapeu Trom through hydrological or ecological processes.

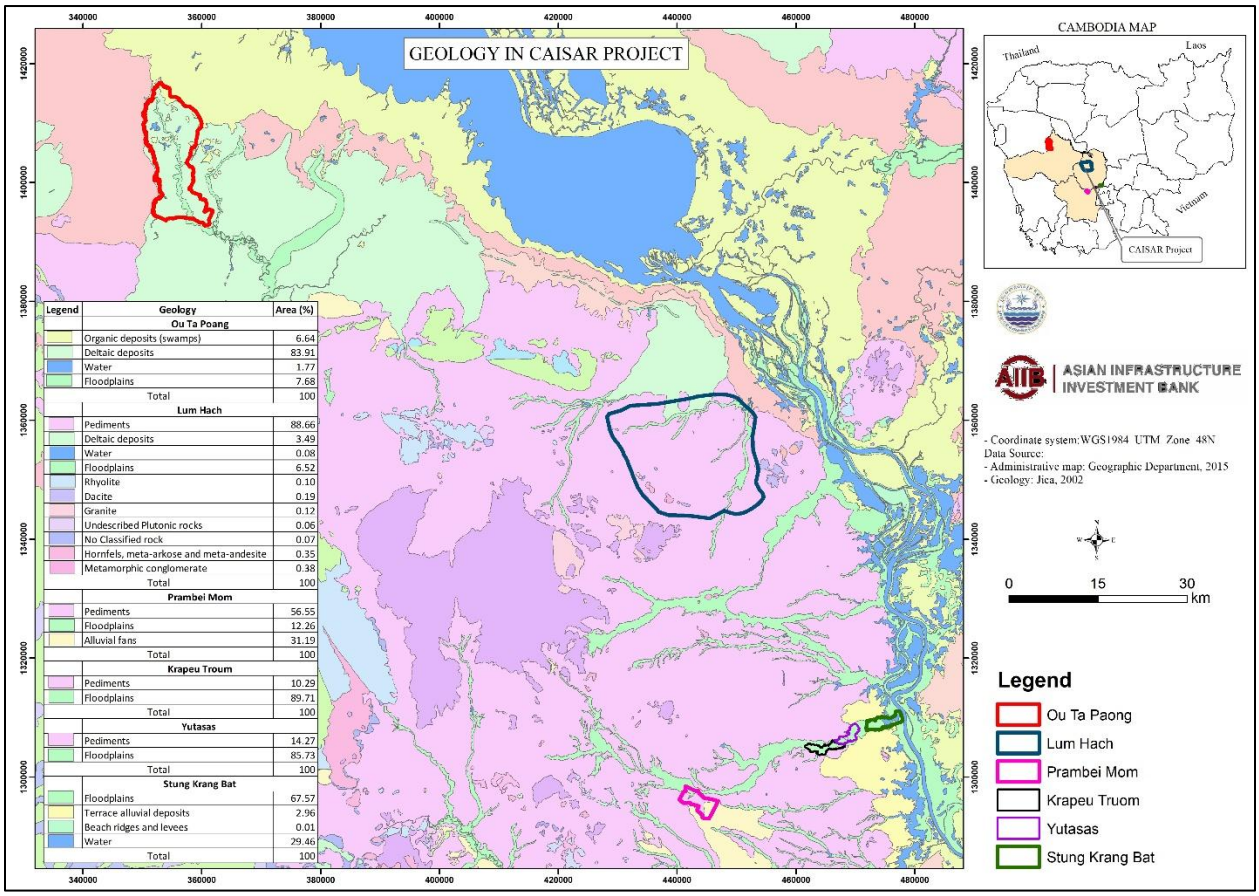
5. BASELINE CONDITIONS

5.1 Physical Conditions and Environmental Condition

5.1.1 Geological Conditions

The geology of Krapeu Troum is overwhelmingly characterized by floodplains, which cover 89.71% of the area, indicating that the region is highly influenced by periodic flooding, likely contributing to fertile soils for agricultural use. Pediments, which account for the remaining 10.29%, suggest some areas of more stable and eroded rock formations.

Figure 4: Geological Map of the sub-schemes



Legend	Geology	Area (%)
	Ou Ta Poang	
	Organic deposits (swamps)	6.64
	Deltaic deposits	83.91
	Water	1.77
	Floodplains	7.68
	Total	100
	Lum Hach	
	Pediments	88.66
	Deltaic deposits	3.49
	Water	0.08
	Floodplains	6.52
	Rhyolite	0.10
	Dacite	0.19
	Granite	0.12
	Undescribed Plutonic rocks	0.06
	No Classified rock	0.07
	Hornfels, meta-arkose and meta-andesite	0.35
	Metamorphic conglomerate	0.38
	Total	100
	Prambei Mom	
	Pediments	56.55
	Floodplains	12.26
	Alluvial fans	31.19
	Total	100
	Krapeu Troum	
	Pediments	10.29
	Floodplains	89.71
	Total	100
	Yutasas	
	Pediments	14.27
	Floodplains	85.73
	Total	100
	Stung Krang Bat	
	Floodplains	67.57
	Terrace alluvial deposits	2.96
	Beach ridges and levees	0.01
	Water	29.46
	Total	100

(Source: ESCIA Study 2024)

5.1.2 Topography

The sub-scheme, with an elevation of less than 40 meters, has a predominantly flat topography. This low-lying region is dominated by floodplains, reflecting its susceptibility to seasonal flooding and water accumulation. The low elevation also suggests proximity to rivers, lakes, or coastal areas where

sediment deposition has shaped the landscape. The flat terrain at this low elevation is likely ideal for wetland ecosystems or agriculture but may require careful water management.

5.1.3 Land Cover and Water Use

The land cover across all four sub-schemes is predominantly rice fields, with only a limited presence of bushes along streams, rivers, and the edges of the rice fields. Sharing the same water sources, farmers in this irrigation system face several key challenges, including water shortages during the dry season, limited market access, pest infestations, and conflicts arising from water scarcity. These issues are primarily driven by the lack of reliable water sources and the impacts of climate change, which have extended the duration of dry seasons. During the dry season, the canal frequently lacks sufficient water, and if there is no rainfall at the start of the wet season, the canal remains dry. Additionally, inefficient irrigation management results in water losses, while extreme heat negatively affects market conditions.

One of the most critical concerns is the water shortage during the rice reproductive stage, as there is no consistent water supply to the fields, leading to significant crop damage. Farmers are often forced to wait for water, which only reaches them after upstream farmers have secured an adequate supply. The Water User Community is responsible for managing the irrigation system, but the current canal infrastructure presents challenges, as the canals are shallow and can only store a limited amount of water. During the dry season, the canals frequently run dry, forcing villagers to take turns pumping water, a process that is both time-consuming and inefficient.

5.1.4 Soil Types

Dr. Crocker travelled across Cambodia to create a map, with a scale of 1 to 1,000,000 and it was publicly published by the Ministry of Agriculture in 1963 (Crocker, Charles D, 1962). The soil of Cambodia is classified into 16 types according to the soil taxonomy of the Ministry of Agriculture, the United States of America. Table below is the detailed information on 16 types of soil in Cambodia (please see in table 6.11).

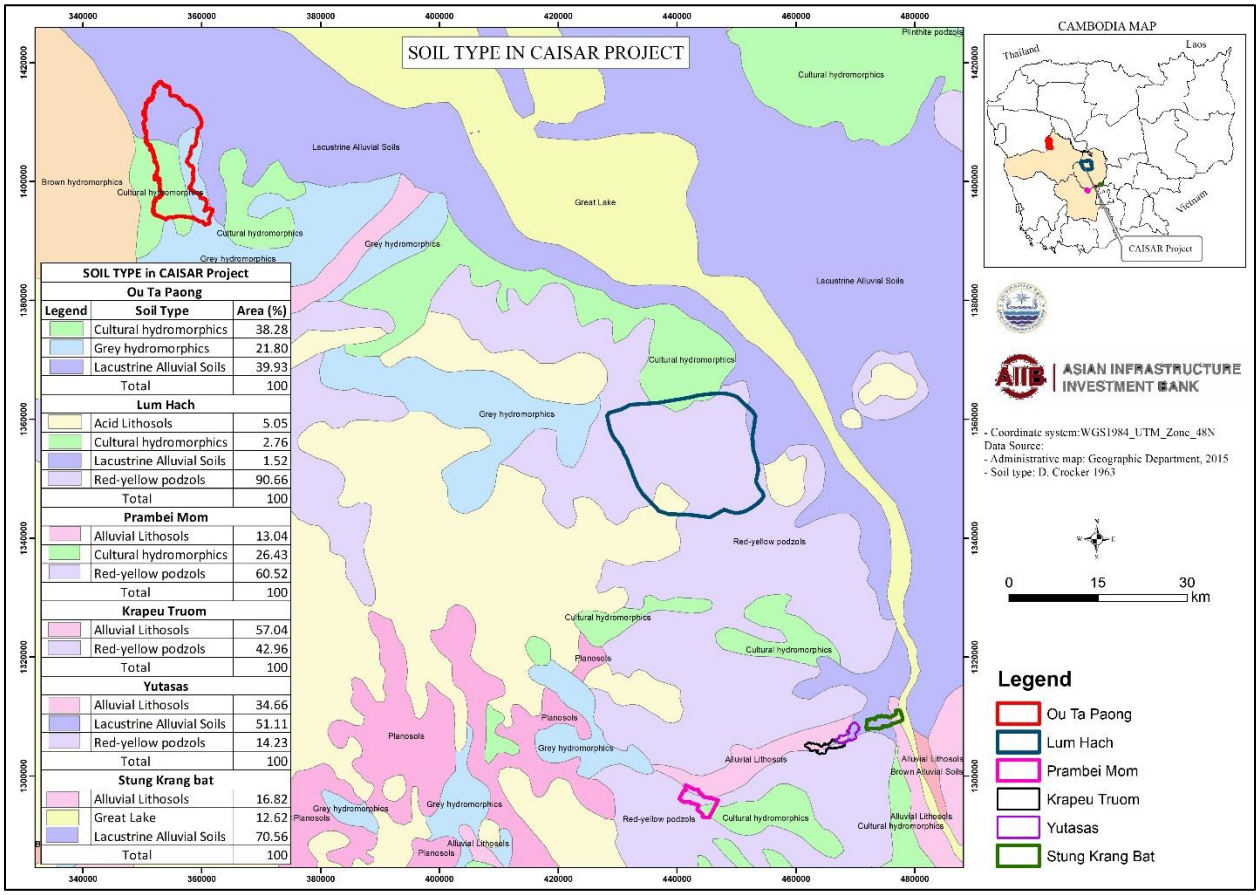
Table 21: Soil types and area in Cambodia

No.	Classification	Land area	
		Km^2	%
1	Red, yellow podzols	22,763.00	12.57%
2	Latosols	7,123.00	3.93%
3	Planosols	1,666.00	0.92%
4	Plinthite podzols	17,147.00	9.47%
5	Cultural hydromorphics	12,896.00	7.12%
6	Grey hydromorphics	17,252.00	9.53%
7	Plenthitic hydromorphics	1,275.00	0.70%
8	Brown hydromorphics	6,701.00	3.70%
9	Alumisols	2,782.00	1.54%
10	Regurs	6,570.00	3.63%
11	Acid lithosols	45,271.00	25.01%
12	Basic lithosols	3,418.00	1.89%

13	Alluvial soils	17,064.00	9.43%
14	Brown alluvials	2,764.00	1.53%
15	Lacustrine alluvials	10,373.00	5.73%
16	Coastal complex	2,229.00	1.23%
	Total (land area)	177,295.00	97.94%
	Water area	3,721.00	2.06%
	Total	**181,035.00**	**100.00%**

(Source: Crocker, 1962)

Figure 5: Map of soil types within the sub-schemes



SOIL TYPE in CAISAR Project		
Ou Ta Paong		
Legend	Soil Type	Area (%)
	Cultural hydromorphics	38.28
	Grey hydromorphics	21.80
	Lacustrine Alluvial Soils	39.93
	Total	100
Lum Hach		
	Acid Lithosols	5.05
	Cultural hydromorphics	2.76
	Lacustrine Alluvial Soils	1.52
	Red-yellow podzols	90.66
	Total	100
Prambei Mom		
	Alluvial Lithosols	13.04
	Cultural hydromorphics	26.43
	Red-yellow podzols	60.52
	Total	100
Krapeu Truom		
	Alluvial Lithosols	57.04
	Red-yellow podzols	42.96
	Total	100
Yutasas		
	Alluvial Lithosols	34.66
	Lacustrine Alluvial Soils	51.11
	Red-yellow podzols	14.23
	Total	100
Stung Krang bat		
	Alluvial Lithosols	16.82
	Great Lake	12.62
	Lacustrine Alluvial Soils	70.56
	Total	100

(Source: ESCIA Study 2024)

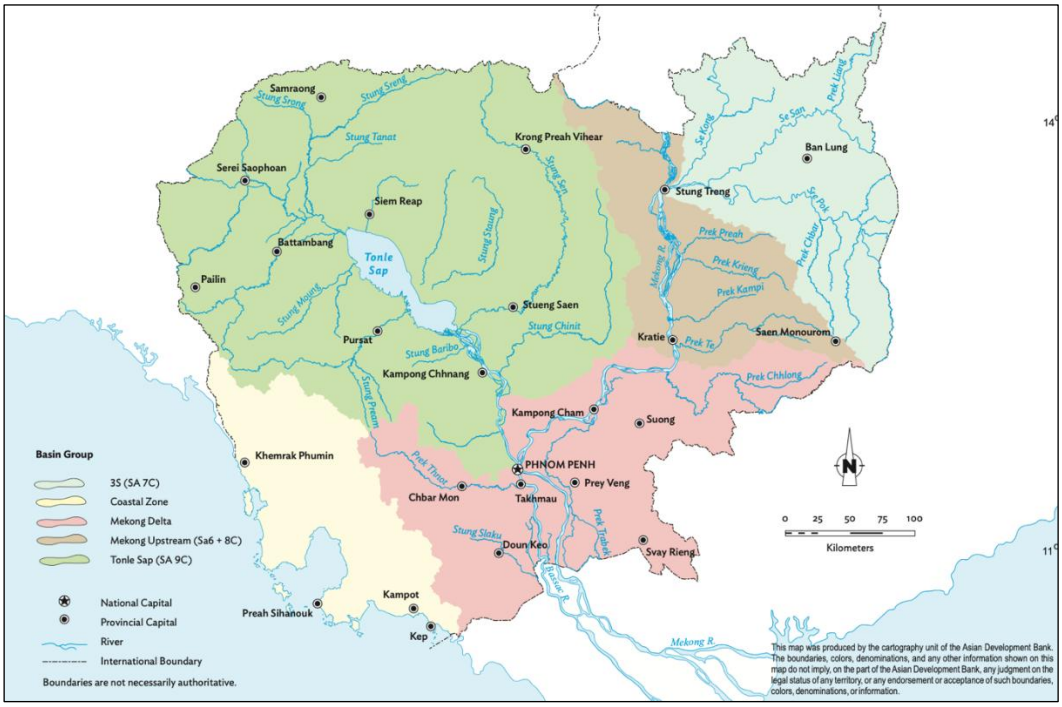
Krapeu Truom also features a two-soil type distribution but with a different balance compared to Brambei Mom. Alluvial lithosols dominate 57.04% of the area, while red-yellow podzols make up 42.96%. This balance indicates that alluvial lithosols are the more prevalent soil type, which may influence agricultural practices and land management strategies within the project area.

5.1.5 Hydrological Resources

Cambodia has considerable water resource potential, with abundant surface water and aquifers and a high level of seasonal rainfall. In spite of the abundance of water sources, many areas in the central plains and plateaus lack water in the dry season and are therefore dependent on unreliable rainfall

patterns. The country's water resources are dominated by the Mekong River system (86% of country's territory), including the catchments of the Bassac River, the Tonle Sap River, and the Lake Tonle Sap and its tributaries[1], and the river system flowing into the Gulf of Thailand (remaining 14%) as per shown in Figure 6.

Figure 6: River Basin Groups in Cambodia



(Source: Ministry of Water Resources and Meteorology, 2019)[2]

However, **75% renewable freshwater comes from upstream transboundary** sources via the Mekong River system (355.5 km^3/year of surface water), mainly from Lao PDR (91.3%), but also Thailand (8.4%) and Viet Nam (0.3%). As an intermediate basin country, up to 471.51 km^3/year of surface water flows out of the country to Vietnam through the Mekong and its tributaries. This emphasizes the critical inter-dependency of Mekong states, and their sensitivity to the actions of neighboring countries, particularly those that are upstream[3]. In terms of groundwater, 17.6 km^3/year is estimated to be produced in-country, although there is no register of transboundary for inflow or outflow of groundwater.

[1] The Mekong River and Lake Tonle Sap are connected by the Tonle Sap River, which twice a year reverses its direction of flow. From July to October, when the level of the Mekong is high, water flows into the Tonle Sap River, which fills Lake Tonle Sap, thereby increasing the size of the lake from 2,600 km^2 to about 10,500 km^2 at its maximum. The storage capacity of Lake Tonle Sap is estimated at 72 km^3. In November, when the level of the Mekong decreases, the Tonle Sap river reverses its flow, and water flows from Lake Tonle Sap to the Mekong river and thence to the Mekong Delta (https://wateractionhub.org/geos/country/37/d/cambodia/).

[2] Irrigated Agriculture Improvement Project: National Water Resources Data Management Center and Water Resources Information System Report

[3] https://tableau.apps.fao.org

Agriculture accounts for 96% of all **water use,** domestic rural use 1%, and industry, domestic urban, and aquaculture use less than 1%4. Although the amount of water used is estimated to be only about 2% of total surface water volume[5], water shortages do occur during the dry season, especially in the Tonle Sap River system—due to the lack of stored water and limited access to water. [6] Cambodia's water resources sector faces a range of multisectoral, geographical, and hydro-meteorological issues. The Mekong River, particularly the Lower Mekong Basin (LMB), has been identified as a region that is highly vulnerable to the impacts of climate change, more frequent and intense. Climate change is affecting the water cycle, bringing change in the hydrology of major rivers and tributaries as well as groundwater recharge. Recurrent floods occurred in the last decade, with important economic losses, mainly on rice crops, but also people's lives[7]. Farmers, who depend on rain-fed agriculture, will be increasingly at risk of disasters, and especially droughts and floods, causing severe damage to rice harvests[8]. In short, Cambodia faces the common climate change challenges of **too much** water in the wet season, **too little** in the dry season, and gradually **too dirty** due the increasing pollution, particularly in populated cities.

The feasibility study report indicates that Cambodia is likely to face changes in water balances and flood regimes due to projected increases in temperature and altered precipitation patterns. An increase in consecutive dry days is expected to worsen water scarcity, especially during the dry season, impacting communities in rain-fed areas around the Tonle Sap more severely than those with year-round access to the Mekong River or irrigation systems.

The Stung Krang Ponley irrigation scheme relies on various water sources to support its sub-schemes, with water availability playing a crucial role in agricultural productivity. The Brambei Mom scheme is supplied by the Ou Khley River and its reservoir, completed in 2012 as part of the Krang Ponley Project. The reservoir, covering 67 hectares, supports domestic use and small-scale agriculture, particularly during the dry season. Water is also drawn from the larger Anlong Chrey Reservoir, enhancing the scheme's capacity. However, the system is incomplete, with canals that are too short and in poor condition, requiring rehabilitation. The siltation of the 37-kilometer-long Ou Khley River further complicates water management, leading to frequent flooding and reduced irrigation capacity, especially during the wet season.

Krapeu Truom, another sub-scheme, primarily relies on the Anlong Chrey Reservoir and the Kdol Dam as secondary water sources. The system consists of two (2) main canals, 11 secondary canals, and multiple distribution and check structures. While the canals are largely functional, some design defects have led to damage in the downstream structures. Additionally, the crest elevations of some offtakes

[4] Government of Cambodia. 2019. *National Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019–2033*. Phnom Penh.

[5] ADB. 2014. Cambodian National Water Status Report 2014. Phnom Penh.

[6] https://MoWRAM.adb.org/sites/default/files/publication/689106/adb-brief-171-surface-water-resouces-rbgs-cambodia.pdf

[7] i.e. Floods accounted for 70% of rice production losses between 1998 and 2002, whereas droughts accounted for 20% of those losses. The most recent report on floods showed that the country had lost 40, 45, 188, 250, and 43 lives in 2020, 2014, 2013, 2011, and 2009, respectively. In addition, the economic loss was estimated at USD 1.000, 521, 70, and 132 million due to floods in 2013, 2011, 2010, and 2009, respectively.

[8] Mak Sithirith (2017). Water Governance in Cambodia: From Centralized Water Governance to Farmer Water User Community. MDPI.

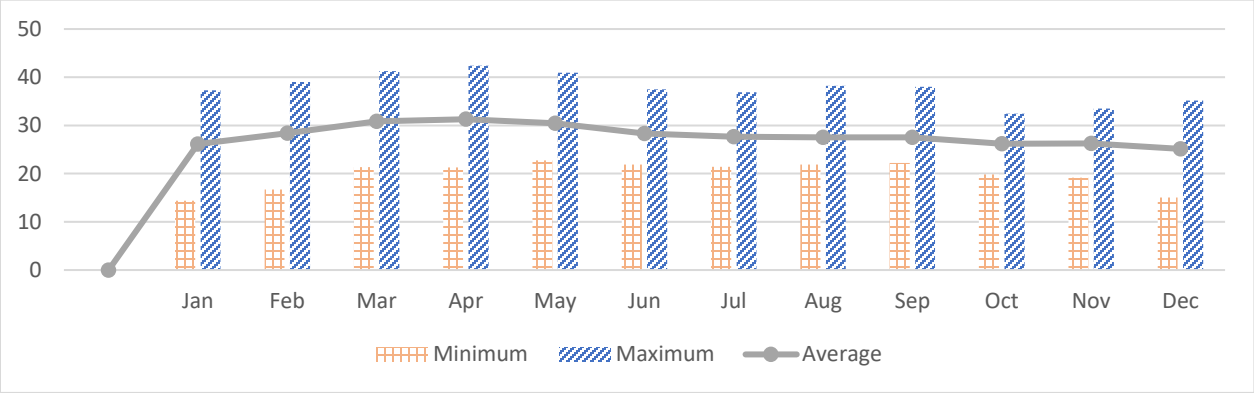
are lower than the adjacent rice fields, hindering irrigation. Despite these challenges, the Farmer Water User Community (FWUC), established in 2016, has been successful in managing water distribution, although improvements are needed to enhance overall efficiency.

5.1.6 Climate Conditions

Temperature

Temperatures in the Stung Krang Ponley scheme area for the last 10 years between 2013-2022 using NASA POWER data. According to the table below shown, the annual average temperature was 27.96 °C, the annual average minimum temperature was 14.37 °C in 2014, and the annual average maximum temperature in 2016 at 42.4 °C. Regarding monthly temperature extremes, the lowest minimum temperature of 14.37°C was observed in January, and the highest maximum temperature of 42.4°C occurred in April.

Figure 7: The maximum, average, and minimum monthly temperature for the last 10 years (°C)

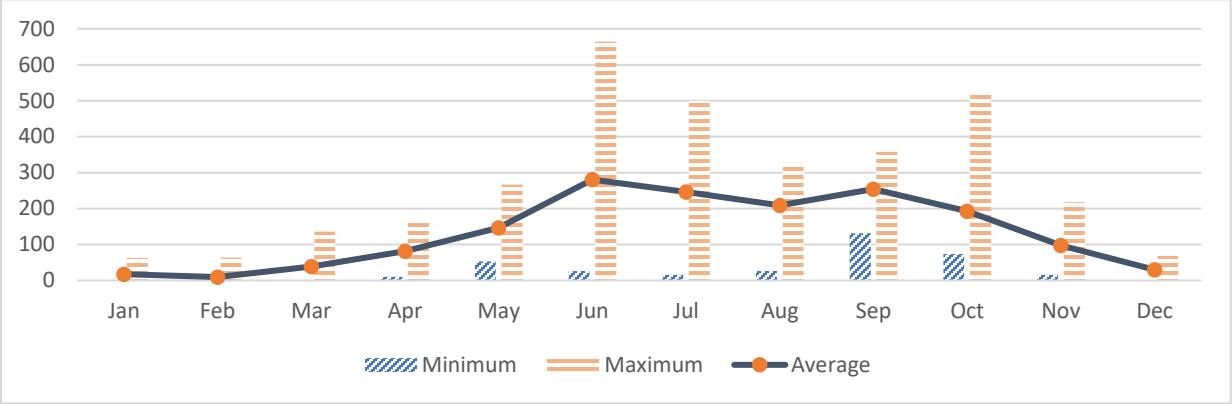


Source: NASA POWER (2024)

Precipitation

The Stung Krang Ponley scheme area shows an average annual precipitation of 1604.14 mm over the decade from 2013 to 2022. The annual minimum precipitation was recorded in 2016 at 653.91 mm, while the annual maximum precipitation occurred in 2020, reaching 2293.95 mm. The lowest minimum rainfall data were found in January, February, March, and December at 0 mm. In October, the highest average monthly rainfall was 516.6 mm.

Figure 8: The maximum, average, and minimum monthly precipitation for the last 10 years (mm)

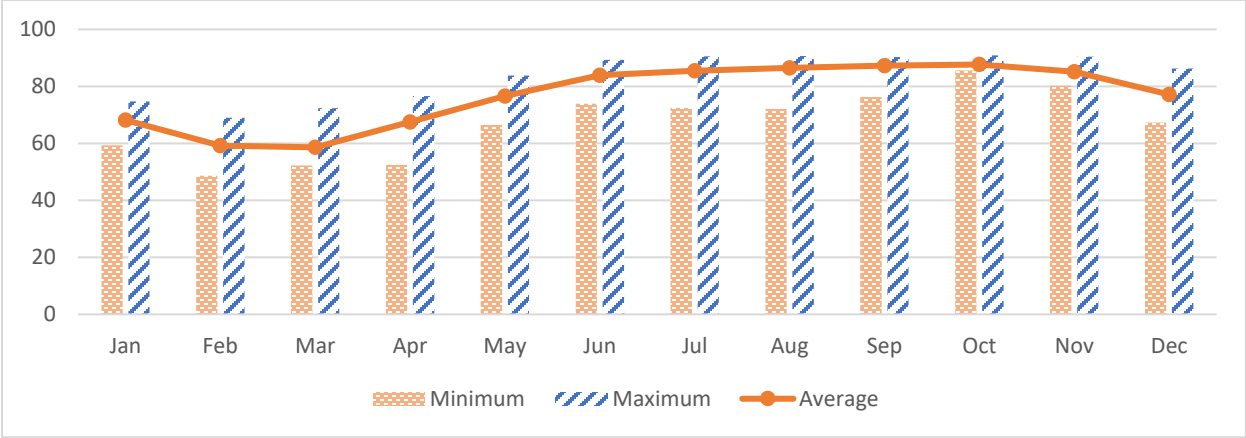


Source: NASA POWER (2024)

Humidity

The table presents monthly humidity data for the Stung Krang Ponley scheme area from 2013 to 2022. The annual minimum average humidity was 69.44% in 2016, while the maximum annual average humidity was 82.81% in 2022. In additional, the annual average humidity was 77.03% over the decade. Regarding monthly variations, the highest monthly maximum humidity was observed in October 2020 at 90.88%, and the lowest monthly minimum humidity was recorded in January 2016 at 48.69%.

Figure 9: The maximum, average, and minimum monthly humidity for the last 10 years (%)

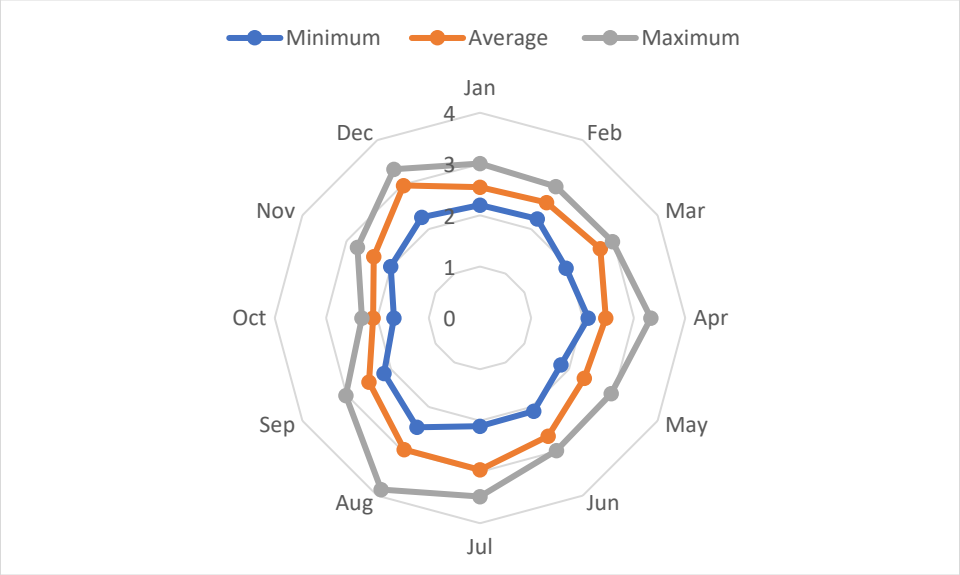


Source: NASA POWER (2024)

Wind Speed

The monthly wind speed data for the Stung Krang Ponley scheme area from 2013 to 2022. The annual minimum average wind speed was 2.45 m/s in 2022, and the maximum annual average wind speed was 2.85 m/s in 2016. While the annual average wind speed was 2.60 m/s in the last 10 years. Regarding monthly variations, the highest monthly maximum wind speed was in August 2016 at 3.86 m/s, and the lowest monthly minimum wind speed was recorded in October 2013 at 1.68 m/s.

Figure 10: The maximum, average, and minimum monthly wind speed for the last 10 years (m/s)



5.2 BASELINE ENVIRONMENTAL QUALITY

5.2.1 Unexploded Ordnances (UXO)

Cambodia remains one of the most heavily landmine-contaminated countries globally, a legacy of decades of conflict that has left a significant portion of its territory affected by landmines and unexploded ordnance (UXO). This contamination poses ongoing threats to safety and hinders socio-economic development, particularly in rural areas. According to the Cambodian Mine Action and Victim Assistance Authority (CMAA), as of 2023, approximately 1,854 square kilometers of land remain contaminated, affecting more than 1.1 million people.[9]

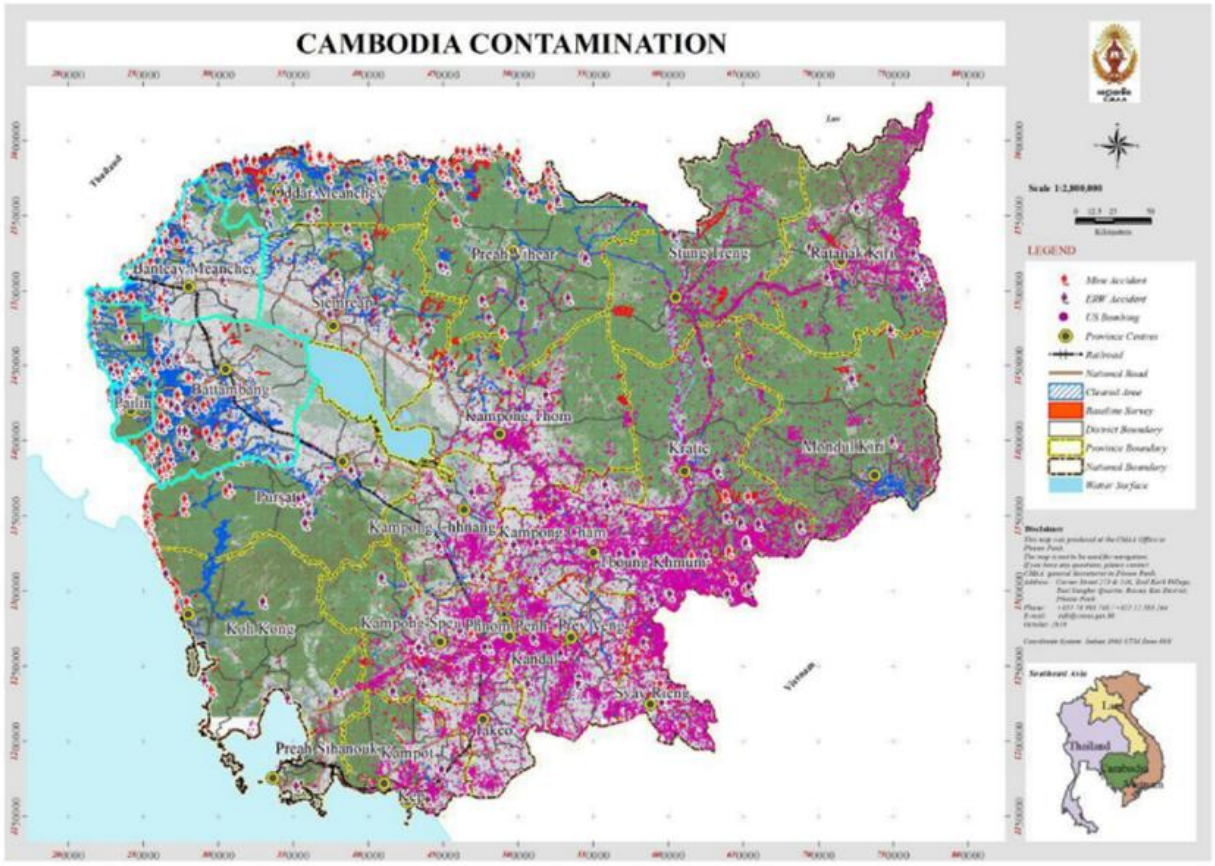
This contamination has caused thousands of casualties over the years and continues to hinder socio-economic development by restricting land use, infrastructure projects, and agricultural expansion. Among the affected provinces, Pursat, Kampong Chhnang, and Kampong Speu have been identified as high-risk areas due to their history of intense conflict and strategic military significance. While mine clearance operations have made progress in these regions, large tracts of land remain dangerous, necessitating ongoing demining efforts to ensure safety and sustainable development. These provinces are critical for agriculture and infrastructure projects, making landmine clearance an urgent priority to enable safe land use and improve local livelihoods.

For construction projects, strict adherence to mine-related regulations is essential. Before initiating any construction activities, risk assessments and clearance operations must be conducted. This includes engaging professional demining organizations to carry out detailed surveys, safely remove and

[9] Yet another Cambodian province bids farewell to landmines - UCA News

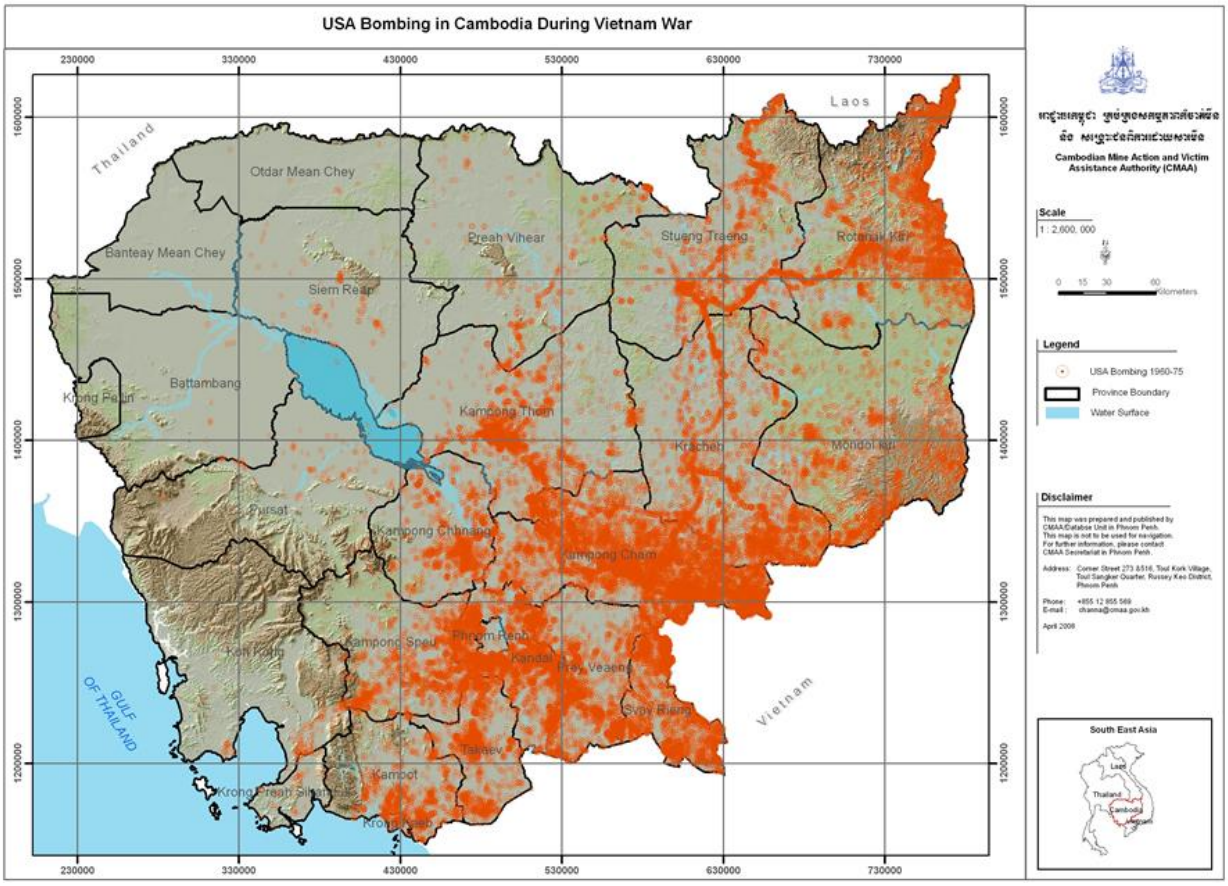
dispose of any detected UXO, and obtain official clearance certificates from recognized authorities like the CMAA. Ensuring compliance with these legal requirements is not only critical for the safety of construction personnel and future occupants but also aligns with Cambodia's national and international commitments to UXO and landmine management.

Figure 11: The landmine contamination map in Cambodia



(Source: Cambodian Mine Action and Victim Assistance Authority (CMAA) 2020)

Figure 12: Map of USA Bombing in Cambodia



(Source: Cambodian Mine Action and Victim Assistance Authority (CMAA) 2020)

Summary of the result of the landmine reports from local community is provided as Table below:

Table 22: Mine and UXO situation

No.	Sub-scheme	Mine and UXO Situation
1	Krang Ponley	The province was declared a mine-free province in October 2023 but nearby sub-scheme (Yutasas still reported the witness of mine)

UXO = Unexploded Ordnance.

5.2.2 Ambient Air quality, Noise and Vibration

5.2.2.1 Air Quality

Stung Krang Ponly located in two (2) provinces – Kampong Chhnang and Kampong Speu. At provincial level, the air pollution level in Kampong Chhnang province is considered moderate. The air pollution level in Kampong Speu province also consider moderate. The AQI is 5810, which is equivalent to 12.7 µg/m3. The Krapeu Troum, a sub-scheme within Stung Krang Ponley, is in the rural settings; therefore, the baseline ambient air quality, noise and vibration is considered generally good. Ambient air quality

[10] https://www.iqair.com/cambodia/kampong-speu, accessed on 23rd September 2024.

is sometime affected by dust from tillage and unpaved road users, including smoke from burning of rice stubble after harvest and burning from swidden cultivation activities. Whilst noise and vibration disturbance are sometime affected by motorist. However, the impacts are minor and short time. The air testing results from another project located about 6 km from Krapeu Troum reported that all five parameters (CO, NO2, SO2, TSP, and PM10) followed the standard of the Ministry of Environment at all durations (8 and 24 hours). The actual air quality testing prior and during construction are required to be conducted. Further air quality tests can be conducted during the preparation of the domestic EIA

Table 23: Air quality testing result

Parameters	**Unite**	**Testing Result**	**Standard (MoE)**
CO	mg/m^3	1.237	**20**
NO_2	mg/m^3	0.038	**0.1**
SO_2	mg/m^3	0.062	**0.3**
O_3	ppm	0.074	**0.2**
TSP	mg/m^3	0.018	**0.33**
PM10	mg/m^3	0.009	**0.05**
PM2.5	mg/m^3	0.007	**0.025**
Pb	mg/m^3	ND	**0.005**

Source: Laboratory of MoE (2023)

Figure 13: Krapeu Troum sub-scheme



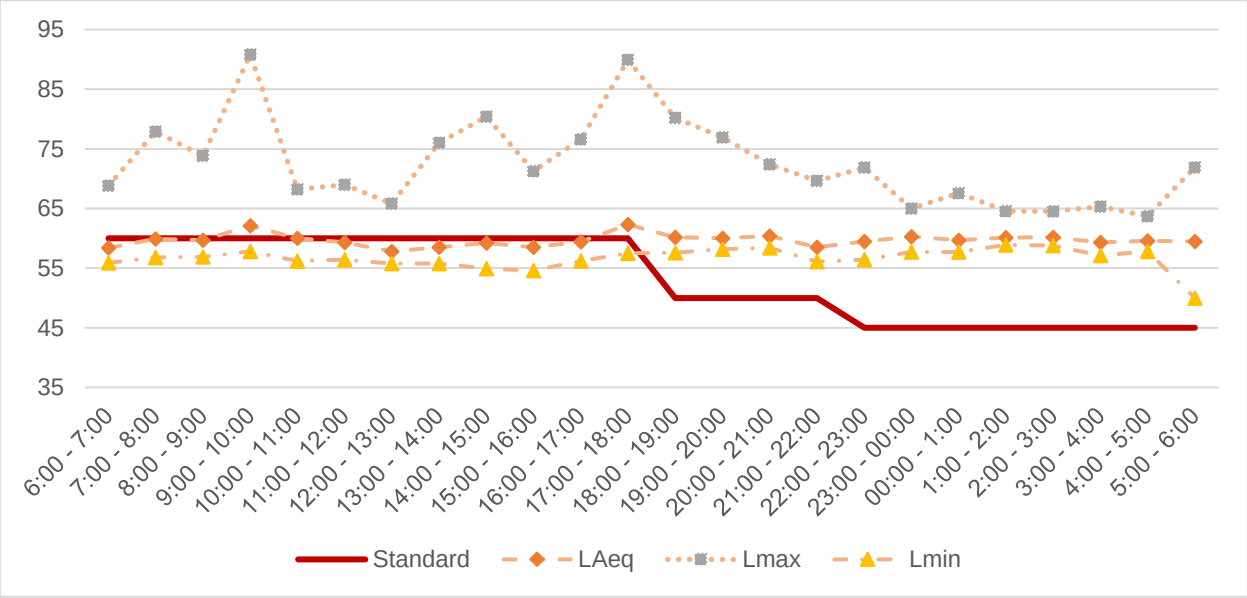
5.2.2.2 Noise and Vibration

Noise and vibration of the project locations in each sub-scheme are currently affected mainly by the commuters mainly along the roads within the areas which can be either the national or local road. As

they are subjected to change over time, the testing of noise and vibration are required to be conducted right before the beginning of the construction.

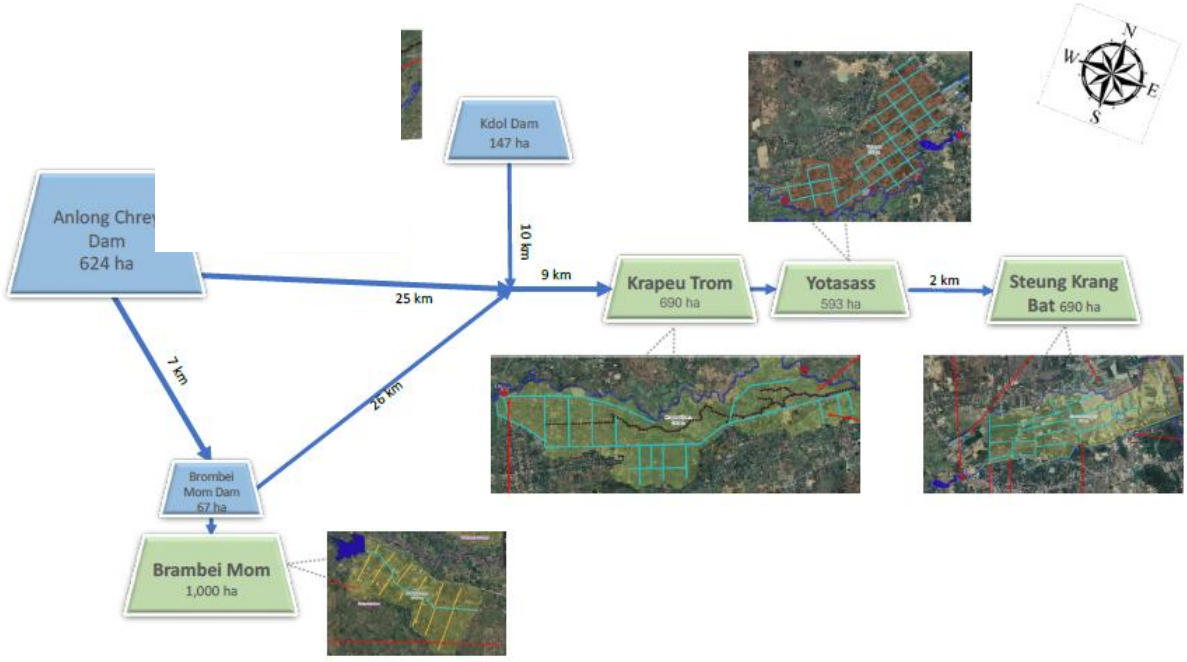
Interviews with 14 village chiefs revealed that 64% of them perceived their villages as slightly (43%) or moderately (21%) noisy, primarily during the evening, with traffic and neighbors' activities being the main sources of disturbance. In addition, the noise testing result of the Animal Feeding Plant project in 2024 located 6 km from Krapeu Troum (shown in Figure below) can be used as the reference for the baseline of this project as it is situated within the same environmental condition as the project areas. Further noise and vibration tests can be conducted during the preparation of the domestic EIA.

Figure 14: Results of noise analysis at location 1



(Source: Laboratory of the Ministry of Environment, 2024)

Figure 15: Length from Sub-Scheme to another of Krang Ponley



5.2.2.3 Soil Quality

The Krapeu Truom sub scheme was represented by one location (SS.04). The analysis results, presented in the table below, provide valuable insights into the physical, chemical, and biological properties of the soils at these locations, which can inform agricultural management practices and decision-making.

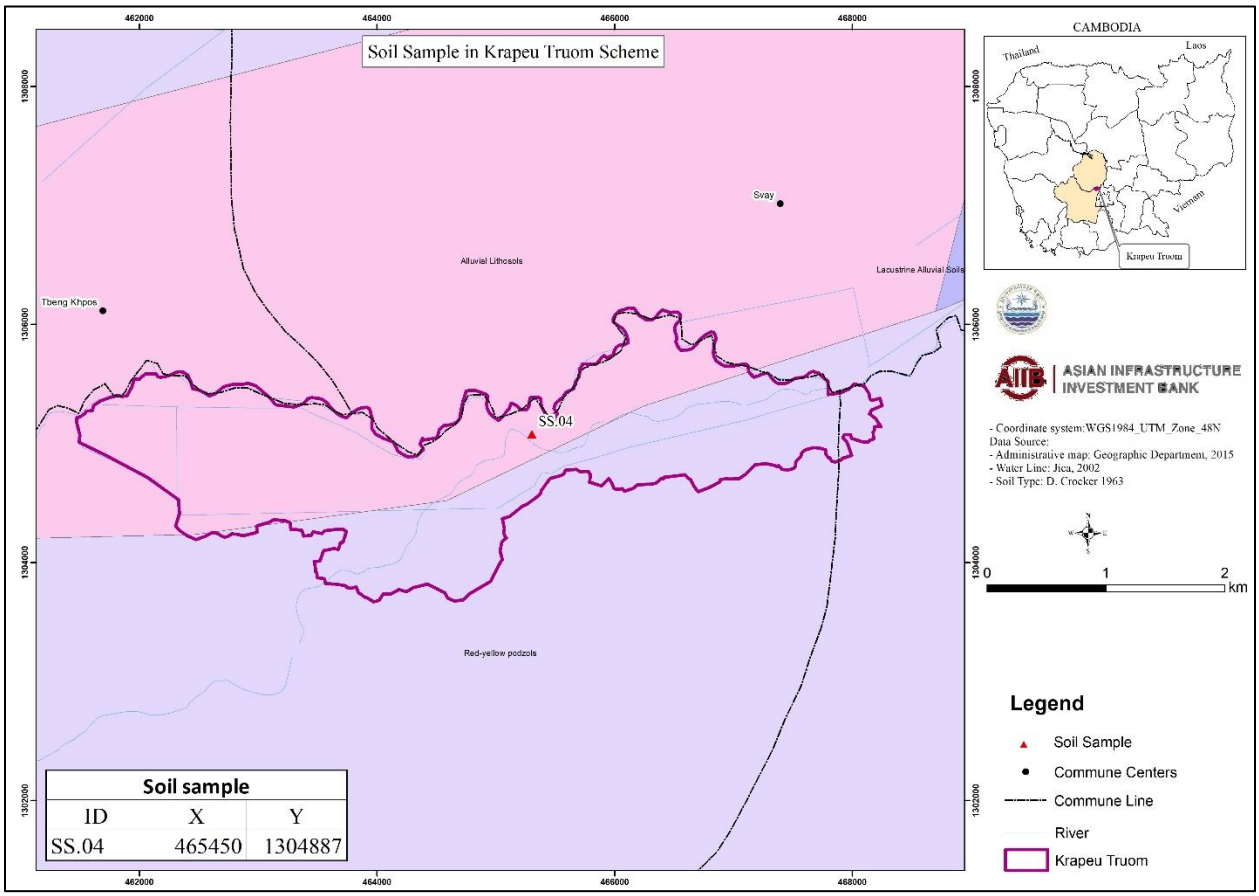
Table 24: Soil analysis results in an agricultural context

No.	Description Parameter		Result of SS.04
1	Particle Size (Pipette Method)	(<0.002mm), Clay %	14.95
		(0.002-0.02 mm), Fine Silt, %	30.00
		(0.02-0.05 mm), Coase Silt, %	19.81
		(0.05-0.2 mm), Fine Sand, %	31.12
		(0.2-2 mm), Coase Sand, %	5.92
2	Ninnu Moisture %, (Oven dry at 105 °C and 24 hours)		2.64
3	Total Carbon (Black & Walkey Method), C%		1.63
4	Total Nitrogen (Kjeldal Sulfuric Method), N%		0.14
5	C/N Ratio (Unit)		12
6	Organic Matter (0M) %		2.80
7	Total Phosphorus (Nitric Digestion) P %		0.044
8	Available Phosphorus (Bray II), P (ppm)		29
9	Cation Exchange Capacity C.E.C meq/100g Soil (Method,1M Ammonium Acetate at pH=7 & Leach with 10% NaCl)		16.50

10	Exchangeable Cation (meq/100g Soil), (Method, IM Ammonium Acetateat H=7)	Calcium (Ca)	8.30
		Magnesium (Mg)	2.37
		Sodium (Na)	2.57
		Potasium (K)	0.36
	Total Exchangeable Bases (meq/100g soil)		13.60
11	Bass Saturation %		70
12	Exchange Acidity meq/100g Soil, (1 M KCl Method)		10.00
13	Exchange Al meq/100g Soll, (1 M KCl Method)		0.12
14	Electrode Conductivity µS/cm, (1:5 Soil: water)		108.40
15	pH H2O (1:5 Soil: water)		7.41
16	pl KCL (1:5 (Soil: IN KCL)		6.23

(Source: Laboratory of the General Directorate of Agriculture, MAFF, 2024)

Figure 16: Location of soil sample selection



5.2.3 Surface Water Quality

Water quality does not seem to be a critical issue for surface water, but the overuse of fertilizers and domestic wastewater are important threads. It is known to be a black market of all sorts of fertilizers, pesticides, insecticides, rodenticides, etc. sold at the borders with Viet Nam and applied indiscriminately by farmers to increase the numbers of crops a year.

The collected water samples were measured at the premises as well as at the laboratory, commissioned by Innovation Lab which is partner of Royal University of Phnom Penh (RUPP). Summary of the water quality testing is provided in Table below:

Figure 17: Location of surface water sample selection

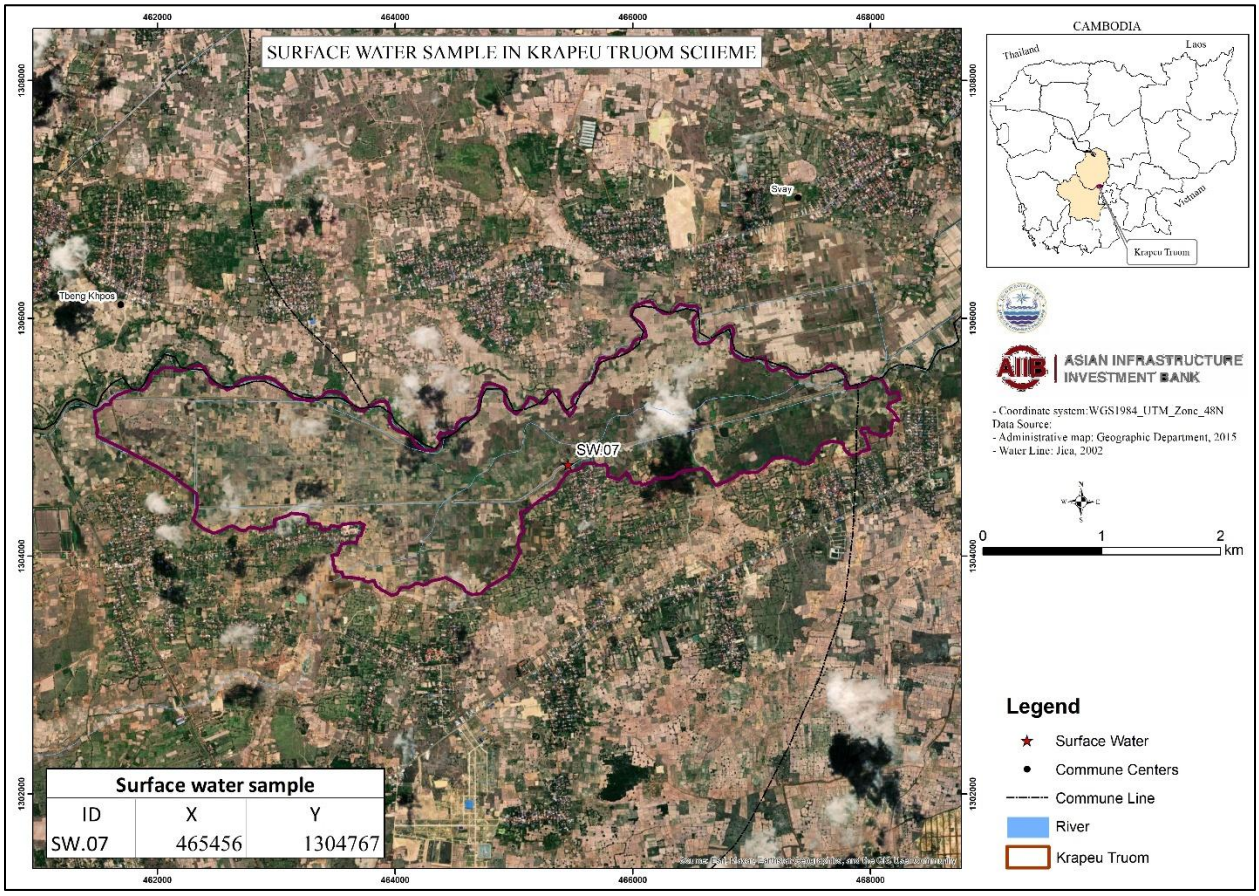


Table 25. Result of surface water quality

No	Parameter	Unit	SW.07	Standard (MoE)	
				River	Lake and reservoir
1	Arsenic	mg/l	0.005	<0.01	<0.01
2	Cadmium	mg/l	0.001	<0.003	<0.003
3	Lead	mg/l	0.005	<0.01	<0.01
4	pH	-	6.53	6.5-8.5	6.5-8.5
5	Total dissolved solids	mg/l	83.43	<1000	<1000

6	Total suspended solids	mg/l	93	<100	<100
7	Total Nitrogen	mg/l	4.7	<3	<2
8	Total Phosphorus	mg/l	0.7	<0.25	<0.15
9	Total coliform	CFU/ 100mL	92,500	<1000	<1000
10	Electrical conductivity	µs/cm	167.1	500-1500	500-1500
11	Temperature	^{0}C	33.7	<45	<45
12	Dissolved oxygen	mg/l	6.84	>3	>4

(Source: Water Innovation Lab, 2024)

The surface water quality results for Krapeu Truom at SW.07 show a mix of acceptable and concerning findings when compared to the Cambodian Ministry of Environment's standards for rivers and lakes/reservoirs. Parameters such as arsenic (0.005 mg/l), cadmium (0.001 mg/l), lead (0.005 mg/l), pH (6.53), total dissolved solids (83.43 mg/l), electrical conductivity (167.1 µS/cm), and dissolved oxygen (6.84 mg/l) are within the acceptable limits, indicating generally good water quality with respect to these indicators. However, the water contains elevated levels of total nitrogen (4.7 mg/l) and total phosphorus (0.7 mg/l), which exceed the standards for both rivers and lakes/reservoirs. This suggests potential nutrient pollution that could lead to eutrophication, negatively affecting aquatic ecosystems. Of particular concern is the extremely high level of total coliform (92,500 CFU/100 mL), far exceeding the acceptable limit of 1,000 CFU/100 mL, indicating likely faecal or agricultural waste contamination, which poses significant health risks. While the temperature (33.7°C) is within limits, it is relatively high and could affect aquatic life if it increases further. Overall, while some parameters are within acceptable ranges, the elevated nutrient and coliform levels raise concerns about pollution and its potential impact on both the ecosystem and human health.

Figure 18: Krapeu Troum sub-scheme



5.2.4 Groundwater Quality

Water testing is used to determine the existing groundwater quality at the project sites before construction and operation. GW3 is a type of open well with a depth of 10 meters and can only be used during the rainy season. The water level of the well is around two meters above the surface during the rainy season. The geographical positions and descriptions of the groundwater sampling points are given in Table 9. The results of the groundwater quality analysis are summarized in Table 9.

Table 26. Groundwater sampling locations

No.	Location				UTM	
	Province	District	Commune	Village	X	Y
GW3	Kampong Speu	Odongk	Veal Pung	Khnaor Ampil	465653	1303947

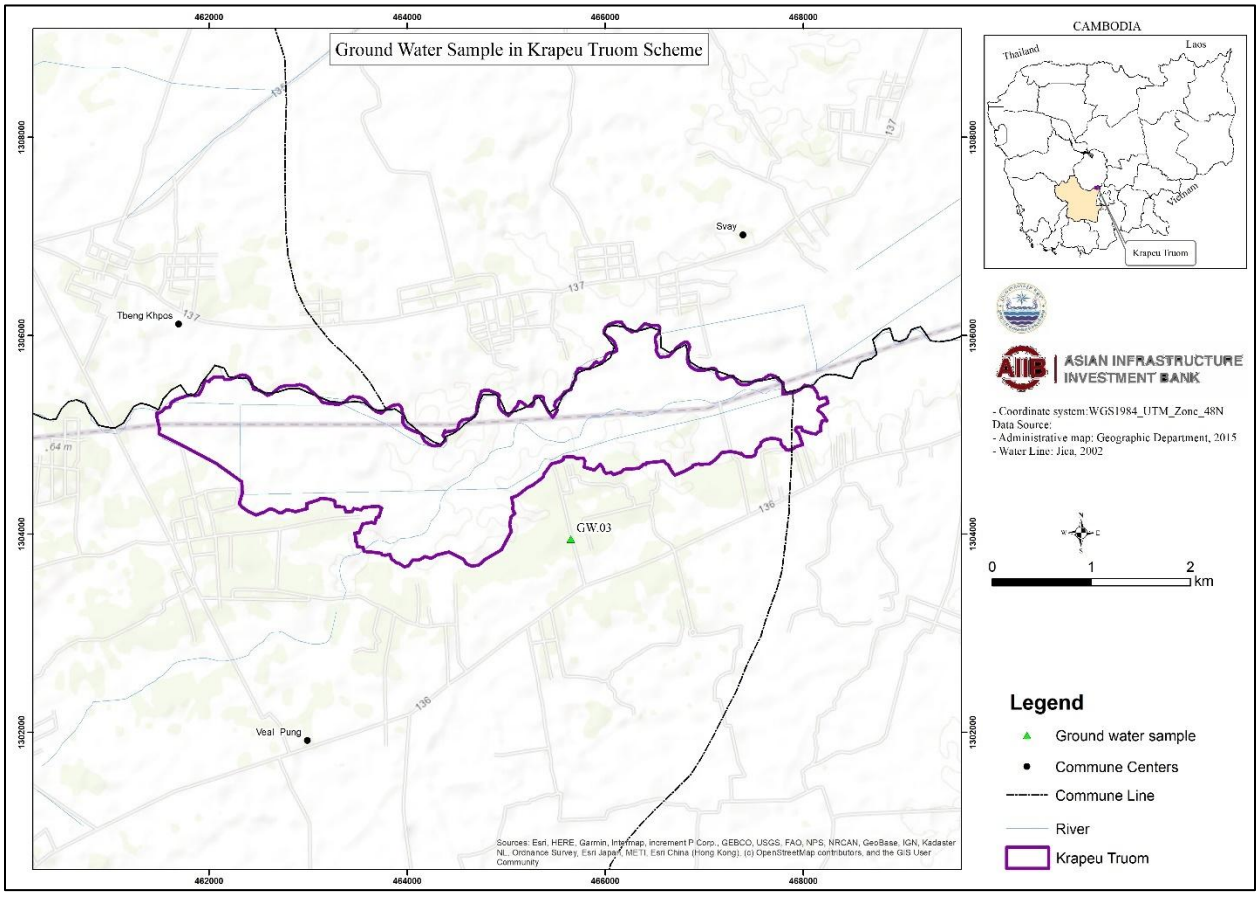
The selected samples were analysed and the results of the testing both at the field and at laboratory is provided in Table 10 below.

Table 27. Result of groundwater quality

No	Parameter	Unit	GW3	CDWQS
1	Arsenic	mg/l	0.005	0.05
2	Cadmium	mg/l	0.001	0.003
3	Lead	mg/l	0.005	0.01
4	pH	-	**6.48**	6.5-8.8
5	Total dissolved solids	mg/l	325.5	800
6	Total suspended solids	mg/l	3	-
7	Total Nitrogen	mg/l	21.5	-
8	Total Phosphorus	mg/l	2.2	-
9	Total coliform	CFU/ 100mL	1,200	0
10	Electrical conductivity	µs/cm	651.6	-
11	Temperature	^{0}C	30.5	-
12	Dissolved oxygen	mg/l	1.25	-

(Source: Water Innovation Lab, 2024)

Figure 19. Map of groundwater sampling location in Krapeu Truom sub-scheme



The groundwater quality results for the Krapeu Troum irrigation sub-scheme show that several key parameters are within safe limits according to the Cambodia Drinking Water Quality Standard (CDWQS). For instance, levels of arsenic (0.005 mg/l), cadmium (0.001 mg/l), and lead (0.005 mg/l) are well within the CDWQS thresholds, indicating that these heavy metals pose no significant health risks. The pH level of 6.5 is on the lower end of the acceptable range (6.5-8.8), meaning the water is slightly acidic but still suitable for consumption. Similarly, the total dissolved solids (TDS) of 58.12 mg/l are well below the limit of 800 mg/l, suggesting that the water has a low level of dissolved salts and minerals, which is generally favorable for drinking.

However, the total coliform count of 1,600 CFU/100mL far exceeds the CDWQS standard of 0 CFU/100mL, indicating significant fecal contamination. This is a serious concern, as the presence of coliform bacteria suggests that the groundwater is potentially unsafe for direct consumption without treatment, which could pose a risk to human health. Although total nitrogen (3.5 mg/l) and total phosphorus (0.29 mg/l) do not have specified CDWQS limits, their elevated levels indicate nutrient pollution, likely from agricultural runoff or other environmental sources, which could impact water quality over time.

Overall, while the groundwater meets the required standards for heavy metals and TDS, immediate action is necessary to address microbial contamination, such as implementing disinfection methods or boiling the water before use. Regular monitoring of nitrogen and phosphorus is recommended to

ensure long-term water quality, as nutrient pollution may degrade the ecosystem. The water is suitable for drinking only after proper treatment, with a focus on addressing the high coliform levels to ensure it is safe for consumption.

5.3 Biological Resources

5.3.1 Analysis to prepare for determining CH status

5.3.1.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Krapeu Trom (KT). The coordinates of KT (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species.

Description of screening for narrowing down

For Krapeu Trom, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the OTP area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, there were two fish species (Isok barb/Jullien's Golden Carp and Leaping barb/Flying Minnow) were screened for the first two rounds. After three rounds of screening focusing on EN and CR species, only Flying Minnow is confirmed as potentially present in the sub-scheme area of influence.

Ecological State of Habitats within the AoA

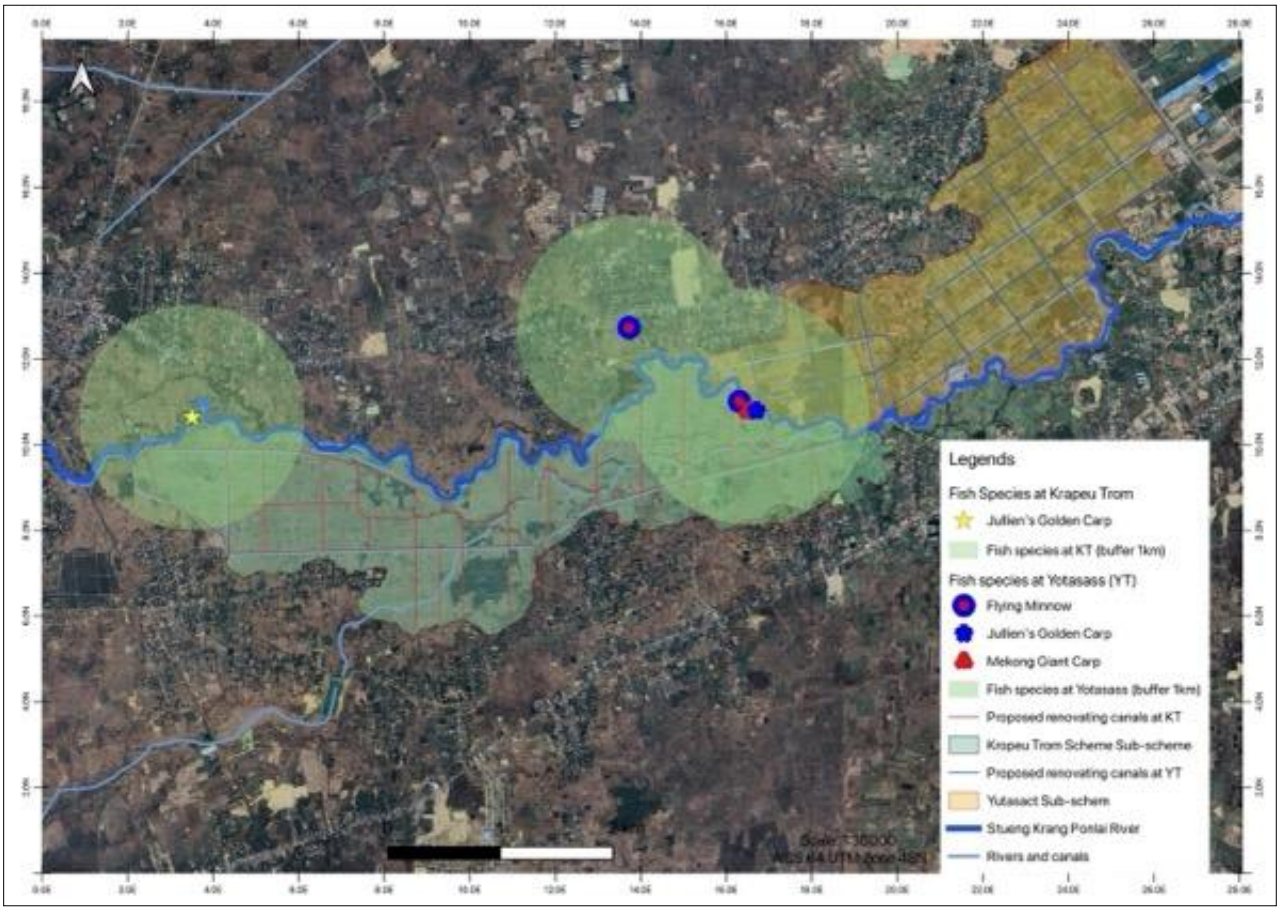
Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the one confirmed species is presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The Krapeu Trom command area has been in existence since the 1970s. The KT is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the Stueng Krang Ponlai serve as the sole ecological and hydrological connection between its upstream watershed and the Tonle Sap River basin downstream. This river is crucial for fish migration during the flooding season. However, reservoirs, spillways, and drought conditions have disrupted these essential ecological functions.

- **Fish (1 species)**

Krapeu Trom, like Brambei Mom, is situated within the same river catchment area in the lower reaches, near the Tonle Sap's annual floodplain. Two fish species, the Isok barb/Jullien's Golden Carp (Probarbus jullieni) and Leaping barb/Flying Minnow (Laubuka caeruleostigmata), were targeted for interviews in this command area. Among ten key informants interviewed, only one reported encountering the Jullien's Golden Carp once in 2022, approximately 500 meters downstream of the reservoir facility during a flooding event (see map below). This individual stated that the species migrated upstream from the Tonle Sap during the flood season but became trapped in spillways. They added that if flooding is insufficient, fish populations decline, and rare species may no longer be present in the area.

Figure 20: A spatial distribution map was generated for four fish species at Krapeu Trom and Yotasas Command Area. 1 km buffer zones were included to approximate their minimum movement range around suitable habitats.



5.3.2 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section on - CH assessment method). This assessment aims to determine whether any species qualify for Critical Habitat features.

Habitat of significant importance to CE and EN species

As presented in Section 4.4.3.3 (Ecological State), the species that qualifies as a critical habitat feature is the Flying Minnow. Krapeu Trom Command Area is part of Stueng Krang Ponlai River system (Tonle Sap's tributary) and situated approximately 11 km from Tonle Sap River. The area was influenced by flood-plus water from Stueng Krang Ponlai upstream and the push-up of flood water from Tonle Sap River Basic allowing fish to short distance migration for food and breeding.

Although climate change has caused dry and drought more frequently, this area still receives a good amount of flood from its upstream and downstream making a good connectivity and providing ecological function for migratory fish.

Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for sub-scheme).

Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for KT, therefore is expected to qualify as critical habitats under this criterion.

Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

5.4 Socio-Economic and Cultural Conditions

5.4.1 Administrative and Social Structure

5.4.1.1 Administrative System

Cambodia's administrative system at sub-national level is organized into three (3) tiers: capital city/province, district/municipality/khan, and sangkat/commune. Phnom Penh, the capital, is divided into khans and further into sangkats, while provinces are divided into municipalities and districts, with municipalities subdivided into sangkats and districts into communes and sangkats. The sub-national government is guided by organic laws, including the Law on Administration of Commune/Sangkat and the Law on Administration of Capital City, Province, Municipality, District, and Khan, supporting decentralization and deconcentration. Commune/sangkat administrations operate with legal, financial, and administrative autonomy, governed by elected councils responsible for budgets, development, and public order. Higher levels, such as provinces and districts, are governed by councils (legislative) and boards of governors (executive), with council members indirectly elected by commune/sangkat councils and supported by technical committees. Boards of governors, nominated by the Ministry of Interior, implement policies and supervise ministry units in their jurisdiction. Recent legal amendments aim to expand local administrations' authority over civil servants from national bodies, awaiting implementation through sub-decrees.

5.4.1.2 None-Governmental Organizations

Another institution which are playing an important role in the development of the country at sub-national level is the civil society. The civil society in Cambodia, particularly the NGOs plays a vital role in development and democratization. These organizations address challenges such as poverty, education, human rights, gender equality, and environmental conservation, filling gaps in governance and social services. NGOs contribute by providing microfinance, vocational training, and livelihood programs to alleviate poverty; supporting education through school construction, scholarships, and inclusive learning; and improving health outcomes with maternal health programs, HIV/AIDS awareness, and mental health support. They advocate for human rights, labor rights, and good governance, engaging in election monitoring and raising awareness about corruption and land rights. Additionally, NGOs promote environmental sustainability and climate resilience while advancing gender equality by combating violence and discrimination and empowering women in leadership. Within the project area, there are a number of NGOs being identified within the area in different sectors including environment, community development, such as Wildlife Conservation Society (WCS), Adventist Development Relief Agency (ADRA), Advocacy Policy Institute (API), and People in Need (PIN).

5.4.1.3 Community-Based Organizations

Another social organization is Community-based organizations (CBOs). Cambodia, CBOs play a critical grassroots role, directly addressing local needs. Unlike NGOs, they are often less formalized and focus on mobilizing local resources for infrastructure, livelihood improvements, and strengthening community networks. CBOs contribute significantly to disaster resilience, especially in flood-prone areas, and foster cultural preservation and social cohesion through community events and initiatives. Together, NGOs and CBOs empower communities, protect rights, and promote inclusive development, offering hope for a more equitable and sustainable future despite ongoing challenges. Types of CBOs include Community Fishery, Forestry Community, Agricultural Cooperatives, and social organizations such as saving groups, old age association, etc. All of these types are reported within the project target areas.

The identified agriculture-related community-based association is provided in Table below:

Table 28. Type of Associations

No.	Types of Associations	Krapeu Troum
1	Agricultural Cooperatives	There are five agricultural cooperatives located in in Krapeu Troum which focus on rice and vegetable.
2	Farmer Water User Community	Krapeu Troum exist of farmer utilizing water, but the systems are not operational due to a lack of cooperation in paying contributions user and unstable water support.
3	Community Forestry	No community forestry in the command area.
4	Community Fishery	No community fishery within this sub-scheme

5.4.1.4 Culture and Religion

Cambodia's culture reflects its rich history and diversity, shaped by the ethnic Khmer majority (90%) and minority groups like ethnic Vietnamese, Cham Muslims, and indigenous highland communities. While Khmer is the official language, many minorities maintain unique languages and traditions. Buddhism, practiced by 95% of the population, deeply influences cultural norms, often blended with Hindu and animist elements such as ancestor worship. As per the commune database and consultation with local authorities regarding the indigenous people, there is no indigenous people being present within the target areas.

5.4.2 Social Condition

The command areas located Kampong Chhnang and Kampong Speu province, span across in Svay, Thbeng Khpos, and Veal Pong commune, giving the total of 13 villages, giving the total households of 2,430 HHs with a total population of 10,535 people (out of which 5,483 are females).

Table 29: Administrative and population coverage of Krapeu Troum sub-scheme

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
	Krapeu Trom					
1	Kampong Speu / Odoung Maechey	Veal Pong	8	932	4,165	2,201
2	Kampong Chhnang /Sameakki Meanchey	Thbeng Khpos	4	1,281	5,207	2,688
		Svay	1	217	1,163	594
	Sub-Total	**3**	**13**	**2,430**	**10,535**	**5,483**

5.4.3 Demographic and Facilities

According to the commune database in 2023, the total number of households who are residing within and nearby the command area is 2,430 HH (out of which 379 HHs (16%) are female headed), giving the total population of 10,360 people (5,308 females). Moreover, the population are young with more than 63% of them are aging below 34 years old. More than half of the people (52%) completed education at primary school and below whereas those with secondary, high school, and higher education is only 25%, 8%, and 1%, respectively. It is noticeable that illiterate people have existed at 0.6%.

Overall, it is apparent that in the sub-schemes contain young population indicating its high potential in future development activities.

Table 30. Demographic information of the HH living within and the vicinity of the command areas

Parameters	Number	Parameters	Number
Overall		**Educational Level**	
Total HH	2,430	Kindergarten	13.2%
Female HH Head	379 (16%)	Primary school	52.1%
Total Population	10,360	Secondary school	24.8%
Female	5,308	High School	8.1%
Age		College/University	1.3%
<18 years old	36%	TVET	0.0%
18 – 34 years old	27%	Illiterate	0.6%
35 – 60 years old	25%		
> 60 years old	12%		

(Source: Ministry of Planning, Commune Database, 2023)

Energy access of the population within the target area was found to be high, giving its proportion at 98% access to electricity and only a minority of them continue using solar (2%). However, the sources of water for domestic consumption were high with 83% of them having access to water supply system while the rest continue using pump well, tube-well, pond, rainwater and river. A good sign for the people is how they are using water for drinking purposes which was found to be almost all using safe water for drinking (tape water 53%, filtered water 20%, and boiled water 26%). There is a concern, however, regarding the reliability of the tape water quality which may create significant impact on the people's health, if they are not properly monitored. Interestingly, almost all the people within the target areas own a toilet showing their understanding of the importance of water, sanitation and hygiene.

Table 31. Access to energy and water and sanitation facilities

Parameters	Percentage	Parameters	Percentage
Source of Energy		**Drinking Water**	
Electricity	98.1%	Tape water	53%
Battery	0.0%	Filtration	20%
Solar	1.9%	Boiled	26%
Biogas	0.0%		

Water Source for HH consumption		Toilet	
Tape water	83%	Pour Toilet	100%
Pump well	5%	Flush toilet	0%
Wells	2%	Total toilet	100%
Opened Well	0%		
Pond	2%		
Rainwater	5%		
River	2%		

(Source: Ministry of Planning, Commune Database, 2023)

5.4.4 Socio–economic Conditions of the Beneficiaries

Agriculture was reported as the main occupation of the population within the command areas. While business and service are the second highest proportion (23%). As for secondary occupations, full-time workers were dominant among the population while rice and crop production accounting for the second largest proportion (24%).

Table 32. Occupation of the HHs living within and the vicinity of the command areas

Parameters	Percentage	Parameters	Percentage
Main Occupation		**Secondary Occupation**	
Rice and crop production	25.08%	Rice and crop production	14.24%
Animal production	0.62%	Animal production	4.02%
Trade	3.72%	Trade	3.10%
Service	1.55%	Service	1.86%
Handicrafts	0.62%	Handicrafts	0.31%
Government staff	4.02%	Government staff	3.72%
Workers (full-time, private sector)	23.22%	Workers (full-time, private sector)	23.53%
Workers, (seasonal, private sector)	2.17%	Workers, (seasonal, private sector)	2.17%
Housewife	1.86%	Housewife	3.72%
Student	19.50%	Student	19.50%
Other	3.10%	Other	2.79%
No job	14.55%		

(Source: ESCIA Field Survey, 2024)

A significant proportion of the population with poor 1 & 2 is reported at 4%, indicating the level of economic condition of the areas while the proportion of the people with disability (PWD) is at 1.1%. The total migration is 13% and all of them only migrated within the country (13%).

Table 33. Migration and vulnerability of the people within the sub-schemes

Parameters	Percentage	Parameters	Percentage
Vulnerability		**Migration**	
Poor 1	1%	Inside the country	13%

Poor 2	3%	Out of the country	0%
Total	**4%**	**Total**	**13%**
Disable person	1.1%		
Old people	0.0%		
Orphan	0.1%		
Total	**1.2%**		

(Source: ESCIA Field Survey, 2024, Ministry of Planning, Commune Database, 2023)

Semi-permanent houses are the most dominated shelter of the people comprising of 49% of the total settlement. Wooden houses with thatched roof are the second most popular (36%) while the rest belong to one or more floor brick wall and temporary house. Interestingly, 3% of them live in temporary houses. The assets that people own the most are Television (81%), followed by motorbikes (71%), and bicycle (39%), and power tiller (11%) while the rest are in small proportion.

Table 34. Houses and Assets of the HHs within the Sub-Schemes

Parameters	Percentage	Parameters	Percentage
Assets		**Type of Houses**	
HH with Tractor	0.1%	One floor or more/brick wall	11.94%
Power Tiller	11%	Semi-permanent	49.25%
HH with Rice Harvester	0.0%	Wooden house, thatched	35.82%
Threshing Machine	0.2%	Temporary houses	2.99%
Harvest and Threshing Machine	0%		
Mobile rice mill	0.2%		
Car	6%		
Other Machinery	0%		
Motorbike	71%		
Tricycle	1%		
Bike cycle	39%		
Boat	0%		
TV	81%		

(Source: ESCIA Field Survey, 2024, Ministry of Planning, Commune Database, 2023)

5.4.5 Agricultural Production

5.4.5.1 Rice Production

In Kropeau Troum, most farmers cultivate paddy rice during the wet season, while some areas grow watermelon, wind gourd, and cucumber in the dry season between March and May. The average land size for rice production ranges from 0.3 to 1 hectare. Common rice varieties grown include Neang Menh, Phka Mlis, Reang Chey, and Phka Rumduol. Farmers typically use about 120 kg of rice seed per hectare during the wet season, with no rice production in the dry season due to water scarcity. Most seeds are self-produced, and farmers only purchase additional supplies when shortages arise.

Fertilizer use during the wet season averages 100 kg of chemical fertilizer and 200 kg of compost per hectare, while pesticide application is not common. Labor for rice farming is primarily household-based, but external labor is hired for tasks such as soil preparation, harvesting, and transporting rice. The average rice yield during the wet season is 4.25 tons per hectare, but production faces significant challenges due to damaged irrigation gates, which lead to water shortages, along with pests like the walker insect and weed infestations.

After harvesting, straw is typically kept for cow feed, sold, or left in the field for 2-3 months before being either burned or ploughed under. The average cost of production ranges from 1,500,000 to 2,000,000 riel, approximately 400 USD per hectare. Farmers in the area have received training on water consumption management, techniques for rice seed storage and use, as well as proper fertilizer and pesticide application techniques.

Table 35. Rice production during wet and dry season

Parameters	Percentage	Parameters	Percentage
Wet season		**Dry season**	
Land size (m^2)	6,816	Land size (m^2)	17,000
Yield (kg/year)	1,838	Yield (kg/year)	6,500
Income (USD/year)	526	Income (USD/year)	1,625

(Source: ESCIA Field Survey, 2024)

5.4.5.2 Vegetable Production

The average land size for vegetable cultivation ranges from 200 to 2,000 square meters. During the dry season, watermelon fields are situated near Stung Krang Ponley, with water accessed through short-distance pumping. In the wet season, some farmers relocate their watermelon cultivation to upland areas, relying on rainwater for irrigation. Rice fields used for watermelon in the dry season are converted back to rice paddies for the wet season. Farmers practice both chemical and organic cultivation methods. Water sources include rainwater, ponds, canals, rivers, and tap water. There are no agricultural associations in the area. Expenditures for vegetable production, including seeds, fertilizers (both chemical and manure), labor, and irrigation (pump rentals), range from USD 50 to USD 500. The average income from vegetable sales is around USD 1,000.

Vegetables are sold for household consumption and at local markets. Challenges faced include insect pests, diseases, water shortages, inadequate planting techniques, lack of materials, high temperatures, low prices, and climate change. Farmers have received agricultural services such as seed provision from the provincial department, market information, and farm demonstrations on planting techniques.

Table 36. Vegetable production during wet and dry season

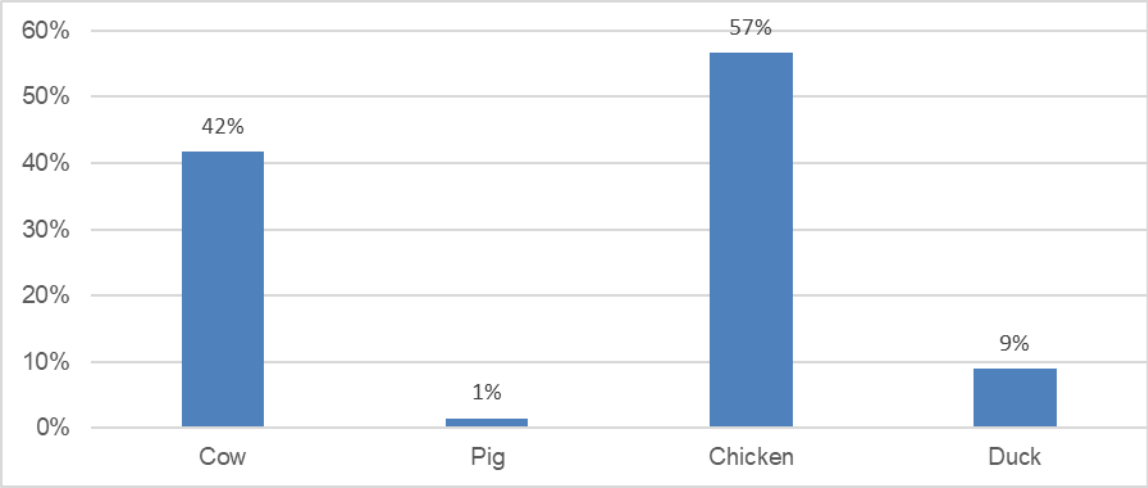
Parameters	Percentage	Parameters	Percentage
Wet season		**Dry season**	
Land size (m^2)	150	Land size (m^2)	575
Yield (kg/year)	750	Yield (kg/year)	10,806
Income (USD/year)	750	Income (USD/year)	7,429

(Source: ESCIA Field Survey, 2024)

5.4.5.3 Animal Production

In the Krapeu Truom, a diverse range of animal production activities is prevalent among local households. Cattle farming is the most common, with 42% of households raising cows. Pig farming is practiced by 1% of households. Chicken farming is the most widespread, with 57% of households involved in raising chickens, reflecting their significant role in the local economy and diet. Ducks are the least common among the livestock options, with just 9% of households raising them. This distribution highlights the varied livestock practices within the area, with a strong emphasis on poultry farming and a notable presence of cattle and buffalo farming.

Figure 3. Type of animal in Krapeu Truom command area



(Source: ESCIA Field Survey, 2024)

5.4.6 Gender

5.4.6.1 Labor Division

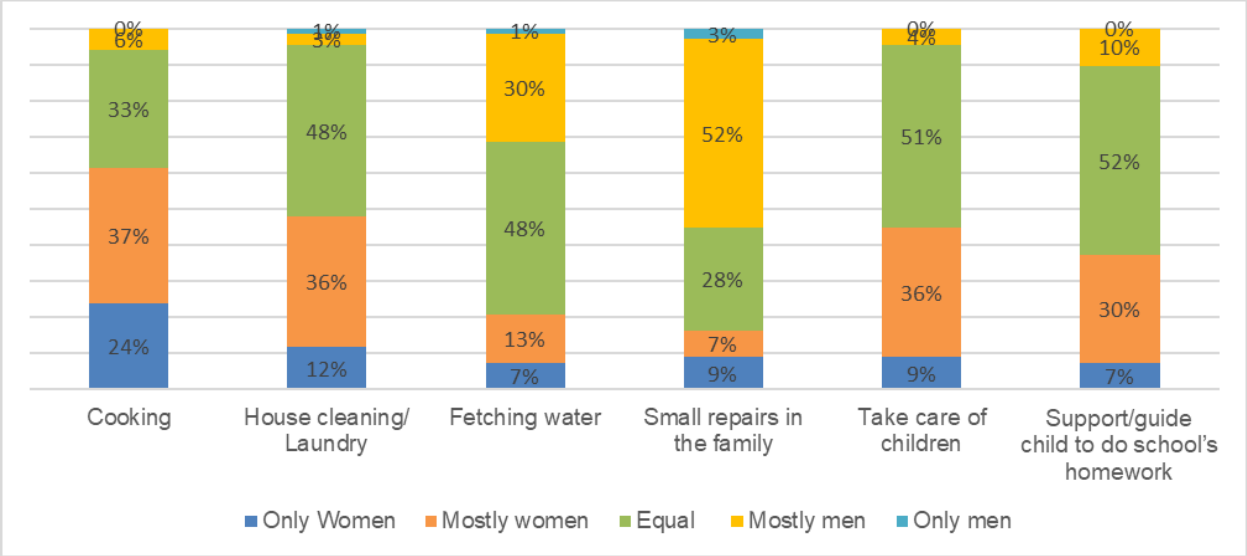
CAISAR Gender Assessment and Social Inclusion Plan reported that men spend on average of 59.4% of their time for farming whereas women spend only 40.5%. In traditional farming context, men involve the most during cultivation stage while women are more engaged in the later production. Heavy duty tasks such as land preparation are designated to men while seedling preparation and weeding are commonly assigned to women. Transplanting, uprooting, harvesting, and marketing are generally shared by both. However, the practices have been changed lately due to the presence of mechanization where land preparation, harvesting and threshing have been replaced by machinery.[11]

Coming to household chores; women handle 90% of the workload. During the COVID-19 outbreak, women spent even more time on domestic and caregiving tasks. Elderly family members bear the full responsibility for raising grandchildren when their mothers have migrated. In the project area, similarly, in families where women work in nearby garment factories or migrate for paid employment, domestic duties are often shifted to young girls and the elderly. [5] However, the ESCIA field survey showed that

[11] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

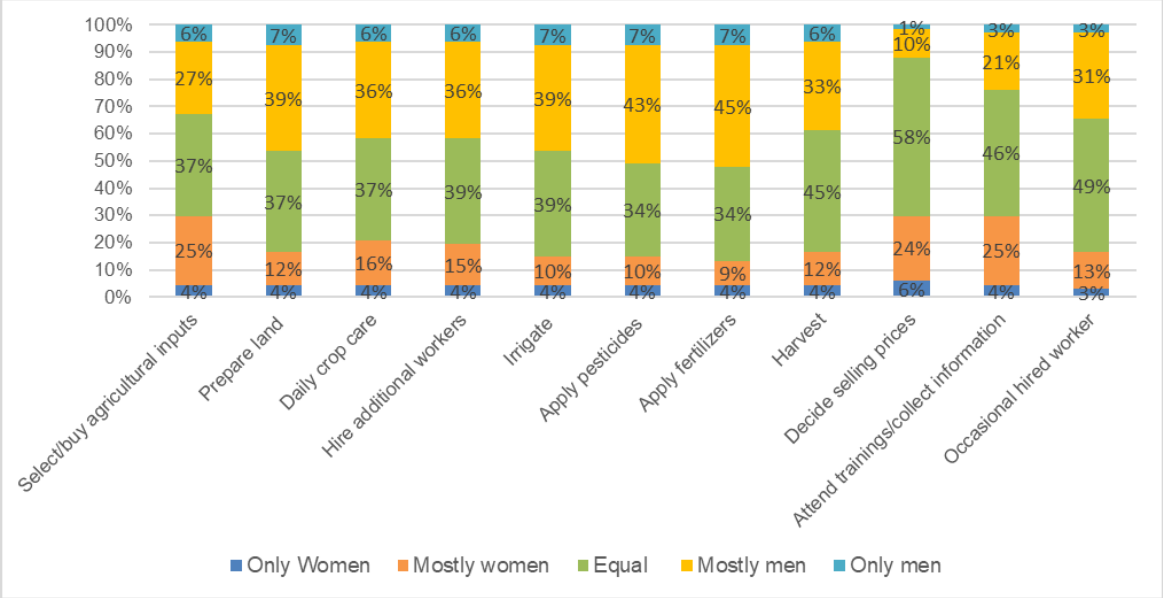
house cleaning, fetching water, child caring and schooling are mainly at the hand both men and women, except cooking mostly hand by women while repairing in the household, men involve the most (Figure 11).

Figure 22. Division of Roles in Household Chores (n=67)



(Source: ESCIA Field Survey, 2024)

Figure 23. Share of Roles in Crop Cultivation (n=67)

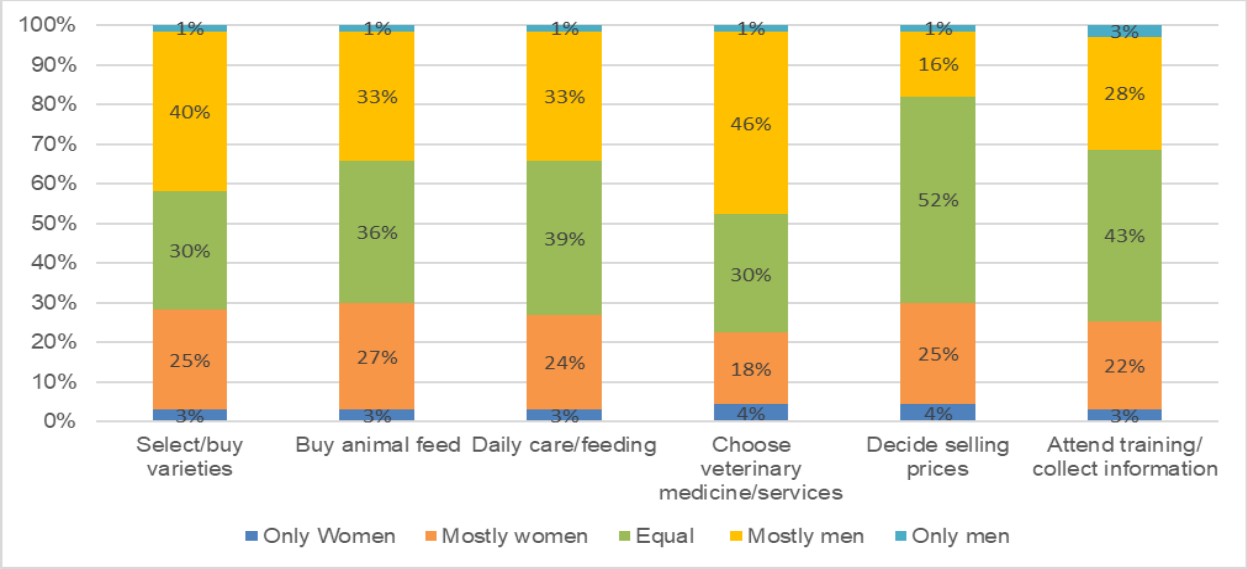


(Source: ESCIA Field Survey, 2024)

In crop production, the majority of tasks, particularly during the production phase, were found to be dominated both men and women except during land preparation, pesticide and fertilizer applied mostly hand by men (Figure 12).

In animal production, the distribution of labour is still found to be equally involved both male and female almost at all stage exception choose varieties and selecting veterinary medicine mostly response by male (Figure 13).

Figure 24. Share of roles in Animal Husbandry (n=67)



(Source: ESCIA Field Survey, 2024)

5.4.6.2 Income

The CAISAR Gender Assessment and Social Inclusion Plan revealed notable findings regarding income differences by gender. On an individual level, the average monthly income for female household members is $121.4 (n=238), which is lower than the $166.6 earned by male members (n=366), showing a statistically significant income gap of $45.2. However, at the household level, there is no significant difference in average income between female-headed and male-headed households, with a small mean difference of $17.3. Nationally, 48% of married men (aged 15–49) reported making joint decisions with their wives on income use, 46% said their wives mainly make these decisions, and 6% said they decide alone. Additionally, 97% of married women (aged 15–49) who earn cash from employment participate in decisions about their earnings, with 63% making these decisions mainly on their own.

5.4.6.3 Decision Making

Regarding decision-making, the matters related to children, such as education, childcare, and marriage, are typically decided by both husband and wife. However, a significant number of households have women as the sole decision-makers on child-related issues. When it comes to daily livelihoods, decisions such as household expenses, sales of home-produced goods, and visiting friends or family are usually made jointly. Still, a notable portion of respondents indicated that women alone make decisions regarding their own livelihoods, family expenses, attending trainings, and similar matters. While women tend to take the lead on child and livelihood issues, decisions concerning agricultural activities, like cultivation and animal husbandry, are mostly handled by men. This is largely

due to the physically demanding and sometimes hazardous nature of agricultural work, such as pesticide application.

6. ENVIRONMENTAL & SOCIAL RISKS, IMPACTS, AND MITIGATION

In this section, the E&S risks and impacts (that potentially arise during activity implementation and operationalization) are identified, analysed, and evaluated at project level — with regards to the nature, scope, scale, and the potential extent of activity impacts — through classification of such risks and impacts as direct, indirect, and cumulative. The assessment of E&S risks and impacts in this chapter is based on the following grounds that is fundamental to proposing measures to avoid, minimize, and mitigate for the impacts in the next chapter:

Project's original technical reports

- Feasibility Studies (August 2023)
- Feasibility Studies (updated by November 2023).
- Additional Pre–Feasibility for Krapeu Truom Sub–scheme.
- Environmental and Social Management Framework – ESMF (Updated by September 2024)
- IBAT reports for Krapeu Truom.

Stakeholder Consultations (national, provincial, district, commune, and village levels)

- Community Meetings
- Focus Group Discussions
- Key Information Interview.

Field observation, using

- Transect walks.
- Drones (for E&S screening and biodiversity assessment)

External technical reports

- Statistical reports/database.
- Publications and Technical Reports from national and internation institutions.

6.1 Risks and Impacts at Preparation and Construction Stage

6.1.1 UNEXPLODED ORDNANCES (UXO)

Construction and rehabilitation activities, particularly those involving earthworks, soil excavation, and river dredging, pose a significant risk of unexploded ordnance (UXO). Despite past demining efforts and clearance of the UXO existence in some sub-scheme as per the report in the Baseline, mortar shells, aerial bombs, and other UXO may still be present within the subproject area. This risk is particularly high in areas where deep excavation is required for structural upgrades or dredging.

The potential detonation of UXO poses a substantial threat to residents, construction workers, animals, and any other entities located near the construction sites. The risk of encountering UXO is considered moderate due to the country's long history of civil war and the limitations of past demining operations, which are often focused on surface-level clearance.

❖ **Mitigation Measures**

- Carry out UXO screening/assessment by certified UXO experts before any physical/ construction activities are allowed.
- In case UXOs are found by certified experts during on-site screening, removal of UXO will be carried out by certified experts.
- A UXO clearance certificate shall be obtained from related authority for each sub-project prior to commencing any subproject activities.
- As part of site-specific ESCMP, conduct training and awareness activities for local community with regards to UXO risks and chance finds.

6.1.2 ENVIRONMENTAL, HEALTH, AND SAFETY

6.1.2.1 Noise and Vibration

During construction phase, noise and vibration will be generated where machineries such as excavator, bulldozer, cement concrete mixing, and trucks are operated. While noise will be a nuisance to construction workers and nearby residents, these impacts are anticipated to local and intermittent during mostly during daytime. During night–time, noise may be occasionally generated from workers' camps due to living activities and occasional maintenance of machinery and equipment. These impacts are expected to have no or minimal impact on local residents as workers' camps will be located near construction site and far away from residential area. However, people who live along the national road (e.g. in Stung Krang Ponley) and small roads that project's trucks use to carry project's equipment and materials, may experience occasional traffic noise during daytime. Given the nature and scope of physical works under this scheme, impact of noise on local residents is expected to be none to minor, and temporary.

❖ **Mitigation Measures**

- Before commencing the irrigation system restoration, the Ministry is requested to organize public forums in collaboration with the commune to gather feedback from the local population, especially from residents who may be affected by the project. Moreover, training sessions for the commune

help them understand the project's processes, including the size of the infrastructure systems and the standards for excavation and construction. This will ensure that the commune is well-informed about the project

- Locate the workers' camp far away from the residential area as much as possible
- Avoid night-time construction in populated/village areas.
- Minimize project transportation through community areas where possible.
- Ensure proper maintenance and proper operation of construction machinery to minimize noise generation.
- No construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and during religious or cultural events near the subproject
- All construction equipment and vehicles must be well maintained, regularly inspected for noise emissions
- Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located (houses, schools, temples, hospitals, etc.
- Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.

6.1.2.2 Air pollution

During construction phase, a number of project activities may cause air pollution. These include physical activities such as movement of trucks (for transportation of materials), clearing & grubbing, grading, excavation, leveling, truck hauling, stockpiling, disposal of solid waste, dredging which may generate dust and particulate matter (PM10 and PM2.5) (if water spraying does not apply). Exhaust emissions from trucks and heavy machinery will release nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO^2), and volatile organic compounds (VOCs) which may contribute to smog formation and greenhouse effect. Burning of waste (by contractors) may release harmful pollutants into the air. While air pollution due to dust, particulate matter, and exhaust emissions from trucks and engines, are anticipated, location where pollution is generated vary and impact for one (1) location is temporary, intermittent, and minor, and are particularly for residents who live along the project's roads.

❖ **Mitigation Measures**

- Avoid burning solid waste or construction waste
- Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition
- Conduct proper maintenance of machineries and equipment
- Place sitting concrete mixing plants, crushing plants, quarries and other facilities far from settlement and other sensitive receptors
- Use cover for vehicles that transport all construction materials such as cements and excavated soils
- Test air quality (NO_2, SO_2, CO, TSP, PM10, PM2.5) prior and during the construction to assess the

level of impact

6.1.2.3 Impact on Water

Water pollution is anticipated, primarily due to physical activities that involves dredging and excavation near or in water course/ source. Such activities do not only cause turbulence for water but also cause increased sedimentation. Disturbed soil – caused by excavation to improve irrigation canal, for instance, may contaminate water at places where water is collected for domestic purpose. The impact is anticipated particularly for planned dredging operation at the upper along the Krang Ponley river. However, water pollution would be minimized through construction methods and time.

Wastewater (released from workers' camps) and leaks of hazardous materials (e.g., oil, diesel, chemical) could make their way into nearby water bodies and during rainy season which cause water contamination and leave varying level impacts on the receptors. The main receptors vulnerable to water pollution during construction include nearby residents and construction workers. Due to the scope and scale of physical works anticipated for each of the six schemes, project impact due to water pollution is anticipated to be minor and localized.

The Sedimentation due to excavation, dredging, and earthworks is a primary cause of water quality degradation. Loose soil can be washed into nearby water bodies, increasing turbidity, reducing light penetration, and altering the aquatic habitat. Additionally, the use of machinery and equipment introduces risks of oil spills, fuel leaks, and chemical contamination, which can enter water sources through surface runoff, affecting aquatic life and water usability downstream.

❖ **Mitigation Measures:**

- Implement a waste management plan to ensure the proper disposal of all construction waste, including wastewater
- Use environmentally friendly construction materials and techniques to reduce the amount of pollutants that are released into the environment
- Install erosion and sediment control measures, such as silt fences, and sediment basins.
- Properly manage construction chemicals, fuels, and waste to prevent water pollution.
- Regularly inspect and maintain construction equipment to prevent leaks and spills.
- Wash construction vehicles and machinery only in designated areas where runoff will not pollute natural surface water bodies.
- Train construction workers on the importance of preventing water pollution.
- Construct of retaining structures.
- Test surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform)

6.1.2.4 Solid and Hazardous Waste

During project implementation, solid wastes – both non–hazardous and hazardous, are anticipated to be generated, primarily due to rehabilitation of irrigation canals and rural roads. In particular, solid waste could be generated from operations that involved site clearing, excavation, trenching, demolition of

existing cement and earthworks structures, construction and disassembly of worker camps, maintenance of machineries, and so forth. Regarding dredged and excavated material, the construction activities can lead to surface erosion and sedimentation, particularly in water bodies. However, the estimates for the amount of dredged or excavated material per scheme do not estimate amounts for reuse or disposal. Improper handling of solid waste generated from the above operation may result environmental pollution that may include soil and water contamination, habitat disruption, visual pollution and give rise to concerns of public health.

❖ **Mitigation Measures**

- All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering.
- The Contractor will be required to train the workers in proper waste management.
- Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum).
- Non-hazardous, non-recyclable solid waste will be temporarily deposited and managed together at existing landfill/dumpsite.
- Safe temporary storage of hazardous waste as required.
- Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations.
- Vehicles, machinery, and equipment maintenance and re-fueling will be carried out in such a way that spilled materials do not seep into the soil.
- Oil traps will be provided for service areas and parking areas.
- Fuel storage and refilling areas will be located at least 50m from canals and channels and will be protected by temporary drainage bunds to contain spills.
- Use or reuse the dredge material on properties with a residential or recreational use (dredging material, if planned for reuse, will be subject to testing to ensure the material is safe for reuse).

6.1.2.5 Wastewater

During construction phase, generation of wastewater is expected, mainly from a) workers' camp (e.g. domestic wastewater), b) cleaning and washing of machinery, c) treatment of leakage and spill, etc. Depending how wastewater is managed, receptors of wastewater may include immediate receiving environment which may include soil, water bodies which may subsequently affect human including construction workers, residents nearby, and fauna and flora along the way wastewater goes.

❖ **Mitigation Measures**

- Reduce, recycle, and reuse waste [e.g. plastic waste, electronic waste, agricultural waste (natural, animal faces for later use as manure, plant waste)] wherever and whenever possible.
- Latrines must be built at construction sites and camp sites for appropriate domestic waste management.

- Hazardous waste, including any spills of chemicals or fuels, should be collected separately and disposed of following environmental regulations.
- Ensure construction sites have enough well-maintained sanitation facilities to prevent the direct discharge of untreated wastewater.
- Promote clean living practices, reduce plastic usage, and improve waste management.
- The construction company must regularly monitor the workers' living conditions, waste management, and ensure there are proper sanitation facilities and adequate housing for the workers.
- The company provides education and guidance on maintaining cleanliness and hygiene for the workers (such as proper waste disposal and handling of oil) and prohibits activities like fish poaching and hunting.

6.1.3 OCCUPATIONAL HEALTH AND SAFETY

6.1.3.1 Physical Hazards

The construction or rehabilitation of irrigation canals and farm roads during the construction phase of the project presents significant physical hazards to workers and those in close proximity to the construction sites. These hazards can result in a range of consequences, from minor injuries requiring medical attention to severe and potentially fatal accidents. The sources highlight several specific types of physical hazards, including Falls from Heights, Drowning and Water-Related Injuries, Falling Objects, Falls into Open Holes, and Injuries from Heavy Equipment.

The impact receptors for physical hazards are primarily construction workers, but also include inspectors, visitors, and nearby residents and children, as well as domestic animals. The sources assess the risk of physical hazards as high, acknowledging that working in the construction field can result in injuries or fatalities if safety standards are not met. The sources emphasize that unsafe practices by construction companies can lead to accidents, injuries, illnesses, and fatalities. While the overall risk might be lower due to the anticipated number of workers involved, stakeholders at the community, district, and provincial levels have expressed concerns about the potential hazards posed to both workers and community members.

❖ **Mitigation Measures**

- Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines.
- Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements.
- Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks.
- Install appropriate fencing and control access to the site.

- Install appropriate safety signage and markings.
- Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m.
- Ensure there are safe ways to enter and exit the excavation.
- Carry out daily toolbox meetings (safety briefings).
- Maintain an accident record book where all major or minor accidents and incidents are recorded with actions taken.
- Educate the workers on construction hazards.
- Train drivers in safe driving skills and traffic regulations.
- Appoint an Environment, Health and Safety Officer who is a qualified engineer.
- Make adequate first aid equipment available on site.
- Carry out training and awareness of the workers on HIV-AIDS prevention.
- Ensure that all workers are equipped with and use Personal Protective Equipment (PPE).

6.1.3.2 Heat Stress

The construction phase of the project, which includes rehabilitating irrigation canals and ponds, presents potential risks of heat stress to workers. This is particularly concerning given Cambodia's tropical climate, characterized by high temperatures and humidity. Construction activities are often physically demanding and performed outdoors, increasing the risk of heat-related illnesses.

Construction workers exposed to prolonged high temperatures and humidity may experience heat stress, potentially leading to heat exhaustion or heat stroke. This can result in reduced productivity, increased accidents, and even fatalities. Heat stress can also exacerbate existing health conditions. The project's Environmental and Social Management Framework (ESCMF) highlights the importance of considering temperature extremes during the construction phase, emphasizing the need for mitigation measures to ensure worker health and productivity.

❖ **Mitigation Measures**

- Providing regular breaks and shaded rest areas for workers to cool down and rehydrate.
- Ensuring access to cool drinking water throughout the workday.
- Adjusting work schedules to avoid the hottest hours of the day, if feasible.
- Providing training to workers and supervisors on recognizing the signs and symptoms of heat stress and appropriate first aid measures.
- Encouraging the use of personal protective equipment, such as light-coloured, loose-fitting clothing and wide-brimmed hats, to minimize heat absorption.
- Monitoring weather conditions and adjusting work practices accordingly.
- Developing and implementing an emergency response plan for heat-related illnesses.

- Providing adequate ventilation and cooling systems in worker accommodations.
- Encouraging workers to maintain good physical fitness and hydration levels.
- Regularly monitoring workers for signs of heat stress and taking appropriate action.

6.1.4 COMMUNITY HEALTH AND SAFETY

The construction phase, the project will rehabilitate existing irrigation canals and build new irrigation channels in an estimated six schemes located in four provinces. Construction activities may disrupt local transportation networks and increase traffic volume, including heavy trucks and machinery, impacting communities and businesses along transportation routes. Construction sites pose health and safety risks to workers and nearby communities. Accidents and exposure to construction-related hazards can have serious consequences. The influx of construction workers from different regions may increase the risk of spreading communicable diseases such as HIV/AIDS to the local community.

Open canals and ponds during rehabilitation work pose a risk of drowning, particularly to children and individuals unfamiliar with the area. Construction activities may increase the depth or alter the flow of water, further increasing the risk. Construction sites can attract curious individuals, particularly children, who may be unaware of the potential hazards. This includes the risk of falls, being struck by moving machinery or vehicles, and contact with hazardous materials. It is important to secure construction areas, implement safety awareness campaigns, and enforce hygiene and sanitation standards at construction camps.

❖ **Mitigation Measures**

- Prior to start of construction work, the contractor in cooperation with the PIU will consult with the local authorities and potentially affected residents/private landowner. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM).
- The contractor shall fence off the construction area and control access to the site.
- A speed limit of 30 km/h for construction related traffic through inhabited areas.
- The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities.
- The contractor in cooperation with the local authorities shall implement traffic management to ensure a smooth traffic and prevent congestion.

6.1.5 BIODIVERSITY

6.1.5.1 Hunting, trading, and consumption of wildlife

During the construction phase of the irrigation infrastructure project, the influx of a new labor force presents a significant risk to hunting, trading, and consumption of wildlife. The arrival of workers from other regions can increase the demand for exotic local foods, including wildlife and endangered species, which are often perceived as interesting delicacies or possessing health-promoting properties. The hunting may be done for relaxation or belief that wildlife is tasty or making people healthy. This heightened demand can drive illegal hunting and trading activities, posing a severe threat to biodiversity and the

stability of local ecosystems.

The impact receptors of this risk are primarily aquatic and terrestrial species, and endangered. The potential impact on endangered species, as their rarity often increases their market value, further incentivizing unsustainable hunting and trading practices that can lead to their extinction. Regarding to biodiversity assessment in the Krapeu Trom identified the potential presence of only the endangered Flying Minnow. While another species was reported downstream, its presence within the sub-scheme was unconfirmed.

❖ **Mitigation Measures**

- Conduct thorough biodiversity inspections along access roads and at quarry sites before starting land clearing works to identify habitats or nesting sites of endangered/protected species.
- Provide mandatory training for contractors' management staff and site workers on the Code of Conduct, Standard Operating Procedures (SOP) for wildlife protection and handling, and human-wildlife conflict management.
- Incorporate a policy in the Project Administration Manual (PAM) and Worker's Agreement that prohibits employees and/or subcontractors from possessing, purchasing, trading, or collecting wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List.
- Undertake regular monitoring of all access roads to prevent poaching activities.
- Properly handle and rescue wildlife encountered during land clearing and construction, following the SOP for wildlife protection and handling.
- Educate the community on local wildlife behavior, avoidance techniques, and deterrent methods.
- Report observed/recorded incidents of illegal activities to relevant authorities.
- Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species.
- Collaborate with local communities to monitor wildlife populations and report any suspicious activities.

6.1.5.2 Loss of fauna and flora

The primary activity contributing to this risk is the construction of canals and roads, particularly in areas that require clearing vegetation and disrupting natural habitats. The construction activities can lead to both direct and indirect impacts on fauna and flora:

- Habitat loss and fragmentation due to construction activities like canal and farm road rehabilitation, land use changes, and altered water management practices can affect species survival and connectivity. These activities may involve dredging, excavation, or modification of existing water channels and infrastructure, leading to habitat destruction and disturbance to nesting and foraging sites.
- Increased vehicle movement increases the chance of collisions with wildlife.

The impact receptors for the loss of fauna and flora are diverse and include various species, particularly those dependent on the Krapeu Trom sub-scheme, which is part of the Krang Ponley River. The biodiversity study has confirmed rare fish species: Isok barb/Jullien's Golden Carp (Probarbus jullieni) and Leaping barb/Flying Minnow (Laubuka caeruleostigmata) were confirmed present from 2020 to 2024. Therefore, the construction of canal expansion and road will impact these species.

❖ **Mitigation Measures**

- Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction by relocating them to safer habitats, following the Standard Operating Procedure (SOP) for wildlife protection and handling.
- Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur.
- Train field workers to recognize and avoid wildlife.
- Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur.
- Develop a system in which drivers report locations of wildlife crossings and wildlife sightings.
- Workers will receive training on frequently encountered wildlife.
- The contractor shall install signs to ban hunting or catching wildlife in the area.
- Apply Find Chance Procedure

6.1.6 CLIMATE CHANGE

6.1.6.1 GHG emission

The main activities that contribute to this risk is the use of heavy machinery and trucks for excavation, transportation, and rehabilitation of irrigation canals and farm roads. The operation of these machineries releases carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) into the atmosphere. Waste burning at worker campsites may also contribute to GHG emission.

❖ **Mitigation Measures**

- Construction vehicles and machinery will be maintained to a high standard to minimize emissions and ensure compliance with the National exhaust emission standards. All mobile equipment should be fitted with catalytic converters.
- Use energy-efficient machinery and equipment during construction to reduce fuel consumption and emissions.
- All open burning of construction and demolition of waste material and refuse will be prohibited.
- Implement proper maintenance programs for equipment and vehicles to ensure they operate

efficiently and with lower emissions.

- Engage with local communities and stakeholders to raise awareness of emission reduction practices and encourage their participation in sustainability efforts.

6.2 Risks and Impacts at Operation Stage

6.2.1 ENVIRONMENTAL, HEALTH AND SAFETY ASPECT/ISSUE

6.2.1.1 Water Management

During the operation phase of the irrigation infrastructure project, alterations to hydrology present potential risks. The main activity that causes these risks is increased irrigation. This can lead to the depletion of water sources if proper management practices are not implemented.

The impact receptors for these risks include the Tonle Sap Lake, upstream watersheds, wetlands, aquatic ecosystems, and downstream communities. The assessment of the impact of hydrology changes during operation is moderate. This takes into consideration the potential for both positive and negative impacts of irrigation systems. Poor water management can result in downstream water scarcity, altered hydrology, and damage to aquatic ecosystems. However, well-designed and properly managed irrigation systems can contribute to improved agricultural productivity and water resource management.

❖ **Mitigation Measures**

- A water user community should be organized prior to construction to participate in identifying key locations and ensure there are caretakers in place.
- Establish detailed water management plans that ensure equitable water distribution and allocation, considering the needs of various users and the environmental flow requirements to maintain healthy aquatic ecosystems.
- Design and construct robust irrigation infrastructure, including canals, ponds, and storage areas, capable of withstanding extreme weather events like floods and droughts. This investment should also include lining canals and refurbishing storage areas to reduce water losses and improve water storage capacity.
- Integrate natural infrastructure, such as wetlands and forests, into water management strategies. Protect and restore degraded habitats to enhance their water regulation capabilities, improve water quality, and support biodiversity.
- Establish and provide training to FWUCs on sustainable water management practices, equitable water rights, and allocation procedures. These communities play a vital role in the operation and maintenance of the irrigation system, ensuring its long-term sustainability.

6.2.1.2 Water pollution

During this phase, the primary activity that causes this risk is the intensification of agricultural production in the command areas as irrigation water becomes readily available. This intensification can lead to an increased use of chemicals, such as fertilizers and pesticides, to enhance crop yields. These chemicals

infiltrate the soil and reach groundwater aquifers, leading to long-term contamination. The excessive application of these chemicals can result in contamination of both surface and groundwater resources. Furthermore, changes in water table levels due to extensive irrigation can alter the flow patterns of groundwater, potentially mobilizing contaminants that would otherwise remain contained.

The assessment of the impact of water pollution during operation is moderate. The potential for significant water quality degradation due to the widespread use of chemical fertilizers and pesticides in rice production. High concentrations of these chemicals in water resources can harm biodiversity, not only within the KT sub-scheme but also in the downstream river systems and the Tonle Sap Lake.

❖ **Mitigation Measures**

- Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing.
- Encourage farmers to adopt IPM techniques that minimize pesticide use and rely on biological control methods, thereby reducing the increased risk of chemical contamination of water resources.
- Provide training and extension services to farmers on the judicious use of fertilizers and, ensuring they apply the correct type and amount based on soil nutrient levels.
- Promote the adoption of organic fertilizers and soil amendments, such as cover crops and green manures, which can improve soil fertility and reduce the need for chemical fertilizers.
- Implement a robust water quality monitoring program to track the levels of pesticides, nitrates, and other pollutants in surface and groundwater resources within and around the command areas.
- Encourage the adoption of water-saving irrigation methods, such as alternate wetting and drying (AWD) in rice cultivation, which can reduce water consumption and minimize the leaching of agrochemicals.

6.2.1.3 Soil pollution

During the operation phase of the irrigation infrastructure project, soil pollution/quality reduction poses a considerable risk. The primary activity contributing to this risk is the increased agricultural production facilitated by the improved irrigation infrastructure. This intensification can lead to the overuse of agri-chemicals, such as chemical pesticides and fertilizers, if farmers lack adequate training or support in adopting environmentally friendly practices.

The impact receptors for soil pollution/quality reduction are multifaceted, encompassing such as soil health, water quality, and biodiversity. The impact of soil pollution/quality reduction during the operation phase as moderate. This assessment considers the potential for increased agricultural production to lead to the overuse of agri-chemicals if sustainable farming practices are not adopted.

❖ **Mitigation Measures**

- Implement Simplified Pesticide Management Plan
- Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing

6.2.2 CLIMATE CHANGE

6.2.2.1 GHG emission

During the operation phase, the intensification of farming activities is expected to result in a rise in greenhouse gas (GHG) emissions. This increase will stem primarily from the greater energy requirements associated with boosting agricultural production. The operation of machinery and equipment for various farming tasks, including tillage, irrigation, harvesting, and transportation, will demand a substantial amount of energy. If this energy comes from fossil fuels, it will lead to higher carbon emissions. The practice of burning rice straw after harvest, a common agricultural method in the region, also releases significant amounts of GHGs, such as carbon dioxide and methane, into the atmosphere. Additionally, the intensification of farming often results in greater use of chemical fertilizers, and the production and application of these fertilizers also contribute to GHG emissions.

The main impact receptor for GHG emissions is the atmosphere. The increase in GHG emissions adds to the problem of global climate change, which can have a wide range of negative consequences. These consequences include rising temperatures, shifts in weather patterns, sea-level rise, and an increase in the frequency and intensity of extreme weather events.

❖ **Mitigation Measures**

- The project needs to introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production.
- The project needs support training farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution.
- The project promotes the utilization of efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions.
- The project needs to advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.

6.2.3 ANNUAL CROP MANAGEMENT PLAN

6.2.3.1 Water resource efficiency

In this phase, inefficient irrigation practices can lead to a reduction in water resource efficiency. Moreover, people in community faced with flooding in wet season and drought in dry season generally. Additionally, farmers also pose with climate change issue which harm to their crop. The increased demand for irrigation, coupled with poor water management practices and lack of infrastructure, can result in the over-extraction of water resources. This over-extraction can have several detrimental effects on the surrounding environment and communities:

- Downstream Water Scarcity: Excessive withdrawal of water for irrigation can deplete water sources downstream, leading to water shortages for other users, such as communities, industries, and ecosystems.
- Altered Hydrology: Over-extraction can disrupt the natural flow patterns of rivers and other water bodies, affecting the balance of aquatic ecosystems and the services they provide.

- Damage to Aquatic Ecosystems: Reduced water flow and altered water levels can harm fish populations, other aquatic organisms, and the overall health of downstream ecosystems.

The impact receptors for inefficient water resource use are downstream communities and aquatic ecosystems, including those in the Tonle Sap Lake and its surrounding watersheds, this impact as the moderate. This assessment highlights the importance of implementing effective water management strategies to ensure the sustainable use of water resources and minimize negative impacts on downstream users and ecosystems.

❖ **Mitigation Measures**

- Water use monitoring system to track consumption and identify areas for improvement.
- implementing appropriate irrigation scheduling based on crop water requirements and weather conditions.
- Utilizing efficient irrigation systems, such as drip irrigation or sprinkler systems, to minimize water loss.
- Exploring opportunities for water reuse, such as capturing and reusing runoff water.

6.2.3.2 Soil erosion and soil erosion risk

The various agricultural activities can elevate the risk of soil erosion and contribute to the degradation of soil health. Land preparation practices, such as tillage and site clearing, along with the use of heavy machinery, can disrupt the soil structure, making it more vulnerable to erosion by wind and water. Additionally, the intensification of farming can lead to changes in vegetation cover, reducing the natural protection against erosion.

Soil erosion poses significant threats to both the environment and agricultural productivity. The loss of topsoil, the fertile upper layer of soil rich in nutrients and organic matter, is a primary concern. This loss diminishes soil fertility, impacting its ability to retain water and nutrients crucial for plant growth. Consequently, agricultural yields decline, and farmers may experience reduced productivity. Furthermore, eroded soil particles contribute to increased sedimentation in water bodies such as rivers and lakes. This sedimentation can harm aquatic ecosystems and degrade water quality, increasing the costs associated with treating water for human consumption.

The impact receptors for soil erosion are soil health, water quality, and agricultural productivity. The sources assess the impact of soil erosion during the operation phase as high, emphasizing the need for sustainable land management practices to prevent and mitigate soil erosion.

❖ **Mitigation Measures**

- Minimize soil compaction and disturbance by using appropriate machinery and timing land preparation activities.
- Consider erosion management practices such as contour planting, terracing, and grass barriers.
- Adopt reduced tillage or no-till farming practices to minimize soil disturbance.
- Establish cover crops during fallow periods or in rotation with main crops to protect the soil from

erosion.

- Practice contour farming on sloping land to reduce runoff and erosion.
- Construct terraces on steep slopes to prevent soil loss.
- Establish windbreaks or shelterbelts to reduce wind erosion.
- Install erosion control structures, such as grassed waterways or sediment basins, to manage runoff.
- Apply much to the soil surface to protect it from rainfall impact and erosion.

6.2.3.3 Nutrient application and management

The excessive or improper application of fertilizers poses a significant risk to water quality and the health of aquatic ecosystems. The intensification of agricultural production, driven by improved irrigation, can lead to an increased reliance on chemical fertilizers to enhance crop yields.

The impact receptors for nutrient runoff and leaching are water quality, aquatic ecosystems, and human health. High levels of nutrients, particularly nitrogen and phosphorus, in water bodies can lead to eutrophication, a process that causes excessive growth of algae. This algal bloom can deplete oxygen levels in the water, harming fish and other aquatic organisms. Additionally, contaminated water sources can pose risks to human health if used for drinking or recreational purposes.

The sources assess the impact of nutrient application and management during the operation phase as high, emphasizing the urgent need for sustainable farming practices that optimize fertilizer use and minimize the risks of nutrient pollution.

❖ **Mitigation Measures**

- Conduct periodic soil analysis to determine nutrient needs and avoid over-fertilization.
- Establish buffer zones near watercourses to filter nutrient runoff.
- Consider using green manures and cover crops to replenish soil nutrients and reduce leaching.

6.2.3.4 Use and effectiveness of pesticides

The use of pesticides to protect crops from pests and diseases can pose significant risks to human health, biodiversity, and the environment. The intensification of farming often leads to an increased reliance on pesticides to maintain high crop yields. However, the effectiveness of pesticides can decline over time as pests develop resistance, requiring farmers to apply higher doses or switch to more potent chemicals.

This cycle of pesticide use, and resistance can have several negative consequences. Pesticide exposure can pose health risks to both farmers who handle and apply these chemicals and consumers who ingest pesticide residues on food. Pesticides can harm non-target organisms, including beneficial insects, pollinators, and soil organisms, disrupting the balance of ecosystems. Environmental Contamination: Pesticides can contaminate soil and water resources, potentially affecting water quality and the health of aquatic ecosystems.

The sources assess the risks and impacts associated with pesticide use and effectiveness as high, highlighting the need for integrated pest management strategies that minimize reliance on chemical

pesticides.

❖ **Mitigation Measures**

- Promote Integrated Pest Management (IPM) strategies to minimize pesticide use.
- Implement training and awareness programs for farmers on the safe handling and application of pesticides.
- Providing training materials that are user-friendly and accessible to farmers with varying literacy levels.
- Including climate information and agrometeorology services in training materials when available.
- Preparing training materials for rice and other crops such as vegetables, poultry, and aquaculture.
- Organizing trainings on "climate-informed agriculture decisions and planning" and having trained individuals disseminate information.

6.2.3.5 Pesticide residues on site soil

The repeated application of pesticides, especially persistent pesticides, and the improper disposal of pesticide containers can lead to the accumulation of pesticide residues in the soil. This accumulation can have several detrimental effects on the environment such as contamination of Groundwater and impacts on Soil Organisms.

The impact receptors for pesticide residues on-site soil are soil health, biodiversity, and water quality. The sources assess the risk of pesticide residue accumulation in the soil as high, emphasizing the need for judicious pesticide use, proper disposal of pesticide containers, and integrated pest management strategies to minimize the risks associated with pesticide contamination.

❖ **Mitigation Measures**

- Promote the use of pesticides with low persistence and mobility in the environment.
- Implement a soil monitoring program to assess pesticide residue levels.
- Consider crop rotation and the use of cover crops to help break down pesticide residues.
- Minimize pesticide use by adopting IPM strategies.
- Conduct soil testing to monitor pesticide residue levels.
- Utilize cover crops to improve soil health and enhance pesticide degradation.

6.2.3.6 Pesticide residues on produce

During the operation phase of the irrigation project, the application of pesticides close to harvest, improper pesticide application techniques, and inadequate pre-harvest intervals can lead to pesticide residues on produce, posing risks to consumer health. Consuming produce with pesticide residues can have adverse effects on human health.

The main impact receptor for pesticide residues on produce is human health, specifically consumers who ingest the contaminated food. The sources assess the impact of pesticide residues on produce as

moderate. This assessment highlights the importance of implementing safe pesticide application practices, adhering to pre-harvest intervals, and promoting alternative pest control methods to minimize the risks to consumer health.

❖ **Mitigation Measures**

- Enforce pre-harvest intervals to allow for pesticide breakdown before harvest.
- Promote the use of pesticides with low toxicity to humans.
- Properly wash and handle produce to remove surface residues.
- Implement a monitoring program to test produce for pesticide residues.
- Ensure compliance with established MRLs for pesticide residues on produce.

6.3 Risks and Impacts at Preparation Stage

6.3.1 LAND ACQUISTION

6.3.1.1 Land acquisition and resettlement

The land acquisition for the construction of the irrigation system within the Krapeu Trom sub-schemes has been limitedly anticipated since the construction of the new system has been avoided the most. The land acquisition in the Krapeu Trom sub-scheme is primarily driven by the construction of infrastructure components such as the Drainage Canal and Carrying Roads (MC2). These activities are projected to affect a total land area approximately 15,850 m^2.

Consultation result addressed that they have concerns of land affected by construction near irrigation systems or the placement of construction projects, with some areas of land that people are using being close to harvest time and potentially rendered unusable but due to the project announcement the project implementation will be inform 6 months in advanced where this issue will be encounter. The affected households will feel not well due to land impact.

Consultation with the Provincial Department of Land Management, Urban Planning and Construction (PDoLMUPC) has revealed that all the land required for this sub-scheme falls under public ownership. Therefore, the land acquisition process is anticipated to proceed without impacting any private property.

❖ **Mitigation Measures**

- Abbreviated Land Resettlement Plan should be prepared to support the proper implementation of the sub-scheme.

6.3.1.2 Economic displacement

The risk of economic displacement is linked to activities like the rehabilitation of irrigation canals and farm roads, and land acquisition. These activities can disrupt existing economic activities and displace households and businesses. The upgrading of irrigation systems may result in the removal of informal farming areas due to dredging, impacting those who rely on these areas for income. Additionally, during the construction phase, local businesses and transportation routes might face disruptions due to

construction activities, affecting the community's daily life and economic activities. The Krapeu Trom Sub-scheme encompasses various infrastructure components, including Main Canals, Drainage Canals and Carrying Roads (MC2.

The impact receptors for economic displacement include households who have production land along the water bodies, informal land users, informal settlers, and nearby construction site business owners. The assessment regard this impact of economic displacement as moderate.

❖ **Mitigation Measures**

- The households who own the land along the rehabilitated canals which will be expanded at the public land should be properly informed prior to the construction to avoid their crops will be damaged at the time of construction.
- Although the acquired land is the public land, there are a need of a proper consultation and information to be conducted to inform and obtain agreement from the affected households.

6.4 Risks and Impacts at Construction Stage

6.4.1 PROTECTING THE WORKFORC

6.4.1.1 Child Labor

The risk of child labor emerges due to the demand for unskilled labor in rural areas where the use of child labor is prevalent. Contractors and subcontractors involved in the project's construction activities may employ children or youth under the legal working age due to labor shortages or the drive to minimize costs. This practice exploits vulnerable children, depriving them of education and opportunities, and perpetuates a cycle of poverty.

The risk of child labor, particularly due to the influx of labor and pre-existing societal inequalities. Vulnerable groups, such as poor and near-poor households, female-headed households with dependents. Children from these groups are often driven to work due to economic hardship, and the increased demand for labor during project construction can exacerbate this situation. Migrant workers, often facing precarious working conditions and separated from support systems, are also highly vulnerable to exploitation, including child labor. The project's Gender Assessment identifies the lack of local wage jobs and increasing migration as key challenges that could further heighten the risk of child labor.

❖ **Mitigation Measures**

- Apply LMP for age check prior to engagement of labor with regular monitoring through proper screening and registering all workforce for the work
- To mitigate the risk of child labor, the project will implement strict measures to ensure compliance with national and international labor laws. Regular monitoring and inspections will be conducted to identify and address any instances of child labor.
- Additionally, awareness-raising campaigns will be implemented to educate communities about the harmful effects of child labor and the importance of sending children to school. The project will also collaborate with local authorities and NGOs to strengthen law enforcement and provide

support services to vulnerable children and their families.

6.4.1.2 Forced Labor

In the construction phase, the risk of forced labor is anticipated, especially for vulnerable individuals who may be coerced into working against their will. Forced labor can manifest in various ways, including:

- Economic Coercion: Individuals may be forced to work due to financial pressures, such as the need to repay debts or support their families.
- Exploitation of Young People: Young people, particularly those from impoverished backgrounds, may be forced to work to contribute to family income or due to a lack of educational opportunities.
- Debt Bondage: Workers may be trapped in a cycle of debt by unscrupulous employers who advance them loans with exploitative terms, effectively binding them to work until the debt is repaid.
- The rehabilitation of irrigation canals and farm roads creates a demand for local labor which can be exploited by those who seek to profit from forced labor.

❖ **Mitigation Measures**

- Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children
- The Project Owner and Sub-Contractors will collaborate with the relevant Government Agency to disseminate information to local communities. This information will include the Contractor's Code of Conduct and the minimum working age as mandated by national laws and international standards.
- The Ministry of Water Resources and Meteorology (MOWRAM) will provide information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.

6.4.2 COMMUNITY HEALTH AND SAFETY

6.4.2.1 Disease transmission

During construction phase, the risk of disease transmission is anticipated due to the influx of construction workers, the potential for their lack of hygiene in living conditions, and their interaction with local community members. The influx of workers increases the likelihood of spreading and contracting communicable diseases, both among the workers themselves and between workers and the local community. Workers may experience poor eating habits, homesickness, stress, and unhygiene living conditions which make them susceptible to diseases.

❖ **Mitigation Measures**

- Conduct public awareness raising activities (IEC) to ensure local people and contractors know about the risks of contracting and spreading communicable diseases such as COVID-19, HIV/AIDS, and water-borne diseases (e.g., amoebiasis, giardiasis, and toxoplasmosis. etc.
- In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising

to the risk groups.

- Conduct training to workers on communicable diseases prior to mobilization to construction sites.
- For water-borne diseases that arise due to polluted or contaminated water, mitigations measures may include:
- Implement filtration, chlorination, or UV disinfection to ensure safe drinking water.
- Build and maintain proper sewage systems and latrines to prevent water contamination.
- Promote handwashing, safe food preparation, and proper sanitation practices in communities.
- Control and properly dispose of waste to prevent water pollution.
- Test water sources frequently for contamination and take corrective actions promptly.

6.4.2.2 Sexual Exploitation and Abuse, Sexual Harassment

The risk of Sexual Exploitation and Abuse/ Sexual Harassment (SEA/SH) is envisaged due to several factors. The influx of workers estimated to be approximately 171 in Krang Ponleng river, as the Krapeu Trom is a part of this scheme, frequent visits by project personnel, and pre-existing SEA/SH issues in the area all contribute to this risk. This risk is primarily associated with the rehabilitation of irrigation canals and farm roads. The influx of labor includes not only construction workers but also individuals who provide logistical services, increasing the potential for exploitation.

❖ **Mitigation Measures**

- Contractors need to explicitly state zero tolerance for sexual harassment, exploitation, and abuse within the workplace.
- Require Code of Conduct (CoC) to be signed by all construction workers.
- For victims coming forward: referral to qualified SEA/SH service provider. The GRM will include a confidential channel for reporting SEA/SH.
- Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children
- Training on SEA/SH and VAC for community members, in particular women and girls (may be done separately for men and women).
- Ensuring workers' sites are situated (at least 500m) from schools and/or other areas where children congregate.
- Ensure access to grievance redress mechanisms for all project-affected persons, including both stakeholders and workers, to address Sexual Exploitation and Abuse, and Sexual Harassment. Support (in the form of training, awareness raising, etc.) to local law enforcement to act on community complaints regarding SEA/SH and VAC.
- Provision of information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.
- Provide counselling services for male and female workers, wives and other female partners of

contractors' workers.

- Build partnerships with local health providers and SEA/SH service providers to conduct community awareness activities, and referrals.
- Implement public awareness campaigns to address sexual harassment in transport services and hubs, and training of police on women's security needs when using transport.

6.4.2.3 Traffic safety & Security

During construction phase, traffic safety is among the local concerns. The rehabilitation of irrigation canals and farm roads necessitates increased transportation of construction materials and equipment, potentially leading to road accidents, especially if safety measures are not strictly enforced. Construction activities can also attract unauthorized individuals seeking to steal or vandalize equipment and materials, further compromising security. The influx of construction workers into the project area may also contribute to a perceived or actual increase in crime rates, impacting the sense of safety among residents.

People subject to risk of traffic accident include anyone which may include project workers and local people who live near the construction sites or travel on transportation routes.

❖ **Mitigation Measures**

- Arrange security guard or engage local authority to guard the construction sites
- Conduct public awareness raising activities (IEC) to ensure local people and road user are aware of road safety regulations and risks and act accordingly while using road.
- Monitor and observe speed limit.

6.4.2.4 Community Health and diseases

During the construction phase, community health and safety risks extend beyond disease transmission and include the potential for accidents and injuries related to construction activities. Rehabilitation work on canals and ponds poses drowning risks, especially for children and those unfamiliar with the altered water bodies. Trespassing in construction zones, which may contain storage areas, camps, lay down areas for construction materials, vehicles, and machinery, presents further risks of incidents and accidents for community members. Additionally, construction activities can lead to traffic and access disruptions that may cause safety issues for the community. The presence of construction workers and associated activities can also lead to potential conflicts with local communities. Construction sites also pose risks of accidents and exposure to construction related hazards.

❖ **Mitigation measures:**

- Establish clear and well-marked construction exclusion zones to prevent unauthorized access, especially to areas with open water, heavy machinery, and storage areas.
- Implement fencing and barriers to prevent trespassing and ensure community safety around construction areas.
- Provide warning signs in local languages to inform communities about the dangers and restricted access to construction areas.

- Install safety barriers around construction sites to minimize risks to the community and workers.
- Ensure proper storage of construction materials, with no materials left unsecured and scattered around the site.
- Develop and implement traffic management plans to minimize traffic and access disruptions and ensure pedestrian and vehicle safety.
- Conduct community awareness campaigns to educate the community about the potential risks and safety measures during construction.
- Establish and maintain a grievance mechanism to address community complaints and issues promptly.
- Implement safety measures around canals and ponds to prevent drowning incidents, such as installing safety barriers and providing warning signs in local languages.
- Create and enforce clear rules regarding access to canals and ponds during construction, and post those rules.
- Implement strict health and safety regulations at all construction sites to protect both workers and the nearby communities.
- Provide training to workers on safety protocols, including how to work safely around water, avoid accidents and minimize risks to the community.
- Ensure all workers are provided with necessary personal protective equipment (PPE) and enforce its use.

6.4.2.5 Personal Protective Equipment

The construction or rehabilitation of irrigation canals and farm roads during the construction phase presents significant risks to worker safety and health due to the potential lack of personal protective equipment (PPE). These activities involve Canal Rehabilitation and Construction, Structure Construction and Rehabilitation, and Drainage Improvement, which expose workers to various hazards, such as Falling Debris, Sharp Objects, and Heavy Machinery.

The absence of proper PPE significantly increases the likelihood of injuries, such as cuts, fractures, or head trauma. Workers without respiratory protection may inhale dust, fumes, or toxic substances, potentially leading to respiratory problems. Similarly, inadequate eye and hearing protection can result in vision impairment or hearing loss due to flying particles and high noise levels. Furthermore, the lack of proper footwear and gloves increases the risk of slips, trips, and falls, and exposure to hazardous materials.

The impact receptors for risks associated with the lack of PPE are primarily construction workers but also include inspectors and visitors to the construction sites. The sources assess the risk associated with inadequate PPE as high, particularly in rural construction settings where cost-cutting measures might compromise worker safety. The sources emphasize that the absence of PPE not only jeopardizes individual safety but also reduces productivity and increases liability risks for the project.

❖ **Mitigation Measures**

- Continue and active use of PPE at all time of construction.
- Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual
- Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out.
- Proper use of PPE should be part of the recurrent training programs for employees.

6.4.2.6 Working conditions and Management of Worker

The construction or rehabilitation of irrigation canals and farm roads during the construction phase of the project carries a risk of underpaid pay and unequal treatment for local workers hired by project contractors. This risk is exacerbated by the lack of written contracts for unskilled workers, particularly those recruited locally. Without a formal contract, these workers are vulnerable to being underpaid compared to the demands and scope of their work.

The sources highlight the potential for underpayment to occur based on gender and temporary work status, further marginalizing already vulnerable groups. The absence of clear contractual terms also increases the risk of late wage payments or even non-payment, jeopardizing the workers' livelihoods and potentially delaying the project's progress.

The impact receptors for underpaid pay and unequal treatment are primarily unskilled workers (mostly local people) and construction workers, particularly women. The sources assess the risk associated with these issues as moderate.

❖ **Mitigation Measures**

- Implement a grievance mechanism for workers where workers can report issues related to underpayment or unequal treatment without fear of retaliation.
- Advise companies to provide equal opportunities for employment and promotions to all workers, regardless of gender, ethnicity, or background, to avoid discrimination.
- Regularly monitor and audit payroll and employment practices to ensure compliance with labor regulations and address any disparities.
- Offer training and capacity-building programs for all workers to enhance their skills and qualify them for higher-paying roles.
- Ensure that subcontractors and suppliers also adhere to fair wage and equal treatment policies.
- Set up worker committees or unions to allow collective bargaining and ensure workers have a voice in addressing wage and treatment issues.
- Provide accessible information to workers about their rights, entitlements, and the proper channels to address grievances through the establishment of the GRM for workers.
- Labor Rights and the Workers' Code of Conduct Regularly engage with labor rights organizations or third-party auditors to evaluate labor conditions and make improvements where necessary.

6.4.3 CULTURAL HERITAGE

There are no significant cultural sites within the sub-scheme. Krapeu Trom may have some connection and link to the ancient city of Longvek leading to the possibility that treasures or artifacts of historical significance were hidden underground. The impact receptors for cultural heritage risks are primarily underground cultural sites, and the sources assess the risk as minor.

❖ **Mitigation Measures**

- Implement Find Chance Procedure

6.4.4 CROSS-CUTTING

6.4.4.1 Loss access to land and other assets

In the construction phase, activities like upgrading existing canal, and implementing river training measures, carries a moderate risk of temporarily or permanently restricting access to natural resources for local communities. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could strain local resources, including water sources and forest products, potentially leading to overexploitation and environmental degradation.

❖ **Mitigation Measures**

- The project will prioritize avoiding physical resettlement and minimizing land acquisition. Design adjustments will be made to avoid or reduce land requirements, especially on private land. Public land will be prioritized for any necessary acquisition.
- Where land acquisition is unavoidable, the project will employ a negotiated settlement process with affected households. This process, guided by the RGC's Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR), aims to ensure that affected households receive fair and adequate compensation for their losses and maintain or improve their income and livelihood status.
- All individuals with assets within the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation, regardless of their legal status. Compensation will be provided for various losses, including land, structures, crops, trees, and income-generating activities.
- Recognizing the potential disruption of income streams during relocation or construction, the project will provide transitional allowances to affected households. These allowances will help cover living expenses and bridge the gap until they can resume their livelihoods.
- A multi-tiered GRM will be established to address grievances from any project-affected person. The GRM will operate based on the principles of the Green Climate Fund (GCF) and be accessible at no cost to the complainant.

6.4.4.2 Loss access to natural resources

The construction phase of the irrigation project, specifically activities like upgrading existing canal, carries a moderate risk of temporarily or permanently restricting access to natural resources for local

communities. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could strain local resources, including water sources and forest products, potentially leading to overexploitation and environmental degradation.

❖ **Mitigation Measures**

- Implement efficient water management practices during construction and operation to prevent over-extraction of water resources from reservoirs and rivers and ensure equitable distribution for downstream communities and ecosystems.
- Use environmentally friendly construction materials and techniques to reduce the risk of pollution. Properly manage construction chemicals, fuels, and waste to prevent water pollution and contamination of natural resources. Prepare and implement a waste management plan to handle waste generated from construction activities and worker camps.
- Optimize construction material use and recycle, when possible, to minimize the extraction of new resources. Implement energy-efficient construction practices and use renewable energy sources where possible.
- Maintain ongoing communication with affected communities, including farmers, fishers, and downstream communities, to address concerns about natural resource access. Provide information and education to construction workers about responsible use of local resources and respect for community access rights. This suggestion is informed by the sources but is not directly stated in them.
- Ensure the GRM is accessible to all community members to address complaints related to natural resource access.

6.4.4.3 Social inequality

The engagement and consultation processes during the design and construction phases of the irrigation project present a moderate risk of social inequality. The sources indicate that while landowners in the project areas are mainly from local communities, suggesting relatively equal access to the consultation process, vulnerable groups without farmland may have limited opportunities to participate and benefit from the rehabilitated irrigation system.

This potential for exclusion raises concerns about the fair distribution of project benefits. While the overall impact of social inequality during the construction phase is assessed as moderate.

❖ **Mitigation Measures**

- Conduct participatory planning and regular consultations with local communities, particularly marginalized groups (e.g., women, smallholder farmers, indigenous communities).
- Prioritize hiring local labor, with special provisions for disadvantaged groups (e.g., youth, women, minorities) in both skilled and unskilled positions.
- Develop and enforce water allocation plans that ensure fair access to water resources for all users, including small-scale and subsistence farmers, during and after construction.
- Implement fair and transparent compensation or resettlement plans for those displaced or affected

by construction activities, especially vulnerable households.

- Establish accessible and responsive grievance redress mechanisms, ensuring all community members can raise concerns or complaints during construction.
- Conduct regular social impact assessments, with a focus on identifying inequality trends, and adjust project strategies to mitigate negative effects.
- Provide support and training for affected communities to diversify their livelihoods, especially for those whose livelihoods may be disrupted by construction (e.g., farmers, traders).
- Ensure transparency in the contracting process, including the selection of subcontractors and suppliers, with opportunities for local businesses, especially those run by marginalized groups.

6.4.4.4 Elite capture

The risk of elite capture is anticipated given the fact these local elite could potentially influence the project to provide them project benefits. While the majority of landowners within the command areas are from the local community, which reduces the likelihood of large-scale land grabbing by powerful individuals or groups, the sources acknowledge the potential for the wealthy to use their influence, connections, or resources to encroach upon protected areas for personal gain. The risk of elite capture is assessed as moderate.

❖ **Mitigation Measures**

- Consultation will be conducted farmers in potential command area, focusing on vulnerable/disadvantaged groups
- Alternative livelihoods for vulnerable group are identified based on their needs vis-à-vis project's investment eligibility
- Conduct consultation at community level (in the command area) to achieve a consensus on how water needs are balanced between different groups in one command area.
- During subproject design, water availability, storage capacity, and water needs of upstream and downstream population are calculated to inform design, and water use coordination during project operation.
- Water user groups should be established for upstream and downstream population and should be coordinated by a higher-level committee/group to negotiate and optimize water coordination
- Guidelines/Manual should be developed to provide guideline for upstream and downstream communities at subprojects to meet, discuss, and achieve consensus on how water is distributed for equal use between upstream and downstream population

6.4.4.5 Gender inequality

The risk of gender inequality due to limited access for women to training, resources, and decision-making processes related to irrigation and agriculture. This risk stems from pre-existing gender inequalities in Cambodia, where women often face barriers in accessing resources, technology, and leadership roles. The impact receptors for this risk are women farmers and laborers, who may be excluded from the full

benefits of the project.

❖ **Mitigation Measures**

- Implement the Gender Action Plan and measures to promote women beneficiaries' improved participation in project planning and implementation, and their economic empowerment.
- Ensure women have access to training, resources, and decision-making processes related to irrigation and agriculture. This includes providing training in local languages at times and locations convenient for women. Childcare provisions can facilitate women's attendance.
- Set targets for women's participation in all project activities.
- Raise awareness of the importance of sharing household chores and farming workloads. This can give women more time to learn new skills, attend training, and participate in project activities.
- Promote women's access to skills and business development training centered around project target value chains for commodities such as rice, poultry, vegetables, and fish.
- Encourage the use of labor-saving technologies that can help reduce women's workloads in farming and household activities.
- Support women's involvement in off-farm activities, such as processing and value addition as well as investments in green products and women-led green enterprises.

6.5 Risks and Impacts at Operation Stage

6.5.1 COMMUNITY HEALTH AND SAFETY

The potential for water use conflicts during the operation phase, particularly between upstream and downstream users, and recognizes the risk of accidental drowning, especially among children. The introduction of irrigation infrastructure and increased agricultural activity may alter existing water allocation patterns, leading to disputes between upstream and downstream communities. Upstream users may prioritize their own irrigation needs, potentially reducing water availability downstream, affecting livelihoods and ecosystems. For example, the Anlong Chrey reservoir, with a limited capacity of 30 Mm^3, is insufficient to meet the dry season irrigation demands of all four proposed irrigation sub-schemes (Brambei Mom, Krapeu Trom, Yutasas, and Stueng Krang Bat) in the Krang Ponley sub-project. This situation could exacerbate competition for water resources. The construction of rehabilitation and farm road introduces open water bodies into the landscape, increasing the risk of accidental drowning, particularly for children.

❖ **Mitigation Measures:**

- The project will promote IWRM principles to ensure the equitable and sustainable allocation of water resources. This involves considering the needs of all stakeholders, including upstream and downstream communities, as well as environmental flow requirements for maintaining healthy ecosystems.
- Establishing a system for monitoring water use and enforcing water allocation regulations will help

prevent over-extraction and ensure a reliable water supply for all users. This may involve installing flow meters, conducting regular water audits, and implementing penalties for non-compliance.

- The project will strengthen the capacity of FWUCs to manage water resources at the local level. This includes training on water allocation, conflict resolution, and operation and maintenance of irrigation infrastructure. Effective FWUCs can play a crucial role in mediating disputes and ensuring fair water distribution within their communities.
- Raising awareness about water safety and the risks associated with open water bodies, especially among children, is essential. Educational campaigns, signage, and community outreach programs can help promote responsible behavior and prevent accidents. This information could be included in the training programs that will be provided to farmers and communities.
- The project will consider incorporating safety features into the design of irrigation infrastructure. This may include fencing around canals and reservoirs, installing safety ladders, and providing designated swimming areas away from irrigation structures.

6.5.2 CROSS-CUTTING

6.5.2.1 Gender inequality

The sources emphasize that women are less resilient to climate change than men and face unique vulnerabilities in terms of income, housing, and access to information and support systems. Socially defined gender roles can also hinder the adoption of climate-smart technologies among women. As a result, women may experience unequal access to water resources, limited participation in Farmer Water User Communities (FWUCs), and a disproportionate burden of negative impacts on their livelihoods.

The KT sub-scheme is a part of the CAISAR project. The social studies in this project show that, women-led households made up 15% of all sub-schemes, which is seen as a significant percentage. There is still gender disparity, which makes it difficult for them to participate in and profit from the project. Men often overestimate, which diverts women's attention from the involvement. Increased gender-based trainings for men and increased support for all vulnerable groups should be proposed by the local government and project implementer.

❖ **Mitigation Measures**

- The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices.
- The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology.
- The project should monitor gender equality indicators and should make adjustments as needed to ensure that women are benefiting from the project.

6.5.2.2 Social inequality

In this phase, the concerning the competition for water resources among different user groups (farmers, communities, industries) and the potential displacement or restricted access to land due to irrigation

infrastructure expansion, presents a minor risk of social inequality. Although the project aims to engage and consult with communities during the design and construction phases, vulnerable groups may still face limited access to irrigation water during the operation stage. This risk is especially relevant for farming communities, indigenous populations (if present), landless or land-poor households, and other vulnerable groups.

The vulnerable groups without farmland might have limited opportunities to benefit from the rehabilitated irrigation system. The impact of this social inequality is considered minor due to the relatively small proportion of poor people within the command area. However, it is important to note that the limited access to resources and capacity could hinder the full potential of efforts to support these vulnerable groups.

❖ **Mitigation Measures**

- Ensure Equitable Water Access: Mechanisms should be in place to support vulnerable and marginalized communities in accessing water resources.
- FWUCs will manage the irrigation systems and ensure sustainability through fee collection. The project will invest in establishing and training FWUCs, emphasizing inclusivity and capacity building for vulnerable groups.
- Implement a Simplified Integrated Pest Management (IPM) Plan.

6.5.2.3 Elite capture

The operation of the irrigation system during the operation phase creates a minor risk of elite capture due to the potential for unequal distribution of project benefits. This could result in powerful individuals or groups gaining a disproportionate share of the benefits at the expense of the intended beneficiaries. This risk is linked to the engagement and consultations conducted during the design and construction phases, as those processes might not fully prevent elite capture during the operational phase.

The main impact receptors are smallholder farmers, marginalized communities, and other vulnerable groups. Despite the project's efforts to ensure equitable access to resources, the sources highlight that wealthy individuals or groups could potentially leverage their power, connections, and resources to secure a larger share of water resources or control over irrigation infrastructure. This situation could further exacerbate existing social disparities and undermine the project's goal of improving livelihoods for all community members. The sources assess the risk of elite capture during the operation phase as minor. This assessment considers factors like the predominance of local landowners within the command areas and the current high land prices, which make large-scale land grabbing economically unfeasible.

❖ **Mitigation Measures**

- Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress mechanisms are essential to prevent manipulation and ensure equitable water distribution.
- Regular monitoring and evaluation: Continuous monitoring of project impact, especially on vulnerable groups, can identify and address elite capture.
- Strengthened land tenure security: Clarifying land rights can protect smallholder farmers and marginalized communities from land grabbing.

- Community engagement: Active community participation, especially from vulnerable groups, empowers them and ensures their needs are met.

6.6 Summary of the Mitigation measures for the Environmental and Social

Based on the ESC risks and impacts identified and assessed, a summary of proposed mitigations measures is presented in the table below.

6.6.1 Mitigation Measures for the Environmental and Climate Risks and Impacts

Table 37: Preconstruction, Construction, and Operation Phase Environmental Mitigation Measures

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
Preconstruction phase				
1	Unexploded Ordnance (UXO) survey & removal			
	Risk of injuries or fatalities among workers or members of the public	• Carry out UXO screening/assessment by certified UXO experts before any physical/ construction activities are allowed. • In case UXOs are found by certified experts during on-site screening, removal of UXO will be carried out by certified experts. • A UXO clearance certificate shall be obtained from related authorities for each sub-project prior to commencing any subproject activities. • As part of site-specific ESCMP, we conduct training and awareness activities for the local community with regards to UXO risks and chance finds.	PMU Contractor	Before construction
Construction phase				
ENVIRONMENTAL, HEALTH, AND SAFETY				
1	Noise and Vibration			
	• Earthmoving activities and the operation of machinery at construction sites will generate dusts and exhaust fumes. • Construction activities, the operation of vehicular movement, excavation machinery, concrete mixing, and other construction activities will generate noise and vibration and will be a nuisance to workers and residents near the site. • Noise may be generated from workers' camp, particularly during living activities or entertainment at nighttime, or due to certain maintenance /repair of equipment, machinery, vehicles.	• Maintain all exhaust systems in good working order and undertake regular equipment maintenance to ensure compliance with applicable regulations and manufacturers' instructions. • Implementation of operating and maintenance practices of equipment and machinery to ensure that they are well-maintained. • Ensure that noise control options such as silencers and mufflers are fitted to exhausts, compressors and fans for construction equipment (such as hydraulic excavator, bulldozer, front loader, backhoe and trucks). • Provide advance warning to the community on timing of noisy activities. Seeking suggestions from community members to reduce noise annoyance and notify the communities about how to raise their concerns (if any) through the Grievance Redress Mechanism. • Undertake noise monitoring at the closest residential area and other noise sensitive receptors during times with ongoing construction work to ensure compliance with the relevant noise standards. • The contractor shall provide all construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80 dB(A)), or any construction	• PMU • Contractor	Daily/ Every 06 months

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		personnel who request hearing protection, with hearing protection equipment. • A speed limit of 30 km/h for construction related traffic through inhabited areas. • The contractor shall conduct noise testing at the sensitive locations as per the detailed engineering design comparing to the IFC EHS Guideline • Avoid night-time construction in populated/village areas. • No noisy construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and during religious or cultural events near the subproject • Provide temporary noise barriers (3–5-meter-high barrier can reduce 5–10 dB(A)), as necessary, if site works will generate high noise levels that could disturb nearby households, hospital, school and other sensitive receptors. • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.		
2	**Air pollution**			
	• Dust and particulate matter (PM10 and PM2.5) generation from soil disturbances, stockpiles, and road works • Exhaust emissions from trucks and heavy machinery (NOx, CO, SO2, VOCs) • Waste disposal, particularly through burning	• Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition. • Select Borrow sites located as close as possible to the construction to reduce distances. • If Concrete batching facilities are in need, it will be located at least 500 m (0.5 km) downwind from the nearest dwellings to reduce the impact of dust and fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions. • Water will be regularly sprayed to suppress fugitive dust at construction sites, material handling areas, access road and borrow pits. • Trucks carrying dry construction materials such as earth or waste will be covered with tarpaulins or other suitable cover. • Construction vehicles and machinery will be maintained to a high standard to minimize emissions and ensure compliance with the National exhaust emission standards. All mobile equipment should be fitted with catalytic converters. • A speed limit of 30 km/h for construction related traffic through inhabited areas and on access road will be enforced. • All open burning of construction and demolition of waste material and refuse will be prohibited. • Testing air quality (NO_2, SO_2, CO, TSP, PM10, PM2.5)	• SEO • E&S specialist consultants • PMU	Daily/ Every 06 months
3	**Impact on Water**			
	• Dredging projects along the rivers and canals • Sedimentation can reach downstream areas, including the Tonle Sap Lake, if not properly mitigated.	• Installation of temporary non-erodible ditches or bunds at the construction site to divert clean runoff away from exposed areas and convey potentially dirty runoff to sediment control devises.	• SEO • E&S specialist consultants • PMU	Daily/ Every 06 months

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Infiltration of wastewater from workers' camps can contaminate groundwater. • Leakage of hazardous materials like oil and diesel from machinery and vehicles can pollute both surface and groundwater.	• Stockpiles and materials will be stored at least 50 m from surface waters with drainage directed away from the canals and streams or water sources. • The sediment quality of the dredge spoil will need to be tested and assessed against an appropriate standard before re-use in the structure of embankments. The sediment testing results will confirm safe re-use of the material • No washing or repair of machinery within 50 m of surface waters. • Portable toilets and small wastewater treatment units will be provided at the construction site and labor camps. All sanitary facilities will be located at least 50 m from surface water bodies. All workers must be instructed to use these facilities, which should be always kept clean. • Pit latrines and septic tanks should be placed at least 2 m above the groundwater table, which must be located at least 50 m from surface water bodies and water wells and in areas of suitable soil profiles. • All hazardous materials including hazardous waste will be stored on an impervious surface, under cover, in adequate tanks or containers and within secondary containment. • Areas where spills of fuel or oil may occur will be equipped with easily accessible spill control kits to assist in prompt and effective spill control. • Hazardous waste (oil waste) shall be properly collected and stored in closed containers under shelter for recycling or disposal by a duly authorized enterprise. • Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform) and pesticide residues in water (to be conducted overseas).		
4	**Solid and Hazardous Waste**			
	• Hazardous wastewater, such as oil or fuel, polluting materials used for machinery and construction processes at the construction site.	• Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations. • Vehicles and equipment shall be properly staged in designated areas to prevent contamination of soil and surface water. • Vehicles, machinery, and equipment maintenance and re-fueling will be carried out in such a way that spilled materials do not seep into the soil; • Oil traps will be provided for service areas and parking areas; • Fuel storage and refilling areas will be located at least 50m from canals and channels and will be protected by temporary drainage bunds to contain spills.	• PMU • Contractor	Daily
5	**Waste and Wastewater**			
	• Domestic wastewater comes from workers/staff's water consumption daily.	• Recyclables will be separated at source and given/sold to recyclers (plastic, metal, card, paper as a minimum). • Safe temporary storage of hazardous waste as required • To the extent possible, a duly authorized waste company will be contracted to recycle hazardous waste. • Non-hazardous, non-recyclable solid waste will be temporarily deposited and managed together at existing landfill/dumpsite.	• PMU • Contractor	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering. • The Contractor will be required to train the workers in proper waste management.		
6	**OCCUPATIONAL HEALTH AND SAFETY**			
		• Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines. • Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements. • Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks. • Install appropriate fencing and control access to the site. • Install appropriate safety signage and markings. • Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m. • Ensure there are safe ways to enter and exit the excavation. • Keep excavations dry. • Provide safety precautions when using high voltage electric power tools. • Carry out daily toolbox meetings (safety briefings); • Maintain an accident record book where all major or minor accidents and incidents are recorded with actions taken. • Educate the workers on construction hazards. • Train drivers on safe driving skills and traffic regulations. • Appoint an Environment, Health and Safety Officer who is a qualified engineer. • Make adequate first aid equipment available on site. • Carry out training and awareness of the workers on HIV-AIDS prevention. • implement emergency preparedness and response procedures Response Plan as planned in the CEMP. • Ensure that all workers are equipped with and use Personal Protective Equipment (PPE). • The Contractor will set out an Emergency Response Plan	• PMU • Contractor	Daily/Weekly
7	**COMMUNITY HEALTH AND SAFETY**			
		• Prior to the start of construction work, the contractor in cooperation with the PIU will consult with the local authorities and potentially affected residents/private landowners. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM). • The contractor shall fence off the construction area and control access to the site. • A speed limit of 30 km/h for construction related traffic through inhabited areas.	• PMU • Contractor	Daily/Weekly

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities. • The contractor, in cooperation with the local authorities, shall implement traffic management to ensure smooth traffic and prevent congestion.		
BIODIVERSITY				
1	**Hunting and trading, and consumption of wildlife**			
	• The influx of a new labour force can increase demand for exotic local foods, including wildlife and endangered species, which are often seen as interesting and delicious. This may be done for relaxation or belief that wildlife is tasty or making people healthy.	• Develop and enforce a strict Code of Conduct/ethics against wildlife collection, possession, and trafficking. This includes clear policies and sanctions for employees and subcontractors. • Provide mandatory training for contractors' management staff and site workers on the Code of Conduct, Standard Operating Procedures (SOP) for wildlife protection and handling, and human-wildlife conflict management. • Incorporate a policy in the Project Administration Manual (PAM) and Worker's Agreement that prohibits employees and/or subcontractors from possessing, purchasing, trading, or collecting wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List. • Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species. • Implement strict penalties for violating wildlife protection laws. • Collaborate with local communities to monitor wildlife populations and report any suspicious activities.	• SEO • PMU • Contractor	Daily/Weekly
2	**GHG emission**			
	• The construction and operation of heavy machinery, such as excavators and bulldozers, during these projects release carbon dioxide (CO2) into the atmosphere, i.e. the energy requirements for construction works can result in increased carbon emissions • At the time of construction, there is possibility of smoke generated by burning of straw in the rice field.	• Use energy-efficient machinery and equipment during construction to reduce fuel consumption and emissions. • Optimize construction logistics to reduce the number of vehicle trips and machinery usage, minimizing fuel use and emissions. • Implement proper maintenance programs for equipment and vehicles to ensure they operate efficiently and with lower emissions. • Reduce deforestation and land-use changes that contribute to carbon emissions by preserving vegetation and replanting trees in affected areas. • Use low-carbon materials and construction techniques that reduce the embodied carbon in construction materials. • Offset unavoidable GHG emissions by investing in carbon offset projects, such as reforestation or renewable energy initiatives. • Engage with local communities and stakeholders to raise awareness of emission reduction practices and encourage their participation in sustainability efforts.	• SEO • E&S specialist consultants • PMU	Daily
DURING OPERATION				
ENVIRONMENTAL				
1	**Water Management**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Irrigation systems have both benefits and drawbacks. • Proper design and management are crucial. • Minimizing negative impacts on the natural water cycle is essential.	• Implement water-saving irrigation technologies like drip irrigation and sprinkler systems to reduce water consumption and minimize the strain on water resources. • Encourage the adoption of the AWD technique in rice cultivation to optimize water use and reduce water withdrawals for irrigation. • Establish detailed water management plans that ensure equitable water distribution and allocation, considering the needs of various users and the environmental flow requirements to maintain healthy aquatic ecosystems. • Design and construct robust irrigation infrastructure, including canals, ponds, and storage areas, capable of withstanding extreme weather events like floods and droughts. This investment should also include lining canals and refurbishing storage areas to reduce water losses and improve water storage capacity. • Integrate natural infrastructure, such as wetlands and forests, into water management strategies. Protect and restore degraded habitats to enhance their water regulation capabilities, improve water quality, and support biodiversity. • Establish and provide training to FWUCs on sustainable water management practices, equitable water rights, and allocation procedures. These communities play a vital role in the operation and maintenance of the irrigation system, ensuring its long-term sustainability.	• PMU	Annually
2	**Water Pollution**			
	• Increased use of chemicals, such as fertilizers and pesticides, to enhance crop yields. The excessive application of these chemicals can result in contamination of both surface and groundwater resources.	• Implement Simplified Pesticide Management Plan • Conduct regular water quality tests to track the change in water quality due to pesticide application using oversea laboratory testing. • Encourage farmers to adopt IPM techniques that minimize pesticide use and rely on biological control methods, thereby reducing the risk of chemical contamination of water resources. • Provide training and extension services to farmers on the judicious use of fertilizers, ensuring they apply the correct type and amount based on soil nutrient levels. • Promote the adoption of organic fertilizers and soil amendments, such as cover crops and green manures, which can improve soil fertility and reduce the need for chemical fertilizers. • Implement a robust water quality monitoring program to track the levels of pesticides, nitrates, and other pollutants in surface and groundwater resources within and around the command areas. • Encourage the adoption of water-saving irrigation methods, such as alternate wetting and drying (AWD) in rice cultivation, which can reduce water consumption and minimize the leaching of agrochemicals.	• PMU	Annually
3	**Soil Pollution**			
	• Increased production could lead to overuse of Agri-chemicals if farmers are not adequately trained or	• Implement Simplified Pesticide Management Plan • Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing	• PMU	Annually

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	supported in adopting environmentally friendly practices.			
BIODIVERSITY				
1	**GHG emission**			
	• Increased GHG emissions from farming activities: - Fertilizer use - Livestock production - Rice cultivation • Increased energy requirements: - Rice field preparation - Flood control systems - Transportation	• The project is to promote sustainable practices like crop rotation and agroforestry to reduce energy consumption and improve soil health. • The project needs to introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production. • The project needs support training farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution. • The project promotes the utilization of efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions. • The project needs to advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.	• PMU • Farmer	Daily
ANNUAL CROP MANAGEMENT PLAN				
	❖ **WATER**			
1	**Water resource efficiency**			
	• Over-extraction of water resources can lead to downstream water scarcity, altered hydrology, and damage to aquatic ecosystems.	• Project needs to implement efficient water management practices to prevent over-extraction and ensure equitable water distribution. This can include: • Water uses monitoring systems to track consumption and identify areas for improvement. • implementing appropriate irrigation scheduling based on crop water requirements and weather conditions. • Utilizing efficient irrigation systems, such as drip irrigation or sprinkler systems, to minimize water loss. • Exploring opportunities for water reuse, such as capturing and reusing runoff water.	• PMU • FWUC	Daily
	❖ **SOIL AND SOIL MANAGEMENT**			
2	**Soil erosion and soil erosion risk**			
	• Soil erosion can lead to loss of topsoil, reduced soil fertility, and increased sedimentation in water bodies.	• Minimize soil compaction and disturbance by using appropriate machinery and timing land preparation activities. • Consider erosion management practices such as contour planting, terracing, and grass barriers. • Adopt reduced tillage or no-till farming practices to minimize soil disturbance. • Establish cover crops during fallow periods or in rotation with main crops to protect the soil from erosion. • Practice contour farming on sloping land to reduce runoff and erosion. • Construct terraces on steep slopes to prevent soil loss. • Establish windbreaks or shelterbelts to reduce wind erosion. • Install erosion control structures, such as grassed waterways or sediment basins, to manage runoff.	• PMU • Agricultural extension officers	After significant rainfall events Annually

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Apply mulch to the soil surface to protect it from rainfall impact and erosion.		
3	**Nutrient application and management**			
	• Over-fertilization and nutrient runoff can contaminate water resources, negatively impacting aquatic ecosystems and potentially leading to eutrophication.	• Conduct periodic soil analysis to determine nutrient needs and avoid over-fertilization. • Establish buffer zones near watercourses to filter nutrient runoff. • Consider using green manures and cover crops to replenish soil nutrients and reduce leaching.	• PMU • Farmers	Before and after fertilizer application Regularly during the growing season
	❖ **PESTICIDE**			
4	**Use and effectiveness of pesticides:**			
	• Pesticide use can have adverse effects on human health, non-target organisms, and the environment. Pesticide resistance can develop, requiring increased application rates.	• Promote Integrated Pest Management (IPM) strategies to minimize pesticide use. • Implement training programs for farmers on the safe handling and application of pesticides. • Ensure proper disposal of pesticide containers and leftover products.	• PMU • Agricultural extension officers	Regularly during the growing season
5	**Pesticide residues on site soil**			
	• Pesticide residues can accumulate in the soil, potentially harming soil organisms and affecting water quality.	• Promote the use of pesticides with low persistence and mobility in the environment. • Implement a soil monitoring program to assess pesticide residue levels. • Consider crop rotation and the use of cover crops to help break down pesticide residues. • Minimize pesticide use by adopting IPM strategies. • Conduct soil testing to monitor pesticide residue levels. • Rotate crops to break pest cycles and reduce the need for repeated pesticide applications. • Utilize cover crops to improve soil health and enhance pesticide degradation. • Consider bioremediation techniques to remove pesticide residues from contaminated soil.	• PMU • Third-party laboratories	Periodically (e.g., annually or before planting sensitive crops)
6	**Pesticide residues on produce**			
	• Pesticide residues on produce can pose a risk to consumer health.	• Enforce pre-harvest intervals to allow for pesticide breakdown before harvest. • Promote the use of pesticides with low toxicity to humans. • Properly wash and handle produce to remove surface residues. • Implement a monitoring program to test produce for pesticide residues. • Ensure compliance with established MRLs for pesticide residues on produce.	• PMU • Third-party laboratories	Before harvest

UXO = Unexploded Ordnance, PMU = Project Management Unit, SEO = Social and Environmental Officer, E&S = Environmental and Social, IFC = International Finance Corporation, EHS = Environmental, Health, and Safety, GHG = Green House Gas, FWUC = Farmer Water User Communities, ESCMP = Environmental, Social, and Climate Management Plans.

6.6.2 Mitigation Measures for the Social Risks and Impacts

Table 2: Preconstruction, Construction, and Operation Phase Social Risks, Impacts and Mitigation Measures

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
BEFORE CONSTRUCTION				
LAND ACQUISITION				
1	**Land acquisition and resettlement**			
	• Krapeu Truom is expected to require minimal land acquisition due to their smaller scale and lack of planned canal system expansion.	• Conduct precise land participates to accurately determine the exact land requirements, ensuring that only necessary land is acquired. • Verify land ownership and usage rights meticulously to prevent disputes and ensure fair compensation. • Abbreviated Land Resettlement Plan should be prepared to support the proper implementation of the sub-scheme.	PMU Contractor	Before construction
2	**Economic displacement**			
	• The potentially disrupting existing economic activities and displacing households and businesses, including informal farmers and businesses. Krapeu Truom is a part of the Krang Ponley scheme. There are 1,249 households using land along the infrastructure that may be affected, with 20 households across all sub-schemes facing land acquisition.	• The households who own the land along the rehabilitated canals which will be expanded at the public land should be properly informed prior to the construction to avoid their crops will be damaged at the time of construction. • Although the acquired land is public land, there is a need of a proper consultation and information to be conducted to inform and obtain agreement from the affected households.	PMU Contractor	Before construction
DURING CONSTRUCTION				
	CHILD LABOR & FORCED LABOR			
1	**Child Labor**			
	• Project activities will occur in rural areas where child labor is prevalent. • Construction contractors and subcontractors may employ children under 18 years old for unskilled labor. • Local children may be particularly vulnerable to exploitation due to poverty and limited educational opportunities.	• Apply LMP for age check prior to engagement of labor with regular monitoring through proper screening and registering all workforce for the work • To mitigate the risk of child labor, the project will implement strict measures to ensure compliance with national and international labor laws. Regular monitoring and inspections will be conducted to identify and address any instances of child labor. • Additionally, awareness-raising campaigns will be implemented to educate communities about the harmful effects of child labor and the importance of sending children to school. The project will also collaborate with local authorities and NGOs to strengthen law enforcement and provide support services to vulnerable children and their families.	• Contractors • PMU	Daily Screening prior to engaging services of primary supplier
2	**Forced Labor**			
	• The risk of forced labor, particularly for vulnerable individuals, is due to economic coercion, exploitation of	• Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children.	• Contractors • Primary supplier	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	young people, and debt bondage. The increased demand for local labor during irrigation and road rehabilitation could exacerbate this risk.	• The Project Owner and Sub-Contractors will collaborate with the relevant Government Agency to disseminate information to local communities. This information will include the Contractor's Code of Conduct and the minimum working age as mandated by national laws and international standards. • The Ministry of Water Resources and Meteorology (MOWRAM) will provide information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.	• PMU	Screening prior to engaging services of primary supplier
COMMUNITY HEALTH AND SAFETY				
3	**Disease transmission**			
	• Disease transmission risks are anticipated due to the influx of construction workers, potentially exacerbated by unhygienic living conditions and interaction with the local community. This influx increases the risk of spreading communicable diseases among workers and between workers and residents, with workers' susceptibility potentially increased by factors like poor diet, stress, and unhygienic conditions.	• Conduct public awareness raising activities (IEC) to ensure local people and contractors know about the risks of contracting and spreading communicable diseases such as COVID-19, HIV/AIDS, and water-borne diseases (e.g., amoebiasis, giardiasis, and toxoplasmosis. etc. • In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising to the risk groups. • Conduct training to workers on communicable diseases prior to mobilization to construction sites. • For water-borne diseases that arise due to polluted or contaminated water, mitigations measures may include: o Implement filtration, chlorination, or UV disinfection to ensure safe drinking water. o Promote handwashing, safe food preparation, and proper sanitation practices in communities. o Control and properly dispose of waste to prevent water pollution. o Provide access to clean water supplies, such as bottled water or tankers, during outbreaks or disasters. o Promote immunizations against water-borne diseases like cholera and typhoid in high-risk areas.	• PMU • Contractors • Local health authorities	• Monthly • During outbreaks • Periodic community health awareness campaigns
4	**Sexual Exploitation and Abuse, Sexual Harassment**			
	• The project's influx of approximately 171 in the Krang Ponleng river, as the Krapeu Truom is a part of this scheme, including construction and logistical personnel, along with frequent project staff visits and pre-existing SEA/SH issues, creates a risk of sexual exploitation and abuse/harassment, particularly during irrigation and road rehabilitation.	• Contractors need to explicitly state zero tolerance for sexual harassment, exploitation, and abuse within the workplace. • Require Code of Conduct (CoC) to be signed by all construction workers. • For victims coming forward: referral to qualified SEA/SH service provider. The GRM will include a confidential channel for reporting SEA/SH. • Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children • Training on SEA/SH and VAC for community members, in particular women and girls (may be done separately for men and women). • Ensuring workers' sites are situated (at least 500m) from schools and/or other areas where children congregate. • Children are prohibited from construction sites and worker's camp.	• Contractors • PMU	• Monthly and during subproject cycle • Reported to PMU within 48 hours if occurred

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Ensure access to grievance redress mechanisms for all project-affected persons, including both stakeholders and workers, to address Sexual Exploitation and Abuse, and Sexual Harassment. Support (in the form of training, awareness raising, etc.) to local law enforcement to act on community complaints regarding SEA/SH and VAC. • Build partnerships with local health providers and SEA/SH service providers to conduct community awareness activities, and referrals. • It is necessary to consider deploying specialists to educate and raise awareness about issues of violence.		
5	**Traffic safety & Security**			
	• Increased transport of materials and equipment in the construction stage raises the risk of road accidents, theft, vandalism, and a perceived or actual increase in crime, affecting project workers, community members, and those living or traveling near construction sites.	• Arrange security guard or engage local authority to guard the construction sites • Conduct public awareness raising activities (IEC) to ensure local people and road user are aware of road safety regulations and risks and act accordingly while using road. • Monitor and observe speed limit.	• PMU • Contractors	• Daily during construction • Weekly during construction • Monthly during operation
6	**Community Health and diseases**			
	• Construction activities, including canal and pond rehabilitation, pose community health and safety risks beyond disease transmission, encompassing drowning, accidents from trespassing in construction zones (including storage and laydown areas), traffic disruptions, potential community conflicts, and general construction site hazards.	• Establish clear and well-marked construction exclusion zones to prevent unauthorized access, especially to areas with open water, heavy machinery, and storage areas. • Implement fencing and barriers to prevent trespassing and ensure community safety around construction areas. • Provide warning signs in local languages to inform communities about the dangers and restricted access to construction areas. • Install safety barriers around construction sites to minimize risks to the community and workers. • Ensure proper storage of construction materials, with no materials left unsecured and scattered around the site. • Conduct community awareness campaigns to educate the community about the potential risks and safety measures during construction. • Establish and maintain a grievance mechanism to address community complaints and issues promptly. • Implement safety measures around canals and ponds to prevent drowning incidents, such as installing safety barriers and providing warning signs in local languages. • Provide training to workers on safety protocols, including how to work safely around water, avoid accidents and minimize risks to the community. • Ensure all workers are provided with necessary personal protective equipment (PPE) and enforce its use.	• PMU • Contractors	• Monthly • During outbreaks • Periodic community health awareness campaigns
7	**Personal Protective Equipment**			
	• The activities involve Canal Rehabilitation and Construction,	• Continue and active use of PPE at all times of construction.	• Contractors • PMU	• Regular inspections/training

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	Structure Construction and Rehabilitation, and Drainage Improvement, which expose workers to various hazards, such as Falling Debris, Sharp Objects, and Heavy Machinery.	• Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual • Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out. • Proper use of PPE should be part of the recurrent training programs for employees.		
8	**Working conditions and Management of Worker**			
	• The lack of written contracts for unskilled, especially locally recruited, workers increase their vulnerability to underpayment, unequal treatment based on gender and temporary status, and late or non-payment of wages, impacting their livelihoods and potentially hindering project progress.	- Advise companies to provide equal opportunities for employment and promotions to all workers, regardless of gender, ethnicity, or background, to avoid discrimination. - Regularly monitor and audit payroll and employment practices to ensure compliance with labor regulations and address any disparities. - Offer training and capacity-building programs for all workers to enhance their skills and qualify them for higher-paying roles. - Ensure that subcontractors and suppliers also adhere to fair wage and equal treatment policies. - Provide accessible information to workers about their rights, entitlements, and the proper channels to address grievances through the establishment of the GRM for workers. This includes training on topics such as: • Environmental and Social Safeguards • Gender Awareness and the Gender Action Plan • Sexual Exploitation, Abuse, and Harassment (SEA/SH) - Labor Rights and the Workers' Code of Conduct Regularly engage with labor rights organizations or third-party auditors to evaluate labor conditions and make improvements where necessary.	• Contractors • PMU	• Regular payroll audits • Periodic worker satisfaction surveys • Prompt investigation of any reported grievances
9	**CULTURAL HERITAGE**			
	Krapeu Truom is a part of the Krang Ponley scheme. However, it is far away from historical and cultural heritage sites. There are still potential for encountering archaeological artifacts during construction due to the history of the ancient city of Longvek.	• Implement Find Chance Procedure	• Contractors • PMU	• Daily • Reported to PMU within 48 hours
CROSS-CUTTING				
10	**Gender inequality**			
	• Women are more vulnerable to climate change impacts due to unequal access to resources, information, and decision-making	• The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices.	• Contractors • PMU	• Daily/ weekly

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	power, often hindered by social gender roles. While women-led households represent a significant portion of project sub-schemes, they still face barriers to participation and benefits. The project area includes a substantial number of vulnerable individuals, including the poor, disabled, elderly, and parentless, highlighting the need for targeted support.	• The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology. • The project should monitor gender equality indicators and should adjust as needed to ensure that women are benefiting from the project.		
11	**Social inequality**			
	• Risk of being unequally engaged and treated, during the design phase and construction. The vulnerable are likely to be limitedly consulted and have limited access to available irrigation water.	• Conduct participatory planning and regular consultations with local communities, particularly marginalized groups (e.g., women, smallholder farmers, indigenous communities). • Prioritize hiring local labour, with special provisions for disadvantaged groups (e.g., youth, women, minorities) in both skilled and unskilled positions. • Implement fair and transparent compensation or resettlement plans for those displaced or affected by construction activities, especially vulnerable households. • Conduct regular social impact assessments, with a focus on identifying inequality trends, and adjust project strategies to mitigate negative effects. • Provide support and training for affected communities to diversify their livelihoods, especially for those whose livelihoods may be disrupted by construction (e.g., farmers, traders). • Ensure transparency in the contracting process, including the selection of subcontractors and suppliers, with opportunities for local businesses, especially those run by marginalized groups.	• Contractors • PMU	• Continuously
12	Elite capture			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• The rich have the resources to grab both available land and water resources, creating greater social disparities	• Consultation will be conducted farmers in potential command area, focusing on vulnerable/disadvantaged groups • Alternative livelihoods for vulnerable group are identified based on their needs vis-à-vis project's investment eligibility • Conduct consultation at community level (in the command area) to achieve a consensus on how water needs are balanced between different groups in one command area. • During subproject design, water availability, storage capacity, and water needs of upstream and downstream population are calculated to inform design, and water use coordination during project operation. • Water user groups should be established for upstream and downstream population and should be coordinated by a higher-level committee/group to negotiate and optimize water coordination • Guidelines/Manual should be developed to provide guideline for upstream and downstream communities at subprojects to meet, discuss, and achieve consensus on how water is distributed for equal use between upstream and downstream population	• PMU • Contractors	• Throughout project implementation • Regular community meetings and consultations
13	**Loss access to land and other assets**			
	• Construction activities, particularly land acquisition for canals and roads, can displace communities or restrict their access to land, homes, and other assets. • Temporary restriction of irrigation access during construction may occur in some areas, potentially impacting livelihoods, even though the project area is mainly rainfed.	• The project will prioritize avoiding physical resettlement and minimizing land acquisition. Design adjustments will be made to avoid or reduce land requirements, especially on private land. Public land will be prioritized for any necessary acquisition. • Where land acquisition is unavoidable, the project will employ a negotiated settlement process with affected households. This process, guided by the RGC's Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR), aims to ensure that affected households receive fair and adequate compensation for their losses and maintain or improve their income and livelihood status. • All individuals with assets within the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation, regardless of their legal status. Compensation will be provided for various losses, including land, structures, crops, trees, and income-generating activities. • Recognizing the potential disruption of income streams during relocation or construction, the project will provide transitional allowances to affected households. • A multi-tiered GRM will be established to address grievances from any project-affected person. The GRM will operate based on the principles of the Green Climate Fund (GCF) and be accessible at no cost to the complainant.	• Contractors • PMU	• Before land acquisition • During land • After resettlement
14	**Loss access to natural resources**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Construction activities and project operations can restrict communities' access to forests, fishing grounds, water sources, or other natural resources they depend on for livelihoods	• Implement efficient water management practices during construction and operation to prevent over-extraction of water resources from reservoirs and rivers and ensure equitable distribution for downstream communities and ecosystems. • Establish construction exclusion zones around sensitive habitats, such as wetlands and forests, to prevent disturbance and minimize impacts on fishing grounds and biodiversity. Implement habitat restoration programs in areas where construction has occurred. • Use environmentally friendly construction materials and techniques to reduce the risk of pollution. Properly manage construction chemicals, fuels, and waste to prevent water pollution and contamination of natural resources. Prepare and implement a waste management plan to handle waste generated from construction activities and worker camps. • Maintain ongoing communication with affected communities, including farmers, fishers, and downstream communities, to address concerns about natural resource access. Provide information and education to construction workers about responsible use of local resources and respect for community access rights. This suggestion is informed by the sources but is not directly stated in them. • Ensure the GRM is accessible to all community members to address complaints related to natural resource access.	• PMU • Contractors	• Regular water quality and quantity monitoring • During project implementation: Monitor the effectiveness of mitigation measures.
DURING OPERATION				
1	**COMMUNITY HEALTH AND SAFETY**			
	• Water use conflicts, especially between upstream and downstream users, are a potential risk due to altered water allocation from new irrigation infrastructure, exemplified by the Anlong Chrey reservoir's limited capacity, and increased drowning risk, particularly for children, due to new canals.	• The project will promote IWRM principles to ensure the equitable and sustainable allocation of water resources. This involves considering the needs of all stakeholders, including upstream and downstream communities, as well as environmental flow requirements for maintaining healthy ecosystems. • Establishing a system for monitoring water use and enforcing water allocation regulations will help prevent over-extraction and ensure a reliable water supply for all users. This may involve installing flow meters, conducting regular water audits, and implementing penalties for non-compliance. • The project will strengthen the capacity of FWUCs to manage water resources at the local level. This includes training on water allocation, conflict resolution, and operation and maintenance of irrigation infrastructure. Effective FWUCs can play a crucial role in mediating disputes and ensuring fair water distribution within their communities. • Raising awareness about water safety and the risks associated with open water bodies, especially among children, is essential. Educational campaigns, signage, and community outreach programs can help promote responsible behaviour and prevent accidents. This information could be included in the training programs that will be provided to farmers and communities.	• PMU • PDWRAM	• Daily for site inspections • Monthly for reports and consultations • Within 48 hours for reporting accidents, disease outbreaks.

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
CROSS-CUTTING				
2	**Gender inequality**			
	• Women are more vulnerable to climate change due to limited access to resources, information, and decision-making power, often exacerbated by gender roles, resulting in unequal access to water, limited participation in water management, and disproportionately negative impacts on their livelihoods.	• The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices. • The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology. • The project should monitor gender equality indicators and should adjust as needed to ensure that women are benefiting from the project.	• PMU • PDWRAM	• Monthly for data collection and reporting
3	**Social inequality**			
	• The competition for water and land displacement, and despite project consultations, vulnerable groups, particularly landless or land-poor households, may still experience limited access to irrigation benefits, though the impact is lessened by the relatively small proportion of poor within the area.	• Ensure Equitable Water Access: Mechanisms should be in place to support vulnerable and marginalized communities in accessing water resources. • FWUCs will manage the irrigation systems and ensure sustainability through fee collection. The project will invest in establishing and training FWUCs, emphasizing inclusivity and capacity building for vulnerable groups. • Implement a Simplified Integrated Pest Management (IPM) Plan.	• PMU • PDWRAM	• Monthly for data collection and reporting
4	**Elite capture**			
	• The rich have the resources to grab both available land and water resources, creating greater social disparities	• Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress mechanisms are essential to prevent manipulation and ensure equitable water distribution. • Regular monitoring and evaluation: Continuous monitoring of project impact, especially on vulnerable groups, can identify and address elite capture. • Strengthened land tenure security: Clarifying land rights can protect smallholder farmers and marginalized communities from land grabbing. • Community engagement: Active community participation, especially from vulnerable groups, empowers them and ensures their needs are met.	• PMU • PDWRAM	• Regularly during FWUC meetings and project implementation • Continuously through the GRM.

PMU = Project Management Unit, LMP = Labour Management Plan, NGOs = Non-governmental Organizations, HIV/AIDS = Human immunodeficiency virus/Acquired immunodeficiency syndrome, UV = Ultraviolet, GRM = Grievance Redress Mechanism, SEA = Sexual Exploitation and Abuse, SH = Sexual Harassment, VAC = Violence Against Children, ESHS = Environmental Social Health and Safety, STDs = Sexually transmitted diseases, PPE = Personal Protective Equipment, IPM = Integrated Pest Management, PDWRAM = Provincial Department of Water Resources and Meteorology, FWUCs = Farmer Water User Communities.

7. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

7.1 Purpose and Process of Stakeholder Engagement

Public consultation is a key component of CAISAR, and it was pivotal in preparation of the Environmental, Social, Climate Impact Assessment report (ESCA) Report and the Environmental, Social, Climate Management (ESCM) Plan. The consultations were conducted with relevant institutions, non-governmental organizations, local authorities, and local people during the preparation of ESCIA and ESCMP for CAISAR project. The data collection and consultations were conducted in four periods:

- The first consultation was conducted between 26 and 28 July 2024 to capture information regarding biodiversity and environmental condition in the project area.
- The second consultation was conducted to consult with forestry and fishery communities, local authorities and key informants to understand the situation and concerns related to the presence of the project. The consultation was conducted between 03 and 09 August 2024.
- The third consultation was conducted at household, village, and commune level stakeholders focusing on status, concerns and feedback regarding the project implementation. This consultation was conducted between 10 and 18 August 2024.
- The last consultation was conducted between 21 and 23 August 2024 with the district and provincial stakeholders, mainly focusing on the opinion, and feedback regarding the implementation of the project.

In addition to the stated consultations, there are also continuous consultations being conducted with AIIB, IFAD, and CAISAR PMU including the PMU management, SECAP team, and engineering team to ensure that the disclosed information being aligned with the most updated information of the project.

During project preparation, various stakeholders have been consulted in July and August 2024. Table below summarizes the number of people consulted by consultation techniques:

Table 38. Type of stakeholder during the consultation

Levels	Household survey (Beneficiaries and Potentially Affected)	Focus Group Discussions	Key Informant Interviews	**Total**
Village level	65	59	4	128
Commune level			3	3
District level			2	2
Provincial level			2	2
			Total	135

7.2 Consultation Process

The purposes of the consultation were to:

- Inform local people and interested stakeholders of the purpose of the rehabilitation and construction of the irrigation system,
- Share the project information and the design options from the draft engineering design,
- Highlight subproject's key activities that are potentially associated with them, and
- Collect their opinion, concern and feedback on the project focusing on background information, project potential impacts (positive and negative), suggestions for impact mitigations, and consultation mechanism.

The consultation agenda with stakeholders included (i) the introduction of the study team, (ii) sharing project information using illustration materials, (iii) discussion and consultation on potential benefits and impacts of the project, (iv) suggestions on the mitigation measures, (v) grievance process and concerns, and (vi) final wrap up for the consultation. The study team were trained to introduce themselves to the purpose of the consultation, followed by the introduction about the project's component and activities expected to be implemented within the area. Materials including leaflet on project information and map of the command area were shared and explained to stakeholders prior to the consultation. Lastly, the consultation began with an overall discussion and specific questions as per the relevant aspect to the stakeholder. Opinions, concerns and suggestions were gathered and confirmed prior to the end of the consultation.

7.3 Results of Consultation

7.3.1 Environment and Biodiversity Component

7.3.1.1 Pollution prevention and resource efficiency

Concerns

- The construction process can release dust, which will disturb the local community and surface water quality.
- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site will negatively impact local air quality and surface water.

Feedback and Suggestions

- Regularly watering on the road transports construction materials and soil to reduce dust that may disturb nearby residents.
- Install garbage bins and waste storage areas in the construction sites and conduct orientation workers to put the waste in the garbage bins.

7.3.1.2 Biodiversity

Concerns

- The fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the reirrigation infrastructure and canal upgrading.

Suggestions from the consulted people

- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.
- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.
- Maintain existing large trees along the dam and canal within the sub-schemes during the reirrigation and upgrading process.

7.3.1.3 GHG emission

Concerns

- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons,

Suggestions from the consulted people

- Installing solar water pumps in agriculture processing facilities can reduce fuel consumption, which causes greenhouse gas emissions.

7.3.2 Social Component

7.3.2.1 Labor and Working Conditions

Concerns

- The presence of construction staff and workers could lead to gender-based violence affecting women workers, women and children in the community.

Suggestions

- Should offer training to their staff and workers on gender issues, violence, and legal protections.
- Preventive support measures should also be put in place to stop abuse, and any incidents must be swiftly handled to avoid repetition. The training should be conducted by technical officers.

7.3.2.2 Community Health and Safety

Concerns

- Concerns about the presence of workers could cause sexual abuse of women and children living near the project site.

Suggestions from the consulted people

- To prevent incidents, construction staff should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community and notify authorities upon project completion to avoid quiet handovers.

7.3.2.3 Land acquisition, economic and physical displacement

Concerns

- Landowners along the irrigation system without land registration are concerned they may not receive compensation due to the lack of title deeds.
- Conflicts between the project and affected families could emerge, often fuelled by external instigators rather than the families themselves.

Suggestions from the consulted people

- A preliminary study on land issues before construction is recommended, with each sector addressing specific aspects of land impact and conducting evaluations for each affected property.
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project.
- The construction company should submit quarterly monitoring reports on implementation activities to the provincial department to identify and quickly resolve any issues.
- The government is requested to assist in issuing land titles to farmers with land adjacent to streams and canals.

7.3.2.4 Cross–cutting risks and impacts

Concerns

- Provincial department facing of limited budget to develop and rehabilitate the existing irrigation system

Suggestions from the consulted people

- The project should thoroughly examine the technical and situational aspects of the sub-scheme before construction to prevent water shortages or flooding post-construction, and it should be implemented promptly.
- Establish a Farmer Water User Group (FWUG) to oversee water use and maintenance by providing technical and management training, materials supported to effectively control and manage water distribution.
- The water consumption fee should be gathered from farmer which could be used later to support caretaker and maintenance the irrigation system.

7.3.2.5 Agricultural Production

Concerns

- The high cost of agricultural inputs continues to reduce farmers' profits.
- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons.
- Manure for fertilizer is declining due to reduced animal raising and lower cattle prices are prompting farmers to reduce livestock raising.

Suggestions from the consulted people

- Build more water storage and reservoir which able to store more water
- The irrigation should be constructed based on technical and water conditions in the area.
- Utilizing durable concrete for the canal system can improve the efficiency and longevity of the irrigation infrastructure.
- Installing and upgrading damaged sluice gates in both main and secondary canals can improve water distribution efficiency and prevent water loss in agricultural production and reirrigation systems.
- Construct both side roads along the canal to enhance transportation for farmers and traders.

7.4 Stakeholder Engagement during Sub–Scheme Implementation

During the implementation of the sub–scheme, particularly prior to construction, when locations of contractor's office, workers' camp, disposal sites for construction debris and construction waste, and labor management plan, etc. are identified – based on Contractor's ESMP, environmental and social risks and impacts associated with Contractor's specific construction methods and measures will be updated in C-ESMP and disclosed for continued consultation with local people and local authorities to avoid/minimize E&S risks and impacts.

7.5 Information disclosure

This ESCMP will be disclosed to the public in both English and Khmer language. The English version will be disclosed in full version whereas the Khmer version will be disclosed as Executive Summary. The documents will be disclosed on the website of MOWRAM (as Project Implementation Unit), and on the website of AIIB, IFAD and GCF before project appraisal and project approval – as per disclosure guidelines required by each donor.

8. GRIEVANCE REDRESS PROCEDURES

8.1 Objectives of the Project GRMs

The objective of the GRM is to provide affected people with redress procedures that can be conveniently used to raise a project related concern or grievance. The GRM guides how a complaint can be lodged, including forms and channels through which a complaint can be submitted. To facilitate the grievance resolution process, grievances received will be acknowledged in writing and solved within a specified timeframe. During the resolution process, where necessary, dialogue will be held with aggrieved people for mutual understanding and effective resolution. Once a complaint is resolved, the aggrieved person will be notified of the resolution results.

The GRM has sequential steps that aggrieved person can use. If the aggrieved person is not satisfactory with the grievance resolution result, or if their complaint is not resolved within the timeframe specified for a particular step, aggrieved person can move on to the next step which is higher in resolution hierarchy. The project has an appeal process where complainants can resort if they are not satisfied with a resolution decision at a particular step, or their complaints are not resolved within a specified timeframe.

8.2 Summary of National Legislation Related to Grievance and Complaint

The RGC has various laws and sub-decrees that have been in place to guide the implementation of the complaint resolution process. These documents specify the right of the complainants as well as the responsibilities of concerned governmental agencies as to complaint resolution. Relevant legal documents include:

- Law on Expropriation (dated 26 February 2010)

- Labor Law (dated 13 March 1997, amended on 20 July 2007 and 26 June 2018)
- Law on Prevention of Domestic Violence and Protection of Victims (dated 24 October 2005)
- Sub-decree No. 22 ANK/BK (2018) on Standard Operating Procedures for Land Acquisition and Involuntary Resettlement for Externally Financed Projects in Cambodia. Guidelines for Grievance Redress Mechanism (Appendix 8)
- Law on Administrative Management of Capital, Provinces, Municipalities, Districts and Khans (dated 22 May 2008) – Section 6 on Solution of Local Conflicts
- Sub-decree No. 22 (25 March 2002) on Decentralization of Roles, Functions, and Power to Commune Councils (Article 61: duty to promote the role of conciliating disputes between citizens)
- Sub decree No 47 ANK.BK (31 May 2002) on Organization and Functioning of the Cadastral Commission (Chapter 4 – District/Khan Level Conciliation).

8.3 Principles of the Project GRMs

Under CAISAR, the following principles will be applied:

- Channels. Different channels are established to enable affected person to submit their grievances, including submission to village committee, as well as district and provincial levels.
- Forms. Grievances can be submitted in writing and verbally, and either directly by the affected households, or by a person delegated by the complainant.
- Complainant can delegate a representative who acts on their behalf. A person lodging a grievance can ask assistance from their family or from individual to act as their representative.
- Disclosure. GRM procedures are disclosed in public domain (e.g., websites of PMU, public notice board at village hall, and in front of substation).
- Documentation. A grievance logbook will be maintained at substation (subproject level) and at PMU level (through PMU GRM focal point).
- Transparency. Grievance procedures include steps, time frame for grievance resolution for each step, notification to affected person, how decision is made.
- Acknowledgement. The unit in charge of complaint resolution will notify complainant upon complaint receipt and will initiate the complaint resolution process.
- Appeal. If the agency in charge does not resolve a grievance in a manner that is satisfactory to the affected person, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court.
- Monitoring. All grievances received are recorded by PMU and relevant substations, and are processed/resolved in a given timeframe, and are monitored by PMU GRM focal point.

- Time-limit. Time-limit is specified for each step in the grievance resolution process.
- Complainants bear no costs. Complaint resolution is free of charge to aggrieved person. However, if the complaints bring their case to court, they will bear the costs associated with their lawsuit.
- Any grievance concerning urgent health and safety issues shall be resolved immediately.

8.4 Project's Redress Procedures

The project has in place complaint handling procedures for three types of potential grievances, including grievances related to 1) land acquisition, 2) labour and working conditions, and 3) sexual exploitation and abuse and sexual harassment (SEA/SH/GBV/GBV), and 3) general complaints. These procedures are established based on the above GRM principles and are in accordance with pertinent national legislation. The GRM for complaints related to land acquisition is provided in the project's Resettlement and Policy Framework (RPF) and that for IPs is provided in the project's IPPF. Summary for the above four procedures is provided below:

8.4.1 Redress Procedure for Complaints related to Land Acquisition

Under this project, to facilitate the grievance redress, the informal and formal steps are combined for convenient use of affected people, as follows:

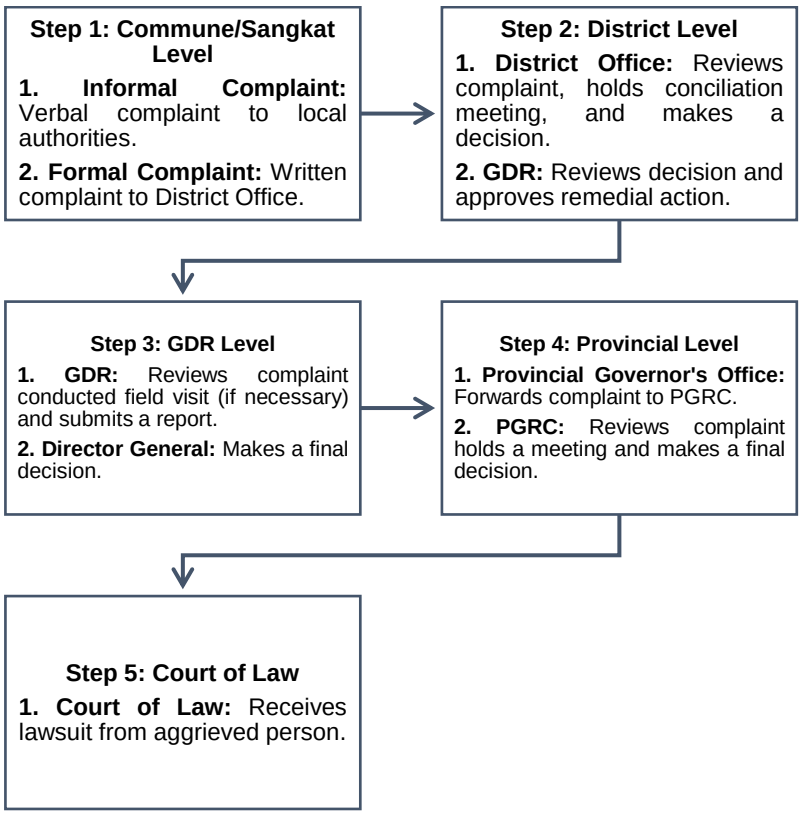
- Step 1 − Commune/Sangkat level. APs will seek assistance from commune/Sangkat chief or community elderlies who will discuss with the leader of the PRSC-WG to find a solution. Verbal grievance can be provided to the commune/Sangkat chief or community elderlies. So, no written complaint is required. It is noted that even if the complaint is made verbally, the complaint will be registered in project's logbook, including resolution process and result for such verbal grievance for monitoring purpose. Upon receipt of the verbal complaint, the PRSC-WG will consult with the IRC-WG to ensure the complaint is addressed timely. If the grievance is not resolved to the satisfaction of the AP, or if the AP prefers, s/he may lodge their complaint through the formal route which includes the steps below.
- Step 2 − District level. AH can lodge a written complaint to the Head of the District Office (where the subproject is located). The AH can bring a community elderly or their representative to discuss their grievance at the District Office. A conciliation meeting shall be held, and a decision be made within 15 working days from the date of complaint is received by the District Office. If the complaint is resolved to the satisfaction of the AH, the IRC-WG will inform GDR's Department of Internal Monitoring and Data Management (DIMDM) who will review and seek the approval of the Director General of GDR for appropriate remedial action. GDR will inform the AF of the decision/ remedial action within 15 working days from the receipt of the grievance by the District Office. If the complaint is rejected at this step, District Office will inform the AH of the rejection in writing. If the complainant is not satisfied with the decision/resolution result, s/he can proceed to step 3 (below).
- Step 3 − GDR level. The complainant who is not satisfied with proposed resolution from Step 2 shall lodge a written complaint to the GDR for resolution. The GDR, through its DIMDM, will carry out a holistic review of the complaint and submit a report on its findings with the relevant recommendations, if any, to the Director General of GDR for review and

decision. GDR may conduct a field visit to meet the complaint and the IRC-WG to gather relevant information. The final report must be completed within 30 working days from the date of receipt of the complaint by GDR for submission to the Director General of GDR who will make a final decision within 5 working days of receipt of the final report. In the event that the subject matter requires a policy level intervention, it will be referred to the IRC for a decision which may require that an additional 10 working days be extended from the original deadline for final decision.

- Step 4 − Provincial level. AH will submit a written complaint to the PGRC through the Provincial Governor's Office. The complainant or a representative will be given an opportunity to present its case during a meeting and the PGRC may consider any compelling and special circumstances of the AH to inform their decision. The GDR will send a representative, as a non-voting member, to provide an explanation to the rejection of the complaint at Step 3 with the GDR. The decision of the PGRC must be made on a consensus basis and will be final and binding except when the matter relates to government's policy. Decisions related to government's policy matters on land acquisition and resettlement are decided by the IRC. The PGRC will have 40 working days from the date of receipt of the complaint to reach a final decision. The decision of the PGRC will be sent to the IRC (through the GDR) for endorsement before any remedial action is taken. There are no fees or charges levied on the AH for their lodgment of complaint and for complaint resolution for the above 4 steps.

- Step 5 − Court of Law. If the aggrieved person prefers filing a lawsuit at the Provincial/Municipal Courts, as applicable, to seek a resolution, AP can do so but will bear cost related to the lawsuit as per the Expropriation Law. When the case is brought to a Court of Law, there is no involvement of the GDR, PRSC or IRC-WG unless there is a judicial order from the competent courts.

Figure 1. Redress Procedure for Complaints related to Land Acquisition



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8.4.2 Redress Procedure for Complaints Related to Labor and Working Conditions

Project workers can lodge their grievance/complaint as follows:

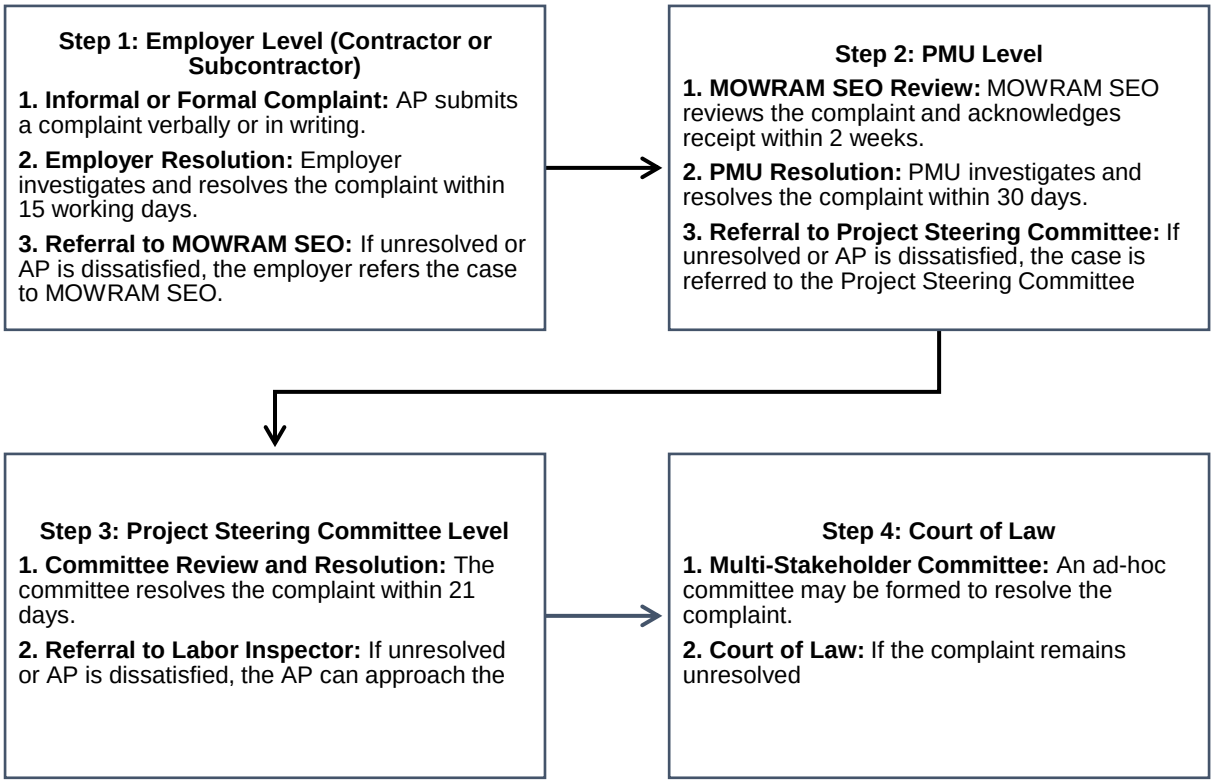
- Step 1 – Employer Level (Contractor and Subcontractor). Aggrieved person (AP) can submit their grievance to their Employer who serves as the first focal point for receiving and resolving grievance. Grievance can be lodged verbally or in writing, in person or by phone, text message, mail or email (anonymous complaint is accepted). The Employer involved will resolve the case no later than 15 working days. Once resolved and the AP is satisfactory, the Employer will report the case, including resolution process and results, to the SEO of the MOWRAM for information and record. If the AP is not satisfied with the resolution of their Employer, the Employer will refer the AP to the SEO of MOWRAM, if needed and inform the AP of this referral. It is noted that if a complaint concerns the safety and health of one or several individuals, such complaint shall be resolved as soon as possible – depending on the nature and urgency of the grievance.

- Step 2 – PMU level. MOWRAM SEO will resolve the complaint referred to by the Employer (Step 1) and acknowledge receipt of the AP's complaints within two weeks from the date of complaint receipt. If the SEO of MOWRAM cannot resolve the complaint, the SEO Team will consult with the Project Manager/Director for resolution. The SEO of the MOWRAM will inform the AP (in writing) of the PMU's resolution result within 30 days from the date of complaint receipt. If the AP is not satisfied with the resolution result proposed by PMU, PMU will refer the case to the Project Steering Committee of the project and shall inform the AP (in writing) of this referral.

- Step 3 – Project Steering Committee level. At this level, the case will be resolved no later than 21 days. The AP will be informed of the resolution decision in writing. In case the grievance has not been solved within the specified timeframe, or the AP does not agree with the proposed resolution, the AP can approach the Labor Inspector of his/her province or municipality.

- Step 4 – Court of Law. If the AP is not satisfied with the resolution proposed above, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court. If the grievance could not be resolved satisfactorily by the multistakeholder committee, the affected person may resort to the court of law. The cost associated with the lawsuit shall be borne by the AP. The decision of the Court will be final.

Figure 2. Redress Procedure for Complaints Related to Labor and Working Conditions



8.4.3 Redress Procedure for Complaints Related to SEA/SH/GBV

Under the project, the GRM for SEA/SH/GBV mainly serves to: (i) refer complainants to a local GBV service provider; and (ii) record resolution of the complaint. In line with the above, the following principles apply so as to recognize SEA/SH/GBV victim as principal decision makers in their own care, and treat them with agency, dignity and respect for their needs and wishes: § Multiple channels are in place for easy access and lodge complaints.

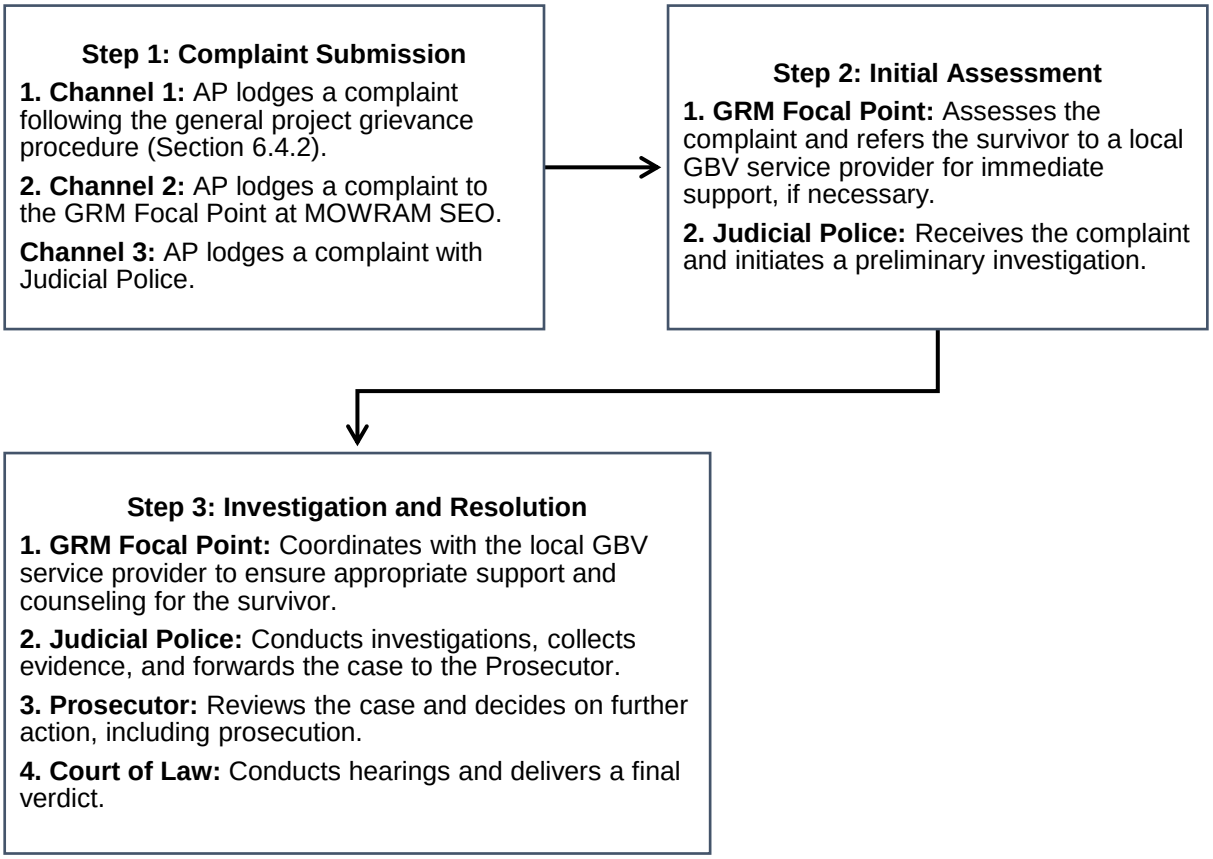
- SEA/SH/GBV survivors will be referred to a local GBV service provider for immediate support if they make a complaint directly to PMU.
- Confidentiality of survivors is protected. GM operator (at PMU and local GBV service providers) will keep confidential for SEA/SH/GBV allegation report.
- No identifiable information on the survivor shall be collected and stored in Project Grievance Logbook.
- Costs of operating the SEA/SH/GBV GRM will be covered by the project.

It is noted that under this project, GBV service provider will be engaged for subprojects that are rated “High” or “Substantial” for SEA/SH/GBV risks − as part of site-specific ESMP. based on SEA/SH/GBV risk assessment The following channels can be used to submit a grievance related to SEA/SH/GBV:

- Channel 1 – AP who believe the SEA/SH/GBV incidence is related to project workers can follow steps outlined in Section 6.4.2 (above) to lodge a SEA/SH/GBV complaint.
- Channel 2 – Alternatively, AP can lodge their complaint, verbally or in writing, to the GRM’s Focal Point within the SEO of MOWRAM for advice and resolution (contact of GRM Focal Point is provided in Section 5.1 (Resources).

- Channel 3 – If AP wants to bring the case to the Court of Law, AP can follow steps below for prosecution. Prosecution related to SEA/SH/GBV is administered under the Criminal Code and the Code of Criminal Procedure and is as follows:

    - Figure 3. Redress Procedure for Complaints Related to SEA/SH/GBV



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    - Step 1 – Judicial Police. SEA/SH/GBV victim or a representative can submit their grievance to a local Judicial Police (JP) Officer. JPs include a) Commune/ Sangkat Chief, b) Commune/ Sangkat/ District/ Provincial/ National Police, and c) District/ Provincial/ National Military Police. The JP is responsible for receiving, recording complaints, and may conduct preliminary investigations to identify and arrest the perpetrator. The JP will also collect evidence to support the prosecutors. If the SEA/SH/GBV happens at home and/or falls under the domain of domestic violence (as per Law on the Prevention of Domestic Violence and Protection of Victims), the SEA/SH/GBV survivor may seek support from a local qualified Judiciary Police Officer (appointed by the Ministry of Women's Affairs) who can act as a complaining party on behalf of the SEA/SH/GBV survivor15.
    - Step 2 – Prosecutor. Upon receiving the completed written record from the JP, the prosecutor can decide on if the prosecutor will hold a file without processing it further or conduct proceedings against the perpetrator. The prosecutor may bring the case to the Court of Law and present the evidence in Court hearings.
    - Step 3 – Investigation by Judge. During this step, the investigating Judge will conduct interrogation of the charged person and perform other required investigation procedure.

- Step 4 – Hearing. After issuing an order of indictment, the investigating Judge will submit the case to the trial court president who shall arrange a date for the trial. The decision of the Court on SEA/SH/GBV resolution is final.

8.4.4 Redress Procedure for General Complaints

In case individuals, households, or communities are affected by any other aspects, for instance, environmental impacts such as increased dust, noise, or lack of safety measures that increase risks of traffic accident to road users or to local EM, various channels will be established for convenient use by affected parties, including IPs. These include:

- PMU GRM focal point's telephone (See Section 5.1 – Resources). o Local EM leaders (in case affected individual/households are EM)
- Contractor's hotline: to report cases that they think contractors can solve timely (contact detail of Contractors will be posted at construction sites, and distributed to IPs (through Subproject Information Booklet) during consultation, and post at public billboard of Commune/Sangkat offices, pagodas, etc.
- Commune/Sangkat offices

8.5 Registration of Project Grievance

The SEO, Project 6. Managers within MOWRAM is responsible to establishing and maintaining the project grievance logbook (PGL). The PGL will be established by the SEO to record all concerns/ grievance that are submitted by project stakeholders during project implementation. In case there is serious complaint, the World Bank should be notified of these complaints within 24 hours of complaint receipt (See Annex 3 for Guidance for establishing and maintaining Project Grievance Logbook).

The GRM is an integral project management element that intends to seek feedback from beneficiaries and resolve of complaints on project activities and performance. The GRMs for the project are based on IAAB, IFAD, UN, and GCF requirements and, most importantly, national requirements for solving potential problems between project owners and residents/persons affected by the subproject(s).

9. IMPLEMENTATION ARRANGEMENTS

9.1 Environmental and Social Duties of the PMU/Detail Design Consultants

9.1.1 MOWRAM'S PMU

The MOWRAM's PMU will work closely with PDWRAM in planning and implementing subprojects located within their province. The PDWRAMs will also supervise project officers at the district-level Department of Water Resource and Meteorology, and are responsible for:

- Coordinating effectively with all project stakeholders, including MOWRAM's SEO, consultants, contractors, local authorities, provincial departments, and project communities.

- Supporting provincial and district-level project officers in monitoring and evaluating progress and performance of consultants and contractors.
- Supporting MOWRAM'S SEO to conduct training on labor, gender, SEA, SH, VAC, and HIV/AIDS.
- Supporting MOWRAM'S SEO to disseminate project information and conduct consultation activities, as well as ensuring effective grievance redress resolution within their province.
- Supporting MOWRAM'S SEO to conduct screening and scoping of the subprojects, and identifying environment, social, land acquisition impacts and screening for presence of IPs in the subproject area.
- Liaising with village authorities in subproject area to encourage vulnerable groups to apply for jobs that may be offered by project's contractors.
- Collaborating with relevant departments involved in land acquisition and/or other environment or social mitigation measures.

9.1.2 NCDD'S PMU

NCDD's PMU will work closely with Provincial Cabinet in planning and implementing subproject located within their province. NCDD PMU will be responsible for day-to-day project implementation, monitoring and evaluation of Project Component 1, 2.1 and 2.2 in collaboration with MAFF. PMU will work under the oversight and guidance of NCDDS and will be responsible for all aspects of environmental and social performance, including E&S monitoring and evaluation, reporting of E&S performance, and relevant incidence during project implementation.

9.1.3 Provincial Department of Water Resources and Meteorology

PDWRAM's main responsibility includes:

During subproject preparation:

- Support design parties in their surveys and consultation to prepare Feasibility Study and Detailed Design for sub-scheme.

During construction:

- Oversee construction activities under Component 2, particularly construction of the new irrigation canal in the command area

During operation:

- Collaborate with other relevant technical departments, especially PDAFF at provincial level, farmer water user groups (FWUG) to ensure its regulators (located within the water distribution network) are operated effectively, and in a manner that minimizes water use conflicts among target water user community in the command area.
- Conduct regular maintenance of the reservoir and irrigation canals during subproject operation and maintenance stage.

9.1.4 Provincial Department of Agriculture, Forestry and Fisheries

PDAFF is responsible for implementing activities under Component 1, 2.1 & 2.2. Under this subproject, PDAFF is responsible for developing and implementing agricultural techniques that

make full use of improved water access (under Component 1) to enable farmers in the command area to produce more food in a sustainable manner which improves farmers' income and livelihoods. PDAFF will focus on the following:

- Promoting crop diversification for farmers in the command area (e.g. crop rotation for rice and horticulture production improves soil conditions whereas enhancing vegetation production for household's better nutrition and income.
- Introducing to farmers new agricultural engineering techniques to promote a) mechanization to increase productivity in crop production (e.g. mechanization in soil preparation using laser land leveling, use of combine harvester to save labor and reduce production costs, b) save water by applying alternate wet and dry (AWD) and drip irrigation for horticultural activities, c) reduce GHG.
- Scaling up Crop Production and engaging Private Sector in value chain development for specific farm product (e.g. rice, bean, and other cash crops such as vegetables…) and relevant agricultural services through agricultural cooperatives, producer groups, etc.

9.2 Contractor's Environmental and Social Management Plan (C-ESMP)

The civil works contractor is responsible for implementing the Environmental and Social (E&S) mitigation measures outlined in this ESMP for Component 2, which involves constructing the irrigation canal and related structures like gates and regulators. Based on the ESMP and the project's Labour Management Plan (LMP), the contractor will:

- Prepare and submit a Contractor's Environmental and Social Management Plan (C-ESMP) for each contract, detailing how E&S risks related to construction activities, workers, camps, machinery, and vehicles will be mitigated. The C-ESMP must also include a labor management plan (C-LMP) and be site-specific, addressing risks based on the contractor's capacity and site conditions.
- If subcontractors are engaged, they must prepare their own E&S plan aligned with the ESMP and LMP, outlining how they will manage identified risks and impacts. Reporting arrangements between the subcontractor and the main contractor must be detailed, with the main contractor consolidating subcontractor reports into monthly E&S performance reports to the PMU, with quarterly reporting potentially required.
- If changes occur to the proposed works and activities during the contract period, the contractor must update the C-ESMP to reflect these changes, including relevant subcontractor plans. The C-ESMP should include:
    - A policy statement outlining the contractor's commitment to the site-specific ESMP.
    - Document details (issue date, revision status, distribution list, and signatures).
    - Applicable laws, regulations, and required permits.
    - Plans to manage E&S risks, including mitigation measures, a Workers' Code of Conduct, and a Contractor's LMP.
    - A list of required environmental and social training for all personnel, including occupational health and safety, SEA/SH/VAC risks, and emergency response.
    - Financial resources and responsibilities for implementing the C-ESMP, including

subcontractor responsibilities and training for local workers.

- Monthly environmental reports, covering accident/incident reporting within 48 hours to MoWRAM, compliance with the C-ESMP, challenges, non-compliance issues, subcontractor activities, and meeting minutes with MoWRAM.

The contractor must ensure timely funding, human resources, and implementation of pre-construction and construction mitigation measures, along with any additional E&S mitigation required.

9.3 Contractor's Safety, Social and Environmental Officer (SSEO)

The contractor must appoint a competent on-site Safety, Social, and Environment Officer (SSEO), trained in environmental management, to oversee contractors and subcontractor personnel. The SSEO's responsibilities include:

- Supervising subcontractor compliance with the Contractor's LMP and C-ESMP.
- Submit the LMP and C-ESMP to the PMU/DDIS for approval before mobilizing staff.
- Conducting site inspections and audits to ensure compliance with environmental and social mitigation measures.
- Monitoring and reporting on E&S compliance and preparing audit reports.
- Investigating complaints, recommending corrective actions, and addressing non-compliance.
- Informing the contractor, PMU, and DDIS of any E&S issues, and maintaining detailed records.
- Collaborating on labor issues and preparing the Contractor's LMP and C-ESMP, including OHS regulations.
- Maintaining employment records, verifying minimum working age, and ensuring signed Workers' Codes of Conduct.
- Providing regular training on occupational safety, SEA/SH/VAC, and community relations.
- Ensuring primary suppliers address SEA/SH/VAC, child labor, forced labor, and OHS risks.
- Developing and implementing a grievance mechanism for contracted workers, resolving grievances promptly, and reporting to the PMU.
- Ensuring all workers sign the Code of Conduct and implement measures to prevent SEA/SH.
- Developing and enforcing COVID-19 prevention and mitigation plans.

Incident reporting

The contractors are required to inform DDIS and PMU any incidents listed below within agreed timeframe (e.g. 48 hours):

- Any violations to national laws, regulations, or international agreements.
- Any serious accidents or fatalities,
- Significant impacts that cause losses to personal property such as traffic accidents,

damages to local houses/roads and other incidents.

- Serious surface/ground water pollution.
- Failures of embankments at disposal sites that cause serious pollutions to the surroundings,
- Fire related to worker's behaviours,
- Any claims related to SEA/SH/VAC, or any other incidents related to children, and
- Receive a complaint about pollution or damages.

9.4 Contractor's obligation as to contractual requirements

The contractor and its subcontractors, if any, shall comply with the ESMP. In particular, the Contractor must prepare a Contractor's ESMP (C-ESMP) to elaborate this ESMP based on a) site condition, b) capacity of the Contractors and their subcontractors (if any), c) national regulations that are active by the time of subproject implementation.

To ensure that necessary action has been undertaken and that steps to avoid adverse impacts and/or reoccurrence have been implemented, the Project Manager, the Safeguard Focal Persons, and/or contractor must report to PMU within 48 hours of any serious incidents of non-compliance that may have serious consequence. In the event of working practices being deemed dangerous either by the subproject, the local authorities, or the other concerned agencies, immediate remedial action must be taken by the contractors. The contractor must keep records of any incidents and any corrective action taken. The records of non-compliance that could be practically addressed (not cause serious impacts) will be reported to the DDIS with a copy to PMU monthly.

The contractor will be responsible for dealing with any reports/grievance forwarded by the local communities, authorities, police or other agencies as soon as practicable, preferably within one hour but always within 48 hours. The Project Manager/Safeguard Focal Persons will monitor and ensure that the contractor has taken appropriate action. Where appropriate, approval of remedial actions may require an agreement from the local authorities and/or other government agencies. Procedures should be put in place to ensure, as far as is reasonably practical, that necessary actions can be undertaken to avoid recurrence and/or serious damage.

10. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM

10.1 Environmental Monitoring Program

To ensure the effectiveness of environmental management, the environmental monitoring program is prepared to monitor the environmental quality. The contractor and/or sub-contractor is responsible for monitoring using appropriate method, equipment and system. Details on monitoring parameters are shown in the table below:

Table 39: Environmental monitoring plan during Pre-construction, construction, and Operation phase

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Pre-construction phase					
UNEXPLODED ORDNANCES (UXO)	• UXO screening by certified experts required before any construction. • Found UXOs to be removed by certified experts. • UXO clearance certificate required before subproject activities. • UXO risk training and awareness for the local community.	Along the canales (construction site)	• Confirm all relevant areas are clear from UXO by consulting national military. • Obtain a certificate of UXO clearance	Before construction	PMU Contractor
During construction phase					
	ENVIRONMENTAL				
Noise and Vibration	• Avoid working during night-time from 21:00 hours to 06:00 hours • Provide ear sets for workers to prevent noise if the noise level exceeds the standard • Check and maintain construction machinery regularly to avoid noisy and high vibration • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures	Construction site Nearby sensitive structures	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
	Measuring noise and vibration level	Construction site, there is one location for noise and vibration level sampling. ANV 7 X: 465547 Y: 1304414	Measuring equipment and/or appropriate monitoring methods	Every 06 months	SEO E&S specialist consultants PMU
Air quality	• Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition • Solid waste or construction waste activities • Construction machinery operation and	Construction site	Site inspection Visual observation Monitoring equipment and/or appropriate monitoring methods	Daily	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	maintenance • Distance of sitting concrete mixing plants, crushing • plants, quarries and other facilities to settle and other sensitive receptors • Transportation of construction materials				
	Testing air quality (NO2, SO2, CO, TSP, PM10, PM2.5)	There is one location for air quality sampling. ANV 7 X: 465547 Y: 1304414	Air quality monitoring equipment	Every 06 months	
Impact to Water	• Wastewater management • Design and capacity of septic tank • Digging of side drain at campsite • Construction of retaining structures	Construction site	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
	• Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform).	There is one location for surface water quality sampling. SW7 X:465456 Y:1307467	Water quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU
	• Testing of soil quality is going to be analyzed in the agriculture context: - Soil classification or particle size, - Soil moisture, - Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na), - Organic Metter - Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio), - Total phosphorus (P), - Cation exchange capacity (CEC), - pH,	There is one location for soil quality sampling. SS4 X: 465450 Y:1304887	Soil quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	- Electrode Conductivity.				
Solid and hazardous waste	• Solid and liquid waste management plan in the project construction sites. • Install septic tanks at the construction camp to prevent the discharge of polluted sewage into the outside. • Implement waste segregation of reusable construction materials, biodegradable, and non-biodegradable wastes. • Orient workers on the solid waste segregation system and prohibit them from indiscriminate throwing wastes outside of waste bins in the construction sites. • Provide sufficient waste bin and proper storage before transportation to dispose at an authorized landfill. • Fuel storage tank will be provided with retention areas to contain accidental spills.	Construction site	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Wastewater	• Establishment of proper wastewater management systems, including adequate sanitation facilities for workers.	Construction site/Camp	• Monitoring wastewater discharge for parameters such as temperature, pH, TSS, DO, COD, BOD_5. • Regular checks for leaks or spills from sanitation facilities.	Daily	PMU, Contractor
Physical Hazards	• Incidence of worker injuries due to physical hazards (e.g., falls, cuts, being struck by objects) • Unsafe working conditions (e.g., inadequate lighting, lack of proper safety equipment, slippery surfaces) • Compliance with safety regulations and use of personal protective equipment (PPE)	• Construction sites • Worker camps • Access roads	• Site inspections • Incident reports • Safety audits.	• Daily during construction Weekly safety meetings	Contractors PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Chemical hazards	• Exposure of workers and communities to hazardous chemicals (e.g., pesticides, fuels, solvents) • Improper storage, handling, and disposal of chemicals • Air and water quality monitoring to detect chemical contamination	• Construction sites • Worker camps • Areas surrounding construction sites	• Site inspections • Training for workers	Regular inspections of chemical storage and handling areas	Contractors PMU
Heat Stress	• Implementation of safety measures and provision of break times for workers during extreme weather events. • Provision of adequate drinking water and shelter.	Construction site/Worker camps	• Monitoring weather conditions, including temperature and humidity. • Observation of worker breaks and access to shade and drinking water. • Records of any heat-related incidents.	Daily	Contractors PMU
	BIODIVERSITY				
Habitat Loss and Fragmentation	• Area of habitat lost or fragmented. • Changes in vegetation cover. • Number of isolated habitat patches • Presence of wildlife corridors.	Construction site	Site inspection Visual observation GIS analysis (if available) Drone surveys (if available)	Daily/Weekly	SEO E&S specialist consultants PMU
Loss of biodiversity and ecosystem services	• Changes in species abundance and diversity • Decline in water quality • Changes in soil fertility • Reduced pollination services • Alterations in hydrological processes	Construction site	Site inspection Visual observation Biodiversity surveys	Daily/Weekly	SEO E&S specialist consultants PMU
Hunting and trading, and consumption of wildlife	• Avoid cutting of trees or destruction of vegetation • No hunting, fishing, or collection of animal and plant materials • Revegetation success will be monitored, particularly surrounding riparian vegetation along area where levee is installed for flood protection and for increased water retention.	Construction site	Site inspection Visual observation Community interviews	Daily/Weekly	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Loss of fauna and flora	• Number of individuals of each species observed • Presence of endangered or threatened species • Changes in plant community composition	Construction site	Site inspection Visual observation Biodiversity surveys	Daily/Weekly	SEO E&S specialist consultants PMU
Destruction of farming ecosystem	• Area of farmland affected • Changes in crop yields • Impacts on livestock • Pollution of water sources used for irrigation	Construction site	Site inspection Visual observation Interviews with farmers	Daily/Weekly	SEO E&S specialist consultants PMU
Landscape and biodiversity	• Adopting good housekeeping and good construction practices. • Ensuring proper lining of canals and adequate assembling of pipes • Adopting slope stabilization techniques. • Implementing Biodiversity Action Plan (BAP)	Construction sites	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Protected Areas	• Exclude a subproject located in the community forestry, and Zone 3 of the protected area.	Construction sites	Site inspection	Daily	SEO
GHG emission	• Monitor the amount of fuel used by construction vehicles, heavy machinery, and generators. • Track the fuel efficiency of these machines to identify opportunities for improvement. • Assess the effectiveness of measures to control dust emissions from construction sites. • Monitor the types and quantities of waste generated and their disposal methods. • Track the amount of waste recycled or reused to reduce emissions associated with landfill disposal. • Monitor the number and types of vehicles entering and leaving the construction site. • Track the efficiency of transportation methods used to deliver materials and equipment.	Construction site Nearby sensitive structures	Site inspection Visual observation Consultation	Daily	SEO E&S specialist consultants PMU
During operation phase					

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Water Quality	Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform) and pesticide residues in water.	There is one location for surface water quality sampling. SW7 X:465456 Y:1307467	Site inspection Visual observation	Annually	SEO E&S specialist consultants PMU
Soil Pollution	• Testing of soil quality is going to be analyzed in the agriculture context: - Soil classification or particle size, - Soil moisture, - Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na), - Organic Metter - Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio), - Total phosphorus (P), - Cation exchange capacity (CEC), - pH, - Electrode Conductivity.	There is one location for soil quality sampling. SS4 X: 465450 Y:1304887	Soil quality monitoring equipment	Annually	SEO E&S specialist consultants PMU
Biodiversity and Ecosystem Services	• Implementing Biodiversity Action Plan (BAP)	The entire sub-scheme	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Habitat Loss and Fragmentation	• Area of habitat converted for agricultural use • Changes in the size and connectivity of habitat patches • Number of isolated habitat fragments	The entire sub-scheme	Site inspection Visual observation	Annually	SEO E&S specialist consultants PMU
Invasive Species	• Presence and abundance of invasive species • Area affected by invasive species • Effectiveness of control measures	The entire sub-scheme	Site inspection Visual observation Vegetation surveys	Annually	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
GHG emission	• Monitor the Knowledge, Attitude and Practices of farmers in farming activities that cause GHG emission	The entire sub-scheme	Site inspection Visual observation Consultation	Daily	SEO E&S specialist consultants PMU
	ANNUAL CROP MANAGEMENT PLAN				
Water resource efficiency	• Monitor water extraction rates from surface and groundwater sources. • Assess irrigation efficiency by measuring the amount of water applied versus the amount of water actually used by crops. • Monitor the implementation and effectiveness of water-saving irrigation methods (drip irrigation, sprinkler irrigation, AWD for rice). • Track water consumption per unit of crop yield (e.g., cubic meters of water per ton of rice produced).	Irrigation intake points Representative fields within the sub-scheme	Water flow measurements Soil moisture monitoring Crop water use assessments	Daily	PMU FWUC
Soil erosion and soil erosion risk	• Monitor soil erosion rates in different parts of the sub-scheme, particularly in sloping areas. • Assess the effectiveness of erosion control measures (contour planting, terracing, grass barriers). • Monitor soil organic matter content as an indicator of soil health and erosion resistance.	Representative fields Areas with different slopes and soil types	• Visual assessments of erosion features (gullies, rills) • Soil loss measurements using erosion plots or sediment traps • Soil organic matter analysis	After significant rainfall events Annually	PMU Agricultural extension officers
Nutrient application and management	• Monitor the types and amounts of fertilizers applied to different crops. • Conduct regular soil testing to assess nutrient levels and guide fertilizer application rates. • Monitor nutrient runoff from fields, especially near watercourses.	Representative fields Water sampling points near fields	• Fertilizer application records • Soil nutrient analysis • Water quality testing for nutrients (nitrogen, phosphorus)	Before and after fertilizer application Regularly during the growing season	PMU Farmers

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Use and effectiveness of pesticides	• Monitor the types and amounts of pesticides used for different crops and pests. • Assess the effectiveness of pest control measures by monitoring pest populations and crop damage. • Track the incidence of pesticide-related health issues among farmers and workers.	Representative fields Pesticide storage facilities	• Pesticide application records • Pest scouting and monitoring data • Health records	Regularly during the growing season	PMU Agricultural extension officers
Pesticide residues on site soil	• Conduct soil sampling and analysis to measure pesticide residue levels in representative fields.	Representative fields Areas near pesticide storage facilities	• Soil residue analysis	Periodically (e.g., annually or before planting sensitive crops)	PMU Third-party laboratories
Pesticide residues on produce	• Collect and analyze samples of produce to determine pesticide residue levels. • Ensure that produce meets national and international standards for maximum residue limits (MRLs).	Representative fields at harvest time	• Laboratory analysis of produce samples	Before harvest	PMU Third-party laboratories

10.2 Social Monitoring Program

To ensure the effectiveness of social management, the social monitoring program is prepared to monitor social issues. The contractor and/or sub-contractor are responsible for monitoring using appropriate methods, equipment and system. Details on monitoring parameters are shown on the table below:

Table 3: Social monitoring plan during Pre-construction, Construction, and Operation phase

Monitoring Parameters	Monitoring Indicators	Locations	Measurements	Frequency	Responsibility
Preconstruction phase					
Land acquisition/ Economic displacement	• Track the process of acquiring land for the project, ensuring fair compensation is provided to affected landowners. • Implement programs to help displaced individuals and communities restore their livelihoods.	Construction sites	• Monitor the distribution of compensation payments and address any disputes or concerns.	• Daily • Reported to PMU within 48 hours	• PMU

	• Establish effective grievance mechanisms to address complaints and concerns related to economic displacement.		• Monitor the effectiveness of these programs.		
During construction phase					
PROTECTING THE WORKFORC					
Child Labor/ Forced Labor	• Involvement of child labor/ forced labor in main contractor and subcontractors' workforce • Involvement of child labor/ forced labor among primarily supply workers	• Construction sites • Worksite of primary supplier	• Site inspection • Observation	• Daily • Screening prior to engaging services of primary supplier	
COMMUNITY HEALTH AND SAFETY					
Community Health and diseases	• Incidence of waterborne diseases • Prevalence of vector-borne diseases (e.g., malaria, dengue fever) • Respiratory illnesses related to dust and air pollution • Availability and accessibility of healthcare services • Community awareness of health risks and preventative measures	• Construction sites • Worker camps • Community and neighboring areas	• Health data collection • Site inspections • Health surveys and interviews • Consultation with workers and community members	• Monthly • During outbreaks • Periodic community health awareness campaigns	• PMU • Contractors • Local health authorities
SEA/SH	• Before mobilizing workers to construction site, conduct orientation/training on SEA/SH (using sample Code of Conduct as a minimum) for all Contractors' managers and workers mobilized to construction site • As part of the above training/orientation, ensure all workers understand SEA/SH risks, disciplines and penalty, and understand project's grievance procedures related to SEA/SH • As part of the workers and manager's work contract, require all workers engaged for project (both workers mobilized to site or work in contractors' office) to peruse and sign Workers' CoC • Ensure Contractors appoint a focal point in charge of ESHS and grievance reception, processing and resolution	• Construction sites • Relevant local communities	• Number and percentage of workers trained on SEA/SH prior to mobilization to subproject site • Number and percentage of workers signing Code of Conduct as part of Work Contract • Percentage of workers perpetrating SEA/SH	• Monthly and during subproject cycle • Reported to PMU within 48 hours if occurred	• Contractors • PMU

	• Apply all measures related to management of work camps		and percentage of cases reported to PMU and resolved • Name and contact of ESHS and grievance focal report reported in Contractor's ESMP.		
Traffic safety and Security	• Security cautions • General disease prevalence • Worker health • Communicable diseases	• Construction sites • Access roads to construction sites • Newly constructed/rehabilitated roads	• Site inspections • Incident reports • Data collection • Consultation with workers and community members • Review of contractor safety plans	• Daily during construction • Weekly during construction • Monthly during operation	• Contractors • PMU • Local authorities
Community Health and diseases	• Consultations with target communities to assess the current social situation and social impacts of sub-projects. • Recommendations and solutions from communities obtained regarding negative social impacts.	• Target communities • Workers	• Assessment of social situation and social impacts. • Collection of community recommendations and solutions.	• During consultations	• Contractors • PMU
Personal Protective Equipment	• Health and safety regulations enforced at construction sites. • Appropriate training and personal protective equipment (PPE) provided to workers.	• Construction sites and worker camps	• Monitoring that contractors provide appropriate PPE and enforce its use. • Observation of training sessions. • Review records of PPE distribution and training.	• Monthly monitoring during construction	• Contractors • PMU

Working conditions and Management of Worker	• Worker wages and benefits compared to legal requirements and industry standards • Instances of discrimination or unfair treatment based on gender, ethnicity, or other factors • Access to grievance mechanisms for workers to report unfair labor practices	• Construction sites • Worker camps	• Payroll records review: Verify worker wages and benefits. • Worker interviews: Confidential interviews to gather feedback on labor conditions and treatment. • Observation of worker interactions: Monitor for signs of discrimination or unfair treatment. • Review of contractor labor policies and practices: Ensure compliance with labor laws and ethical standards.	• Regular payroll audits • Periodic worker satisfaction surveys • Prompt investigation of any reported grievances	• Contractors • PMU
Cultural heritage	• Unexpected impacts on heritage resources	• Construction sites	• Site inspection • Observation • Report by local people/local authority	• Daily • Reported to PMU within 48 hours	• PMU • Contractors
CROSS-CUTTING					
Loss access to land and other assets	• Number of households affected by land acquisition or temporary restrictions on land use • Types of assets affected (e.g., land, houses, crops, trees) • Adequacy of compensation and resettlement measures for affected households	• Project areas where land acquisition is required • Areas affected by temporary restrictions on land use	• Land surveys and asset inventories • Consultations with affected households • Review of compensation and resettlement plans • Monitoring of resettlement implementation	• Before land acquisition • During land • After resettlement	• Contractors • PMU

Loss access to natural resources:	• Impacts on community access to water resources (e.g., for drinking, irrigation, fishing) • Impacts on access to forests and other natural resources • Measures to mitigate impacts and provide alternative access to resources	• Areas downstream of irrigation schemes • Areas surrounding project activities that may affect natural resources	• Water quality and quantity monitoring: Assess impacts on water resources downstream of project activities. • Consultations with communities: Gather feedback on impacts on natural resource access and use. • Development and implementation of mitigation plans: Address impacts and provide alternative access to resources.	• Regular water quality and quantity monitoring • During project implementation: Monitor the effectiveness of mitigation measures.	• PMU • Relevant government agencies • Contractors
Social inequality	• Any actions on the part of Contractors' workers or community member that cause social conflicts (e.g. SEA/SH, the way construction activities are carried out [pollution, restricted access, loss of local income/livelihoods, accidents…)	• Construction sites • Relevant local communities	• Number of social conflicts arising and nature and scope of conflict • Number of social conflicts resolved by contractors within 7 days • Number of social conflicts resolved by local authorities • Number of serious cases that have happened and reported to PMU within 48 hours	• Daily • Monthly	• Contractors • PMU
	• Conflicts between upstream farmers who prioritize water storage for their crops and downstream farmers who require a consistent water supply for their agricultural needs.	• Local communities are living downstream and upstream.			

Elite capture	• Equitable distribution of project benefits among community members • Transparency and accountability in decision-making processes • Mechanisms for community participation and feedback	• Project implementation areas • Community meetings and consultations	• Monitoring of benefit distribution: Track who is receiving project benefits and ensure fairness. • Observation of decision-making processes: Assess inclusivity and transparency. • Community feedback mechanisms: Establish channels for communities to voice concerns and provide input.	• Throughout project implementation • Regular community meetings and consultations	• PMU • Contractors • Community representatives
Gender inequality	• Percentage of female beneficiaries • Percentage of beneficiaries who are youth • Average percentage women consulted • Number of action plans integrating specific women's • Average percentage FWUC with women in leadership positions • Women/youth trained in O&M • Number of training on gender and social inclusion delivered to MOWRAM staff	• Project sites • Community level	• Data collected through surveys and consultations • Review of project documents, training plans, and meeting minutes	• Monthly monitoring • Quarterly • Semi-annually • Annually	• PMU • Contractors •
During operation phase					
COMMUNITY HEALTH AND SAFETY	• Number of accidents and fatalities related to construction activities • Number of disease outbreaks and environmental pollution incidents • Number of reported cases of worker health issues	• Construction sites • Camp site and Worker camps • Nearby community	• Site inspection reports • Accident/Incident reports • Medical records/reports • Consultation minutes/reports	• Daily for site inspections • Monthly for reports and consultations • Within 48 hours for reporting accidents,	• PMU • PDWRAM

				disease outbreaks.	
CROSS-CUTTING					
Gender inequality	• Percentage of female workers in different roles (skilled, unskilled) • Number of reported cases of gender-based violence or discrimination • Participation of women in FWUCs and decision-making processes related to water management.	• Construction sites • FWUC meetings • Community consultations	• Observation of worker roles and interactions. • Records of complaints and their resolution. • Attendance records and meeting minutes.	• Monthly for data collection and reporting	• PMU • PDWRAM
Social inequality	• Employment rates of vulnerable groups (poor, ethnic minorities, people with disabilities) in project activities. • Access to project benefits (training, information, resources) among different social groups.	• Construction sites • Training sessions • Community consultations	• Employment records and beneficiary lists. • Attendance records and feedback surveys. • Consultations with community members and representatives of vulnerable groups.	• Monthly for data collection and reporting	• PMU • PDWRAM
Elite capture	• Participation and representation of different social groups in decision-making bodies (FWUCs, committees). • Transparency and accountability in the allocation of project resources and benefits. • Monitoring of complaints related to favoritism or exclusion in decision-making.	• FWUC meetings • Community consultations • Project implementation records	• Observation of meeting dynamics and representation • Analysis of resource allocation records. • Records of complaints and their resolution.	• Regularly during FWUC meetings and project implementation • Continuously through the GRM.	• PMU • PDWRAM

11. ESTIMATED COSTS

11.1 Estimated Costs for ESCMP Implementation

The costs of implementing the ESCMP listed below are related to PMU costs in addition to the dedicated safeguards PMU personnel budget line item. The main costs of implementing this ESCMP are the additional cost which have not been budgeted within the project, exclusive of the actual budget for the land resettlement and land acquisition which will be estimated by the end of the year as per the newly approval on the final conceptual design. For example, the project component 1 focus on establishment, capacity building and strengthening the FWUCs, therefore the concern regarding water management and water distribution inequality have already covered. Moreover, the sustainable agricultural practices and agricultural value chain is already in the project action plans. In this regard, the concern regarding GHG emission from the farming activities have been already addressed. The proposed budget therefore is the additional cost which are added to the existing one.

Table 41: Estimated cost for ESCMP implementation

No.	Items	Qty	Unit	Cost (USD)	Total (USD)
1	UXO clearance	Lum-sump	1	50,000	50,000
2	Preparing National EIA Report	Lum-sump	1	100,000	100,000
3	Implementing Biodiversity Management Plan	Year	5	7,500	37,500
4	ESCMP awareness raising and sensitization with key stakeholders and communities (5 times)	Times	2	3,000	6,000
5	Community outreach at the project area	Sub-scheme	1	15,000	15,000
6	Consultation facilitation	Sub-scheme	1	10,000	10,000
7	Monitoring activities	Lum-sump	1	18,500	18,500
	Total				**237,000**

11.2 Estimated Costs for ESMCP Monitoring Program

The monitoring cost will be budgeted only for the activities which are supposed to be additional expenditure which are not included in the social and safeguard consultant. The cost for monitoring is mainly focused on the monitoring cost for soil, water, and air quality.

Table 44: Estimated cost for ESCMP monitoring program

No.	Items	Unit	Qty	Cost	Total
1	Soil quality monitoring (every six months* 1 location * 1.5 year)	Times	3	1,500	4,500
2	Air quality, noise and vibration quality monitoring (every six months * 1 locations * 1.5 year)	Times	3	2,000	6,000
3	Water Quality monitoring (every six months* 1 location * 1 year) and groundwater (Annually * 1 location * 1 year) for around half of the total sample for surface water	Times	4	2,000	8,000
	Total				**18,500**

Annex

Annex 1 – Screening checklist for E&S impacts for each sub-scheme

Circle screening conclusion:

- If the answers to the checklist questions are “No”, there is no need for further action.
- If the answers to the questions are “Yes”, then consult the relevant procedures /guidelines for assistance inaddressing issues of concerns.

A	Environmental and Social Impacts	No	Yes	Notes
Location				
1	Are there environmentally sensitive areas (forests, pastures, rivers, and wetlands) or threatened species that could be adversely affected by the sub-project?			
2	Does the sub-project area (or components of the project) occur within or adjacent to any protected areas designated by government (national park, national reserve, world heritage site, etc.)?			
3	If the sub-projects are outside of, but close to, any protected area, is it likely to adversely affect the ecology within the protected areas (e.g., interference with the migration routes of mammals, fish, or birds)?			
4	Will the sub-projects reduce people’s access to pasture, water, public services, or other resources that they depend on?			
5	Might the sub-projects alter any historical, archaeological, or cultural heritage site or require excavation near such a site?			
Physical and biological environment				
6	Will projects require large volumes of construction materials (e.g. gravel, stones, water, timber, firewood)?			To build rehabilitate irrigation canals and dam
7	Might the projects lead to soil degradation or erosion in the area?			
8	Might the projects affect soil salinity?			
9	Will the projects create solid or liquid waste that could adversely affect local soils, vegetation, rivers, streams, or groundwater?			
10	Might river or stream ecology be adversely and remarkably affected due to the installation of structures such as weirs, etc.?			
11	Will the projects have adverse impacts on natural habitats that will not have acceptable mitigation measures?			
12	Do the projects have human health and safety risks, during			OHS safety and Dam

	construction or later?			safety
13	Might the projects lead to migration into the area?			
Alternatives				
14	Is it possible to achieve the objectives above in a different way, with fewer environmental and social impacts?			
B	**Land Acquisition and Social Issues**			
1	Have all groups within the community been consulted about the proposed project?			
2.	Which groups have not been consulted?			
3	Will the projects require acquisition of land (public or private) and/or other assets for its development?			
4	Will anyone be prevented from using economic resources (e.g. pasture, community place, forests etc.) to which they have had regular access?			
5	Will the projects result in the involuntary resettlement of individuals or families?			
6	Will the projects result in temporary or permanent loss of crops, fruit trees and household infrastructure such as granaries, toilets, kitchens etc.?			
7	Will the projects affect the livelihoods of particular groups within the communities, especially vulnerable groups such as the landless?			
8	Will the projects affect the well-being and livelihoods of women, particularly female-headed households?			
9.	Will the projects benefit all groups within the community equally?			
10.	Are there ongoing land or water disputes within the community/with neighboring communities?			
C	**Pesticides and Waste Materials**			
1	Will the project result in the introduction of pesticides or an increase of pesticide use if use of such products currently exists?			
2	Will the project result in the production of solid or liquid waste (e.g. water, domestic or construction waste), or result in an increase in waste production during construction or operation?			
D	**Is there a probability of the presence of unexploded ordinance (UXO) at or near the proposed sub-project area?**			

1.1 Summary of Consultation with project Stakeholders

This section summarizes four consultation rounds carried out during the project preparation phase. These consultations involved discussions with relevant institutions, non-governmental organizations, local authorities, and local communities throughout the preparation process. The data collection and consultations were conducted in four periods:

1.1.1 First consultation

- The first consultation was conducted between 26 and 28 July 2024 to capture information regarding biodiversity and environmental condition in the project area.

1.1.2 Second consultation

- The second consultation was conducted to consult with forestry and fishery communities, local authorities and key informants to understand the situation and concerns related to the presence of the project. The consultation was conducted between 03 and 09 August 2024.

1.1.2.1 Result of consultation

- Krapeu Trom is situated within the same river catchment area in the lower reaches, near the Tonle Sap's annual floodplain. The reported endangered species in this sub-scheme is the Isok barb/Jullien's Golden Carp (Probarbus jullieni) being seen once in 2022, approximately 500 meters downstream of the reservoir facility during a flooding event. The community people reported that the species migrated upstream from the Tonle Sap during the flood season but became trapped in spillways. They added that if flooding is insufficient, fish populations decline, and rare species may no longer be present in the area.

1.1.2.2 Proposed project activities

Some potential project activities to address habitat conservation and species protection in Krapeu Trom:

Habitat Assessment and Monitoring:

- Baseline Survey: Conduct a comprehensive baseline survey to assess the current state of the habitat, including water quality, vegetation cover, and fish populations.
- Habitat Mapping: Create detailed maps of the sub-scheme, identifying key habitats, potential threats, and areas for conservation.
- Long-Term Monitoring: Establish a long-term monitoring program to track changes in habitat conditions, fish populations, and the effectiveness of conservation measures.

Habitat Restoration and Improvement:

- Riverine Habitat Restoration: Restore degraded riverine habitats by removing obstructions, improving water quality, and promoting riparian vegetation.
- Wetland Restoration: Create or restore wetlands to provide critical habitat for fish and other aquatic species.
- Floodplain Management: Implement measures to maintain the natural flood regime and protect floodplain habitats.
- Fish Population Assessment and Conservation:
- Fish Surveys: Conduct regular fish surveys to assess the abundance, distribution, and health of targeted fish species.
- Population Enhancement: If necessary, implement population enhancement measures, such as captive breeding and restocking.
- Habitat-Based Conservation: Focus on habitat-based conservation measures to support fish populations, including improving water quality, restoring spawning grounds, and reducing threats from fishing and pollution.

Community Engagement and Awareness:

- Community Workshops: Organize workshops to educate local communities about the

importance of habitat conservation and sustainable fishing practices.

- Community-Based Monitoring: Involve local communities in habitat monitoring and data collection.
- Alternative Livelihoods: Support the development of alternative livelihoods for local communities to reduce dependence on unsustainable fishing practices.

1.1.3 Third consultation

- The third consultation was conducted at household, village, and commune level stakeholders focusing on status, concerns and feedback regarding the project implementation. This consultation was conducted between 10 and 18 August 2024.
- Overall, it is apparent that in the sub-schemes contain young population indicating its high potential in future development activities. Agriculture was reported as the main occupation of the population within the command areas. While business and service are the second highest proportion. As for secondary occupations, full-time workers were dominant among the population while rice and crop production accounting for the second largest proportion. A notable 4% of the population falls under poor categories 1 and 2, reflecting the economic conditions of the areas. The proportion of people with disabilities (PWD) stands at 1.1%. Additionally, the total migration rate is 13%, with all migrations occurring domestically.
-

Figure 1. Focus Group Discussion with Rice Farmers



Table 1. List of participants of KII and FGD in Krapeu Truom Command area

No	Name	Sex	Position	Commune	District
Key Informant Interview					
1	Mao Mon	M	Commune Council	Veal Pong	Oudong Mae Chey
2	Sorn Sem	M	Commune Council	Veal Pong	Oudong Mae Chey
3	Toem Sanu	M	Commune Council	Preh Srae	Oudong Mae Chey
4	Chhay Em	M	Commune Council	Preh Srae	Oudong Mae Chey
5	En Thy	M	Commune Council	Preh Srae	Oudong Mae Chey
6	Huy Seng	M	Commune Council	Preh Srae	Oudong Mae Chey
7	Thoy Voan	M	Village Chief	Veal Pong	Oudong Mae Chey
8	Oam Phorn	M	Village Chief	Veal Pong	Oudong Mae Chey
9	Kroun Thiem	M	Deputy Village Chief	Veal Pong	Oudong Mae Chey
10	Kuy Cheun	M	Village Chief	Preah Srae	Oudong Mae Chey
Focus Group Discussion					

1	Thiem Lida	F	Vegetable Farmer	Veal Pong	Oudong Mae Chey
2	Soung Lang	F	Vegetable Farmer	Veal Pong	Oudong Mae Chey
3	Nom Sarorn	F	Vegetable Farmer	Veal Pong	Oudong Mae Chey
4	Khut Chou	M	Vegetable Farmer	Veal Pong	Oudong Mae Chey
5	Mith Rien	M	Vegetable Farmer	Veal Pong	Oudong Mae Chey
6	Kroun Theam	M	Vegetable Farmer	Veal Pong	Oudong Mae Chey
7	Soung Som	M	Vegetable Farmer	Veal Pong	Oudong Mae Chey
8	Soun Sokny	F	Vegetable Farmer	Veal Pong	Oudong Mae Chey
9	Muth Chanthoeurn	F	Vegetable Farmer	Veal Pong	Oudong Mae Chey
10	Khloeng Sophann	F	Vegetable Farmer	Veal Pong	Oudong Mae Chey
11	Khon Soeurn	F	Vegetable Farmer	Veal Pong	Oudong Mae Chey
12	Penh Sary	F	Vegetable Farmer	Veal Pong	Oudong Mae Chey
13	Toun Pov	F	Vegetable Farmer	Preah Srae	Oudong Mae Chey
14	Phan Savin	F	Vegetable Farmer	Preah Srae	Oudong Mae Chey
15	Sin Sophanny	F	Vegetable Farmer	Preah Srae	Oudong Mae Chey
16	Chan En	F	Vegetable Farmer	Preah Srae	Oudong Mae Chey
17	Chan Orn	F	Vegetable Farmer	Preah Srae	Oudong Mae Chey
18	Sieng Chaneng	F	Vegetable Farmer	Preah Srae	Oudong Mae Chey
19	Uon Srey	F	Vegetable Farmer	Preah Srae	Oudong Mae Chey
20	Uong Muon	M	Vegetable Farmer	Preah Srae	Oudong Mae Chey
21	Thiem Lida	F	Rice Farmer	Veal Pong	Oudong Mae Chey
22	Soung Lang	F	Rice Farmer	Veal Pong	Oudong Mae Chey
23	Nom Sarorn	F	Rice Farmer	Veal Pong	Oudong Mae Chey
24	Khut Chou	M	Rice Farmer	Veal Pong	Oudong Mae Chey
25	Mith Rien	M	Rice Farmer	Veal Pong	Oudong Mae Chey
26	Kroun Theam	M	Rice Farmer	Veal Pong	Oudong Mae Chey
27	Soung Som	M	Rice Farmer	Veal Pong	Oudong Mae Chey
28	Soung Sophal	F	Rice Farmer	Veal Pong	Oudong Mae Chey
29	Phat Rorn	F	Rice Farmer	Veal Pong	Oudong Mae Chey
30	Soy Chandy	F	Rice Farmer	Veal Pong	Oudong Mae Chey
31	Rin Channeang	F	Rice Farmer	Veal Pong	Oudong Mae Chey
32	Soy Ny	M	Rice Farmer	Veal Pong	Oudong Mae Chey
33	Khem Yeun	F	Rice Farmer	Veal Pong	Oudong Mae Chey
34	Youn Pao	F	Rice Farmer	Preah Srae	Oudong Mae Chey
35	Phan Sary	F	Rice Farmer	Preah Srae	Oudong Mae Chey
36	Sin Sophanny	F	Rice Farmer	Preah Srae	Oudong Mae Chey
37	Sieng Chanthol	F	Rice Farmer	Preah Srae	Oudong Mae Chey
38	Chan Orn	F	Rice Farmer	Preah Srae	Oudong Mae Chey
39	Oun Srey	F	Rice Farmer	Preah Srae	Oudong Mae Chey
40	Uong Muon	M	Rice Farmer	Preah Srae	Oudong Mae Chey
41	Roeurn Siem	F	Chicken Farmer	Veal Pong	Oudong Mae Chey
42	Khen Sokha	F	Chicken Farmer	Veal Pong	Oudong Mae Chey
43	Son Saoly	F	Chicken Farmer	Veal Pong	Oudong Mae Chey
44	Kann Tonglim	F	Chicken Farmer	Veal Pong	Oudong Mae Chey
45	Phorn Sophal	M	Chicken Farmer	Veal Pong	Oudong Mae Chey
46	Sorn Siengly	M	Chicken Farmer	Veal Pong	Oudong Mae Chey
47	Dong Duy	M	Chicken Farmer	Veal Pong	Oudong Mae Chey
48	Hai Venghong	M	Chicken Farmer	Veal Pong	Oudong Mae Chey
49	Chey Say	F	Chicken Farmer	Veal Pong	Oudong Mae Chey
50	Phat Rorn	F	Duck Farmer	Veal Pong	Oudong Mae Chey

51	Soy Chandy	F	Duck Farmer	Veal Pong	Oudong Mae Chey
52	Rin Channeang	F	Duck Farmer	Veal Pong	Oudong Mae Chey
53	Soy Ny	M	Duck Farmer	Veal Pong	Oudong Mae Chey
54	Khem Yeun	F	Duck Farmer	Veal Pong	Oudong Mae Chey
55	Loeurn Samhak	M	Duck Farmer	Veal Pong	Oudong Mae Chey
56	Tut Chanthoeurn	F	Duck Farmer	Veal Pong	Oudong Mae Chey
57	Khloeng Sophann	F	Duck Farmer	Veal Pong	Oudong Mae Chey
58	Penh Sary	F	Duck Farmer	Veal Pong	Oudong Mae Chey
59	Soun Sokny	F	Duck Farmer	Veal Pong	Oudong Mae Chey

1.1.4 Fourth consultation

The last consultation was conducted between 21 and 23 August 2024 with the district and provincial stakeholders, mainly focusing on the opinion, and feedback regarding the implementation of the project.

1.1.4.1 Environment and Biodiversity Component

1.1.4.1.1 Pollution prevention and resource efficiency

Concerns

- The construction process can release dust, which will disturb the local community and surface water quality.
- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site will negatively impact local air quality and surface water.

Feedback and Suggestions

- Regularly watering on the road transports construction materials and soil to reduce dust that may disturb nearby residents.
- Install garbage bins and waste storage areas in the construction sites and conduct orientation workers to put the waste in the garbage bins.

1.1.4.1.2 Biodiversity

Concerns

- The fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the reirrigation infrastructure and canal upgrading.

Feedback and Suggestions

- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.
- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.
- Maintain existing large trees along the dam and canal within the sub-schemes during the reirrigation and upgrading process.

1.1.4.1.3 GHG emission

Concerns

- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons,

Feedback and Suggestions

- Installing solar water pumps in agriculture processing facilities can reduce fuel consumption, which causes greenhouse gas emissions.

1.1.4.2 Social Component

1.1.4.2.1 Labor and Working Conditions

Concerns

- The presence of construction staff and workers could lead to gender-based violence affecting women workers, women and children in the community.

Suggestions

- Should offer training to their staff and workers on gender issues, violence, and legal protections.
- Preventive support measures should also be put in place to stop abuse, and any incidents must be swiftly handled to avoid repetition. The training should be conducted by technical officers.

1.1.4.2.2 Community Health and Safety

Concerns

- Concerns about the presence of workers could cause sexual abuse of women and children living near the project site

Suggestions

- To prevent incidents, construction staff should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community and notify authorities upon project completion to avoid quiet handovers.

1.1.4.2.3 Land acquisition, economic and physical displacement

Concerns

- Landowners along the irrigation system without land registration are concerned they may not receive compensation due to the lack of title deeds.
- Conflicts between the project and affected families could emerge, often fuelled by external instigators rather than the families themselves.

Suggestions

- A preliminary study on land issues before construction is recommended, with each sector addressing specific aspects of land impact and conducting evaluations for each affected property.
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project.
- The construction company should submit quarterly monitoring reports on implementation activities to the provincial department to identify and quickly resolve any issues.

- The government is requested to assist in issuing land titles to farmers with land adjacent to streams and canals.

1.1.4.2.4 Cross–cutting risks and impacts

Concerns

- Provincial department facing of limited budget to develop and rehabilitate the existing irrigation system

Suggestions

- The project should thoroughly examine the technical and situational aspects of the sub-scheme before construction to prevent water shortages or flooding post-construction, and it should be implemented promptly.
- Establish a Farmer Water User Group (FWUG) to oversee water use and maintenance by providing technical and management training, materials supported to effectively control and manage water distribution.
- The water consumption fee should be gathered from farmer which could be used later to support caretaker and maintenance the irrigation system.

1.1.4.2.5 Agricultural Production

Concerns

- The high cost of agricultural inputs continues to reduce farmers' profits.
- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons.
- Manure for fertilizer is declining due to reduced animal raising and lower cattle prices are prompting farmers to reduce livestock raising.

Suggestions

- Build more water storage and reservoir which able to store more water
- The irrigation should be constructed based on technical and water conditions in the area.
- Utilizing durable concrete for the canal system can improve the efficiency and longevity of the irrigation infrastructure.
- Installing and upgrading damaged sluice gates in both main and secondary canals can improve water distribution efficiency and prevent water loss in agricultural production and reirrigation systems.
- Construct both side roads along the canal to enhance transportation for farmers and traders.

Table 2. List of participants during the fourth consultation meeting

No	Name	Sex	Position	Organization
1	Chet Dom	M	Deputy Head	Kampong Speu Provincial Administration
2	Prak Leakkhina	F	Deputy Head	Kampong Speu Provincial Administration
3	Chea Hokly	M	Officer	DAFF
4	Huong Eksamnang	M	Officer	DoWRM
5	Phun Phin	M	Deputy Director	DoWA
6	Koy Sonin	M	Deputy Director	DoE
7	Vann Sambath	M	Director	Svay Kravan Disabled People's Federation Organization

No	Name	Sex	Position	Organization
8	Chea Ratha	M	Director	Koung Pisei Integrated Agricultural Community
9	Kong Sophannak	M	Deputy District Governor	Oudong Mae Chey Town Hall
10	Keo Borey	M	Head of Office	Oudong Mae Chey Town Hall
11	Yoeng Soyen	M	Head of Office	Oudong Mae Chey Town Hall
12	Mak Samoeurn	M	Deputy Head of Office	Oudong Mae Chey Town Hall
13	Sok Khanit	F	Head of Social Office	Oudong Mae Chey Town Hall
14	Um Vann	M	Head of Admin Office	Oudong Mae Chey Town Hall

Figure 2: Consultation with Provincial Officers, Kampong Speu Province



Figure 3: Consultation with Provincial Department of Water Resources and Meteorology, Kampong Speu Province



Figure 4: Consultation with Krong Odoung Mae Chey, Kampong Speu Province



Annex 2: Layout of Krapeu Trom sub-scheme

Figure 1. Administrative map of Stung Krang Ponley sub-command area 168

Figure 2. Length from Krapeu Trom sub-Scheme to another of Krang Ponley and water source 168

Figure 4. Map of Construction Sites and Residential Area in Stung Krang Ponley 169

Figure 5. Location of soil sample selection in all sub-scheme under CAISAR project 170

Figure 6. Location of surface water sample selection 170

Figure 7. Map of groundwater sampling locations 171

Figure 1. Administrative map of Stung Krang Ponley sub-command area

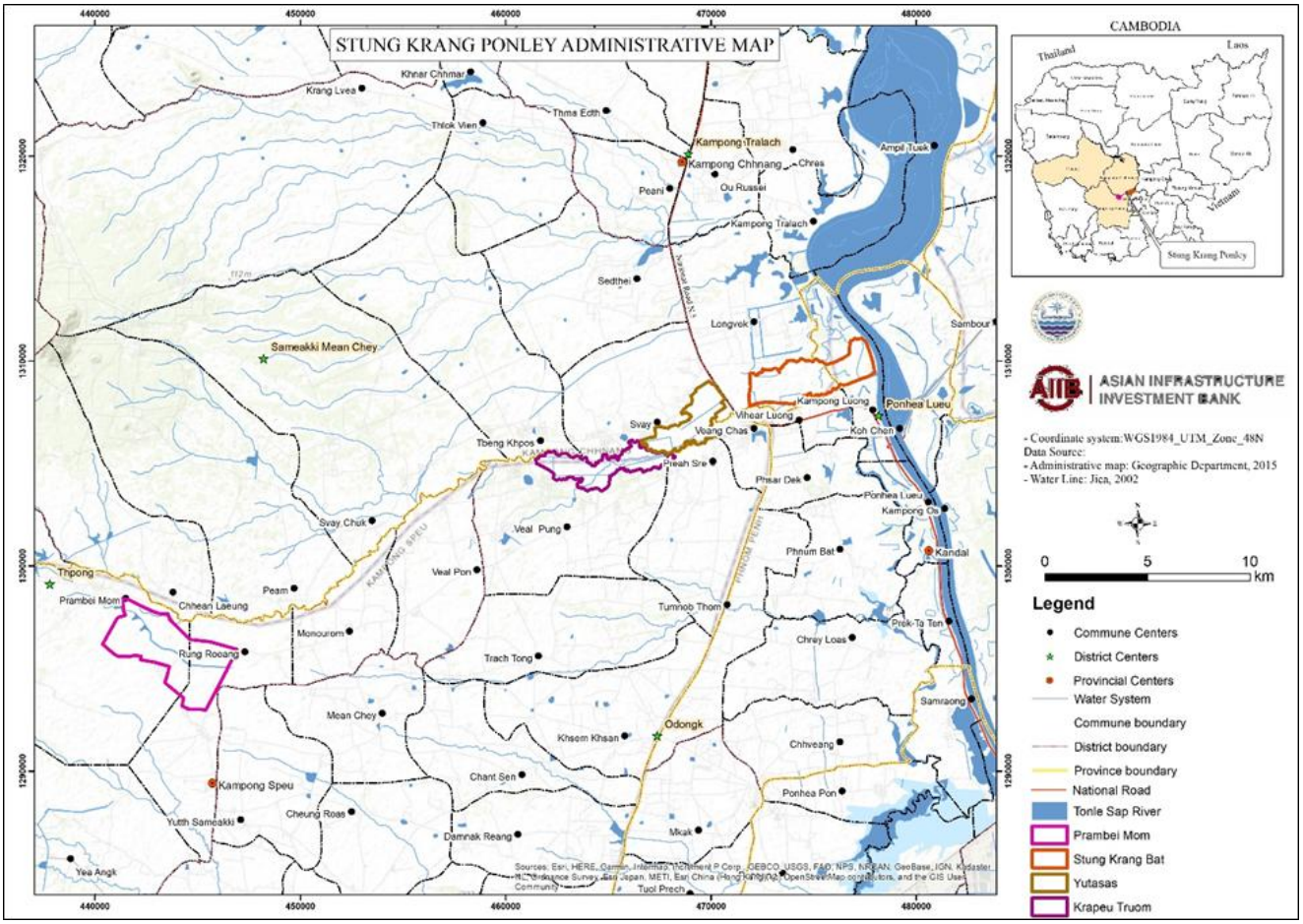


Figure 2. Length from Krapeu Trom to another of Krang Ponley sub-scheme and water source

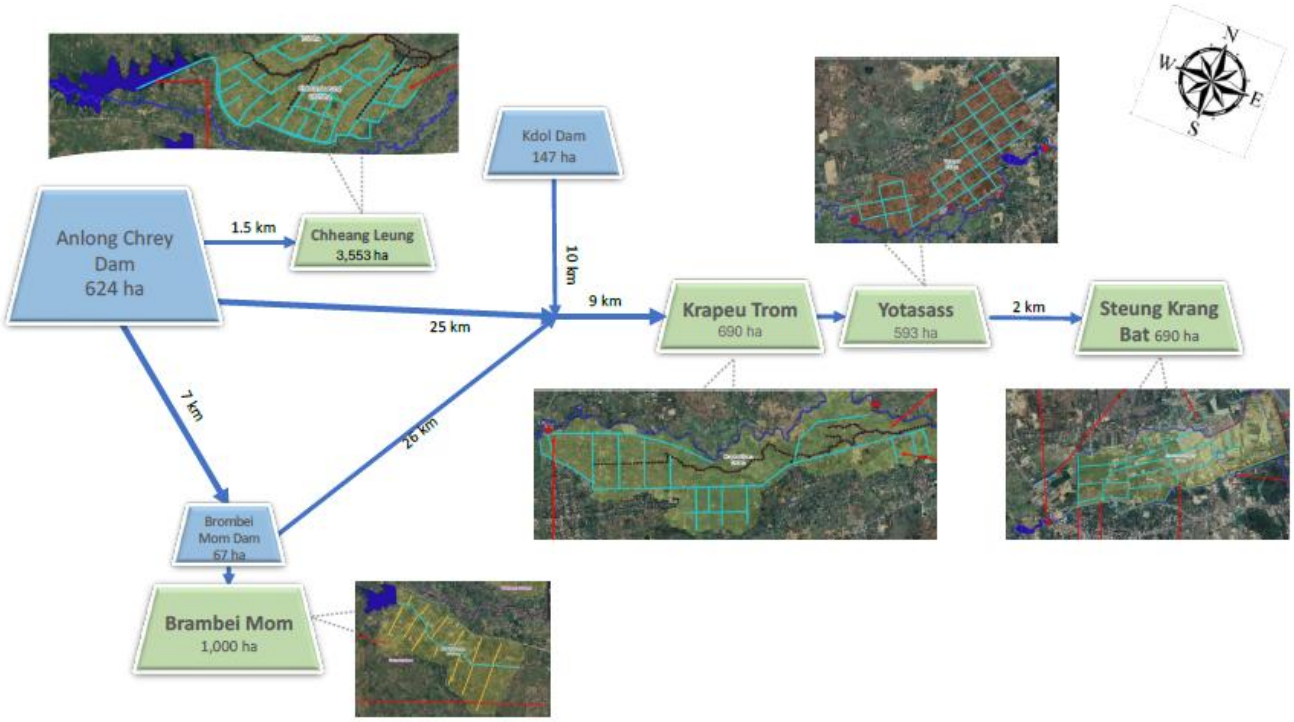


Figure 3. Concept design of irrigation of Krapeu Trom sub-scheme

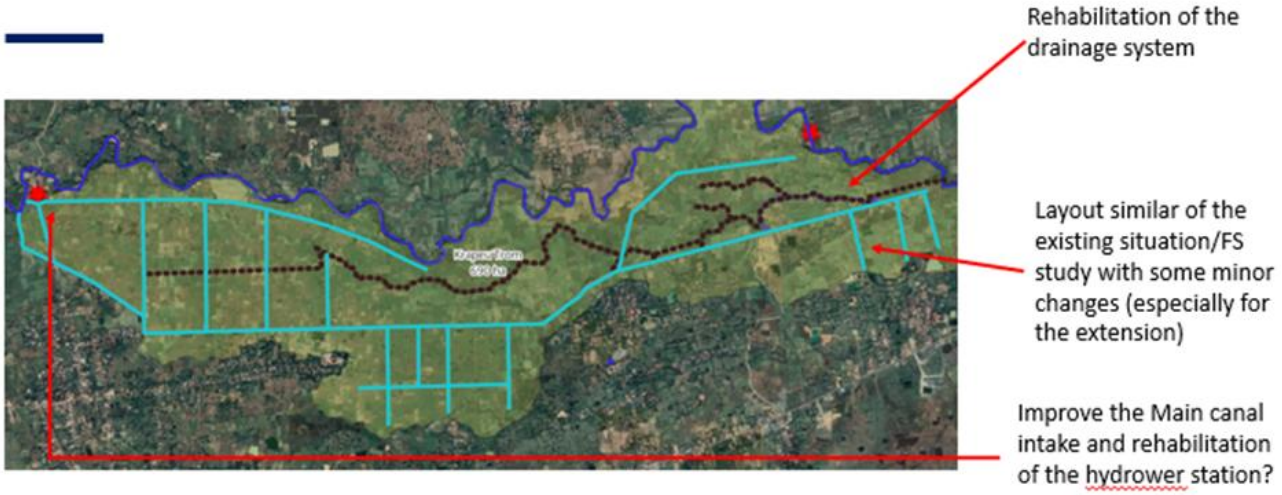


Figure 4. Map of construction sites and residential rea in Stung Krang Ponley

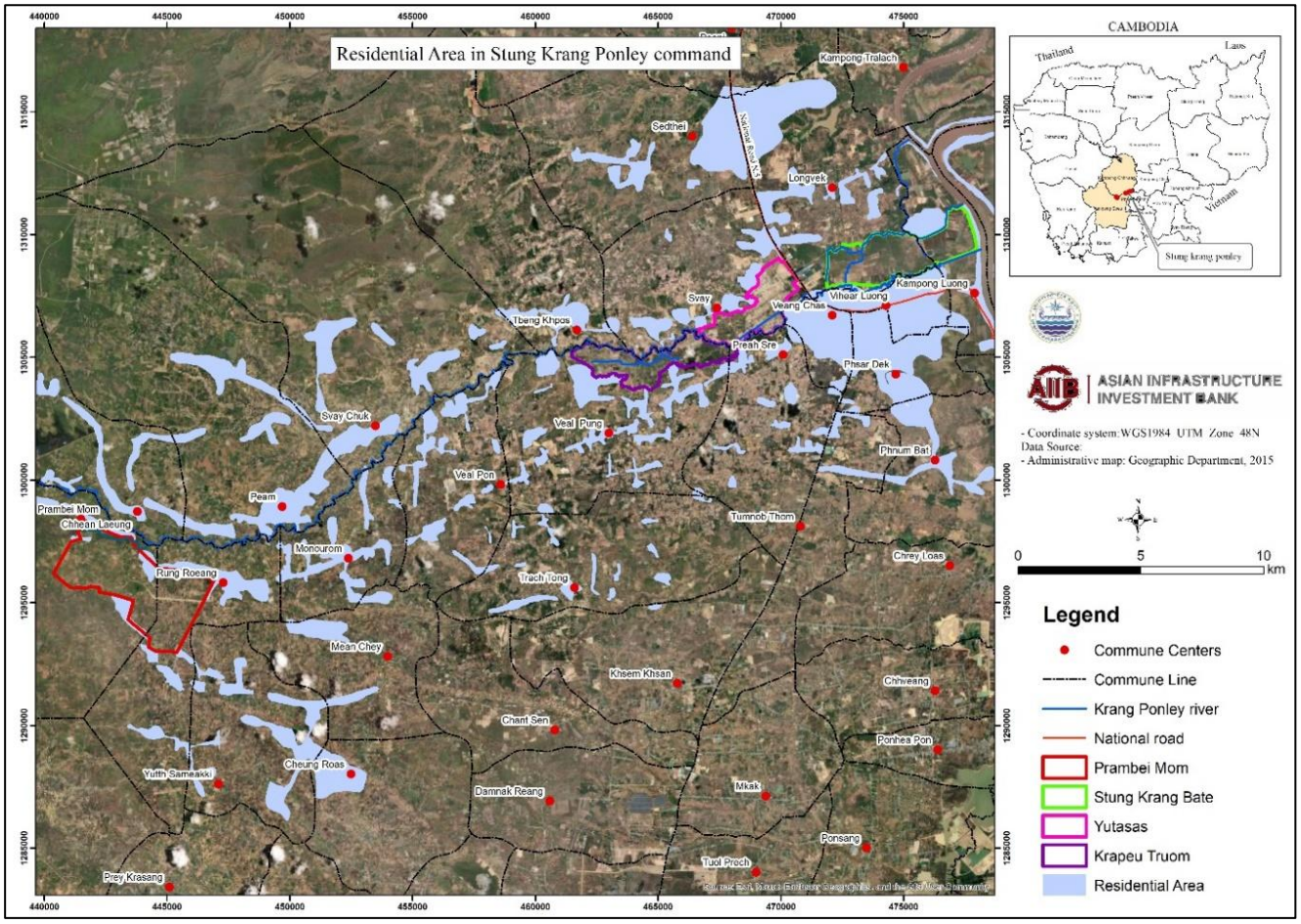
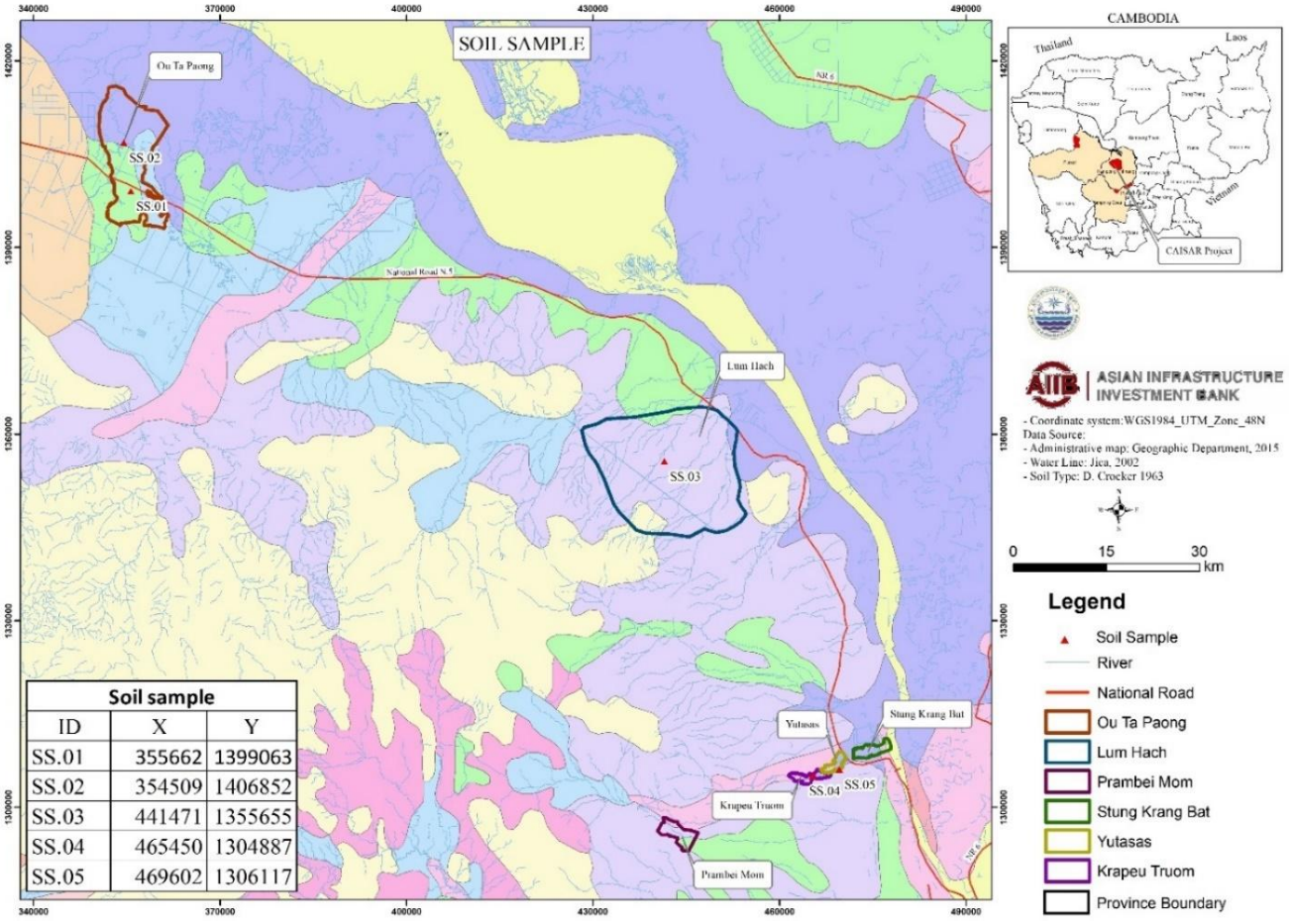
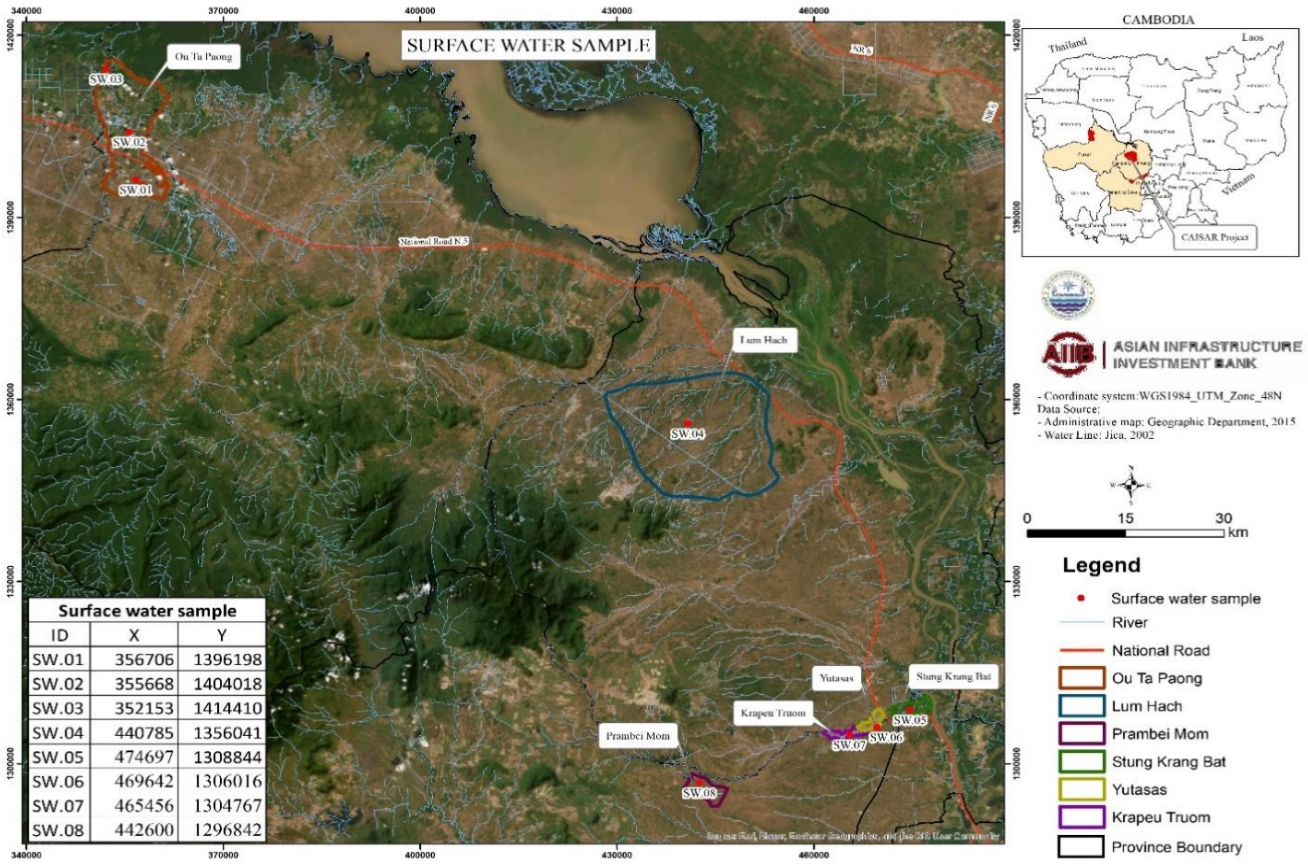


Figure 5. Location of soil sample selection in all sub-scheme under CAISAR project



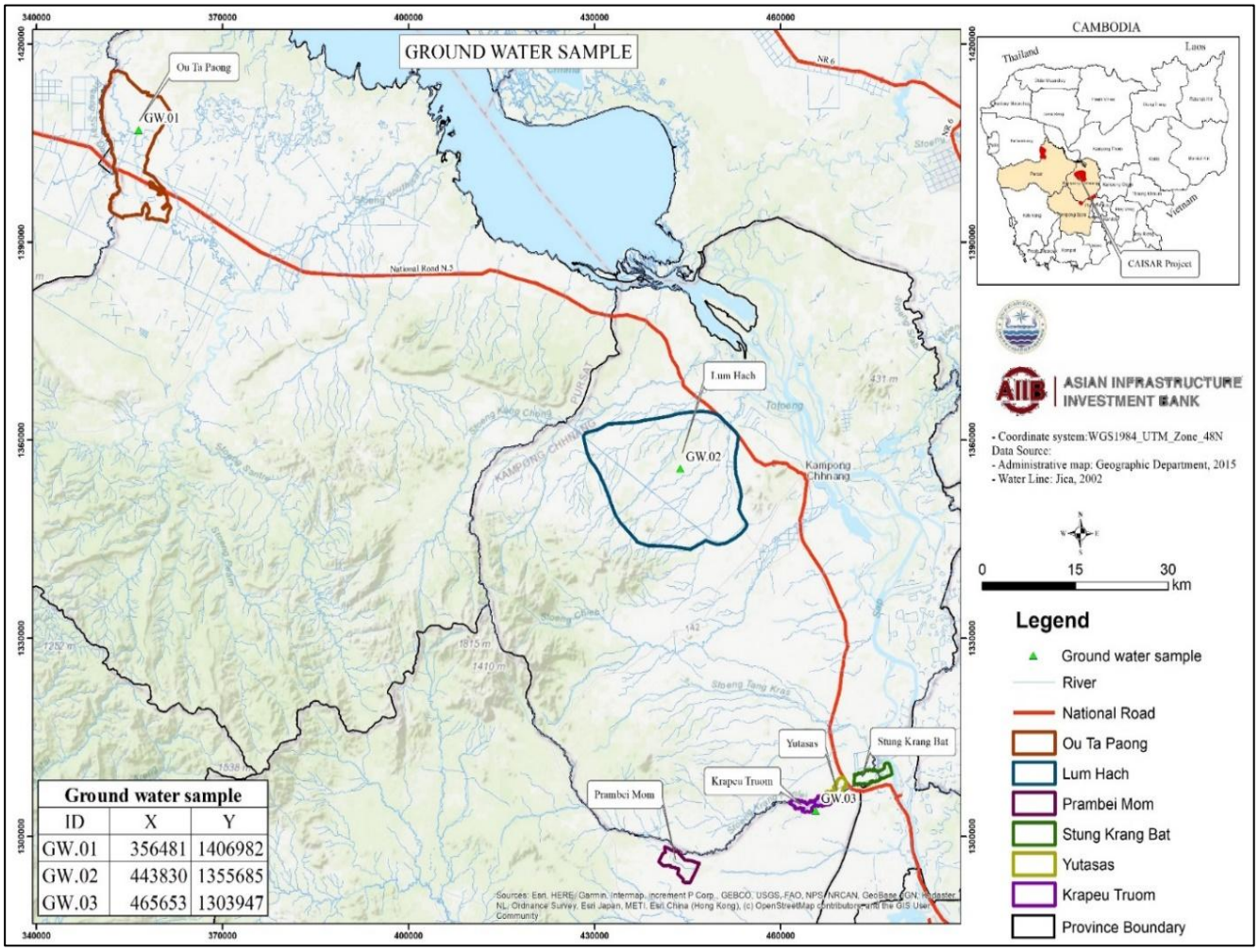
Soil sample		
ID	X	Y
SS.01	355662	1399063
SS.02	354509	1406852
SS.03	441471	1355655
SS.04	465450	1304887
SS.05	469602	1306117

Figure 6. Location of surface water sample selection



Surface water sample		
ID	X	Y
SW.01	356706	1396198
SW.02	355668	1404018
SW.03	352153	1414410
SW.04	440785	1356041
SW.05	474697	1308844
SW.06	469642	1306016
SW.07	465456	1304767
SW.08	442600	1296842

Figure 7. Map of groundwater sampling locations


GROUND WATER SAMPLE
Ou Ta Paong
GW.01
Lum Hach
GW.02
Kampong Chhnang
Yutasas
Stung Krang Bat
Krapeu Truom
GW.03
Prambei Mom
National Road N.5
NR 6
Ground water sample
ID X Y
GW.01 356481 1406982
GW.02 443830 1355685
GW.03 465653 1303947
CAMBODIA
Thailand
Laos
Vietnam
CAISAR Project
ASIAN INFRASTRUCTURE INVESTMENT BANK
- Coordinate system:WGS1984_UTM_Zone_48N
Data Source:
- Administrative map: Geographic Department, 2015
- Water Line: Jica, 2002
0 15 30 km
Legend
Ground water sample
River
National Road
Ou Ta Paong
Lum Hach
Prambei Mom
Stung Krang Bat
Yutasas
Krapeu Truom
Province Boundary

Annex 3 – Grievance Monitoring Logbook

1.1 Reportable Incidents

The following incident types are to be reported using the environmental and social incident response process.

- **Fatality**: Death of a person(s) that occurs within one year of an accident/incident including from occupational disease/illness (e.g., from exposure to chemicals/toxins).
- **Lost Time Injury**: Injury or occupational disease/illness (e.g., from exposure to chemicals/toxins) that results in a worker requiring 3 or more days off work, or an injury or release of substance (e.g., chemicals/toxins) that results in a member of the community needing medical treatment.
- **Acts of Violence/Protest**: Any intentional use of physical force, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, deprivation to workers or project beneficiaries, or negatively affects the safe operation of a project worksite.
- **Disease Outbreaks**: The occurrence of a disease in excess of normal expectancy of number of cases. Disease may be communicable or may be the result of unknown etiology.
- **Child Labor:** An incident of child labor occurs: (i) when a child under the age of 14 (or a higher age for employment specified by national law) is employed or engaged in connection with a project, and/or (ii) when a child over the minimum age specified in (iii) and under the age of 18 is employed or engaged in connection with a project in a manner that is likely to be hazardous or interfere with the child's education or be harmful to the child's health or physical, mental, spiritual, moral or social development.
- **Forced Labor:** An incident of forced labor occurs when any work or service not voluntarily **performed** is exacted from an individual under threat of force or penalty in connection with a project, including any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor-contracting arrangements. This also includes incidents when trafficked persons are employed in connection with a project.
- **Environmental pollution incident:** Exceedances of emission standards to land, water, or air (e.g., from chemicals/toxins) that have persisted for more than 24hrs or have resulted in harm to the environment.
- **Discrimination based on SOGI:** Discrimination means creating a distinction, exclusion, or restriction which has the purpose or effect of impairing or excluding a person based on their real or perceived sexual orientation, gender identity, gender expression, or sex characteristics from being on an equal basis with others.
- **Sexual Exploitation:** Any actual or attempted abuse of position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially, or politically from the sexual exploitation of another. In Bank financed operations/projects, sexual exploitation occurs when access to or benefit from a Bank financed Goods, Works, Non-consulting Services or Consulting Services is used to extract sexual gain.
- **Sexual Abuse:** Actual or threatened physical intrusion of a sexual nature, whether by force or under **unequal** or coercive conditions. In Bank financed operations/projects, sexual abuse occurs when a project related worker (contractor staff, subcontractor staff, supervising engineer) uses force or unequal power vis a vis a community member or colleague to perpetrate or threat to perpetrate an unwanted sexual act.
- **Sexual Harassment:** Any unwelcome sexual advance, request for sexual favor, verbal or physical conduct or gesture of a sexual nature, or any other behavior of a sexual nature that might reasonably

be expected or be perceived to cause offence or humiliation to another, when such conduct interferes with work, is made a condition of employment, or creates an intimidating, hostile or offensive work environment. In Bank financed operations/projects, sexual harassment occurs within the context of a subcontractor or contractor and relates to employees of the company experiencing unwelcome sexual advances or requests for sexual favor or acts of a sexual nature that are offensive and humiliating among the same company's employees.

- **Other**: Any other incident or accident that may have a significant adverse effect on the environment, the affected communities, the public, or the workers, irrespective of whether harm had occurred on that occasion. Any repeated non-compliance or recurrent minor incidents which suggest systematic failures that PMU deems needing the attention of the WB.

1.2 For environmental and social incidents

1.2.1 Form to be completed by PMU within 48 hours

Q1: Incident Details	
1. Date of Incident:	
2. Time:	
3. Date Reported to PMU:	
4. Date Reported to WB:	
5. Reported to PMU by:	
6. Reported to WB by:	
7. Notification Type (Email/'phone call/media notice/other):	
8. Full Name of Main Contractor:	
9. Full Name of Subcontractor:	
Q2: **Type of incident (please check all that apply)**	
1. ☐ Fatality 2. ☐ Lost Time Injury 3. ☐ Displacement Without Due Process 4. ☐ Child Labor 5. ☐ Acts of Violence/Protest 6. ☐ Disease Outbreaks 7. ☐ Forced Labor 8. ☐ Unexpected impacts on heritage resources 9. ☐ Unexpected impactson biodiversity resources 10. ☐ Environmental pollution incident 11. ☐ Dam failure 12. ☐ Other	
Q3: Description/Narrative of Incident	
For example: 1. What is the incident? 2. What were the conditions or circumstances under which the incident occurred (if known)? 3. Are the basic facts of the incident clear and uncontested, or are there conflicting versions? What are those versions? 4. Is the incident still ongoing or is it contained?	

5. Have any relevant authorities been informed?

Q4: Actions taken to contain the incident

Short Description of Action	Responsible Party	Expected Date	Status

For incidents involving a contractor:

1. Have the works been suspended under Contract GCC8.9?
   a) ☐ Yes
   b) ☐ No
2. Name of Contractor: **……**

Q5: What support has been provided to affected people?

1.2.2 Form to be completed by PMU (following investigation)

Q6. Fatality/Lost time Injury information

Cause of fatality/injury for worker or member of the public (please check all that apply):

1. ☐ Caught in or between objects
2. ☐ Struck by falling objects
3. ☐ Stepping on, striking against, or struck by objects
4. ☐ Drowning
5. ☐ Chemical, biochemical, material exposure
6. ☐ Falls, trips, slips
7. ☐ Fire & explosion
8. ☐ Electrocution
9. ☐ Homicide
10. ☐ Medical Issue
11. ☐ Suicide
12. ☐ Others

Vehicle Traffic:

13. ☐ Project Vehicle Work Travel
14. ☐ Non-project Vehicle Work Travel
15. ☐ Project Vehicle Commuting
16. ☐ Non-project Vehicle Commuting
17. ☐ Vehicle Traffic Accident (Members of Public Only)

Name	Age/DOB	Date of Death/injury	Gender	Nationality	Cause of Fatality/Injury	Worker (Employer)/Public

Q7: Financial Support/Compensation Types (To be fully described in Corrective Action Plan template)

1. ☐ Contractor Direct
2. ☐ Contractor Insurance
3. ☐ Workman's Compensation/National Insurance
4. ☐ Court Determined Judicial Process
5. ☐ Others
6. ☐ No Compensation Required

Name	Compensation Type	Amount (US$)	Responsible Party

Q8: Supplementary Narrative:

1.3 For SEA/SH Incident

1.3.1 Incident Form for SEA/SH (to be completed by PMU within 48 hours)

Q9. Incident Details		
Date of incident intake by project/GM:	Date Reported to PMU:	Date Reported to WBG:
Reported to project/GM by: 1. Survivor 2. Third party 3. Others:	Reported to PMU by: 1. GM operator 2. Directly, by Survivor 3. Directly, by third party 4. Others:	Reported to WBG by: 1. PMU 2. Directly, by Survivor 3. Directly, by third party 4. Other:
Q10. Is a record of this incident in GM? a) ☐ Yes b) ☐ No		
Q11: Incident type (please check all that apply) See Appendix 1 for definitions		
c) Sexual exploitation d) Sexual abuse e) Sexual harassment		
Q12: Provide the following details from the GM record.		
1. Age of survivor (if recorded in GM):		
2. Have the national legislation or mandatory reporting requirements been followed? f) ☐ Yes g) ☐ No		
3. Sex of survivor (if recorded in GM): a) ☐ Male b) ☐ Female c) ☐ Others		
4. Was the survivor referred to service provision? a) ☐ Yes b) ☐ No		
5. Is the survivor employed by the project (as indicated by the survivor or complainant and reported in the GM)? a) ☐ Yes		

	b) ☐ No
6.	Is the alleged perpetrator employed by the project (as indicated by the survivor or complainant and reported in the GM)? a) ☐ Yes b) ☐ No
Q13: Basis for further action	
1.	Has the complainant provided informed consent to lodge a formal complaint? a) ☐Yes b) ☐ No
2.	Does the employer have a suitable administrative process and capacity in place to investigate misconduct relating to SEA/SH in a survivor-centered way? a) ☐ Yes b) ☐ No
3.	Has the survivor provided informed consent to be part of an investigation into misconduct? a) ☐ Yes b) ☐ No
4.	Has the complaint been filed anonymously or through a third party? a) ☐ Yes b) ☐ No
5.	If the answer to any of these questions is no, has the GM assessed the risks and benefits of carrying out an investigation into the alleged misconduct, taking into account the survivor's safety and wellbeing? a) ☐ Yes b) ☐ No
6.	Will an investigation into misconduct be undertaken in addition to an investigation into adequacy of project systems, processes or procedures? a) ☐ Yes b) ☐ No

1.4 Incident Form for SEA/SH (to be completed by PMU following SEA/SH investigation)

Q14: Findings of the investigation	
1.	Have sanctions against a perpetrator been recommended as part of an investigation into misconduct? a) ☐ Yes b) ☐ No
2.	Has an investigation into adequacy of project systems, processes or procedures been undertaken? a) ☐ Yes b) ☐ No

Q15: Corrective actions to be implemented (To be fully described in Corrective Action Plan)		
Short Description of Action (SEA/SH examples)	**Responsible Party**	**Timeline for completion/Status**

1.	Referral of Survivor to holistic care services		
2.	Undertake disciplinary investigation in accordance with GM timelines and confirmed process		
3.	Disciplinary actions, including sanctions, to be applied following misconduct investigation by employer		
4.	Increased training on Codes of Conduct (CoC)		
5.	Audit of implementation of SEA/SH safety mitigation		
6.	Strengthened awareness training on project-related risks, CoC and how to report incidents for project-affected community		
7.	Training for project supervisors on the need to follow guidelines of behavior in CoC and their supervisory responsibilities		
8.	Plan to improve coverage/quality of service provision		
9.	Any other system strengthening measures or corrections for system failures that are necessary		

3.1 Project's Grievance Logbook

3.1.1 Sample for Local Levels

No	Name of complainant (or anonymous)	Addresses	Sex	Age	Contact information	Date Received	Details of nature of grievance (Environmental impacts, social impacts, labor, health, etc.)	Which of the three GRM that was used?	Actions taken to resolve grievance, by whom	How many steps that have been used in the relevant GRM	Date grievance was finally resolved/closed?	Notes

3.1.2 Sample for PMU Level to be elaborated on Excel spreadsheet with filter function

No	Questions	Response
1	**Date Received:**	
2	**Name of Complaint** (or anonymous):	
3	**Sex:**	
4	**Age:**	
5	**Contact information** (Phone number/email, other channel(s):	
6	**Location of Complainants** (Province, District, commune, village):	
7	**Form of grievance received** (Writing or Verbal (face to face, telephone, online), SMS, MOWRAM and DoWRAM comment box in designated Website/Face book/What's App, etc.	

8	**Channel of Receipt** (Direct to PMU GRM Focal Point, or Relayed from other channels (Provide details)	
9	**Key topics of Grievances** a) Labor and Working Condition Resettlement (incl Voluntary Land Donation) b) SEA/SH c) Environmental impacts d) Community Health and Safety Accidents	
10	**Nature of complaints?** a) Resolution required b) Clarification required c) Suggestion n only (for project improvement) d) General Concerns	
11	**Step 1 of GRM Procedure:**	
	a) Date receipted:	
	b) Date solved/transferred:	
	c) Duration spent (in days):	
12	**Step 2,3,4** (Replicated in Excel spreadsheet):	
13	**Closing of Case** (At which Steps, date of case closing):	
14	**Notes:**	

Annex 4 – Worker's Code of Conducts

The Annex has two Code of Conduct (COC): one is for ESHS and SEA/SH/VAC, and the other is for working with local Ethnic Communities.

1.1 Code of Conduct related to ESHS and SEA/SH/VAC

Instructions:

This Code of Conduct shall be perused and signed by all individual workers who enter direct work contract with a) PMU, b) PMU's consulting firms and service providers, c) contractors who renovate existing HCFs.

I,_____, acknowledge that adhering to environmental, social, health and safety (ESHS) standards, following the project's occupational health and safety (OHS) requirements, and prevention of Sexual Exploitation & Abuse (SEA)/Sexual Harassment (SH), are important.

I understand that that failure to follow ESHS and OHS requirement, or to partake in activities constituting SEA/ SH -- be it at the project site, the surrounding area of the project site, workers' camps, or the project communities, including community members and project workers, constitute acts of gross misconduct and are therefore grounds for sanctions, penalties, or potential termination of employment. Prosecution by the Police of those who commit SEA/SH may be proceeded as applicable under relevant Laws.

I agree that while working on the project, I will:

- Carry out my duties competently and diligently.
- Comply with this Worker's Code of Conduct and all applicable laws, regulations, and other requirements, including requirements to protect the health, safety and well-being of other project workers, and any other person and community members.
- Maintain a safe working environment including by:
    - Ensure that workplaces, machinery, equipment, and processes under each person's control are safe and without minimal risk to health and safety of those involved.
    - Use appropriate measures relating to chemical, physical and biological substances, and agents; and
    - Follow applicable emergency response procedures.
- Report works situations that I believe unsafe or unhealthy to either project workers and/or community and remove myself and inform those relevant to remove themselves from a work situation which I reasonably believe imminent and dangerous to safety, life, and

health of those involved.

- Consent, if required, to a background check in any place I have worked for more than six months.
- Attend and actively partake in training courses related to ESHS, OHS, SEA/SH and VAC, as requested by my employer.
- Always wear my personal protective equipment (PPE), as required while at work or engaged in project related activities.
- Take all practical steps to implement the environmental and social management plan (ESMP), which may include OHS Management Plan.
- Abide by a zero-tolerance policy as to SEA/SH/VAC and alcohol consumption during work activities, and refrain from use of narcotics or other substances which can impair worker's expected working ability and judgement.
- Respect women, children (persons under 18 years of age), and the elderlies regardless of their ethnic background, language, religion, personal opinions, disability, and/or other socioeconomic status.
- Shall not use language or behavior that are inappropriate to community members and project workers, particularly women, children, and the elderlies,
- Shall not commit any sexual abuse and or exploit, and/or sexual harassment of any kinds to community members in the project area and any project workers.
- Shall not engage in sexual harassment of project personnel and staff — for instance, making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature (looking somebody up and down; kissing, howling or smacking sounds; hanging around somebody; whistling and catcalls; in some instances, giving personal gifts.
- Shall not engage in offering any work-related favors such as making promises of favorable treatment (i.e., promotion), or make threats of unfavorable treatment (i.e., loss of job), or make payments in kind or in cash depending on sexual acts — or other forms of humiliating, degrading or exploitative behavior.
- Shall not engage in using prostitution service -- in any form and at any time during project implementation.
- Shall not participate in sexual contact or activity with children under 18 years of age — including grooming or contact through digital media. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not considered a defense or excuse.
- Consider reporting through the project's GRM, or to my manager, any suspected or actual SEA/SH deed by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.
- Complete relevant training courses that will be provided related to the environmental and

social aspects of the Contract, including on health and safety matters, and Sexual Exploitation & Abuse, Sexual Harassment, and Violence Against Children (VAC).

- Report violations of this Code of Conduct; and

With respect to children under the age of 18:

- Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
- Wherever possible, ensure that another adult is present when working in proximity to children.
- Shall not invite unaccompanied children unrelated to my family into my home unless they are at immediate risk of injury or in physical danger.
- Not use any computers, mobile phones, video, and digital cameras or any other medium to exploit or harass children or to access child pornography (see also “Use of children's images for work related purposes” below).
- Avoid, in all circumstances, any verbale and/or physical punishment or discipline of children.
- No hiring of children (under 18) in any project activity.
- Comply with all relevant local regulations, including labor law in relation to child labor and forced labor.
- Take appropriate caution when photographing or filming children (see also section below). Photos or films of children should not be taken under the project, except for instances showing the benefits or impacts of road works, such as impacts to schools or school safety trainings.

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

- Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this, I must explain how the photograph or film will be used.
- Ensure photographs, films, videos present children in a dignified and respectful manner and not in a manner that is vulnerable or submissive. Children should be adequately dressed up and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Raising Concerns

If any person observes behavior that I believe may represent a violation of this Code of Conduct, or that otherwise concerns me, I will raise the issue promptly. This can be done in either of the following ways:

1. Contact [enter name of the Employer's Social Focal Point] to handle these incidences.
2. Call Employer's telephone number (See contact detail at Section 5 of project's Stakeholder Engagement Plan).

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. PMU will take all reports of possible misconduct seriously and will investigate and take appropriate action. In case of SEA/SH, PMU will provide referral to local service provider who will provide support to SEA/SH victims (See also Section 6.4 of project's Stakeholder Engagement Plan).

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

Sanctions

I understand that if I breach this Workers' Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning.
- Formal warning.
- Additional Training.
- Termination of employment.
- Report to the Police if warranted.

I understand that it is my responsibility to:

Ensure that the Environmental, Social, Health and Safety requirements are met. Adhere to the Occupational Health and Safety Management Plan

Avoid actions or behaviors that could be construed as SEA/SH/VAC. Any such action will be a breach of this Workers' Code of Conduct.

I hereby acknowledge that I have perused the foregoing part of this Workers' Code of Conduct, agree to comply fully with the requirements contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, SEA/SH/VAC issues. I understand that any actions that are inconsistent with this Workers' Code of Conduct, or failure to act as mandated by this Workers' Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

1.2 Code of Conduct for Working with Local Ethnic Communities

This Code of Conduct is grounded on the objectives of the WB's ESS7, which are:

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To avoid adverse impacts of projects on Indigenous Peoples, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a manner that is accessible, culturally appropriate and inclusive.
- To improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the Indigenous
- To recognize, respect and preserve the culture, knowledge, and practices of Indigenous Peoples, and to provide them with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.

Annex 5 – Simplified Pest Management Plan

1.1 Rationale

In Cambodia, around 90% of cultivated land is used for rice production. Rice alone accounts for about 70% of the country's total calorie supply. Rice production contributes an estimated 44% of rural household income, making the rice sector an area for strategic development in the country. Despite rice is the major crop in Cambodia, rice production is characterized by widespread misuse of pesticides. This is due to inconsistent enforcement of current regulation and a lack of information on pesticide safety and alternative pest management techniques among rice farmers. Most pesticides are imported and labelled in a foreign language incomprehensible to farmers. It is common that rice farmers mix two to five pesticides by intuition, leading to pesticide poisoning among farmers and adverse impact on environment[12]. Rice farmers tend to apply more pesticide when they see pests on their field[13]. Vegetable farmers also typically mix various types of pesticides per spray which is not good practice[14].

The CWSIP project will 1) improve overall water security for all stakeholders in the targeted basins in three provinces, 2) exploit the potential of the unused water resources and increase agricultural productivity in the targeted basin, and 3) enhance the overall capacity of the water resources management of the central government, concerned local governments, and concerned communities. Through three out of five project components, the project will improve 1) Water Service Delivery, 2) Agricultural Productivity, and 2) Water Resources Management. The project does not involve procurement of pesticides.

Under CWSIP, the project will support target farming population in irrigated area to improve their use of good agricultural practices, including integrated crop water management, climate-smart agriculture (diversification into high-value crop plantation, public-private-partnership and commercialization), as well as agribusiness and trade development. The CWSIP does not involve procurement of chemical fertilizers, pesticides, and/or other toxic agrochemicals nor promote use of chemical agricultural inputs during project implementation. However, rehabilitation /upgrading of existing reservoirs/irrigation system, etc. to be financed under the Project are expected to increase the agricultural command areas, including the number of crops per year. This increased crop may give rise to increased use of fertilizers, pesticides, and/or other toxic agrochemicals in the subproject areas which are unintended impact of the project.

1.2 Key Pesticide Management Outcomes in Cambodia

[12] https://ipmil.cired.vt.edu/our-work/projects/rice-ipm-for-cambodia/

[13] Matsukawa, M., Ito, K., Kawakita, K. et al. Current status of pesticide use among rice farmers in Cambodia. Appl Entomic Zool51, 571–579 (2016). https://doi.org/10.1007/s13355-016-0432-5.

[14] Sim Skooching, Keo Socheat and Sarom Moldiest. 2021. Pesticide Use Practices in Cambodia's Vegetable Farming. CDRI Working Paper Series No. 128. Phnom Penh: CDRI.

Pesticide Use and IPM implementation in Project Provinces: General Directorate of Agriculture (GDA)'s survey in 2014 and nation-wide inspections in 2013 of pesticide and herbicide suppliers in provincial capitals and other main distribution hubs, indicate that the most commonly sold products include: abamectin, chlorpyrifos, cypermethrin, glyphosate, imidacloprid. In the Northern provinces, where a large part of the herbicide use is on corn and rubber plantations, the main products sold are the herbicides Glyphosate, Paraquat and Atrazine. Nowadays, on Rice and Maize cultivation farmers don't use pesticide accept some vegetables. These inspections have also shown that the most problematic highly hazardous products, such as monocrotophos, methyl parathion, methamidophos, mevinphos, endosulfan, etc., are no longer found on the market with the exception of the occasional old bottle. The only banned products that still are found regularly are paraquat and methomyl. This is because these products were banned only recently (2010) and are still permitted in the neighboring countries from where they are informally brought in by users or retailers. The banning of highly hazardous pesticides in China does not seem to have led to dumping of old stocks in Cambodia. There are no known large stocks of obsolete pesticides.

Insecticides are used mainly on vegetables (such as Long Yard Bean, Chilly, Cabbage, Chinese Cabbage) marketable high-value crops and plantation crops, notably rubber. Field surveys by the national IPM program and GDA indicate there still is wide-spread abuse of pesticides among farmers. Lack of knowledge among farmers is a major constraint. Abuse includes mixing without justification (just to be sure), use of wrong pesticides, use of wrong dosages, etc. Adequate protective gear is hardly being used. Shops often have gloves and masks for sale, but these tend to be inadequate for protection against hazardous chemicals. Buyers of pesticides rarely also buy protective gear, and shops do not provide it for free. Half used pesticide bottles or packages are often stored within the house or near homesteads, often in easy reach of children. Empty pesticide containers are often discarded at the border of fields or in drainage ditches.

1.3 Government Regulation Related to Pest Management

Pest management practices in Cambodia have been promoted through the expansion of the National Integrated Pest Management (IPM) Program by both the government and NGOs. These agencies have been working together to establish a Pesticide Reduction Network to develop awareness of the risks associated with pesticide use amongst farmers.

As a key function, Ministry of Agricultural and Forestry (MAFF) has been examining and implementing various international legal guidelines and instruments relating to regulating the trade, distribution and use of pesticides in Cambodia. These include adherence to the FAO Code of Conduct on the Distribution and Use of Pesticides, the Stockholm Convention on Persistent Organic Pollutants, and the WTO sanitary and phytosanitary measures.

Following the promulgation of the Law on Management of Pesticides and Fertilizers as Royal Kram Number 0112/005 on 14th January 2012, MAFF had developed five Prakas in relation to Procedures for Registration and Business Operations, as follows:

- Prakas No. 415/MAFF dated 17 August 2012, on Procedures and Standard

Requirements for Fertilizer Registrations.

- Prakas No. 456/MAFF dated 19 October 2012, on Procedures and Standard Requirements for Pesticide Registrations.
- Prakas N. 484/MAFF dated 26 November 2012, on List of Pesticides in the Kingdom of Cambodia.
- Prakas No. 119/MAFF dated 11 April 2013, on Procedures for Management of Fertilizers for Business Operations.
- Prakas No. 120/MAFF dated 11 April 2013, on Procedures for Management of Pesticides for Business Operations.

Within MAFF, the Department of Agriculture Legislation and GDA are mandated to oversee all pesticide regulations and use.

1.4 International Code of Conduct on the Distribution and Use of Pesticides

The following rules are observed for IPM:

- The standards of conduct set forth in this Code: 1.7.6. are designed to promote Integrated Pest Management (IPM) (including integrated vector management for public health pests).
- Concerted efforts should be made by governments to develop and promote the use of IPM. Furthermore, lending institutions, donor agencies and governments should support the development of national IPM policies and improved IPM concepts and practices. These should be based on scientific and other strategies that promote increased participation of farmers (including women's groups), extension agents and on-farm researchers.
- All stakeholders, including farmers and farmer associations, IPM researchers, extension agents, crop consultants, food industry, manufacturers of biological and chemical pesticides and application equipment, environmentalists and representatives of consumer groups should play a proactive role in the development and promotion of IPM.
- Governments, with the support of relevant international and regional organizations, should encourage and promote research on, and the development of, alternatives posing fewer risks: biological control agents and techniques, non- chemical pesticides and pesticides that are, as far as possible or desirable, target-specific, that degrade into innocuous constituent parts or metabolites after use and are of low risk to humans and the environment.
- Governments should provide extension and advisory services and farmers' organizations with adequate information about practical IPM strategies and methods, as well as the range of pesticide products available for use.

- Governments should ensure that any pesticide subsidies or donations do not lead to excessive or unjustified use which may divert interest from more sustainable alternative measures.

1.5 Current Governmental Implementation Arrangements Related to Pest Management

Integrated Pest Management (IPM) refers to all pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

Under MAFF, Plant Protection Centers and their branches in provinces as well as Agricultural Extension Centers at district level are governmental agencies that coordinate and work on Integrated Pest Management Programs. These activities are built on the National IPM program that was initiated with assistance from the FAO, DANIDA and other donors since early 1990s which is largely being maintained using national budget.

IPM activities implemented by these local authorities and technical backstopping by experts from GDA include conducting field surveys, making forecast, monitoring and checking progress of on-field pest development. Using the forecast based on the timing, scale and level of damage that the key pests may cause, provincial plant protection authorities recommend policies, plans, and measures for pest management purposes.

Relevant authorities such as Plant Protection Centers and Agricultural Extension Centers also conduct IPM training for farmers. Farmers learn how to implement various integrated measures such as pest identification, pest control, pest analysis, pest surveillance, and apply measure to control pest, such as applying chemical and botanical control agent, promoting application of biological measures for pest management, reducing chemicals and practice sustainable IPM. Farmers are also trained on proper use of chemical pesticide and fertilizers to ensure efficiency in pest management, ensuring safety for human, natural enemy, and the environment. Communication campaigns on plant protections and quarantine legislations and advance IPM technics to the farmers are also carried out depending on budget availability, etc.

GDA's Plant Protection Center, including the national IPM program, has developed a 3-day curriculum for a Farmer Training on Pesticide Risk Reduction (FT-PRR) which is intended to raise awareness, develop capacity and help rural communities formulate and implement their own action plans for pesticide risk reduction. As of June 2014, some 4,900 Lao farmers (including 1,600 women) have participated in FT-PRR courses in 149 villages of 34 Districts in 9 provinces. Season-long Integrated Pest Management training through Farmers Field Schools (FFS) often includes these short-duration FT-PRR courses. These FFSs allow farmers to learn about and adopt Integrated Pest Management to reduce overuse of pesticides in crop production. 10. The

National IPM Program has implemented 806 season-long IPM Farmers Field Schools, with over 24,350 rice, vegetable and fruit farmers trained. More, however, remains to be done. Pesticide Risk Reduction and IPM adoption at farm level remains a priority for the Government.

Operational costs of plant protection agencies are allocated from state funds. Their staff also work on projects and programs that are financed by other international funding and conduct additional annual trainings (using international budget) for farmers.

1.6 Objective of Simplified Pest Management Plan

This Simplified Pest Management Plan (S-PMP) aim to see out plan and measures to ensure the project does not unintentionally give rise to increased overuse of chemical agricultural inputs (such as chemical pesticide, fertilizers, and plant growth regulators, etc.). This S-PMP will be integrated into on-going pest management program and effort that provincial DAFF in project provinces have been doing and make sure pest management efforts target areas where water access is improved through project investment activities.

To mitigate this potential impacts as a 'good practice', the subproject owner will prepare and implement a S-PMP aiming to increase famers knowledge on Government regulations, policies, and/or technical guidelines related to safe use (application, storage, and disposal) of pesticides and toxic agrochemicals likely to be used by farmers as well as promote the application of an Integrated Pest Management (IPM) practice that are appropriate for the agriculture productions in the subproject area through training and other capacity building activities.

Key Elements - The elements of the S-PMP include the followings:

- Preventing pest problems.
- Monitoring for the presence of pests and pest damage.
- Establishing the density of pest population, which may be set at zero, that can be tolerated or corrected with a damage level sufficient to warrant treatment of the problem based on health, public safety, economic or aesthetic threshold.
- Treating pest problems to reduce population below those levels established by damage thresholds using strategies that may include biological, cultural, mechanical and pesticidal control methods and that shall consider human health, ecological impact, feasibility and cost effectiveness; and
- Evaluating the effects and efficacy of pest treatments.

Decision Making

Detecting a single pest under the Project will not always mean control is needed. A decision to use pesticides will be taken only as the very last resort and will also be based on conclusions reached from an agroecosystem analysis and trials. The decision will also depend on the number of pests and diseases found in the respective crop and the level of damage they are doing. If it is

necessary to spray crops with pesticides, use of selective rather than broad-spectrum pesticides shall be strictly observed.

Pest Monitoring and Surveillance

A process for the reporting and identification of unusual plants, animals and pests will be established to

track and document all pest cases, be it minor or major in a pest inventory register. Pest surveys will be conducted on a regular basis to detect new infestations and will include the types, abundance, location of pest plants, date when first spotted or seen, and date when reported. This information will be

gathered from surveillance or monitoring system to be put in place, periodic surveys to be conducted and feedback from farmers/farm assistants. The data will be managed in a standardized way so that trends can be established. A rapid response process for the management of new infestations will be established to treat and manage new pest infestations as soon as they are identified.

Table 1. Potential impacts and proposed mitigation for pest

Potential Impacts	Proposed Mitigation
Contamination of ground water resources	Conducting trials on relatively flat land with less than 2% slope reducing the possibility of run off and at more than 500m away from water sources
Effect of pesticides on non-target species	Use pesticides that are systemic and narrow range and specific to sucking insects.
Effect of pesticides on grazing areas, settlements	Spraying in the morning hours when the weather is cool and less windy to reduce spray drifts. Locating trials or plots at distance of between 500-1000m away grazing areas or human settlements
Possibility of increasing resistance of pests to the pesticide	Training of field staff responsible on recommended usage of the pesticide
Harmful effects on staff applying pesticides	Provision and usage of safety clothing and working gear to staff
Harm to people within the homestead where the chemical is stored	Designation of a separate and secured storage room for pesticide Warnings and notices to increase awareness

1.7 Mitigation Measures

It is expected that there will be no procurement of pesticides under the project and that pesticide use, overall, will decline as a result with the introduction of good agricultural practices. To ensure the tendency of increased overuse of pesticide does not happen with subproject where project intervention take place, the project will prohibit procurement of large pesticides using the “negative list” and provide training to key staff and farmers on integrated pest management, safe use of pesticides, and organic farming practices. This will be integrated as part of the safeguard training. This S-PMP will be applied to the project activities that involve:

a) Any rehabilitation/upgrading of weirs/reservoirs/dams/existing irrigation schemes that are likely to prompt farmers to increase their use of pesticides:

b) Change/introduction of best agricultural practices such as integrated crop water management, Climate-smart agriculture, and

c) Promotion of agribusiness and trade related to farm products produced from target command area, and neighboring areas.

The plan is comprised of three parts:

(i) Application of government regulation on pesticide control.

(ii) Training of the integrated pesticides concept and/or other approaches for the safe use of pesticides; and

(iii) Monitoring.

Annex 6. Biodiversity Assessment Findings for Krapeu Truom Sub-scheme

1.1 Proposed project activities and potential risks and impacts

By carefully considering the ecological implications of the project, it is possible to balance the needs of agriculture with the environment and ecosystem functions. Under Krapeu Trom, various activities will be carried out that cause the following E&S risks and impacts:

Table 1: Projection activities that may cause potential impacts on the environment and social aspects at Krapeu Trom sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes, and water management practices	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.
2	Increased agricultural activities, sedimentation, and pollution	**Water quality degradation** could impact aquatic ecosystems and species that rely on clean water.
3	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats.
4	Use of chemicals and nutrient loading	If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.
5	Biodiversity degradation, and soil erosion	The **potential** impacts of the project on water flow, water quality, and sedimentation patterns. The changes in microclimate.

6	Blockage of migration routes by dams or other structures	Irrigation structures, such as dams and weirs, can create physical barriers that prevent fish from migrating upstream or downstream. This can disrupt their reproductive cycles and reduce their survival rates.

1.2 Areas of Influence

Potential areas of influence might include:

- Downstream areas: The lower reaches of the Stoeung Krang Ponley River and the Tonle Sap Lake, may be affected by water quality, sediment loads, and fish migration from Krapeu Trom.
- Upstream areas: The upper reaches of the Stoeung Krang Ponley River and its tributaries, which may be influenced by water flow regulation and sediment transport from Krapeu Trom.
- Adjacent ecosystems: Forests, wetlands, and agricultural areas that are connected to Krapeu Trom through hydrological or ecological processes.

1.3 Analysis to prepare for determining CH status

1.3.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

1.3.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Krapeu Trom (KT). The coordinates of KT (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species.

Description of screening for narrowing down

For Krapeu Trom, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the OTP area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, there were two fish species (Isok barb/Jullien's Golden Carp and Leaping barb/Flying Minnow) were screened for the first two rounds. After three rounds of

screening focusing on EN and CR species, only Flying Minnow is confirmed as potentially present in the sub-scheme area of influence.

1.3.3 Ecological State of Habitats within the AoA

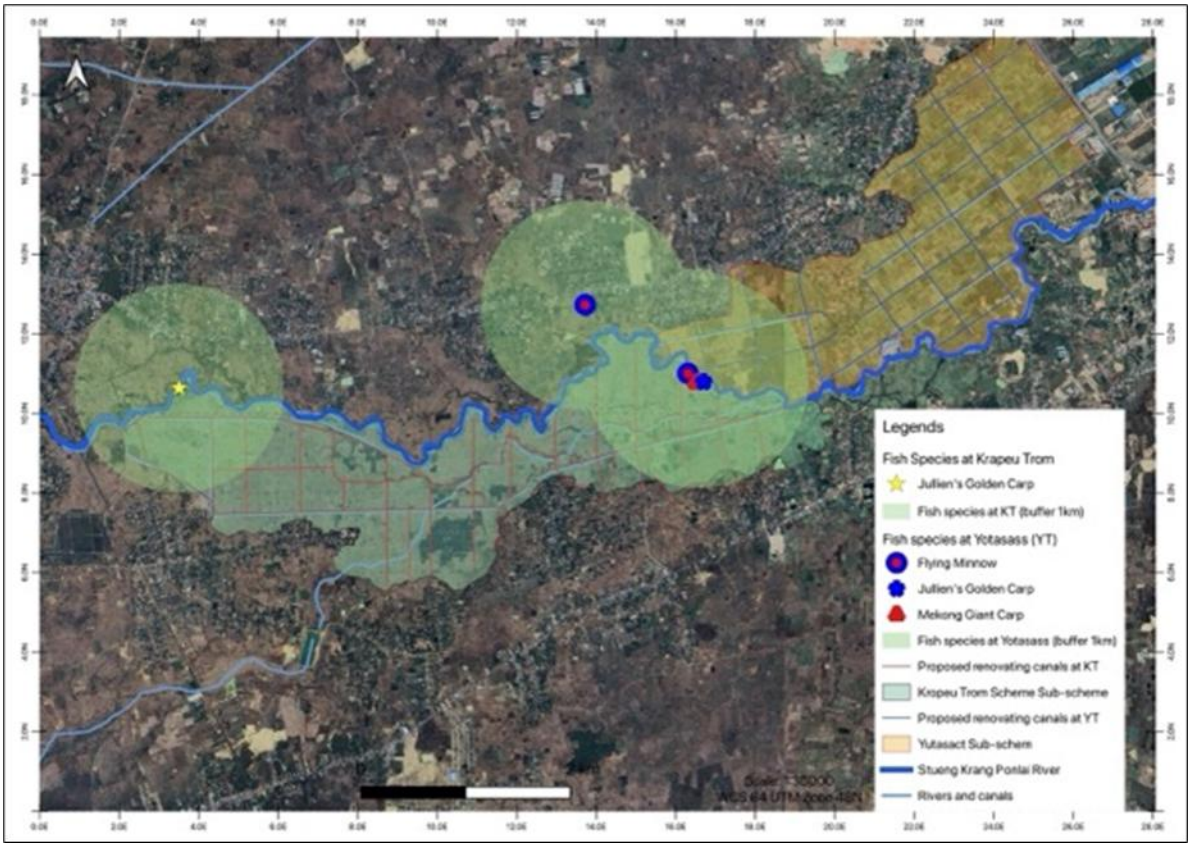
Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the one confirmed species is presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The Krapeu Trom command area has been in existence since the 1970s. The KT is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the Stueng Krang Ponlai serve as the sole ecological and hydrological connection between its upstream watershed and the Tonle Sap River basin downstream. This river is crucial for fish migration during the flooding season. However, reservoirs, spillways, and drought conditions have disrupted these essential ecological functions.

1.3.4 Fish (1 species)

Krapeu Trom, like Brambei Mom, is situated within the same river catchment area in the lower reaches, near the Tonle Sap's annual floodplain. Two fish species, the Isok barb/Jullien's Golden Carp (Probarbus jullieni) and Leaping barb/Flying Minnow (Laubuka caeruleostigmata), were targeted for interviews in this command area. Among ten key informants interviewed, only one reported encountering the Jullien's Golden Carp once in 2022, approximately 500 meters downstream of the reservoir facility during a flooding event (see map below). This individual stated that the species migrated upstream from the Tonle Sap during the flood season but became trapped in spillways. They added that if flooding is insufficient, fish populations decline, and rare species may no longer be present in the area.

Figure 23: A spatial distribution map was generated for four fish species at Krapeu Trom and Yutasas Command Area. 1 km buffer zones were included to approximate their minimum movement range around suitable habitats.



1.4 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species qualify for Critical Habitat features.

1.4.1 Habitat of significant importance to CE and EN species

As presented in Section 4.4.3.3 (Ecological State), the species that qualifies as a critical habitat feature is the Flying Minnow. Krapeu Trom Command Area is part of Stueng Krang Ponlai River system (Tonle Sap's tributary) and situated approximately 11 km from Tonle Sap River. The area was influenced by flood-plus water from Stueng Krang Ponlai upstream and the push-up of flood water from Tonle Sap River Basic allowing fish to short distance migration for food and breeding.

Although climate change has caused dry and drought more frequently, this area still receives a good amount of flood from its upstream and downstream making a good connectivity and providing ecological function for migratory fish.

1.4.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for sub-scheme).

1.4.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for KT, therefore is expected to qualify as critical habitats under this criterion.

1.4.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

1.4.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

1.5 Mitigation Measures for all sub-schemes

1.5.1 Overviews

Krapeu Trom: this sub-scheme confirmed the potential presence of only the endangered Flying Minnow. While another species was reported downstream, its presence within the sub-scheme was unconfirmed. Existing water infrastructure and drought have already impacted fish migration. Construction activities may further threaten the Flying Minnow and its habitat. Mitigation measures are recommended across all project phases, including habitat avoidance, buffer zones, pollution control, water quality and fish population monitoring, and public awareness.

1.4.6 Trigger of Implementation

Overall: The reports emphasize the urgent need for careful project planning and mitigation measures, including habitat restoration and sustainable water management, to minimize negative impacts on vulnerable species and their critical habitats. The project's area of influence extends beyond immediate command areas, requiring a holistic approach to conservation. Collecting and trafficking protected species are prohibited as described in the *Cambodia law/regulation:*

- Forestry Law (2002): This law provides the framework for the management and protection of forests, including wildlife. It prohibits hunting, capturing, and trading protected wildlife species without permission.
- Fisheries Law (2006): This law governs the management and protection of fisheries resources, including aquatic wildlife. It prohibits illegal fishing methods and the trade in endangered aquatic species.

- Protected Areas Law (2008): This law establishes and manages protected areas, such as national parks and wildlife sanctuaries, to conserve biodiversity, including threatened species. It restricts activities that could harm wildlife within these areas.
- Sub-decree on International Trade in Endangered Animals and Plant Species (2006): This sub-decree implements the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Cambodia. It regulates the import, export, and re-export of CITES-listed species.
- Penal code: he Cambodian Penal Code includes provisions that criminalize wildlife trafficking, with penalties including imprisonment and fines.

P1.1. Impact: Illegal wildlife collection, possession, and trafficking by site workers/ personnel.

Mitigation Measures:

<u>Pre-construction</u>:

- Develop a:
  a. Code of Conduct/ethics against wildlife collection, possession, and trafficking,
  b. SOP for wildlife protection and handling, and
  c. Training and awareness materials on human-wildlife conflict management. This should include biodiversity awareness training to raise their awareness on the:
     (i) ecological sensitivity of the site, importance of forest habitats, protected and threatened plants and animals within the Project area;
     (ii) proper protocols to adopt when wildlife is encountered;
     (iii) need to be cautious when operating machinery to avoid injury/mortality to fauna; and
     (iv) zero tolerance policy to possession of wildlife and forest resources. This should be applicable to both staff and contractors. These materials will also be used for Phase 2 and Phase 3 of the Project.

Responsible for Implementation:

- The PMC-Ecologist/Biodiversity Specialist to develop a) Code of Conduct/ethics against wildlife collection, possession and trafficking, b) an SOP for wildlife protection and handling, and c) training and awareness materials on human-wildlife conflict management.
- The PMC-Ecologist/Biodiversity Specialist to coordinate with the government agencies on wildlife conservation (MoE, MoAFF) and may seek technical assistance from NGO that has strong experience in wildlife protection, collection, possession, and trafficking, such as WCS, CI, and WA in developing the Code of Conduct, SOP

for wildlife protection and handling and awareness and training materials on human wildlife conflict management.

- **Provide mandatory training for Contractors management staff and site worker on:**
  a. Code of Conduct/ethics against wildlife collection, possession and trafficking,
  b. SOP for wildlife protection and handling, and
  c. Human-wildlife conflict management.

Responsible for Implementation:

- The PMC is responsible in providing Training of Trainers to the CSCs and the CSCs are responsible to provide training on the Code of Conduct, SOP for wildlife protection and handling and awareness and training materials on human wildlife conflict management to all Contractors management staff and field workers prior to construction and operational Phases of the CAISAR project.
- The NGO and Cambodia conservation agency (WCS, CI, ANKO) staff can provide human resource in delivering the training.
- All management and field staff of the Construction Contractor are mandatory to attend the training on a) Code of Conduct/ethics against wildlife collection, possession and trafficking, b) SOP for wildlife protection and handling, and human-wildlife conflict management.

- Incorporate policy and associated systems and procedures inclusive of appropriate sanctions/contract termination actions that prohibit employees and/or subcontractors from possession, purchase, trade or collection of wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List, in the Project Administration Manual (PAM) and Worker's Agreement.

Responsible for Implementation:

- The PMU and PIU to incorporate the policy and associated systems and procedures in the PAM.
- The CAISAR Contractors and CAISAR Operators to incorporate the policy and associated systems and procedures in the Worker's Agreement.

Construction:

1. Minimize forest encroachment, wildlife poaching, and tree cutting due to improved access from new roads, a community-based management plan will be developed and implemented.
   a. Minimize the increased potential for forest encroachment and wildlife poaching by people who could use new roads to access forest areas.
   b. Avoid forest and land encroachment.

c. Minimize the intensity of poaching.

d. Tree cutting by the people, due to improved access to the area

Responsible to implement:

- Plan Development: Jointly develop a practical management plan with local communities and landowners.
- Guard Posts: Establish and maintain guard posts on temporary access and inspection roads near residential areas and priority biodiversity areas. (Include guard post construction costs in contractor agreements.)
- Surveillance: Conduct routine surveillance inspections on roads and in priority biodiversity areas (with landowner cooperation) to remove traps and deter hunting, logging, and plant removal.
- Signage**:** Install and maintain signs:
  - Banning unauthorized access on temporary roads.
  - Prohibiting hunting, snaring, and other harmful activities, especially near priority biodiversity areas and working zones.
- Reporting**:** Report observed/recorded incidents of illegal activities to FiA, FA or other authorized agencies.

2. Undertake regular monitoring of all access roads (including all quarries and the cement batching plant) to secure them from poaching activities.

Responsible to implementation.

- The Contractor is responsible in undertaking regular monitoring of all access roads (including all quarries and the cement batching plant) to secure them from poaching activity.

3. Implement the PAM and Worker's Agreement which includes policy and associated systems and procedures inclusive of appropriate sanctions/contract termination actions that prohibit employees and/or subcontractors from poaching, possession, purchase, trade or collection of wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List. Corrective measures should be taken where necessary including appropriate actions against infringements.

Responsible for Implementation:

- The Contractor to implement the policy and associated systems and procedures.
- PIU should develop appropriate levels of penalisation against degree of infringement ranging from fines, suspension, and employment termination, and reporting to local authorities for prosecution (for most severe cases).

4. Check if feasible to control access road users during construction through use of security gates. If yes, security gates are to be manned by at least one (1) security officer 24 hours per day who will record the particulars (name, address, vehicle registration number, personal identification number) of all vehicles who are allowed into the access road. Visitors must also be always accompanied by a company representative. The security officers should be trained to identify behaviour associated with poachers and vehicle searches. The security gate should be equipped with 24-hour CCTV cameras. Evidence of such inspections/ vehicle searches to be recorded and available for review.

   Responsible to implement:

   - The CAISAR Contractor.

5. Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction Phase by to safer habitats. Handling and rescuing wild fauna will follow the SOP for wildlife protection and handling.

   Responsible for Implementation:

   - The is responsible handling, rescuing, and reporting encountered or caught wildlife during land clearing and construction works.
   - The Contractor needs to coordinate with Cambodia conservation agency (FA, Phnom Tamao Wildlife Rescue Centre, or ACCB) in handling or rescuing the wildlife.
   - Wildlife Encounter Protocols & Training: Implement protocols for wildlife encounters and train workers on appropriate responses, emphasizing non-interference and prohibiting harmful actions.
   - Rapid Response Wildlife Unit: Establish a rapid response unit (potentially through a third party) to address human-wildlife conflict effectively.
   - Community Information: Educate the community on local wildlife behavior, avoidance techniques, and deterrent methods.

Residual Impact: Minimal residual impact.

P1.2. Impact: Wildlife collisions with construction and quarry vehicles.

Trigger of Implementation:

The increase in vehicle movements such as trucks and excavators, particularly in quarry areas and access roads, will likely lead to increased chances of collisions with wildlife such as mammals and reptiles.

Mitigation measures:

Design/Pre-construction:

1. Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works. The inspections should be conducted to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur.

Responsible to implement:

- The Contractor is responsible to conduct the inspections and identify hotspots where collisions with wildlife are likely to occur.
- The CSC- Project Ecologist to provide technical assistance and guidance to the Construction Contractor in in conducting the inspections.

2. Provide general guidance to land clearance (refer to Appendix XX on Land Clearance SOP):

   a. When planning for expansion, ensure land clearance is undertaken in a Phased approach such that it complements wildlife shepherding activities.

   b. All proposed clearance areas will be marked in the field prior to any vegetation being cleared. The marking can use spray paint or marking tape. A briefing is to occur with personnel to outline the area proposed for clearing.

   c. An inspection is to occur following clearing to determine if clearing has been limited to the identified clearance area. Any clearing outside of the marked area is to be reported to the HSE Manager.

Responsible to implement:

- The Project Ecologist of CSC is responsible in providing guidance.

3. Prior to wildlife shepherding activities, undertake briefing with all involved personnel so they are aware of their roles and responsibilities; measures to deal with injured wildlife; occupational health and safety requirements; and requirements regarding the prohibition of hunting/ catching/ taking of fauna and flora. This will include incident reporting measures to relevant forestry authorities and stakeholders, and the reporting of any individual suspected or caught with fauna and flora to the relevant authority. Random inspections of personnel arriving and leaving the Project area can be considered. Refresher training is to occur with new employees.

Responsible to implement:

- The CSC- Project ecologist to train field workers to recognize and avoid wildlife.
- The field workers to report to the CSC HSE Manager of any wildlife sightings or collisions.

4. Provide features such as tunnels or rope bridges along temporary roads to enable wildlife movement and to reduce potential traffic incidents.

Responsible to implement:

- Design & Engineering Team: Responsible for incorporating wildlife crossing features (tunnels, rope bridges) into temporary road designs.
- Construction Contractor: Responsible for the physical implementation and construction of these features.

Construction:

1. Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur.

Responsible to implement:

- The Contractor to install the signage to alert drivers to the presence of wildlife and encourage them to slow down and drive with caution.

2. Implement speed limit (less than 40km/hour), to reduce the likelihood of collisions and give drivers more time to react to wildlife on the road.

Responsible to implement:

- The Contractor to implement the speed limit.

Residual impact: Minimal Residual Impact

P1.3. To prevent wildlife deaths and minimize disturbance to wildlife along access and inspection roads.

Management Actions: To prevent negative impacts of vehicle traffic on wildlife (animal collisions, disturbance etc.) the following actions will be implemented by Contractors:

Mitigation measures:

Design/Pre-construction:

1. Develop a system in which drivers report locations of wildlife crossing and wildlife sightings**.**

Responsible to implement:

- Project Environmental Team: Responsible for designing and implementing the wildlife sighting/crossing reporting system.
- Drivers/Transport Staff: Responsible for reporting observed wildlife crossings and sightings.
- Site Supervisors/Foremen: Responsible for collecting and relaying driver reports to the Project Environmental Team.

2. Information campaigns to explain to drivers about the biodiversity management objectives that seek to avoid wildlife collisions and disturbance, including:

Responsible to implement:

- Wildlife Awareness: Workers will receive training on frequently encountered wildlife (e.g., snakes, turtles, tortoises, nocturnal animals) and appropriate roadkill avoidance measures.
- Speed Limit Enforcement: Training will emphasize adherence to speed limits and the consequences of violations.
- Roadkill Reporting: A clear reporting system for animal collisions will be established, including reporting locations and designated recipients.

Construction:

3. Install and maintain signs in areas of frequent wildlife crossings, saying "beware of animal crossing" (complete with pictures of animals) in language understandable to all.

Responsible to implement:

- Environmental/Safeguards Team: Responsible for identifying high-risk crossing areas and designing appropriate signage.
- Construction Contractor: Responsible for the physical installation and maintenance of the signs.

Residual impact: Minimal Residual Impact

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Project Design Report

Annex: 14. e. ESCMP

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CLIMATE ADAPTIVE IRRIGATION AND SUSTAINABLE AGRICULTURE FOR RESILIENCE (CAISAR) AIIB PPSF GRANT S0452A, CODE 00-452-PPSF-DTA

ENVIRONMENTAL, SOCIAL, AND CLIMATE MANAGEMENT PLAN FOR OU TA PAONG SUB-SCHEME

FINAL

Submitted To:

Project Management Unit
Ministry of Water Resources and Meteorology,
AIIB and IFAD

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24TH FEBRUARY 2025

EXECUTIVE SUMMARY

This document is an Environmental, Social, and Climate Management Plan (ESCMP) for the Ou Ta Paong sub-scheme, part of the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project in Cambodia. The project aims to improve farm-level climate adaptation, water use efficiency, and agricultural productivity. The Ou Ta Paong sub-scheme is the largest investment focus of the CAISAR project and will rehabilitate existing irrigation infrastructure and enhance agricultural practices, focusing on the Ou Ta Paong River ecosystem and surrounding communities.

The ESCMP is crucial for ensuring the project's sustainability by addressing potential environmental and social impacts. It outlines measures to mitigate risks associated with water resource management, infrastructure development, and agricultural intensification. The plan recognizes the Ou Ta Paong River's importance for both agriculture and local livelihoods and promotes efficient irrigation practices to optimize water use and minimize the risk of water shortages. The ESCMP ensures that communities are actively engaged in the project's planning and implementation, addressing their concerns through consultations and fair compensation where necessary.

The ESCMP's objectives include:

- Identifying and assessing environmental and social risks and impacts.
- Applying a mitigation hierarchy to avoid, minimize, or mitigate risks and impacts.
- Engaging affected communities and vulnerable groups in the assessment and mitigation process.
- Ensuring compliance with both national and international environmental and social standards.

The project's geographical area is the Bakan District, Pursat Province. The existing sub-scheme is characterized by a complex water supply system drawing from the Pursat River, Ou Ta Paong River, and Svay Don Keo River. This system creates distinct hydraulic zones within the scheme, each with specific water availability levels, impacting agricultural output. The area has faced natural challenges like droughts and floods over the past decade.

The proposed investments include:

- Rehabilitation and improvement of existing irrigation canals.
- Construction of new tertiary canals.
- Installation of solar power systems.
- Training and capacity building for Farmer Water User Communities (FWUCs).
- Agricultural extension services for improved farming practices and value chain development.

The tentative implementation schedule includes detailed design starting in January 2025, followed by procurement and construction. The construction is expected to start after the rainy season in 2026 and be completed by mid-2030.

The ESCMP identifies potential environmental and social risks and impacts during different project stages and proposes mitigation measures.

Before and during construction, potential risks include:

- Unexploded ordnance (UXO): The presence of UXO requires a clearance plan and expert assessment before any construction activity.
- Air and noise pollution: Dust suppression measures, reduced operating hours for machinery, and regular maintenance are proposed to mitigate air pollution and noise.
- Water pollution: Construction diversion control, restrictions on filling canals, and proper waste disposal are crucial to prevent water pollution.
- Solid and hazardous waste: Waste management plans, including designated dump sites, are needed to handle various types of waste generated during construction.
- Wastewater: Proper handling and disposal of hazardous wastewater, such as oil or fuel, are essential.
- Biodiversity impacts: Measures to minimize habitat loss and fragmentation, prevent the spread of invasive species, and raise awareness about wildlife protection are necessary.
- GHG Emissions: Construction and operation of heavy machinery, waste burning, and agricultural burning can increase GHG emissions. Mitigation measures include using low-carbon materials, offsetting emissions, and raising awareness.
- Social impacts: These include labor influx, community health and safety, potential for SEA/SH (Sexual Exploitation, Abuse, and Harassment), and traffic accidents. Mitigation measures involve labor management plans, awareness campaigns, safety training, and grievance redress mechanisms.

During operation, potential risks include:

- Water pollution: The ESCMP emphasizes the need for sustainable agricultural practices, including Integrated Pest Management (IPM), to minimize the risk of water pollution from agricultural runoff.
- Biodiversity impacts: Continued monitoring and management are necessary to address the potential for long-term habitat loss and fragmentation.
- Invasive Species: Changes in land use and water management can introduce invasive plant and animal species.
- Climate change: Promoting energy-efficient irrigation, reducing reliance on fossil fuels, and adopting climate-smart agricultural practices are key to mitigating GHG emissions.
- Social impacts: Continued attention must be paid to elite capture, water use conflict, social inequalities, and potential overuse of pesticides.

The ESCMP outlines a comprehensive stakeholder engagement plan, including consultations with various stakeholders during project preparation and implementation. This plan ensures that local communities and other stakeholders are informed about the project and have opportunities to voice their concerns and suggestions. The ESCMP also includes a grievance redress mechanism to address complaints and grievances from affected people. The mechanism provides a structured process for resolving issues related to land acquisition, labor, SEA/SH, and other project-related concerns.

The plan details implementation arrangements, outlining the roles and responsibilities of various stakeholders, including government agencies, contractors, and consultants, in implementing and monitoring the ESCMP. The monitoring program will include regular monitoring of soil, air, and water quality, and biodiversity.

The financial resources allocated for implementing the ESCMP amount to USD 1,510,119. This budget encompasses a range of expenses, including UXO clearance, assessment for land acquisition and resettlement planning, biodiversity management, community engagement, and essential monitoring activities. Transparency and accountability are paramount throughout the project's lifecycle. To this end, the ESCMP will be made publicly available in both English and Khmer, ensuring accessibility and fostering informed participation.

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii
TABLE OF CONTENTS v
LIST OF TABLES xi
LIST OF FIGURES xii
1. INTRODUCTION 1
1.1 Rationale of Ou Ta Paong Sub-scheme 1
1.2 Objectives of the ESCMP 1
2. PROJECT DESCIPTION 2
2.1 Geographical Area of the Sub–scheme 2
2.2 Characteristics of the Existing Sub–scheme 3
2.2.1 Water Availability 3
2.2.2 Irrigation Management 5
2.2.3 Cropping Patterns 5
2.2.4 Crop Productivity 7
2.2.5 Natural challenges 8
2.3 Analysis of Alternatives 8
2.3.1 Site Selection 8
2.3.2 Project Layout and Design 8
2.3.3 Project Technology 16
2.3.4 Project Scenario Analysis 17
2.4 Proposed Investment 18
2.4.1 Key activities by Project Component 18
2.4.2 Tentative Schedule for Sub–scheme Implementation 21
2.5 Proposed Infrastructure 22
2.5.1 Design Concepts and Options 22
2.5.2 Types of Infrastructure and Design 24
2.6 Implementation Resources Requirement 29
2.6.1 Labour and Workforce 29
2.6.2 Power Usage 31
2.6.3 Supporting Facilities 31
2.6.4 Water Consumption 31
2.6.5 Expected GHG Emission and Discharge 33

2.6.6 Land Acquisition for Material Storage 33
2.7 Project Area of Influence 33
2.7.1 Definitions 33
2.7.2 Areas of Influence of Ou Ta Paong Sub–scheme 34
3. LEGAL AND INSTITUTIONAL FRAMEWORK 36
3.1 Royal Government of Cambodia's Legal Framework 36
3.1.1 National legal framework 36
3.1.1.1 The Constitution of the Kingdom of Cambodia (1993) 36
3.1.1.2 Legal Framework on the Management and Conservation of Natural Resources and Biodiversity 37
3.1.1.3 Legal Framework on Labour, Public Well-Being, and Safety 39
3.1.1.4 Legal Framework on Governance and Social Inclusion 40
3.1.1.5 EIA Classification 41
3.1.1.6 Applicable Ambient Quality Standards 42
3.1.1.7 Water quality standards for public health protection .... Error! Bookmark not defined.
3.2 AIIB'S ENVIRONMENTAL AND SOCIAL FRAMEWORK (ESF) 44
3.3 IFADs' SECAP 45
3.4 GEF'S ENVIRONMENTAL AND SOCIAL SAFEGUARDS POLICIES 46
3.5 International Conventions and Treaties 46
3.6 Good International Industry Practices (GIIP) 48
3.6.1 WBG General EHS Guidelines (2007) 48
3.6.2 WBG EHS Guidelines for Annual Crop Production (2016) 48
4. BASELINE CONDITIONS 53
4.1 Physical Conditions 53
4.1.1 Existing Infrastructure (Irrigation and drainage facilities) 53
4.1.2 Rivers and Hydrology 54
4.2 Environmental Conditions 56
4.2.1 Air Quality and Noise 56
4.2.2 Soil Quality 57
4.2.3 Surface Water Quality 58
4.2.4 Groundwater Quality 59
4.3 Biological Resources 61
4.3.1 Analysis to prepare for determining CH status 61

4.3.1.1 Species with Potential Occurrence within the AoA 61
4.3.1.2 Description of screening for narrowing down 62
4.3.1.3 Ecological State of Habitats within the Area of Analysis (AoA).....64
4.3.1.4 Occurrence of Protected Areas near the Sub-scheme Area 76
4.3.2 Determination of Critical Habitat Status (Step 3).....79
4.3.2.1 Overview of the current land use and land cover at OPT.....81
4.4 Socio-Economic and Cultural Conditions.....87
4.4.1 Administrative and Social Structure.....87
***4.4.1.1 Administrative System*.....87**
***4.4.1.2 None-Governmental Organizations* 87**
***4.4.1.3 Community-Based Organizations*.....87**
4.4.2 Demographic and Facilities.....88
4.4.3 Socio–economic Conditions of the Beneficiaries 89
4.4.4 Cultural Sites.....91
4.4.5 Gender 92
4.4.5.1 Labor Division 92
4.4.5.2 Income 94
4.4.5.3 Decision Making.....94
4.4.6 Agricultural Production 94
4.4.6.1 Rice Production 94
4.4.6.2 Vegetable Production 96
4.4.6.3 Animal Production 97
5. ASSESSMENT OF ENVIRONMENTAL & SOCIAL RISKS, IMPACTS, AND MITIGATION 98
5.1 Environmental Risks, Impacts, and proposed Mitigation Measures at the Preparation and Construction Stage.....98
5.1.1 UNEXPLODED ORDNANCES (UXO) 98
5.1.2 ENVIRONMENTAL, HEALTH, AND SAFETY.....99
5.1.2.1 Noise and Vibration 99
5.1.2.2 Air pollution.....100
5.1.2.3 Impact on Water 100
5.1.2.4 Solid and Hazardous Waste 101
5.1.2.5 Wastewater 102

5.1.3 OCCUPATIONAL HEALTH AND SAFETY 103
5.1.3.1 Physical Hazards 103
5.1.3.2 Heat Stress 104
5.1.4 COMMUNITY HEALTH AND SAFETY 105
5.1.5 BIODIVERSITY 105
5.1.5.1 Habitat Loss and Fragmentation 105
5.1.5.2 Hunting, trading, and consumption of wildlife 106
5.1.5.3 Loss of fauna and flora 107
5.1.6 CLIMATE CHANGE 108
5.1.6.1 GHG emission 108
5.2 Environmental Risks and Impacts at Operation Stage 109
5.2.1 ENVIRONMENTAL, HEALTH AND SAFETY ASPECT/ISSUE 109
5.2.1.1 Water Management 109
5.2.1.2 Water pollution 109
5.2.1.3 Soil pollution 110
5.2.2 BIODIVERSITY 111
5.2.2.1 Habitat loss and fragmentation 112
5.2.2.2 Invasive Species 113
5.2.3 CLIMATE CHANGE 114
5.2.3.1 GHG emission 114
5.2.4 ANNUAL CROP MANAGEMENT PLAN 114
5.2.4.1 Water resource efficiency 114
5.2.4.2 Soil erosion and soil erosion risk 115
5.2.4.3 Nutrient application and management 116
5.2.4.4 Use and effectiveness of pesticides 116
5.2.4.5 Pesticide residues on site soil 117
5.2.4.6 Pesticide residues on produce 117
5.3 Social Risks, Impacts, and proposed Mitigation Measures at the Preparation Stage 118
5.3.1 LAND ACQUISTION 118
5.3.1.1 Land acquisition and resettlement 118
5.3.1.2 Economic displacement 119
5.4 Social Risks and Impacts and Mitigation Measure at Construction Stage 120

5.4.1 ROTECTING THE WORKFORC 120
5.4.1.1 Child Labor 120
5.4.1.2 Forced Labor 121
5.4.2 COMMUNITY HEALTH AND SAFETY 122
5.4.2.1 Disease transmission 122
5.4.2.2 Sexual Exploitation and Abuse, Sexual Harassment 122
5.4.2.3 Traffic safety & Security 124
5.4.2.4 Community Health and diseases 125
5.4.2.5 Personal Protective Equipment 125
5.4.2.6 Working conditions and Management of Worker 126
5.4.3 CULTURAL HERITAGE 127
5.4.4 CROSS-CUTTING 127
5.4.4.1 Loss access to land and other assets 127
5.4.4.2 Loss access to natural resources 128
5.4.4.3 Social inequality 129
5.4.4.4 Elite capture 130
5.4.4.5 Gender inequality 130
5.5 Social Risks and Impacts and Mitigation Measure at Operation Stage 131
5.5.1 COMMUNITY HEALTH AND SAFETY 131
5.5.2 CROSS-CUTTING 132
5.5.2.1 Gender inequality 132
5.5.2.2 Social inequality 133
5.5.2.3 Elite capture 133
6. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE 156
6.1 Purpose and Process of Stakeholder Engagement 156
6.2 Consultation Process 156
6.3 Stakeholder Engagement during Sub–Scheme Preparation 157
6.3.1 Environment, Biodiversity and Climate Change Impact 157
6.3.1.1 Pollution prevention and resource efficiency 157
6.3.1.2 Biodiversity 158
6.3.1.3 GHG Emission 159
6.3.2 Social Aspects 160
6.3.2.1 Labor and Working Conditions 160

6.3.2.2 Community Health and Safety....160
6.3.2.3 Land acquisition, economic and physical displacement....161
6.3.2.4 Cross–cutting risks and impacts....162
6.4 Stakeholder Engagement during Sub–Scheme Implementation....164
6.5 Information disclosure....164
7. GRIEVANCE REDRESS PROCEDURES....164
7.1 Objectives of the Project GRMs....164
7.2 Summary of National Legislation Related to Grievance and Complaint....165
7.3 Principles of the Project GRMs....165
7.4 Project's Redress Procedures....166
7.4.1 Redress Procedure for Complaints related to Land Acquisition....166
7.4.2 Redress Procedure for Complaints Related to Labor and Working Conditions....168
7.4.3 Redress Procedure for Complaints Related to SEA/SH/GBV....169
7.4.4 Redress Procedure for General Complaints....171
7.5 Registration of Project Grievance....171
8. IMPLEMENTATION ARRANGEMENTS....172
8.1 Environmental and Social Duties of the PMU/Detail Design Consultants....172
8.1.1 MOWRAM'S PMU....172
8.1.2 NCDD'S PMU....172
8.1.3 Provincial Department of Water Resources and Meteorology....173
8.1.4 Provincial Department of Agriculture, Forestry and Fisheries....173
8.2 Contractor's Environmental and Social Management Plan (C-ESMP)....173
8.3 Contractor's Safety, Social and Environmental Officer (SSEO)....174
8.4 Contractor's obligation as to contractual requirements....175
9. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM....176
9.1 Environmental Monitoring Program....176
9.2 Social Monitoring Program....186
10. ESTIMATED COSTS....193
10.1 Estimated Costs for ESCMP Implementation....193
10.2 Estimated Costs for ESMCP Monitoring Program....193
Annex....195
Annex 1: Screening checklist for E&S impacts for Ou Ta Paong Sub-scheme....195
Annex 2: Layout of Ou Ta Pong sub-scheme....198

Annex 3: Grievance Monitoring 204
Annex 4: Worker's Code of Conducts 213
Annex 5: Simplified Pest Management Plan 218
Annex 6: Biodiversity Assessment Findings for Ou Ta Paong 224
Annex 7: Chance Find Procedure 259
Annex 8: Summary of Stakeholder Consultation 262
Annex 9: Laboratory Testing Result 272
Annex 10: List of Archeological and Cultural Sites 282

LIST OF TABLES

Table 1: Administrative coverage of Ou Ta Paong sub-scheme 2
Table 2: OTP - Paddy cultivation areas. 6
Table 3: Irrigation System Design and Options 9
Table 4: River Training Design Options 11
Table 5: Slope Design Options Comparison 13
Table 6: Slope Design Option Comparison 15
Table 7: Irrigation System Options 16
Table 8: Tentative implementation schedule of Ou Ta Paong irrigation scheme. 21
Table 9: Ou Ta Paong Sub-Project Key Characteristics 24
Table 10: The estimated influx labor within the sub-schemes 30
Table 11: The estimated quantity of water for domestic use of the project 32
Table 12: ESIA Classification for Development Projects relevant 41
Table 13: Water quality standards in public water areas for bio-diversity conservation 42
Table 14: Groundwater and Drinking Water Quality Standards. 43
Table 15: Ambient Air Quality Standards. 43
Table 16: Maximum permitted noise levels in public and residential areas (dB (A)) 44
Table 17: Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF 49
Table 18: Soil analysis results in an agricultural context 57
Table 19: Result of surface water quality 58
Table 20: Groundwater sampling locations 59
Table 21: Result of groundwater quality 60
Table 22: Confirmed List of endangered and critically endangered species for the Ou Ta Paong sub-scheme 62
Table 23: List of international and national key expert was consulted to check and verify each all target EN and CR species 79
Table 24: Status of relevant CBOs within the project area 88
Table 25: Administrative and population coverage of Ou Ta Paong sub-scheme 88
Table 26: Demographic information of the HH living within and the vicinity of the command areas 88

Table 27: Access to energy and water and sanitation facilities 89
Table 28: Occupation of the HHs living within and the vicinity of the Ou Ta Paong 90
Table 29: Migration and vulnerability of the people within the sub-schemes 90
Table 30: Houses and Assets of the HHs within Ou Ta Paong 90
Table 31: Issues in the project communities 91
Table 32: Rice production during wet and dry season 96
Table 33: Rice production during wet and dry season 97
Table 34: Indicative figure of canal expansion at Ou Ta Paong 118
Table 35: Land Acquisition and Asset Impacts in the Ou Ta Paong sub-scheme 119
Table 36: Affected and Vulnerable Households in Ou Ta Paong Sub-scheme 120
Table 37: The estimated influx labor within the sub-schemes 122
Table 38: Preconstruction, Construction, and Operation Phase Environmental Mitigation Measures 135
Table 39: Social Risks, Impacts and Mitigation Measures 145
Table 40: Number of participants being consulted for Ou Ta Paong Sub-scheme 156
Table 41: Environmental monitoring plan during pre-construction, construction, and operation phase 177
Table 42: Social monitoring plan during pre-construction, construction, and operational phase 186
Table 43: Estimated cost for ESCMP implementation 193
Table 44: Estimated cost for ESCMP monitoring program 193

LIST OF FIGURES

Figure 1: Administrative map of Ou Ta Paong sub-command area 3
Figure 2: Map with Illustration of Dam No. 2 4
Figure 3: Ou Ta Paong Sub-project Options Map 10
Figure 4: Three (3) blocks (sub-scheme) of Ou Ta Pong sub-project 22
Figure 5: Concept design of Block A of Ou Ta Pa Ong Scheme 23
Figure 6: The Selected 3 Options 24
Figure 7: Typical canal section in full cutting 26
Figure 8: Pictures and design layout of a typical regulator or off-take structure at a canal section 26
Figure 9: Locations of irrigation structures in Ou Ta Paong 34
Figure 10: Damnak Ampil Main canal and Ou Ta Paong Sub-scheme 53
Figure 11: Map with Illustration of Dam No. 2 55
Figure 12: Map of groundwater sampling locations 59
Figure 13: Groundwater sampling activities 61
Figure 14: Map showing the observed distribution of identified EN and CR species (with the potential movement of 1-2 km within and around suitable habitats (2020 to 2024) 64
Figure 15: Distribution of identified turtle and tortoise species in and outside the OTP Command Area 67

Figure 16: A spatial distribution map was generated for three bird species—the Bengal Florican, Greater Adjutant, and Milky Stork—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 68
Figure 17: Photograph of a Milky Stork foraging alongside a flock of Painted Storks (credit: Sang Mony, Sam Veasna Conservation Tour), and a map illustrating the distribution of Milky Stork sightings in Cambodia from 2020 to 2024, extracted from eBird data.....70
Figure 18: Photo of Yellow-breasted Bunting (Emberiza aureola) and its distribution map from eBird data (2020-2024) recorded by birdwatcher and wildlife overserves. 71
Figure 19: A spatial distribution map was generated for two primate species—the Indochinese Silvered Langur and Long-tailed Macaque—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 73
Figure 20: A spatial distribution map was generated for two fish species—the Siamese Tiger Perch, and Striped Catfish (old record-7 years ago)—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 75
Figure 21: Map of Ou Tapong Command Area and other existing protected areas under administered of the Ministry of Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministries of Water Resources and Meteorology 79
Figure 22: Land use and land cover map based on the satellite image from Sentinel-2 with 10m resolution. 82
Figure 23: Map of Ou Ta Paong command area and other existing protected area within the Tonle Sap Basin 83
Figure 24: Boeung Kansaeng located in Ou Tampaong's upper reaches, offers sighted records of Siamese Tiger Parch. The area's upper part in this photo is a settlement along the Svay Daunkav River.....85
Figure 25: Overview of Boeung Kansaeng, located upstream of Ou Tapaong Command Area. A canal connects to Stueng Svay Daunkav River (left) and Ou Tapaong (right), a potential fish migration route during floods. 85
Figure 26: Aerial photograph depicting the Ou Tapaong Stream/canal fragmented by earth dams, roads, and ponds, illustrating its diversion for non-intended purposes. 85
Figure 27: Aerial photograph of intake flooded forest habitat within Tonle Sap Zone 3 and the continuous land encroachment, converting forest land for rice cultivation. 86
Figure 28: Maps of archaeological and cultural sites in and near Ou Ta Paong Sub-scheme 91
Figure 29: Division of Roles in Household Chores (n=140) 92
Figure 30: Share of Roles in Crop Cultivation (n=140) 93
Figure 31: Share of roles in Animal Husbandry (n=140) 93
Figure 32: Type of animal in Ou Ta Paong command area 97
Figure 33: Redress Procedure for Complaints related to Land Acquisition 168
Figure 34: Redress Procedure for Complaints Related to Labor and Working Conditions 169
Figure 35: Redress Procedure for Complaints Related to SEA/SH/GBV 170

1. INTRODUCTION

1.1 Rationale of Ou Ta Paong Sub-scheme

Ou Ta Paong sub-scheme is one of the six sub-schemes supported under the CAISAR project, with the largest command area covering over 14,000 hectares. This makes it the largest investment focus of the project, with concentrated activities required. In this context, the preparation of the Environmental, Social, and Climate Management Plan (ESCMP) for Ou Ta Paong is essential to ensure that the project's infrastructure development aligns with sustainable environmental practices. Given the sensitivity of the Ou Ta Paong River ecosystem and its importance to surrounding communities, the ESCMP is designed to identify potential environmental risks early and provide clear guidelines for mitigating them. Without a structured plan, irrigation construction activities could degrade water quality, harm biodiversity, and disrupt the river's natural balance.

Social impacts are also a critical consideration in the preparation of the ESCMP. The Ou Ta Paong River is vital to the livelihoods of local communities, particularly those engaged in farming and fishing. Infrastructure development without proper social safeguards could disrupt these livelihoods, leading to economic challenges and potential social conflict. The ESCMP ensures that communities are actively engaged in the project's planning and implementation, addressing their concerns through consultations and fair compensation where necessary. This inclusive approach minimizes social disruption and fosters stronger community support for the project.

Additionally, the ESCMP is crucial for ensuring that the CAISAR Project meets both national and international environmental and social standards. Compliance with these standards is necessary for securing funding and aligning with global best practices in sustainable development. By preparing a comprehensive ESCMP, the project mitigates both environmental and social risks while promoting long-term sustainability, ensuring that both the natural environment and local communities' benefit from the project's outcomes.

1.2 Objectives of the ESCMP

The objectives of the ESCMP for Ou Ta Paong sub-scheme are:

- Identify and assess environmental and social (E&S) risks and impacts that are potentially associated with investment activities proposed under Component 1 and Component 2.
- Ensure the identification and assessment of E&S risks and impacts are in accordance with the requirements of the laws and regulation of the Royal Government of Cambodia, AIIB's Environmental and Social Framework, IFAD's Social, Environmental and Climate Assessment Procedures (SECAP), and GEF's Safeguard Policies.
- Apply a mitigation hierarchy to: (a) anticipate and avoid risks and impacts; (b) where avoidance is not feasible, minimize or reduce risks and impacts to acceptable levels; (c) once risks and impacts have been minimized or reduced, mitigate them; and (d) where

residual risks or impacts remain, compensate for or offset them, where technically and financially feasible.

- As part of the risk and impact identification and assessment, engage a) people potentially affected by project activities (including both project beneficiaries and those potentially affected adversely, and parties interested in project implementation and operations.
- Conduct consultation, particularly with affected people who are disadvantaged/ vulnerable.
- Propose measures to avoid/ minimize/ mitigate E&S risks and impacts and compensate for adverse impacts where residual risks or impacts remain, compensate for impacts that remain, or offset residual risks, where technically and financially feasible.

Coverage of the ESCMP Ou Ta Paong

This site–specific ESCMP cover project activities proposed under Component 1 and Component 2 (See brief description of investment activities in Section 2.3 below).

2. PROJECT DESCIPTION

2.1 Geographical Area of the Sub–scheme

Geographically, Ou Ta Paong command area is located inside a larger Pursat Flood Plain. The flood plain covers a gross area of 63,000 ha, of which 20,500 ha South and 42,500 ha North of National Road No 5. Roughly two thirds (about 10,000 ha) of the OTP scheme area are located North of the road and is part of the flood zone of the Tonle Sap Lake.

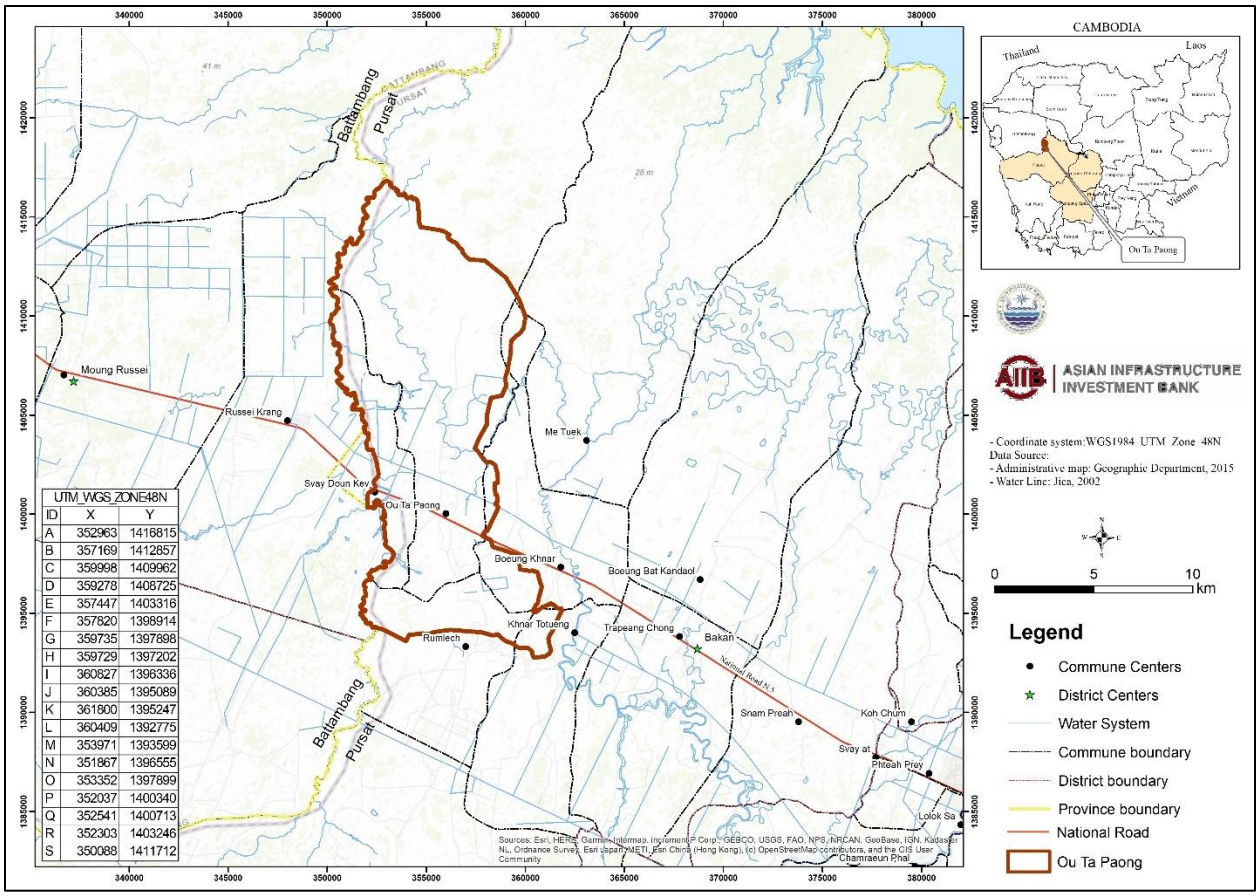
The OTP command area, located in Bakan District, Pursat Province, spans approximately 16,074 hectares and is a crucial rice-producing region. The Ou Ta Paong scheme encompasses five communes within Bakan district, Pursat province: Ou Ta Paong, Boeung Khnar, Svay Duon Kev, Khnar Totueng, and Rulech. Additionally, three surrounding communes affect the scheme: Me Tuek commune in Bakan district, Pursat province, Russei Krang Moung in Russei district, and Prey Tralach in Rokkiri district, Battambang province.

Table 1: Administrative coverage of Ou Ta Paong sub-scheme

Category	Commune Name	District	Province
Within the Scheme	Ou Ta Paong	Bakan	Pursat
	Boeung Khnar	Bakan	Pursat
	Svay Duon Kev	Bakan	Pursat
	Khnar Totueng	Bakan	Pursat
	Rulech	Bakan	Pursat

Surrounding the scheme	Me Tuek	Bakan	Pursat
	Russei Krang Moung	Russei	Battambang
	Prey Tralach	Rokkiri	Battambang

Figure 1: Administrative map of Ou Ta Paong sub-command area



2.2 Characteristics of the Existing Sub–scheme

2.2.1 Water Availability

The Ou Ta Poang (OTP) irrigation scheme, located in the Bakan District of Pursat Province, Cambodia, depends on a complex network of water sources and infrastructure to support agricultural activities. The primary water sources for the OTP scheme are the Pursat River, Svay Donkeo River, and Ou Ta Paong River, each contributing to distinct hydraulic zones with varying water availability and agricultural productivity.

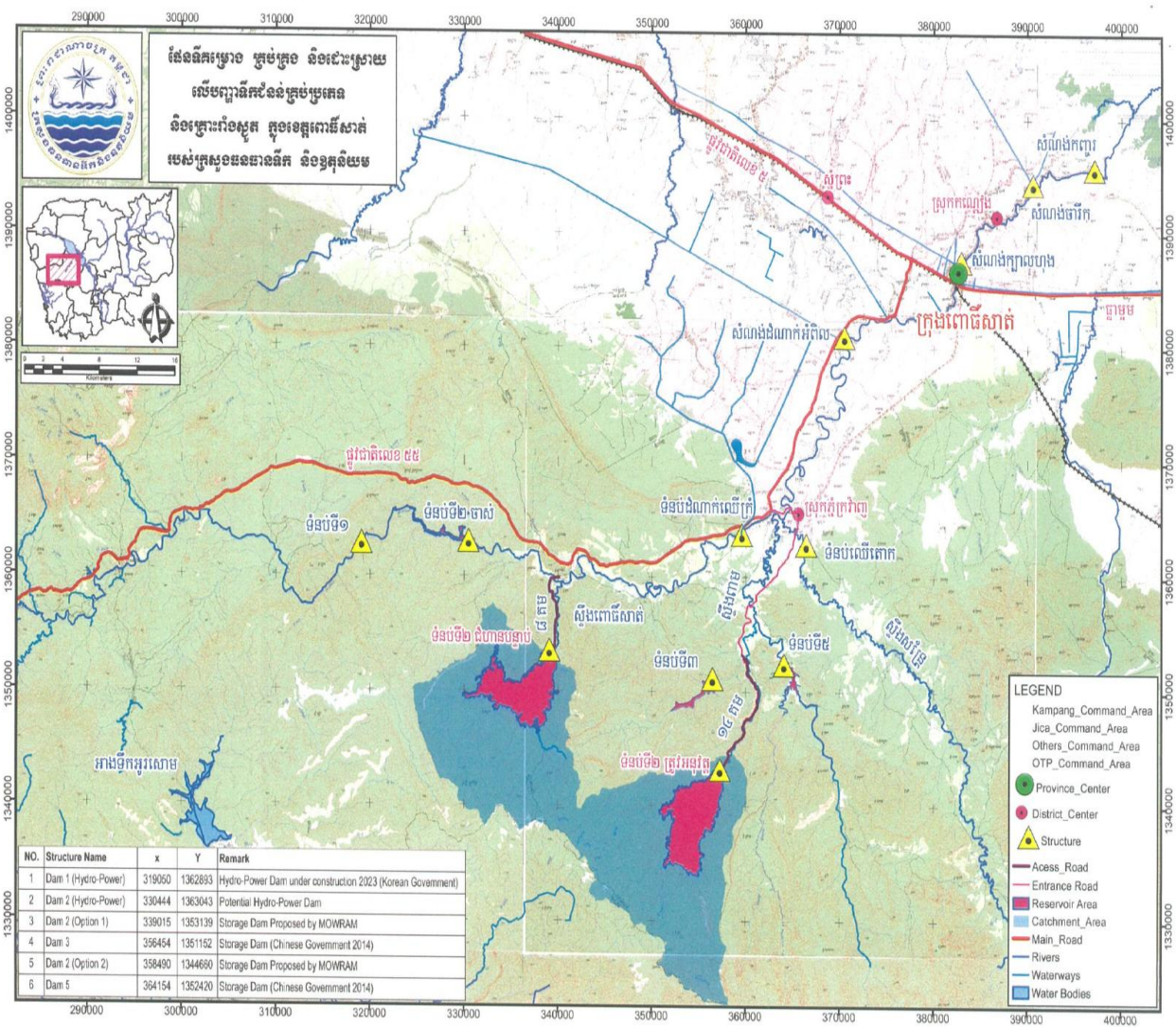
The upper part of the scheme, situated south of National Road 5, relies mainly on the Pursat River, feeding the Damnak Apil Canal and its network of irrigation canals. Gravity-fed irrigation is possible in this area due to the natural slope from south to north, but existing infrastructure requires improvements to optimize water distribution. Enhancements to the canal network and

the construction of additional regulating structures are necessary to enhance water availability in this zone.

The eastern part of the scheme, nestled between the Ou Ta Paong River to the west, the Wat Chre scheme to the east, and National Road 5 to the north, draws water from a mix of sources. These include infrastructure in the south, such as the Damnak Apil and Kbal Hong hydraulic systems, as well as the Wat Loung canal and sections of the Svay Donkeo and Ou Ta Paong rivers. The low hydraulic gradient in this area necessitates one-stage pumping and the development of more efficient distribution networks to ensure adequate water availability for irrigation.

Similarly, the western section of the scheme, situated between the Svay Donkeo River to the west and the Ou Ta Paong River to the east, requires pumping due to the low gradient, with Svay Donkeo serving as the primary water source.

Figure 2: Map with Illustration of Dam No. 2



NO.	Structure Name	x	Y	Remark
1	Dam 1 (Hydro-Power)	319050	1362893	Hydro-Power Dam under construction 2023 (Korean Government)
2	Dam 2 (Hydro-Power)	330444	1363043	Potential Hydro-Power Dam
3	Dam 2 (Option 1)	339015	1353139	Storage Dam Proposed by MOWRAM
4	Dam 3	356454	1351152	Storage Dam (Chinese Government 2014)
5	Dam 2 (Option 2)	358490	1344680	Storage Dam Proposed by MOWRAM
6	Dam 5	364154	1352420	Storage Dam (Chinese Government 2014)

The CAISAR project reported that water availability was adequate at the time Dam No. 1 was completed, provided there was proper coordination among the stated dams. However, at the current stage, Pursat PDoWRAM has reported that the available water is insufficient for irrigation purposes within the province, with a shortfall of approximately 700 MCM. Additionally, PDoWRAM acknowledged that the water from Dam No. 1 is designated solely for hydroelectric purposes, which may limit the amount available for agriculture or irrigation. There is, however, another dam, Dam No. 2, which was approved by the government in late June 2024. PDoWRAM also reported that the construction is in the process of mobilizing equipment to the site. The reservoir for this dam covers 4,016 hectares, with a storage capacity of 861.75 MCM. The dam is expected to be completed by the end of 2026 (Figure 2). Earlier projections indicated that the combined water supply from Dam No. 1, Dam No. 3, and Dam No. 5 would likely be sufficient. With the addition of Dam No. 2, it is highly likely that the province's water needs will be fully met.

The current discussion with farmers on water availability at Ou Ta Paong showed that during the periods that the crop requires irrigation, conflicts about water tend to arise. The available water along the river was diverted into the rice field via secondary canals along the river. The limited availability of water regulated from the upstream, mainly the Damnak Ampil canal cannot flow until the end of the river where the river has become a string of ponds, causing some locations of the rivers to have been turned into backyard garden of the residents along the river. As water is limited, water shortage has become the main cause for financial losses. This causes much stress, because of the risk of drought damage to the crops, and the cost of pumping from low water levels. The risks reduce farmers' motivation to invest in new technologies and climate-smart agriculture.

2.2.2 Irrigation Management

The water distribution system for Ou Ta Pong is managed by the Farmer Water User Community (FWUC), which coordinates with the Provincial Department of Water Resources and Meteorology (PDWRAM) in Pursat. The FWUC handles requests from local farmers and oversees the allocation of water to the various villages within the command area. Water from the Damnak Apil Headwork is diverted into the OTP scheme based on these requests. Additionally, the Damnak Cheukrom barrage, which manages a 16,100-hectare command area, will receive priority water supply from Dam 1, potentially affecting the water availability downstream to the OTP area.

2.2.3 Cropping Patterns

The OTP sub–scheme has a great agricultural potential, particularly for paddy production. However, currently, the monoculture cultivation of paddy prevails in almost all fields. More than 90% of farmers apply manual direct seeding. Grain kept from the previous harvest is used as seed and the varieties have different maturities. Very few households engage in vegetable production for the market. Small scale horticulture activities take place in the dry season around the homestead, where water can be used from wells and ponds. Such activities were observed in two 'Agriculture Cooperatives (AC): Psar Andeth AC and Chamkar Khluy AC. Also, in neighboring Rumlech Commune, farmers cultivate horticulture crops, such as watermelon on their dry paddies. Ou Ta Paong is traversed by Highway 5 on the northern side with a major road running

eastward towards Tonle Sap Lake. This major road is significant to the farmers since it makes it easy to transport goods and agricultural products to the market shared by the 6 communes.

Farmers grow two early-maturing paddy crops annually: one in the wet season (May-August) and the other in the early dry season (November-February). Where water for irrigation is available in February-April, farmers can grow a third crop, which is harvested in May-June. February-April is the driest period of the year and water is extremely scarce in the Pursat plain. Thus, the size of the third cropping area is inherently minor. In parts of the plain where water is available from local storage ponds/reservoirs, farmers grow horticulture crops in the dry season.

Table 2: OTP - Paddy cultivation areas.

Commune	Cropped area	
	Total in commune (1)	In OTP command area (2)
Beung Khnar	3,966	1,209
Khnar Toteung	2,824	152
Me Tuek	4,332	108
Ou Ta Pong	6,344	5,616
Rom Lech	4,650	578
Svay Dounkeo	2,557	1,702
Total		**9,365**

Notes
[1] As per 2021 Statistics from Bakan District Bureauof Agriculture, Natural Resources and Environment.
(2) As measured on map by CAISAR FS Consultant

In the wet season (WS), when rainfall is generally abundant, all the areas cultivate paddy. Currently, about 40% of the crop area is fully rain-dependent and some 60% is irrigated, namely where water can be accessed (pumped) from adjacent canals of ponds. The varieties used are either early maturing (<100 days) or medium maturing varieties (110-150 days). Land preparation is conducted in early May when rainfall has been enough to soften the soil.

For the common wet season crops, plowing starts in May, the seeding is in May-June, and the harvest falls in in September, yielding 2.0-2.5 t/ha. About 5% of the farmers plant a long duration variety, 150-160 days. They prefer to use these traditional fragrant/aromatic, photo-period sensitive varieties. These crops typically yield 2.5-3 t/ha. Their experience is that the traditional varieties can survive better any dry-spells and explain this from the root systems penetrating deeper into the soil where there is still moisture retained and nutrients reside.

Photo-period sensitive varieties need to be planted in late May and June, in order to be synchronized with the short-day period required for flowering. These varieties include Somaly, Phka Romdoul, and Pkha Malis for the medium maturing varieties, and Sen Kro Ob, OM 5451, and Sra Ngae for the early maturing varieties.

Where at least some irrigation water is available and there is no annual flood, fields can produce two WS crops: an early WS crop planted very early on or even shortly before the rains start, and a late WS crop which is planted during the rainy season but will still have to stand on the field for some weeks after the rains have stopped. For this, varieties with a short growth period (120 days

or less) need to be used. Popular are 'OM varieties. For example, OM 5451 is a high-yielding long-grain cultivar of fragrant rice grown in the Mekong Delta. It has good pests and disease resistance. A DS paddy crop of the same variety may be grown as a third crop, as possible near to natural stream or ponds which usually provide a bit of water.

Some farmers plant a dry season paddy crop, which is typically a short-maturing variety (Sen Kro Ob and OM5451). Some 5% of farmers plant non-rice crops during the dry season including watermelon and sweet corn. Rice yields during dry season are slightly higher than the wet season crop. It has been confirmed from the discussions with the commune representatives that production of non-rice crops may be expanded when irrigation comes. If reliable irrigation water supply becomes available, Ou Ta Pong farmers could grow crops which can be exported to Thailand such as soybeans, mungbean, maize, and sesame in sequence with early-maturing rice crop which can be planted in May.

Where there is no irrigation, the fields can produce just one crop, which is planted when the rains are well on their way. For this, varieties with a medium growth period (120 -150 days) are used. These are commonly photo-sensitive and typically can be harvested in early November. Medium maturity rice has better local marketability and does not face the risk of drought damage, because it flowers in mid-October, when rainwater is still readily available.

Where the area tends to flood to a low level only, farmers may plant just one paddy crop, with preference for a long growth duration paddy (more than 150 days; flowering after mid-November) which can stand flooding better. However, the crop variety used has deep roots, so that they have a better chance of surviving the higher risk of drought damage during the last stage, especially when moisture from preceding rainfall has been retained in the deeper soil layers.

Where the area annually floods to a high level, the farmers still try to grow two crops, but with a higher risk: an early short-duration rain- dependent crop (non- photo-sensitive) can be planted before the flood. These fields may (need to) enjoy some minimum flood protection by a system of low dikes/elevated roads/natural riverbanks, which delays the water during the very early stage of the flood rise from entering the area early, to provide sufficient time to harvest the crop. When the flood has come down sufficiently, they plant - usually in October November - a second short growth duration paddy crop (non- photo-sensitive) "flood recession rice". This crop will run well into the dry season and is indeed classified in the statistics as dry-season paddy (DS rice). When there is no rain or irrigation water, this crop runs a high risk of drought damage. This flood recession rice is widespread in the large tail-end area of the Ou Ta Pong scheme.

2.2.4 Crop Productivity

According to the statistics, WS rice yield in OTP is 4.02 Tons/Ha which is relatively higher than in the other CAISAR schemes (which is possibly related to an increase in soil fertility due to the flooding). DS rice cultivation yielded on average about 7.5 T/Ha (which seems very high for what generally is non- irrigated recession rice; this can be verified from the household survey). Both of these estimates have not accounted for significant crop losses due to droughts in recent years. There has been reported large scale debt incurred by local farmers as a result. Some have even reported family members departing to Thailand to find more secure work. These climate change

induced losses of livelihoods are what the CAISAR scheme is aiming to address. Yields used in further calculations are lower than these figures (especially the dry season yield) to consider these drought crop failures in recent years. This serves as a significant justification for the scheme.

2.2.5 Natural challenges

Droughts and floods are among two major challenges for paddy production in OTP. These ongoing challenges reduce the farmers' interest in investing in their crop and result in average yields being on the low side.

- In terms of drought, the threats are most severe North of the National Road. Droughts, in particular, is a problem because the area is very difficult to reach for irrigation water supply. Infamous is the 'short dry season' that occurs during the wet season. So far, the main route for irrigation water supply throughout the Pursat Flood Plain has been from Damnak Ampil Head Works (DAHW) on Pursat River, via Damnak Ampil Main Canal (DAMC, 23 km length) and its secondary canals. The secondary canals typically end in the Pursat River's former flood-spill route roughly East West, relatively near (4-9 km) to DAMC. The flood route is made up of interconnected creeks/rivers/river sections, of which the main ones are Kambot, Bakan, Boeng Khnar, and ultimately Ou Ta Paong. Pursat River does not overtop its banks anymore and there are no largeflood discharges to be conveyed via this zone of natural drains. All sections have silted up and are dammed off at intervals. The zone forms a formidable obstacle for bringing DAMC water further North. Most water ends up in the river sections, from which much of gets diverted for irrigation.
- As for floods, this problem is particularly in the low terrain North of the road/rail way. Most of the areas there is vulnerable to inundation, be it caused by accumulation of surface run-off or by the upcoming lake flood. Nowadays, farmers plant early maturing paddy crops, and these are not as inundation and heavy-rainfall tolerant as the traditional medium- and late-maturing varieties. Most critical for the crops are the months September - October. To minimize the risk, farmers do not grow crops during that period. Also, on higher terrain where there is no thread of inundation, fields are left fallow, to avoid crop damage by high intensity rainstorms. Farmers are aware of the positive impact of the inundations on soil fertility and there are few if any efforts to improve drainage. Drains are intensively used for collecting and storing water for supplementary irrigation and therefore widely regarded as irrigation canals.

2.3 Analysis of Alternatives

2.3.1 Site Selection

The number of hectares of Ou Ta Paong is approximately 14,000 hectares. This command area will be the same regardless of any options being proposed.

2.3.2 Project Layout and Design

The design layout of the irrigation system in OTP remains the same as per the project description (please see in table 3). However, a number of design options have been finalized and removed

from the design options. The (i) Polder improvements (20.1 Km); (ii) “new” secondary canal (8.78 Km), (iii) “new” tertiary canal (19.3 Km); and (iv) “new” quaternary canal (4.2 km) in the previous design of PPTA Team had been agreed to remove to minimize the impacts from land acquisition and resettlement. To supplement the removals, off-take structures will be installed leaving farmers to abstract water as per their internal agreement on the conveyor type to be built within their block command area. The off-take structures that will be installed and locations to install will be identified during the DED.

Table 3: Irrigation System Design and Options

No	Structures	Design Length (km)	Existing Width (Average) (m)	Expansion (L) (m)	Expansion (R) (m)	Total Width (m)
1	Feeder 1	8.80	16.00	7.00	7.00	**30.00**
2	Feeder 2	6.10	29.10	1.50	1.50	**32.10**
3	Main Canals	37.50	37.10	5.00	5.00	**47.10**
5	Creek Re-shape	27.60	61.00	0.00	0.00	**42.00**
6	Main Drainage	11.70	52.00	Reshape	Reshape	**42.00**
7	Secondary Canals	60.12	16.10	2.50	2.50	**21.10**

L = Left, R = Right.

Feeder Canals. The feasibility study of Ou Ta Paong indicated no other design layout except the construction of the feeder canals to abstract water to feed the irrigation system. All options have its own specific strengths and shortage as describe below:

Option 1: Water is extracted from Pursat River through Damnak Ampil Main canal with a length of 6.5 km extended from the main canal feeding into Ou Ta Paong River. The option is one (1) of the best choices, given its shortest length from the main canal to reach command area. However, expanding only the feeder canal reaching a width that can carry adequate water to the sub-scheme will acquire a huge land area along the canal for canal expansion, and side road.

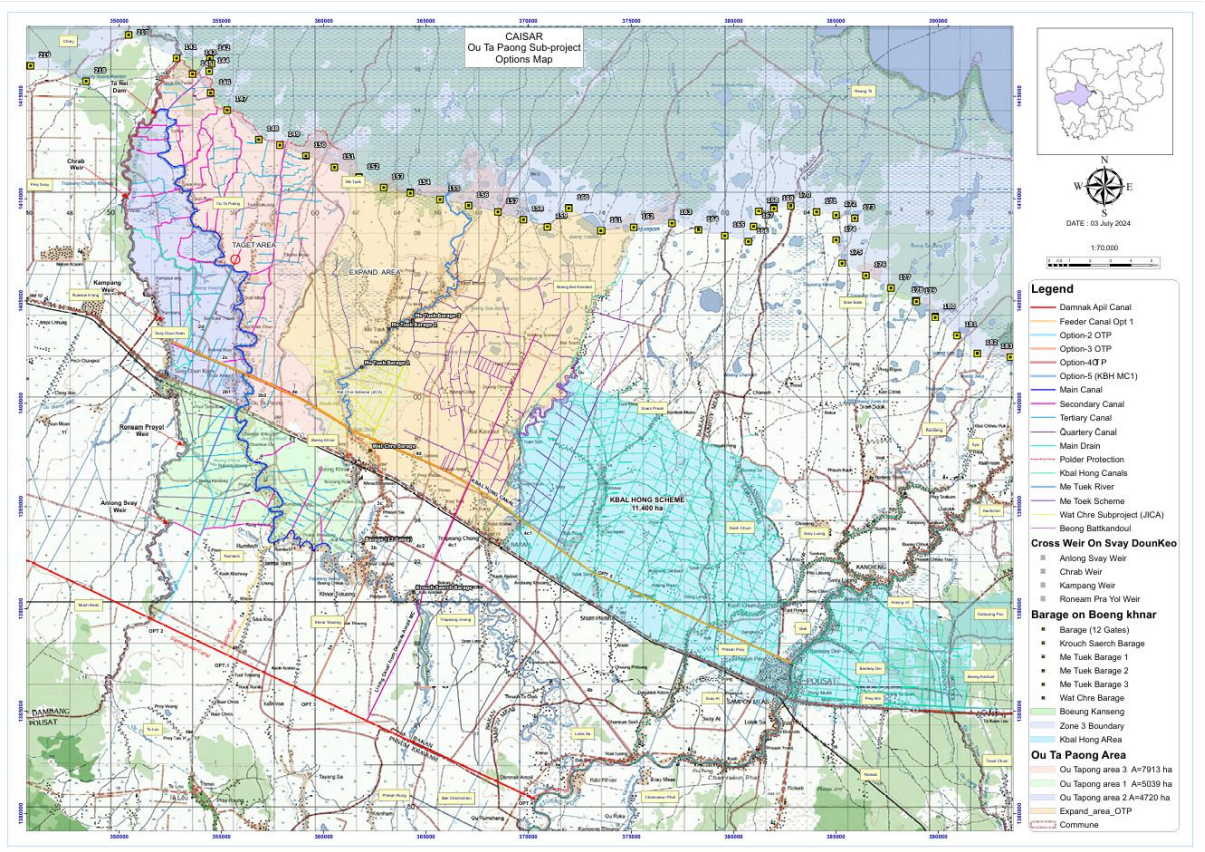
Option 2: The feeder canal is parallel to Option 1 but it extends further down. Prior to releasing water into Ou Ta Paong River, the canal releases water into Boeng Kanseng, flowing across the block allowing the irrigation to take place at this area. With the extension, the canal is about 12 km in length. Once again, the issue of land acquisition along the canal will be encountered due to the expansion.

Option 3: Similar to Option 1, the feeder canal extends further, allowing the water to flow into Kbal Hong main canal prior to the connection to Ou Ta Paong River at further downstream at the middle part of the catchment, making the total length of the canal at about 14 km from Damnak Ampil to Kbal Hong. This option may cause the water availability at the upper part of the sub-scheme being concerned while water will be fed into another area prior to Ou Ta Paong. The option, therefore, requires the budget for excavation to be around twice as much as Option 1.

Option 4: The option carries water from Wat Loang canal, flowing through the barrage at Damnak Ampil. The option will require the expansion of the canal to ensure that an adequate volume of water can be carried to Ou Ta Paong. The canal length to reach Ou Ta Paong is approximately 30 km. The expansion of the canal would result in huge acquisitions of land areas along the main canal.

Option 5: The option begins at Kbal Hong barrage at Pursat provincial town involving the enhancement of the Watergate height and the distance of carrying water will be approximately like Option 4. However, the increase in the height of the Watergate will cause inundation of the upper area of the Pursat River which may cause flooding in the town. This may bring in huge discontentment of the people in the city as height water level may cause in delay of storm water flow during raining period.

Figure 3: Ou Ta Paong Sub-project Options Map



(Source: CAISAR Project, 2024)

Evaluation of Options:

Evaluating the OTP Options is not easy as there are many factors that need to be considered, which makes the matter complex. So, the approach below are proposed for adoption:

- Reduce the number of cross regulators on OTP River
- Focus on improving the existing distribution system

- No new canals (in principle)
- No lining of canals
- No construction of the tertiary canals
- No pump stations, and
- No canals in fill

With the above approach, which aims to maximize water distribution (to support prefered crop patterns) while minimizing investment costs (including potential social and environmental impacts, three options (Option 1, Option 3 and Option 5) were extensively discussed, agreed, and finally selected by MOWRAM and AIIB. The combination of these three options does not only complement each other (minimizing costs related to construction and land acquisition) but also water use efficiency is enahnced through improved water distribution across thre three blocks within the command area.

Polder System. The polder system is expected to play a role as an embankment for protecting flood and invasive species from the Tonle Sap during early raining season. The discussion on the system agreed to remove the system as the operation of the system may face challenges. Firstly, the land areas for the construction are needed since it is the new system which may cause a lot of land impact. Secondary, managing challenge may lead to delay in draining function during flooding period for the command area while flooding protection function would affect a lot of biodiversity exchange between the command area and zone 3 fauna and flora. Lastly, the meeting with engineering team decided not to include the system within the project design.

Secondary Canals. The construction of new secondary canal is expected to acquire huge land areas of farmers which may result in disruption of household economy. To avoid the negative impact, the construction of the canal was agreed to remove the newly plan secondary canal while off-take structure (culverts) will be used to allow farmers to abstract water from the system as per their block command areas. Farmers who own the land within the block need to discuss and agree whether they are going to build their own water canal or use plot by plot irrigation. The risk as per this option is when farmers could come up with the agreement on the construction of a small canal on their own, they have to continue irrigating their farm through deploying plot-to-plot irrigation or using long range pumping which involve with high cost and limited water use efficiency. Since the design is trying to avoid land acquisition, this will be the option for the system which is also applied to the quaternary and fourth-level canal as well.

River Training. River training methods are designed to regulate and stabilize river flows for various purposes, including irrigation, flood control, and erosion prevention. Below are three common types of river training, along with their respective advantages and disadvantages adopted from online source to provide general overview regarding the design and possible options which should be considered for the actual practices. However, it is up to the DED team to decide as per the consultation with Social Safeguard consultant (Table 4).

Table 4: River Training Design Options

River Training	Description

Embankments (Levees)	Embankments are artificially raised banks made of earth, concrete, or stone along the sides of a river to prevent water from overflowing into adjacent lands.
Advantages:	• **Flood Control:** Protects agricultural lands and infrastructure from river flooding. • **Irrigation Water Regulation:** Helps direct water flow into irrigation channels efficiently. • **Erosion Prevention:** Reduces bank erosion, safeguarding nearby farmlands and structures. • **Cost-Effective:** Generally, less expensive compared to more complex river training structures.
Disadvantages:	• **Sediment Deposition Issues:** Can lead to sediment buildup within the riverbed, raising water levels and increasing flood risks over time. • **Breaching Risk:** If poorly maintained, embankments can break during extreme floods, leading to catastrophic damage. • **Ecological Impact:** Alters natural river dynamics, affecting aquatic ecosystems and wetlands.
Spurs (Groynes)	Spurs (also called groynes) are structures extending perpendicularly from the riverbank into the river. They help deflect and slow down water flow to prevent erosion and sediment deposition in key areas.
Advantages:	• **Bank Protection:** Reduces erosion by redirecting strong currents away from vulnerable banks. • **Sediment Control:** Helps accumulate sediments in specific areas, aiding in land reclamation or creating stable riverbanks. • **Improves Water Availability:** Can be strategically placed to direct water flow into irrigation systems.
Disadvantages:	• **Local Scouring:** Can cause deep erosion near the structure, affecting nearby irrigation headworks or riverbanks. • **Periodic Maintenance Required:** Sediment accumulation may require periodic dredging to maintain functionality. • **High Initial Cost:** Construction and material costs can be relatively high compared to natural erosion control measures.

Weirs and Barrages	Weirs are low dams built across a river to regulate water flow, while barrages are adjustable structures with gates that control water levels for irrigation and flood management.
Advantages:	• **Water Level Control:** Maintains steady water levels in irrigation channels, ensuring consistent supply to farmlands. • **Hydropower Potential:** Some barrages can integrate small-scale hydroelectric generation. • **Prevents Saltwater Intrusion:** Useful in coastal areas where tidal effects can introduce salinity into freshwater irrigation systems.
Disadvantages:	• **Disrupts Natural River Flow:** Can impact fish migration and aquatic ecosystems if fish passages are not incorporated. • **Expensive to Build and Maintain:** High initial investment and ongoing maintenance are required for long-term functionality. • **Flooding Risk Upstream:** Can cause water accumulation upstream, leading to potential flooding in extreme weather conditions.

Design Slope. As per the confirmation of the Engineering Team, canal slopes will either be protected or left as earthen slopes based on their condition and the available budget, which will be determined during the detailed design phase. For weak slopes, concrete lining and geosynthetic materials will be recommended for reinforcement. The feasibility of bio-engineering solutions will be assessed based on the specific site conditions of the project. The following is the comparison between the vegetated and concretized design slope:

Table 5: Slope Design Options Comparison

Concretized Canal Slopes	• Erosion Control: Concretized canal slopes provide strong erosion resistance, reducing sedimentation in water bodies downstream. This helps maintain water quality and prevents sediment-related ecological degradation. • Maintenance Needs: Concretized slopes generally require less maintenance compared to vegetated banks. They are easier to inspect and repair, reducing ongoing operational costs. • Habitat Impact: Concretized slopes typically offer limited habitat for aquatic organisms and vegetation compared to natural or vegetated banks. This can reduce biodiversity and ecological resilience in the waterway.

	• Heat Absorption: Concrete can absorb and retain heat, leading to higher water temperatures in the canal. This can affect aquatic life, especially sensitive species, and alter ecosystem dynamics. • Aesthetics: Concretized slopes may be perceived as less visually appealing compared to natural or vegetated banks. This could impact recreational use and community engagement with the water resource.
Vegetated Banks	• Erosion Control: Vegetated banks provide natural stabilization, reducing erosion by absorbing water, slowing runoff, and binding soil with root systems. They contribute to maintaining soil structure and preventing sedimentation downstream. • Biodiversity: Vegetated banks offer diverse habitats for aquatic and terrestrial species, promoting biodiversity and supporting ecological balance. They can serve as wildlife corridors and provide nesting sites for birds. • Water Quality: Vegetated banks act as buffers, filtering pollutants, and absorbing excess nutrients from runoff. This improves water quality and supports healthier aquatic ecosystems. • Temperature Regulation: Vegetation provides shade, helping to regulate water temperature and mitigate thermal pollution. This is particularly important for species sensitive to temperature fluctuations. • Community Benefits: Vegetated banks enhance the aesthetic value of the waterway, offering green spaces for recreation, relaxation, and cultural activities. They can also contribute to community engagement and ownership of the water resource.

Cross-Regulator/Off-Take Structure. The structure is required for all sub-schemes and specific size, number, and locations need to be assessed during DED stage. The calculation regarding the design specification need to consider the water requirement in each block of the sub-command areas.

Fish Passes/Sliding Gate. There is practice using fish passage in barrage or headworks across the river where environmental flow is available. The engineering team indicated that the option is not practical at the field level canal because the water flow at the hydraulic structures along the canal system need to be fully closed for some time for farmers to irrigate their system. However, the fish passage may be practical for OTP river and Svay Doun Keo river which needs to be assessed at the DED stage. Two fish passes are provided below:

Table 6: Slope Design Option Comparison

Vertical Slot Fish Passway:	• Biodiversity Risks:
	  ○ Habitat Fragmentation: Vertical slot fish passways can contribute to habitat fragmentation by interrupting the natural flow of rivers. This interruption can create barriers to fish migration, leading to isolated populations and reduced gene flow between different sections of the river.
	  ○ Species-Specific Challenges: Some fish species may face difficulties navigating through the narrow, vertical slots of the passway. Species with limited jumping abilities or specific habitat preferences may struggle to ascend or descend through the structure, limiting their access to essential spawning or feeding areas.
	• Environmental Risks:
	  ○ Sedimentation: Improperly designed vertical slot fish passways can alter flow patterns, leading to increased sedimentation downstream. Changes in flow velocity and direction can cause erosion of riverbanks and streambeds, resulting in sediment accumulation in downstream habitats. Excessive sedimentation can degrade water quality, smother benthic habitats, and reduce oxygen levels, harming aquatic life.
	  ○ Hydraulic Impacts: Vertical slot fish passways may create hydraulic conditions that are unsuitable for fish passage. High velocities and turbulent flows within the passway can impede fish movement and cause physical stress or injury. Additionally, rapid changes in water level or flow rate can disorient fish and hinder their ability to navigate through the structure.

Cone Fishway	• Biodiversity Risks
	  ○ Selective Passage: Cone fishways may not provide equal passage opportunities for all fish species. Some species may have difficulty navigating through the structure due to factors such as water depth, flow velocity, or hydraulic complexity. This selective passage can create barriers to migration for certain species, leading to reduced genetic exchange and population fragmentation.
	  ○ Altered Hydrology: Cone fishways can modify natural flow patterns within river systems, potentially altering habitat availability and quality for aquatic organisms. Changes in flow

	velocity, turbulence, and water depth can influence the distribution and abundance of fish and other aquatic species, impacting ecosystem dynamics and biodiversity.
	• Environmental Risks
	  ○ Habitat Modification: Construction of cone fishways may require alterations to river channels and banks to accommodate the structure. Channel dredging, bank stabilization, and other habitat modifications can disrupt natural riverine habitats and alter ecosystem processes. Changes in habitat structure and composition can affect the distribution of aquatic flora and fauna, leading to shifts in community composition and trophic interactions.
	  ○ Sediment Transport: Cone fishways can affect sediment transport dynamics within river systems, with potential implications for downstream habitats. Changes in flow velocity and turbulence induced by the structure can influence sediment deposition and erosion patterns, altering habitat availability and quality for benthic organisms and other aquatic life.

2.3.3 Project Technology

There are different technological options being proposed for the project activities. The key technological options are provided here:

Table 7: Irrigation System Options

Options	Component	Options	Description
Pumping	1	Diesel water pump	Traditional water pumping systems powered by diesel engines. These are commonly used in areas where electricity is unavailable but it has higher operational cost and environmental impacts. However, it can be used anywhere in the sub-scheme.
		Solar pumps	Sustainable and cost-effective water pumping systems that harness solar energy, suitable for remote areas with abundant sunlight. They offer lower long-term costs but may require higher initial investment.
		Electric pumps	Powered by electricity from the grid or other sources, these pumps are efficient but depend on the availability of consistent electrical supply which maybe inapplicable at farm level in most of the sub-scheme

IPM	1	Pesticide application	A conventional approach involving chemical pesticides to manage pests, often leading to quick results but with potential risks to health, environment, and biodiversity. The times of application without IPM will be up to 6 times as per the reported from the field survey.
		With IPM*	The application of pesticides will be reduced to only around 3 times, minimizing the impacts on the quality and health of water, environment, wildlife, fauna and flora, human and animal
Agromet	1	Without Agromet	Farming practices carried out without the use of weather and climate data, potentially leading to inefficiencies and higher vulnerability to climate risks.
		Agromet	Incorporates meteorological data and forecasts into agricultural decision-making, enhancing productivity, resource optimization, and resilience to climate variability. However, the major challenge is mainly the operational cost of the system.
SCADA**	2	Convention	Manual or semi-automated control systems for monitoring and managing operations, which may be labour-intensive and less efficient in handling complex systems.
		SCADA	Advanced digital systems that provide real-time monitoring, data analysis, and remote-control capabilities for improved efficiency and operational oversight.

*. IPM = Integrated Pest Management

**. SCADA = Supervisory Control and Data Acquisition

For pumping, there is a need to be case specific to each of the option. Applying these technological options are important since the technologies will facilitate the agricultural production and complimenting each other is needed. The promotion of only one (1) option would decrease the effective farming activities. Regarding the IPM, it is quite important to promote the technologies as it will reduce the negative impacts which will be caused by the farming activities. The application of agromet will require technical skill and management capacity

2.3.4 Project Scenario Analysis

In the without-project scenario, the net command area in OTB (14,874 ha), will continue to be cultivated with a cropping intensity of 155% (23,055 ha). This includes 14,131 ha of wet-season paddy and 8,924 ha of dry-season paddy. In addition, the land area for vegetable production within the sub-scheme is reported to be approximately 141 ha, approximately 1% of the total command area.[1] The without-project scenario suggests that continuation of ongoing agricultural

[1] MoP (2023). Commune Database 2023. Ministry of Planning.

practices in the project area, with suboptimal yields for rice cultivation and poor crop diversification resulting in low farmer income and high vulnerability to climate risk. With poor rice yield and agricultural productivity, there is the possibility that farmers will alternate their livelihood options to seeking for additional sources of income such as illegal fishing, hunting, and migrating to other areas for income making to feed their families. Without adequate water, their livelihood is highly depending on climate which tends to be highly variated over the past years with series of climate occurrence at a high level of severity and frequency, reported to be approximately occurred every two (2) years both drought and flood and 29% of migration rate. This would be likely to be accelerated when the level of climate impact continues to increase.

In the with-project scenario, it is anticipated that the net command area will be cultivated with greater intensity, increasing from one (1) cropping cycle to two (2) or three (3) cycles per year. This improvement is attributed to enhanced water availability, better water management, higher water transmission efficiency, and improved drainage as a result of the project's investments. The rehabilitation of existing irrigation canals and the construction of new ones will enable an increase in cropping intensity of up to 270%, covering 40,161 hectares. This will yield a net increase of up to 17,106 hectares with reliable irrigation access, including 26,776 hectares of wet-season paddy, 11,899 hectares of dry-season paddy, and 1,488 hectares of high-value crops, such as fruits and leafy vegetables.

The project is expected to deliver the following agricultural outcomes for the 8,130 farming households in the OTP scheme: i) improved yields for wet-season rice, ii) expanded cultivation area and increased yields for dry-season rice, and iii) the introduction of high-value crops like leafy and fruit vegetables for dry-season cultivation. These changes are projected to boost agricultural production, raise farmer incomes, and enhance farmer resilience to drought, pests, diseases, and market risks through crop diversification.

2.4 Proposed Investment

2.4.1 Key activities by Project Component

The project has three Components (summarized below). However, the ESCMP Ou Ta Paong will covers investment activities proposed under only Component 1 and Component 2.

Component 1. ***Improving farm-level climate adaptation, resilience, and water use efficiency***

The objective of this component is to build climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. This component is designed to address the lack of knowledge and skills to deploy technologies and practices at farm level by farmers and the lack of appropriate extension services to propagate them. It will introduce farmers with various climate resilient technologies and practices for both rice and non-rice activities such as vegetable production, poultry and aquaculture.

Sub-component 1.1 Deployment of farm-level climate adaptation and water use efficiency measures

Output 1.1: Increased capacity of farmers to deploy climate resilient (CR) practices at farm level

This output will focus on developing farmers' capacity in deploying CR technologies and practices to transform the agricultural production system to adapt to the changing climate context. Farmer's will be trained to first develop Action Plans (AP) to re-orient farmer behaviour and assist them in transforming the agriculture production system in a manner that is better adapted to factoring in the agro-ecological context and expected climate change impacts.

- Activity 1.1.1 Preparation of community-based action plans (AP) to transform agriculture with CR practices.
- Activity 1.1.2 Preparation of training materials to support implementation of the AP.
- Activity 1.1.3 Conduct trainings to create a pool of expertise to demonstrate and propagate the CR technologies and practices.
- Activity 1.1.4 Train farmers on applying CR technologies using the FFS approach.
- Activity 1.1.5 Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery.
- Activity 1.1.6 community-based monitoring and evaluation (CBME) of implementation

Sub-Component 1.2 Climate adapted, value added, and market led agricultural investments

Output 1.2 CR value added, and market led agriculture investments secured.

This output involves improving and enhancing some value chains that are key for the project area and include rice, vegetable, chicken and aquaculture value chains, through the use of Public Private Producer Partnerships (4Ps) and increased access to finance, which will improve market access, climate adaptability, and ensure increased income for smallholders in the value chains.

- Activity 1.2.1 Value chain study and planning
- Activity 1.2.2 Establish District Multi-Stakeholder Platforms (MSPs)
- Activity 1.2.3 Public Private Producer Partnership Facility (4PF)

Sub-component 1.3 Improve enabling conditions, capacities and disaster risk management strategies

Output 1.3. Increased access to and use of climate information and advisory services for climate responsive agriculture planning

This sub-component will strengthen the production and dissemination of tailored agro-meteorological information to inform climate responsive management and planning of agriculture in the project target areas through ICT technologies. The aim is to ensure that agro-meteorological services are accessible and useful to farmers to manage climate risks, access to and use of water and efficient cropping systems.

- Activity 1.3.1 Establish ICT based multi-disciplinary platform at provincial level.
- Activity 1.3.2 Building the capacities of the platform to deliver services.
- Activity 1.3.3. Establish the agromet information systems and the outreach mechanisms.
- Activity 1.3.4 Awareness raising and capacity building of farmers and stakeholders in applying the *services.*

Sub-component 1.4 Rural roads

Output 1.4: Increased resilience of farm road infrastructure to climate change

- Activity 1.4.1 Initial planning and identification
- Activity 1.4.2 Technical survey and design considerations, preparation of cost estimation
- Activity 1.4.3 Improve 50 Kilometers of farm roads.
- Activity 1.4.4 Handing over of the completed works.

Component 2: Irrigation Infrastructure for increased resilience

Component 2 will focus on rehabilitating/creating and modernizing hydraulic infrastructure, including canals, ponds, flood-proof infrastructure (river, drain) and to provide high-efficiency climate-resilient irrigation systems for adapting to both increasing flood and drought conditions. It will include support and capacity building to O&M operators at both, Provincial (PdoWRAM) and scheme (FWUC) level, to ensure the sustainability of the scheme. The output will secure and increase farmer's agricultural production by improving the irrigation supply and protect crops from water-related disasters.

Component 2 is linked with Component 1 such that it facilitates the implementation of CR on farm crop and water management practices through improved field level water supply delivery and drainage. It will focus on rehabilitating and modernizing of irrigation and flood protection/drainage infrastructure in the six sub-projects, including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions.

Sub-Component 2.1: Modernization of irrigation scheme and ponds

- Activity 2.1.1 Technical analysis, field surveys and preparation of plans for system upgrading.
- Activity 2.1.2 Implementation of infrastructure upgrading.

Activity 2.1.3 Preparation of canal O&M plans including application of ICT and SCADA for operation***Sub-Component 2.2: Flood-proofing and Drainage improvements***

- Activity 2.2.1 Establish flood monitoring, information, and early warning systems.

Activity 2.2.2 Strengthening and construction of flood control and drainage infrastructures.***Sub-Component 2.3: Establishments and training of Farmers Water User Communities (FWUC)***

- Activity 2.3.1 Formation of institutional strengthening of the FWUC

- Activity 2.3.2 Build technical capacities of FWCU for canal structure O&M
- Activity 2.3.3 prepare long term financing plan for O&M of the systems including the WUAS.

Sub-Component 2.4: Water information and Management (SCADA)

Component 3. Institutional Strengthening

Sub-Component 3.1 MOWRAM capacity Support.

Output 3.1 Strengthened MOWRAM Capacity

- Activity 3.1.1 Preparation of climate resilient design manuals for irrigation and train staff.
- Activity 3.1.2 Building capacities on application of ICT and RS technologies, data management.
- Activity 3.1.3 Capacity building in water Accounting and Auditing.

Sub-Component 3.2 Strengthening of NDA and NCDD.

Output 3.2 Improved capacities for climate action monitoring

- Activity 3.2.1 Preparation of Loss and Damage Strategy
- Activity 3.2.2 Strengthen national M&E process for climate action
- Activity 3.2.3 Enhancing Capacity of NDA and other stakeholders.

2.4.2 Tentative Schedule for Sub–scheme Implementation

By this time, the feasibility study for the Ou Ta Paong is under finalization to allow for the design process, procurement process and approvals. To implementation of the sub–scheme, the following assumptions have been made:

- The detailed design will start in January 2025; it will take two years to get a better understanding of the upstream hydraulic infrastructure, conduct additional survey and propose the best solution for a sustainable water supply of the scheme.
- The procurement process will not take more than three quarters.
- The work construction will start after the rainy season in Cambodia with a mobilization period (last quarter of the year);
- The work construction duration will not last more three dry seasons.

Hence the construction would be able to commence at the last quarter 2027, with completion by mid-2030.

Table 8: Tentative implementation schedule of Ou Ta Paong irrigation scheme.

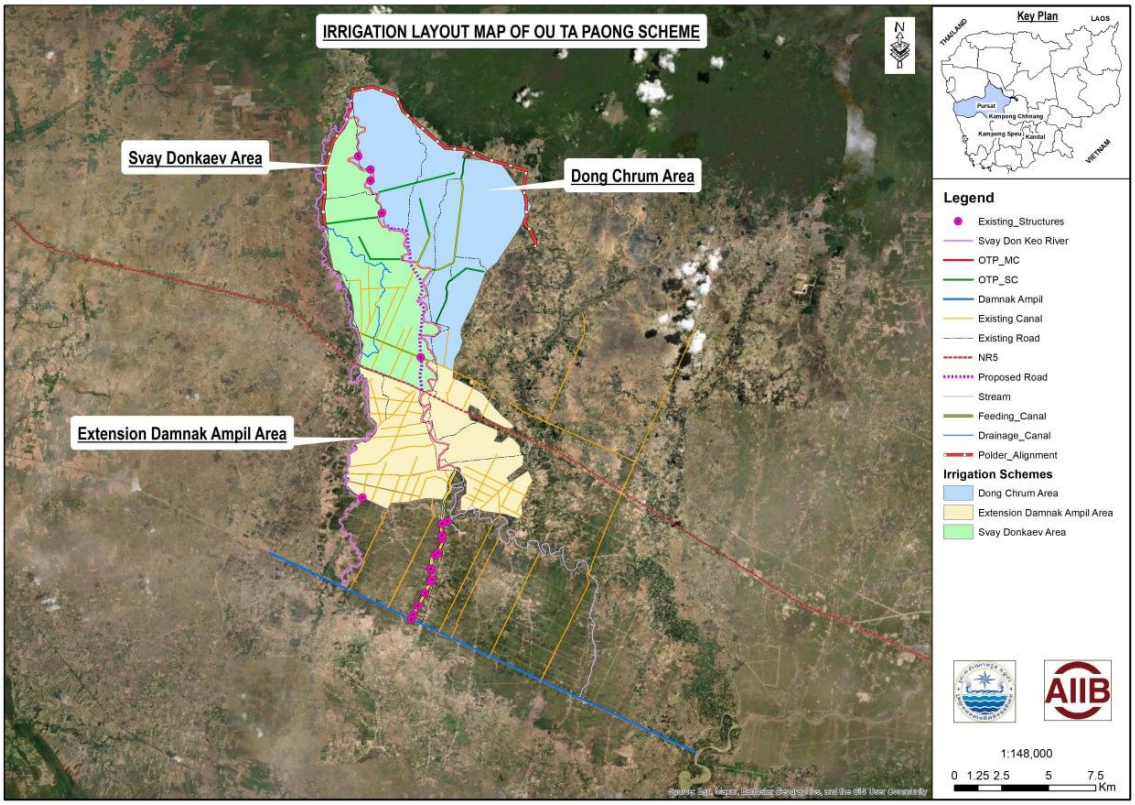
COMPONENTS, SUB-COMPONENTS, OUTPUTS AND ACTIVITIES	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
2.1.1 - Ou Ta Paong	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
Activity 2.1.1.1 - Pursat West Hydraulic system masterplan	●	●	●																					
Activity 2.1.1.2 - Detailed design			●	●	●	●	●	●																
Activity 2.1.1.3 - Procurement									●	●	●													
Activity 2.1.1.4 - Work construction and supervision												●	●	●	●	●	●	●	●	●	●	●		

2.5 Proposed Infrastructure

2.5.1 Design Concepts and Options

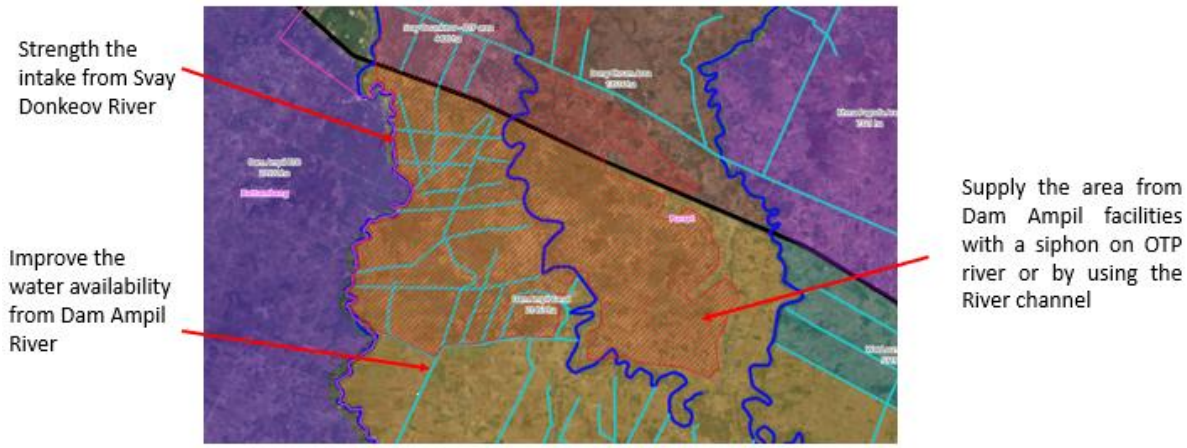
The Ou Ta Paong River system is divided into three (3) distinct blocks for irrigation purposes as per the block colour in Figure below. Block A, located south of National Road shaded in light yellow colour, is supplied by the Pursat River through the Dam Ampil Canal and upstream infrastructure, covering an area of 4,198 hectares. Some of the upstream infrastructure may require rehabilitation to increase its hydraulic capacity and fully irrigate the area. Block B, situated in the northwest and covering approximately 4,400 hectares shaded in light green colour, is currently supplied by the Svay Donkeov River. It relies on existing canals, which require upgrades to improve water delivery, with additional overflow from Block A and drainage from National Road 5 also contributing to water supply. Block C, in the northeast, covers around 6,276 hectares shaded in light blue colour and is the most challenging area to irrigate, as it depends on multiple sources of water, including the Svay Donkeov River, Kbal Canal, and Dam Ampil Canal, all of which require rehabilitation and upgrades to meet irrigation needs.

Figure 4: Three (3) blocks (sub-scheme) of Ou Ta Pong sub-project



(Source: CAISAR Project, 2024)

Figure 5: Concept design of Block A of Ou Ta Pa Ong Scheme

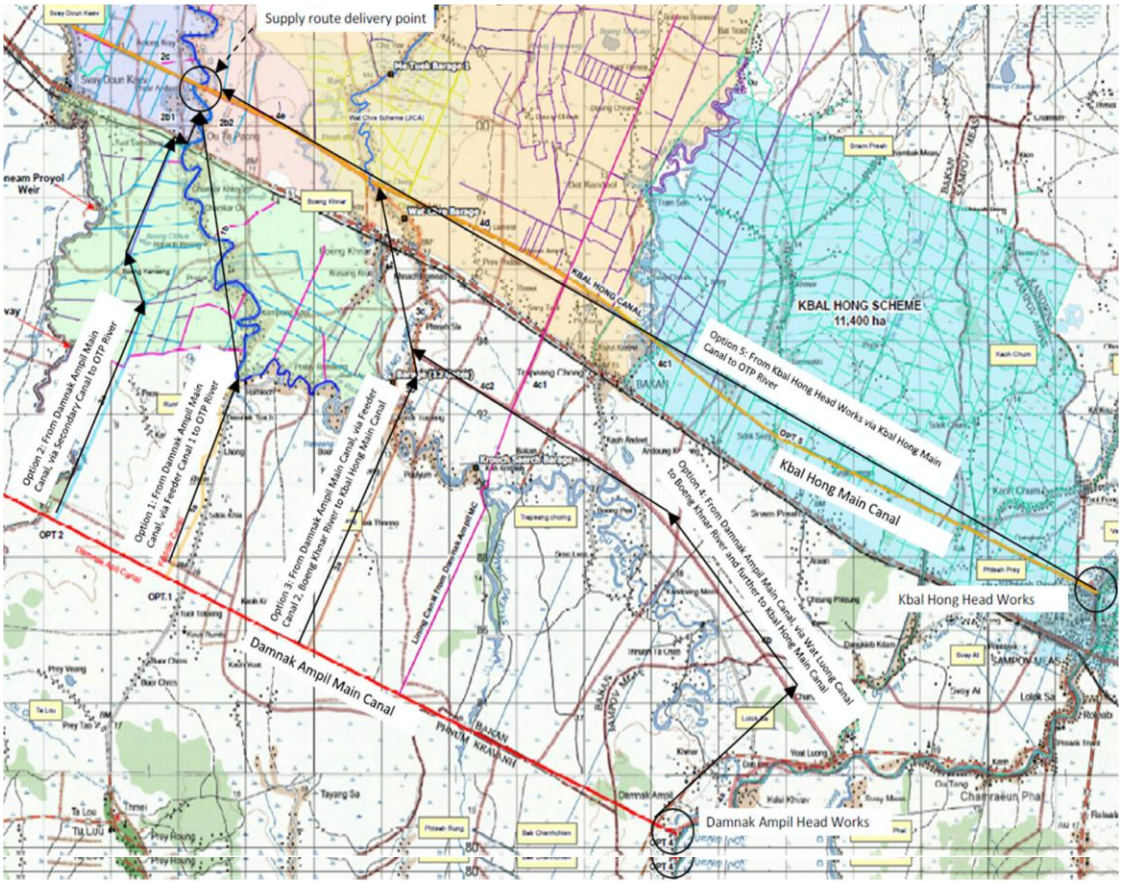


In addition, existing infrastructure along the Svay Donkeov river should be investigated at the design study to see if the western side can still be irrigated partially from the stream or directly from Dam Ampil Canal which intercept the river upstream. The eastern part is more difficult to be irrigated by Dam Ampil existing infrastructures as the Ou Ta Paong River creates a natural upstream barrier. Five options were proposed and considered (described bellow). But only three options were finally selected to proceed with detailed design: including Option 1, Option 3 and Option 5 (See Figure 6):

- **Option 1**: The option will release part of the required water of the Damnak Ampil secondary canal to the Ou Ta Paong River and create necessary work rehabilitation/ construction to divert the extra flow to the eastern area (river rehabilitation under component 2.2 and river diversion). The canal is routed from Damnak Ampil Headwater (DAHW), via Damnak Ampil Main Canal (DAMC) (18.7 km), via the Secondary Canal (‘Feeder Canal 1’, 8.8 km), into OTP River, and via OTP River’s section (13.8 km) South of the National Road to the supply point. The totaltotaltotal length of this route is 41.3 km.
- **Option 3**: Parallel to Option 1, the canal will additionally release water from Damnak Ampil but extended further reaching Kbal Hong Canal, then continues to Ou Ta Paong River. **Route description:** From DAHW, via DAMC (16.7 km), via the Secondary Canal at km 16.7 (‘Feeder Canal 2’, 6.1 km), into Boeng Khnar River’s section (9.9 km) South of the National Road to Wat Chrey Head Works, and via link canal (0.5 km) into KHMC, and via KHMC (7.2 km) to the supply point. Total length of this route is 40.4 km.
- **Option 5:** The option begins at Kbal Hong barrage at Pursat provincial town involving the enhancement of the Watergate height and the distance of carrying water will be approximately like Option 4. However, the increase in the height of the Watergate will cause inundation of the upper area of the Pursat River which may cause flooding in the town. This may bring in huge discontentment of the people in the city as height water level may cause in delay of storm water flow during raining period. The route is from Kbal Hong Head Water (KHHW), via Integrated Water Resources Management (IWRM) Kbal Hong

Main Canal (KHMC) (17.0 km) into KHMC Extension (17.0 km) to the supply point on OTP River. The total length of this route is 34.0 km.

Figure 6: The Selected 3 Options



(Source: CAISAR Project, 2024)

2.5.2 Types of Infrastructure and Design

The Ou Ta Paong sub-project utilize water from the Pursat River and Svay Don Keo. It integrates nature-based solutions such as the restoration of the Ou Ta Paong River, fish passages on Don Keo and OTP, and natural management of Tonle Sap floods. The project includes 35 solar pump installations. Canal infrastructure development comprises a main/feeder canal of 8 km with 29 structures, secondary canals totalling 65.8 km with 121 structures, and tertiary canals extending 198.5 km with 1,591 structures. Additionally, there are 36.3 km of drains and 21 km of flood embankments with five (5) structures. Storage solutions include local ponds, fish refuges, and two (2) existing reservoirs within the Pursat catchment, with the Pursat Dam 1 hydropower project under construction and Dam 2 water storage. Please see also Table 9.

Table 9: Ou Ta Paong Sub-Project Key Characteristics

Sub Project	Ou Ta Paong
Area Cultivated (ha)	13,000
Water Source	Pursat River and Svay Don Keo

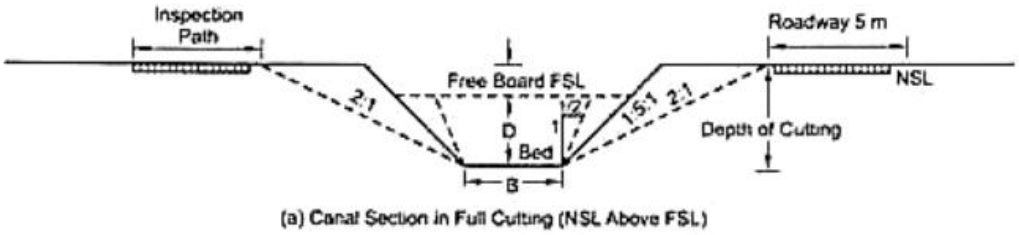
Nature Based Solution[2]	Restoration of Ou Ta Paong River, fish passage on Donkeo and OTP, Natural Management of TS floods.
Solar Pump Installations	35 (Not suitable in flood areas)
Main/Feeder Canals C/L(km)/N	1_8.0km_29
Secondary Canal C/L (km)/N (Existing)	8_30.0km_ 13_35.8km_108
Tertiary Canal C/L (km)/N Exist	34_47.5km 139_151.0km_1452
Main/Secondary Drains (C/L km/N)	7_36.3km_15
Storages	Local Ponds and fish refuge. Storage within OTP river. 2 Existing reservoirs in Pursat catchment, Pursat 1 hydropower under construction
Land Area of Canals (Existing proposed Ha)	299_575
Cost Estimate (USD/m)	70.8
Cost/ha $	5,450

The latest decision on the infrastructure in OTP confirmed that the polder system is no longer needed, and the focus is given to the existing canal system only. The key components of OTP include a canal system with concrete linings, and water regulation structures. Two (2) tertiary canal options are proposed, one (1) using diesel pumps and another employing solar-powered pumps for improved sustainability. Expansion of existing feeder canals is also planned, though specifics remain subject to change. The following are the conceptual design for each of the design where the detail design is supposed to be considered:

Canal. The design of the canal system (Figure 7) aims to serve both irrigation and drainage functions, considering the topography, limited water resources, and potential land resettlement issues. Where possible, the canals will follow existing paths to minimize social impacts. The size of the canals will be adjusted based on the irrigated area and the local topography. To ensure long-term sustainability and reduce water loss through percolation, it is recommended to construct the main canals using concrete linings or suitable alternatives. This approach will help maintain water distribution efficiency and improve the durability of the infrastructure.

[2] Nature-Based Solution, in this case is the restoration of the river system through dredging, is applied to contribute to the recovery of the natural condition of the Ou Ta Paong as the system has already been deteriorated due to over water abstraction and blockage of the river system while the restoration of fish passage/sliding gate is going to be decided at the time of DED since no specific design being considered at this stage.

Figure 7: Typical canal section in full cutting

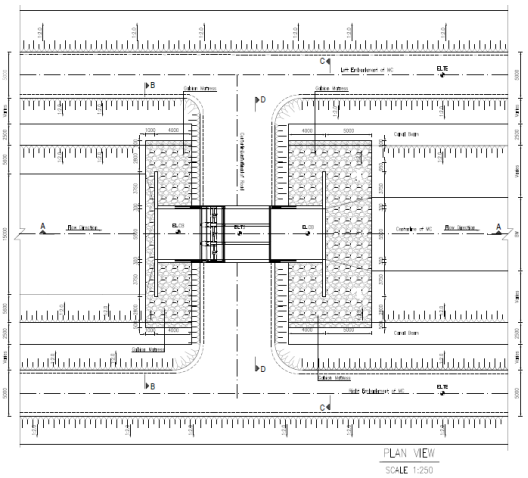


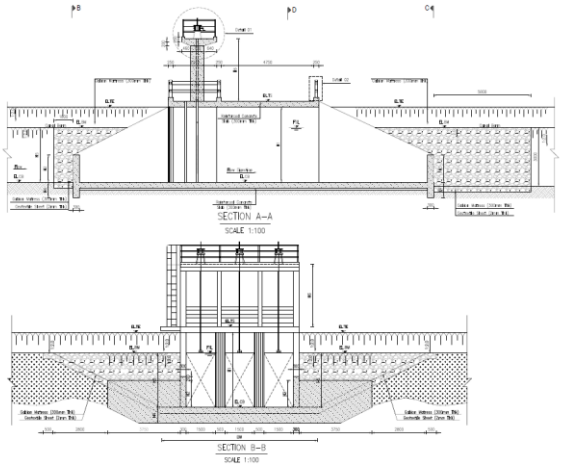
River Training and Drainage: A well-designed drainage system will be a critical component of the project, intended to manage excess runoff during the rainy season and prevent waterlogging in the command area. This system will also serve as the outlet for the on-farm drainage network, which is designed to control groundwater levels and drain surplus irrigation water. The layout of the drainage system will be based on the main natural drainage channels, upstream watersheds, rainfall over the command area, and changes in water levels in the Tonle Sap. It will also consider land use, crop types, and the planned irrigation systems to ensure efficient water management.

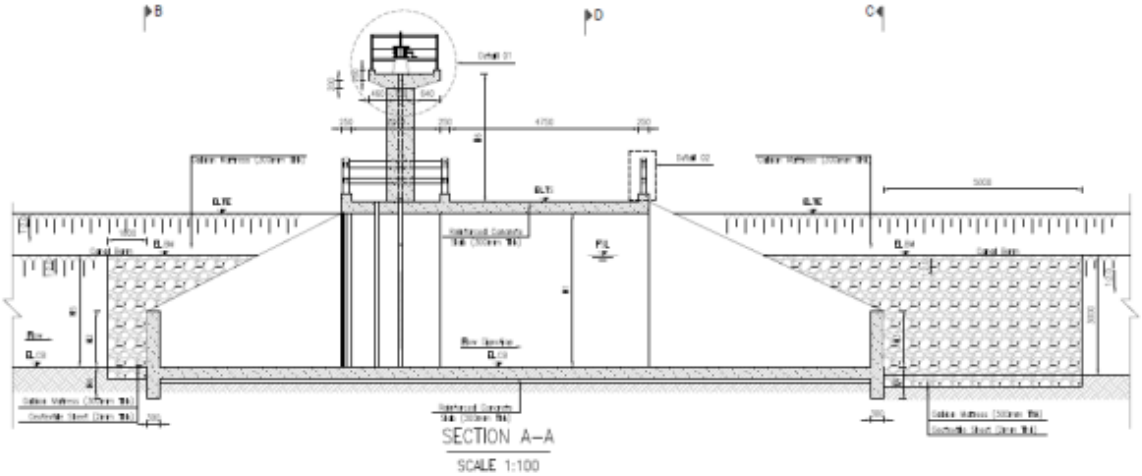
Water Regulation and Off-Take Structures: Water will be diverted from multiple sources into the main canals according to water availability and a demand schedule prepared by the FWUC and PDoWRAM, based on crop needs. Various cross structures (off-take structures) will be installed to maintain the full supply level in the main and secondary canals where necessary. The flow of water into each canal will be controlled by operating the gates of the head regulators, ensuring efficient delivery to the tertiary canals, which will distribute water to individual fields. Farmers will have the option to irrigate their plots either through plot-to-plot irrigation or by constructing field ditches through the diversion of water using these off-take structure (See also Figure 8).

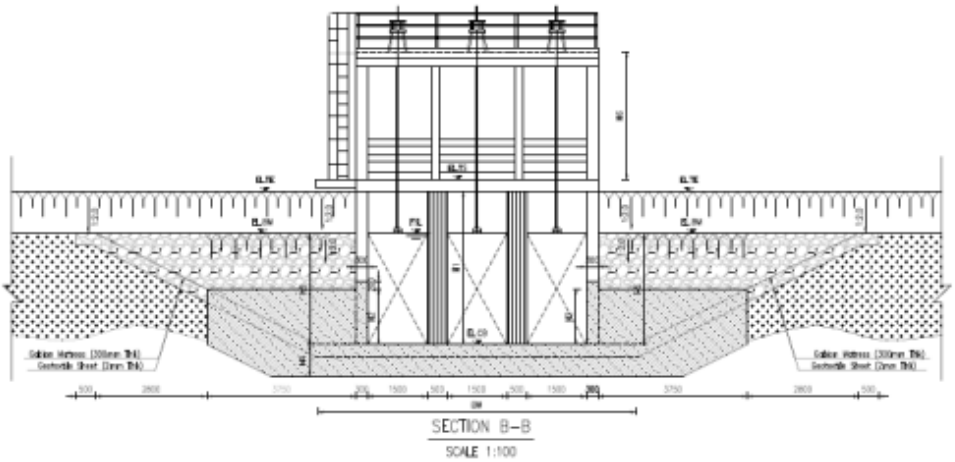
Figure 8: Pictures and design layout of a typical regulator or off-take structure at a canal section

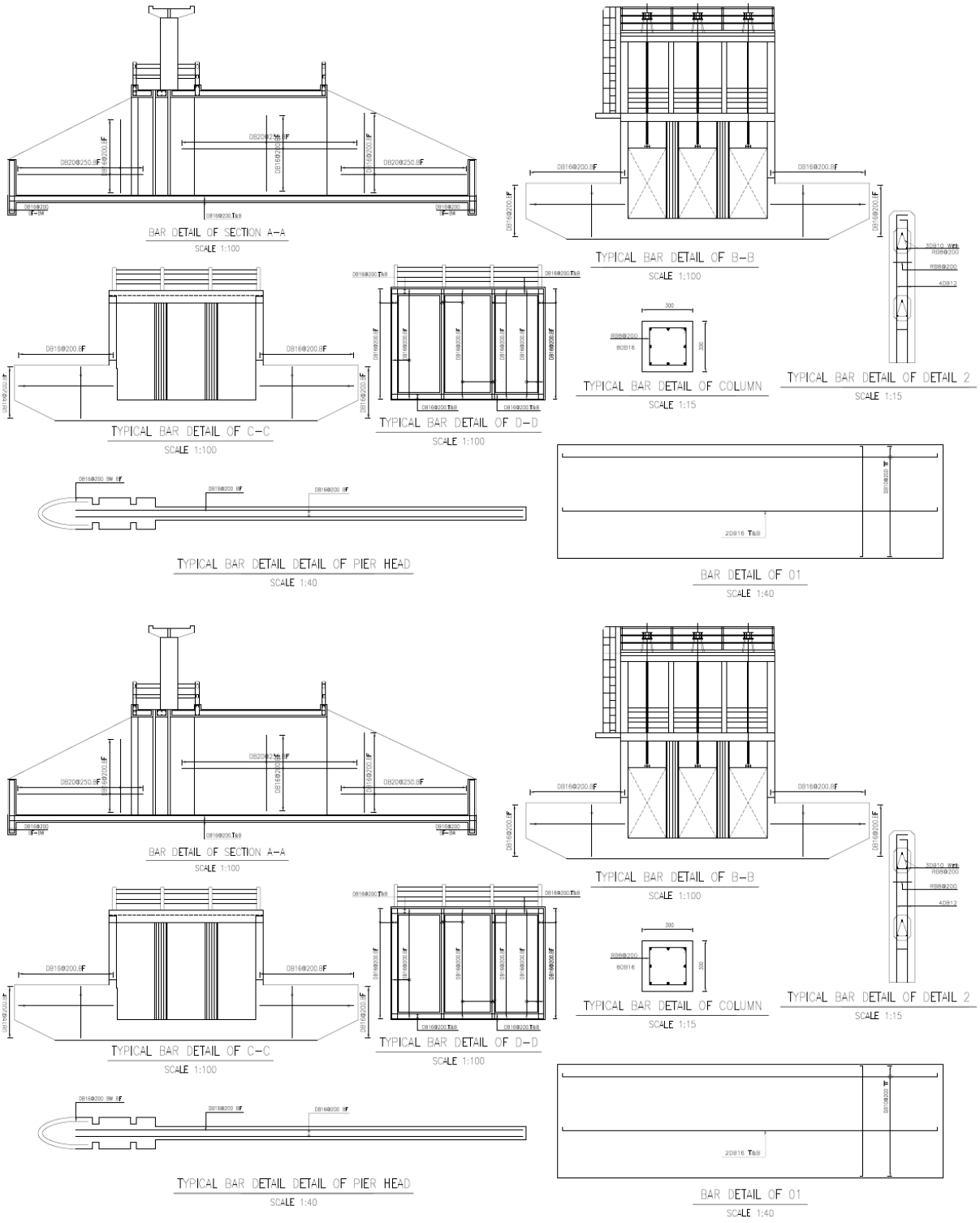



PLAN VIEW
SCALE 1:250


SECTION A-A
SCALE 1:100
SECTION B-B
SCALE 1:100


SECTION A-A
SCALE 1:100


SECTION B-B
SCALE 1:100



BAR DETAIL OF SECTION A–A
SCALE 1:100
TYPICAL BAR DETAIL OF B–B
SCALE 1:100
TYPICAL BAR DETAIL OF C–C
SCALE 1:100
TYPICAL BAR DETAIL OF D–D
SCALE 1:100
TYPICAL BAR DETAIL OF COLUMN
SCALE 1:15
TYPICAL BAR DETAIL OF DETAIL 2
SCALE 1:15
TYPICAL BAR DETAIL DETAIL OF PIER HEAD
SCALE 1:40
BAR DETAIL OF 01
SCALE 1:40

Tertiary System: The irrigation system design extends to the tertiary canal level, which is the final distribution point before water reaches individual plots. Two (2) options are considered for the tertiary canals. The first option involves creating traditional tertiary canals through excavation, where farmers will individually pump water using diesel pumps based on their needs. However, this requires significant cooperation from beneficiaries, as canal alignment must be accepted

without land compensation. The second option is to install collective solar pumping stations, a more sustainable and cost-effective solution that eliminates the need for diesel pumps and reduces CO2 emissions.

Collective Solar Pumping System: The project aims to implement a solar-powered pumping system as a low-tech, sustainable alternative to diesel pumps, with a pilot test covering 30-50 hectares in each irrigation block. The solar pumping system requires minimal maintenance and has no fuel costs, making it an environmentally friendly and cost-effective solution for farmers. The southern part of Block A is particularly suitable for the implementation of this system due to its proximity to villages and protection from floods. The solar pumping system could cover 4,198 hectares with 80-90 units, improving water efficiency by 20% and reducing the risk of land conflicts along the canal alignment. This system would ensure reliable water delivery and support sustainable agricultural practices.

2.6 Implementation Resources Requirement

2.6.1 Labour and Workforce

Table 10 outlines the estimated labor requirements for the construction of the irrigation system under the CAISAR project. Four main groups of the labor forces include: Direct Workers, Contracted Workers, Primary Supply Workers, and Other Stakeholders. The Direct Workers include individual consultants and members of the Project Implementation Unit (PIU), who are essential from the project preparation phase through to completion. The Contracted Workers, engaged by the PIU and construction contractors, consist of national specialists such as Detailed Design Consultants and Construction Supervision Consultants, as well as skilled and unskilled laborers. This group is engaged on intermittent basis. The Primary Supply Workers are mostly local workers involved in providing services to the project at local level during construction, while Other Stakeholders include civil servants from various government ministries and departments, such as MoWRAM, NCDDS, and MEF are technical support. Ou Ta Paong has the highest number of workers in most categories as it is the largest sub-scheme, given 80 skilled workers and 150 unskilled workers while only 40 skilled and 60 unskilled workers.

The involvement of local workers and civil servants is a key feature of the labor requirements. Local workers are heavily engaged as unskilled laborers and primary supply workers, emphasizing the project's reliance on local resources and its potential to create employment opportunities in the region. Additionally, civil servants from ministries such as MoWRAM, NCDDS, and MEF play a significant role, particularly during the construction phase, ensuring compliance with safeguards and providing technical and administrative support. The total estimated labor requirement of 393 workers demonstrates the scale and complexity of the CAISAR project, requiring careful coordination among consultants, contractors, government agencies, and local communities to ensure successful implementation.

Table 10: The estimated influx labor within the sub-schemes

Type of project workers	Characteristics of project workers	Duration of Labor Requirements	Total
Direct Workers			
PIU's member MoWRAM & NCDDS	Individual consultants (e.g., E&S Specialists, Design Engineers, Construction Supervision Engineers, etc.	From project preparation till project completion	20
Contracted Worker			
Engaged by PIU			
Detailed Design Consultant	National specialists	From project preparation until project completion	15
Construction Supervision consultant	National specialists		15
Independent E&S Monitoring Consultant		One (1) month in very six (6) months	10
Technical Assistance			15
Engaged by construction contractors			
Skilled workers	National specialists	Durations vary, depending on construction stages & needs.	80
Unskilled workers	Local workers (around subproject location)		150
Primary Supply Workers			
Workers producing materials for core project activities	Mostly local workers	Construction stage	30
Other Stakeholders Working in Connection with Project			
Civil servants of MoWRAM, PDWRAM at provincial & district level	SEO safeguard team	The construction stage of the project.	18
Civil servants of NCDDS	Staff of NCDDS	From project preparation until project completion	15
Civil servants of MEF	Staff of GDR	From project preparation until project completion	10
Civil servants of relevant Ministries	Staff	The construction stage of the project.	15
Total			**393**

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, E&S = Environmental and Social, NCDDS = National Committee for sub-National Democratic Development Secretariat, PDWRAM = Provincial Department of Water Resources and Meteorology, SEO = Social and Environmental Officer, MEF = Ministry of Economy and Finance, GDR = General Department of Resettlement.

2.6.2 Power Usage

During the construction, the project requires a reliable and sufficient power supply to support various construction activities including equipment operation, worker facilities, and site management. A significant portion of power consumption will be allocated to heavy machinery and equipment, including concrete mixers, cranes, drilling rigs, welding machines, water pumps, and earthmoving equipment such as excavators and bulldozers. These machines require high-power supply mainly from the self-propel engine using diesel or gasoline as the fuel whereas the power for lighting and security systems for general visibility on the construction site could be from the power grid as the location is accessible to power grid. Apart from machinery, electricity for worker facilities and site infrastructure can be the power grid or diesel generators. Worker camps will require power for lighting, cooking, air circulation, and mobile charging.

The overall power demand will vary based on the project's phase, the number of workers, and the type of equipment used. However, the estimate of the demand is far from actual since many information is lacking. The engineering team recommended to wait until the DED stage. A hybrid power system using a combination of grid electricity, and diesel generators. Efficient energy management strategies will help optimize power use, reduce costs, and minimize environmental impact.

2.6.3 Supporting Facilities

Several supporting facilities that are required for the construction activities include site offices and administrative facilities, worker accommodation and welfare facilities such as worker camps containing toilets, showers, handwashing stations, and kitchens to ensure proper hygiene and nutrition. A stable power supply is needed for machinery operation, lighting, and worker facilities, sourced from grid electricity, diesel generators, or solar panels can be the options. Additionally, wastewater treatment facilities are need to manage sewage and reduce environmental pollution for the camp sites.

Proper storage and material handling facilities is needed to protect construction materials such as cement, steel, and gravel. Transportation infrastructure and access roads is used to facilitate the movement of materials and personnel, with designated loading and unloading zones to streamline logistics. To ensure safety, security measures such as perimeter fencing, guard posts, and fire safety stations is needed. Furthermore, environmental management facilities such as waste segregation units, drainage systems, and recycling bins are also needed to minimize environmental impact. The specific layout and location of the facilities can only be projected at after obtaining the final design layout plan of the engineering team during the construction stage after the contract award.

2.6.4 Water Consumption

Water is needed for construction activities and domestic uses of workers. Water is essential for various activities, including material preparation, earthworks, equipment operation, worker sanitation, and site maintenance. A significant portion of water use is allocated to concrete and material preparation, where it is needed for mixing concrete, mortar preparation, curing, and soaking bricks or blocks to prevent rapid water absorption. Additionally, earthworks and dust

control require water for soil compaction, suppressing dust on unpaved roads, and softening the ground during grading and levelling. Water is also crucial for equipment and machinery operations, including cooling construction machinery, cleaning tools and formworks, and conducting hydraulic testing of pipelines to check for leaks and pressure integrity. In road construction and asphalt work, water is required for wetting base layers before compaction, mixing with bitumen, and cooling asphalt equipment. Estimate the quantity of water for such activities need the figure of the facilities. As per the consultation with the engineering team, it is not feasible to make an estimate on the water need for such a work since the scope of work including volume of excavated soil, volume of concrete to be used, and so on are not available.

The estimate of water needs for domestic use of the project associated workforce use the 70 liters per day[3] as the basis for the calculation. As the duration of engagement of staff and officials, workers, civil servants over the project life time are varied from one to another. The PMU staff engagement at the field is estimated at 3 days per month over the period of 6 years. The DED Consultant is estimated at 100 days per year for one year, following by construction supervision consultant at 250 days per year for 2.5 year, independent E&S Monitoring Consultant at 25 days per year for 3 years, technical consultant at 50 days per year for 3 years, skilled and unskilled workers at 250 days per year for 2 years, primary supply workers at 50 days per year for 2 years, officials for MOWRAM and PDoWRAM at 50 days per year for 6 years, and other officials at 40 days per year for 6 years. The result of the estimate for water demand is provided below:

Table 11: The estimated quantity of water for domestic use of the project

No.	Type of Workers	Total Workers	Number of Days at Field	Total Water Demand (liters/day)	Total Water Demand (m3)
1	PIU member MoWRAM & NCDDS	20	4,320	1,400	6,048
2	Detailed Design Consultant	15	1,500	1,050	1,575
3	Construction Supervision consultant	15	9,375	1,050	9,844
4	Independent E&S Monitoring Consultant	10	750	700	525
5	Technical Assistance	15	2,250	1,050	2,363
6	Skilled workers	80	40,000	5,600	224,000
7	Unskilled workers	150	75,000	10,500	787,500
8	Primary Supply Workers	30	3,750	2,100	7,875
9	Civil servants of MoWRAM, PDWRAM	18	5,400	1,260	6,804
10	Civil servants of NCDDS	15	3,600	1,050	3,780
11	Civil servants of MEF	10	2,400	700	1,680
12	Civil servants of relevant Ministries	15	3,600	1,050	3,780
	Total	**393**			1,055,773

[3] water-quantity.pmd

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, NCDDS = National Committee for sub–National Democratic Development Secretariat, E&S = Environmental and Social, PDWRAM = Provincial Department of Water Resources and Meteorology, MEF = Ministry of Economy and Finance.

The estimated water demand is mainly for needed during the construction period, given less than 1% of the estimated water is required for pre-construction stage.

2.6.5 Expected GHG Emission and Discharge

During construction, the construction activities will generate Greenhouse Gas (GHG) emissions from various activities, primarily due to the use of fossil fuels, electricity consumption, and material production. One of the major contributors to emissions is fuel combustion in heavy machinery and construction equipment, such as excavators, bulldozers, cranes, and trucks. These machines rely mainly on diesel fuel, which releases carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) into the atmosphere. Additionally, transportation of materials such as sand, gravel, cement, and steel to the construction site will also contribute to emissions through fuel consumption by trucks and other vehicles.

Another significant source of GHG emissions is the production and use of construction materials, particularly cement, steel, and asphalt. Cement manufacturing is known for high CO_2 emissions due to the chemical process of calcination, while steel production requires significant energy, leading to further emissions. The use of electricity for site operations, including lighting, worker accommodations, water pumping, and equipment, will also add to the overall carbon footprint, depending on the energy mix used. However, the exact amount of GHG emissions can only be determined after the detailed engineering design is completed, which will provide specific information on construction scope, number and size of equipment usage, and material requirements. Future calculations should take into account project-specific data to ensure a more accurate estimation of the environmental impact.

2.6.6 Land Acquisition for Material Storage

To support construction activities, contractors will need to rent land or engage local households to store materials and vehicles. This land will be used for essential contractor facilities, such as temporary storage areas, worker accommodations, and machinery stations. Securing this land is critical for ensuring efficient operational logistics and smooth construction management throughout the project. Ou Ta Paong, being the largest sub-scheme, is estimated to require the highest allocation. Overall, it is projected that a total of 10 households or land units will be needed for Ou Ta Paong.

2.7 Project Area of Influence

2.7.1 Definitions

Under Ou Ta Paong sub–scheme, term "Areas of Influence" (AoI) comprise, as appropriate, areas that are likely to be affected by the following:

(i) **Project activities**, including i) project activities and the facilities under Component 1 and Component 1 that are directly owned, operated or managed (including by contractors) and; ii) the impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or indirect project impacts on biodiversity, or on ecosystem services upon which affected communities' livelihoods are dependent;

(ii) **Cumulative impacts**[4] that result from the incremental impacts (direct and indirect) from a) project activities proposed under Ou Ta Paoing sub–scheme on the project command area, and b) Ou Ta Paoing sub–scheme, and combined cumulative effect from Ou Ta Paoing sub–scheme, past and planned projects, on the area downstream the Ou Ta Paoing sub–scheme, and other relevant projects; and

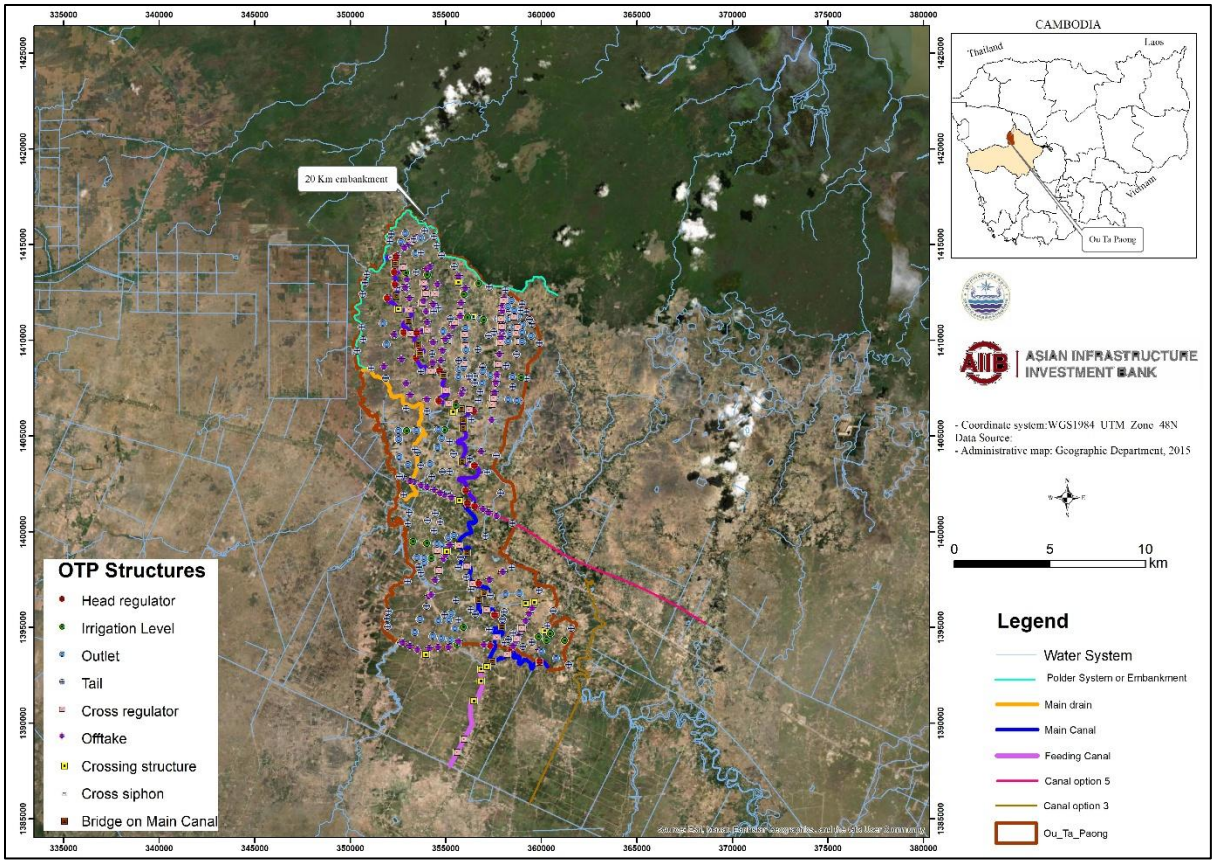
(iii) **Associated facilities** are facilities not included in the Project set out in the Legal Agreements governing the Project, but they are: (a) **directly** and **materially** related to the Project, (b) **carried** out, or **planned to be carried out**, **contemporaneously** with the Project; and **(c) necessary** for the Project to be **viable** and would **not be carried out if the Project did not exist**".

2.7.2 Areas of Influence of Ou Ta Paong Sub–scheme

Under CAISAR, since project design for Ou Ta Paoing is still ongoing, the area of influence for Ou Ta Paoing is anticipated based on: a) target command area of each scheme (where most proposed project activities will take place during project construction, and later during project operation), and b) the environmental footprint that are likely caused by project activities during project construction (as direct and indirect impacts due to activities under Component 2), and by project activities (mainly cumulative impacts due to intenstified crop production activities under component 1).

Figure 9: Locations of irrigation structures in Ou Ta Paong

[4] Cumulative impacts are limited to those impacts generally recognized as important on the basis of scientific concerns and/or concerns from Affected Communities.



Based on investment activities proposed under project component 1 (improved crop production) and component 2 (improved irrigation access), the sub-scheme's area of influence is defined by the following investment activities:

- **Command area:**
  - Areas with increased number of crops per years (under Component 1)
  - Specific location where existing irrigation canals are repaired/improved, extended (at selected location at tertiary level), new small-scaled water gates
- **Construction areas** (mostly inside command areas)
  - Workers' camps
  - Areas where construction materials are stockpiled and machineries and construction vehicles are parked, repaired, operated during construction process.
  - All routes used by contractors and subcontractors for operation of vehicles and machinery for construction (e.g. access roads, communal roads)
- **Road networks**
  - All roads, routes that connect the construction sites and the sites that are used as a) disposal site, b) construction material supply site, c) borrow pits, d) quarries, etc.

- **Disposal site(s), borrow pit(s)**
- **Any area affected by environmental footprint**
    - As defined by the area subject to noise, vibration, air, soil, water pollution due to project activities.
- **Land impacts**
    - Any land area that are acquired for the purpose of expansion of irrigation canals (Compopent 2) and/or farm roads (Component 1).

It is noted that while direct and indirect impacts could be reasonably anticipated based on currently proposed scope of works and prior experience for similar works, cumulative impacts, particularly their spatial extent and severity (over the time) require collection of supporting scientific evidence from data collected under project's environmental and social monitoring program.

These above anticipated areas of influence need to be updated when more information becomes available to allow a more reliable assessment, particularly when project detailed design is completed, and construction measures proposed by construction constractors are identified. Future update on area of influence (at respective sub-scheme) will be made on the basis of updated environmental and social assessments once a) locations of construction sites, auxiliary facilities, and logistics operations are confirmed, and b) the full scope of the project's impacts (direct, indirect, and cumulative) is firmed up based on detailed engineering design (for Component 2) and project implementation approach (for Component 1).

3. LEGAL AND INSTITUTIONAL FRAMEWORK

Following a framework for effective project development as well as environmental sustainability, the project owner shall comply with the national legal framework and protocols ratified by the Kingdom of Cambodia. For CAISAR Project, there are national laws, agreements, guidelines and relevant legal instruments as described below:

3.1 Royal Government of Cambodia's Legal Framework

3.1.1 National legal framework

3.1.1.1 The Constitution of the Kingdom of Cambodia (1993)

The Constitution is the highest legal authority in Cambodia and establishes the fundamental rights and duties of citizens and the state. It sets the groundwork for environmental protection, governance, social inclusion, and public well-being, ensuring that environmental and social rights are integrated into national laws.

3.1.1.2 Legal Framework on the Management and Conservation of Natural Resources and Biodiversity

This framework aims to ensure sustainable use and conservation of Cambodia's natural resources, including water, land, biodiversity, and ecosystems. Laws under this framework help guide ESCIA processes to minimize environmental degradation.

- **Royal Decree on Protected Areas (2008)** sets the standard for managing Cambodia's protected areas. It categorizes these areas into **National Parks**, **Wildlife Sanctuaries**, **Protected Landscapes**, and **Multiple-Use Areas** to conserve biodiversity, ecosystems, and cultural heritage while supporting sustainable development.
- **Law on Environmental Protection and Natural Resource Management (1996)**: Establishes principles for sustainable development and environmental protection, requiring environmental assessments for projects impacting natural resources.
- **Environmental and Natural Resources Code 2023**: Provides a comprehensive approach to natural resource governance, setting standards for the sustainable management of resources.
- **Law on Land Management, Urban Planning and Construction (1994)**: Governs land use, urban development, and construction to ensure that environmental and social impacts are mitigated.
- **Law on Water Resource Management (2007)**: Regulates water usage, conservation, and management, ensuring that development projects do not negatively impact water resources.
- **Law on Fisheries (2006)**: Focuses on sustainable fisheries management and biodiversity conservation in aquatic ecosystems, crucial for ESCIA in projects affecting water bodies.
- **Protected Areas Law (2008)**: Establishes protected areas to conserve biodiversity and natural resources, ensuring that development projects respect these protected regions.
- **Land Law (2001)**: Regulates land ownership and management to promote sustainable land use practices.
- **Forest Law (1994):** Regulating the management, use, protection, and restoration of Cambodia's forests, this law is crucial for balancing economic development with environmental conservation, particularly in biodiversity-rich ecosystems.
- **Biodiversity Law (2009):** This foundational law provides a comprehensive legal structure for the sustainable management of biodiversity resources. It addresses habitat protection, species conservation, genetic resource management, and the sustainable use of biodiversity, outlining the government's responsibilities and promoting public participation.
- **Sub-Decree on Water Pollution Control (1999)**: Sets standards for water quality and pollution control in development projects.

- **Sub-Decree on Water Quality Standard for Public Waters for the Purpose of Biodiversity Conservation (1999):** These standards aim to maintain conditions suitable for aquatic ecosystems by limiting pollutants, ensuring water remains safe for the survival and reproduction of aquatic life, and preventing ecological degradation.
- **Sub-Decree on Environmental Impact Assessment (1999)**: Requires EIA for development projects, ensuring environmental impacts are assessed and mitigated.
- **Sub-Decree on Air Pollution Control and Sound Disturbance (2000)**: Provides standards to control air pollution and noise disturbances from development projects.
- **Sub-Decree on Solid Waste Management (1999)**: Governs solid waste management in projects, preventing environmental harm from improper waste disposal.
- **Prakas on Environmental Impact Assessment Reports (1999)**: Offers guidelines for preparing EIA reports to ensure thorough assessment of environmental impacts.
- **Prakas on Hazardous Substances (2015)**: Sets limits on the disposal of toxic substances, preventing environmental contamination from hazardous materials.
- **Biodiversity Convention (1994)**: Focuses on conserving ecosystems, species, and genetic diversity. Promotes sustainable use of resources, establishment of protected areas, and fair benefit-sharing from genetic resources.
- **Nagoya Protocol (2010):** As a party to the Nagoya Protocol under the Convention on Biological Diversity (CBD), Cambodia commits to the fair and equitable sharing of benefits arising from the utilization of genetic resources. This protocol supports Cambodia's efforts to protect its biodiversity while ensuring that the benefits of its genetic resources are shared with local communities and stakeholders.
- **Ramsar Convention (1999)**: Aims to conserve wetlands of international importance for biodiversity, water management, and climate resilience. Encourages sustainable use and designation of Ramsar sites.
- **UNFCCC (1994)**: Provides a framework to combat climate change impacts on ecosystems. Supports sustainable land use, forest conservation, and integration of climate adaptation into conservation strategies.
- **Kyoto Protocol (1997, entered into force 2005, Cambodia accessed 2002)**: Strengthens the UNFCCC by setting legally binding targets for reducing greenhouse gas emissions, promoting sustainable development and renewable energy.
- **Vienna Convention for the Protection of the Ozone Layer (1988, Cambodia accessed 2001)**: Aims to protect the ozone layer through global cooperation, encouraging research, monitoring, and measures to phase out harmful substances.
- **Montreal Protocol on Substances that Deplete the Ozone Layer (1987, entered into force 1989, Cambodia accessed 2001)**: A legally binding treaty to phase out ozone-depleting substances. Contributes to environmental and climate protection.

- **Basel Convention (1992, Cambodia accessed 2001)**: Controls the transboundary movement of hazardous wastes and their disposal, emphasizing waste reduction and environmentally sound management.
- **United Nations Convention to Combat Desertification (1996, Cambodia ratified 1997)**: Addresses land degradation and desertification through sustainable land management, conservation of soil and water resources, and restoration of degraded land.
- **CITES (1975, Cambodia ratified 1997)**: Regulates trade in endangered species to ensure their survival, focusing on sustainable management and combatting illegal wildlife trade.
- **UNESCO Network of Biosphere Reserves (Cambodia joined in 1997)**: Promotes the sustainable management of biodiversity, ecosystems, and cultural heritage through conservation and sustainable development practices.
- **Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs)**: Cambodia committed to global goals for environmental sustainability, including biodiversity conservation, climate action, and ecosystem protection.
- **ASEAN Agreement on Transboundary Haze Pollution (2006)**: Focuses on preventing and mitigating air pollution caused by forest fires through regional cooperation and sustainable forest management.
- **ASEAN Agreement on Disaster Management and Emergency Response (2009)**: Strengthens disaster preparedness, risk reduction, and environmental resilience in the ASEAN region.
- **Mekong Agreement (1995)**: Promotes sustainable development, equitable water use, and conservation of the Mekong River Basin's ecosystems and resources.

3.1.1.3 Legal Framework on Labour, Public Well-Being, and Safety

This framework emphasizes the protection of workers' rights, public safety, and well-being in project development. It ensures that development projects comply with labor laws and safety standards.

- **Labor Law (1997)**: Protects workers' rights, ensuring safe and fair working conditions during project implementation.
- **Law on Roads (2014)**: Governs the construction and maintenance of roads, with provisions for minimizing environmental and social impacts.
- **Law on Road Traffic (2014)**: Addresses traffic management and safety measures to prevent accidents and disruptions during development.
- **Law on Suppression of Human Trafficking and Sexual Exploitation (2008)**: Protects vulnerable populations during project implementation from exploitation and trafficking.

- Government Occupational and Community Safety and Health (OHS) guidelines follow the OHS Program for Cambodia (2010-2013) developed by the International Labor Organization (ILO). The draft guidelines provide the framework for instituting OHS at the workplace and in the community.
- The Ministry of Labor and Vocational Training (MLVT) has the following guidelines which will be implemented during the construction phase of the Project:
    - MLVT Prakas on Sanitation at the Construction Site (March 2011). The Prakas sets to ensure that the sanitation and safety conditions are fulfilled for workers at construction sites by owners, directors, contractors or subcontractors of construction establishments or construction companies. Articles 3 and 4 ensure that workers are provided with shelter, sanitation facilities and safe potable water for drinking and washing.
    - MLVT Prakas on The Protection of Risk Resulting from Climate Change at Construction Sites (March 2011). Articles of this Prakas require safety measures and break times for workers at the construction site during extreme weather events.
    - MLVT Prakas on Providing of Information at the Construction Site (March 2011). This Prakas states requirements for owners or responsible persons of a construction site to provide information, i.e. name and address of the owner of enterprise, construction establishment, Construction Company, name and address of architect, nature of construction, date for the start of the construction, estimated time to finish the construction works, and estimated number of workers to be employed for construction activities.
    - MLVT Prakas on Stock of Materials, Waste Disposal and Clearance at Construction Site (March 2011). This Prakas provides safety guidelines and requirements for the safe storage of construction of materials and waste.

3.1.1.4 Legal Framework on Governance and Social Inclusion

This framework ensures that development projects promote inclusive governance, respect cultural heritage, and safeguard social rights. It includes provisions for tax obligations, land acquisition, resettlement, and social protection schemes.

- **Law on Taxation (1997)**: Governs the taxation of development projects, ensuring they contribute to national revenue and economic sustainability.
- **Sub-Decree on Construction Permit (1993)**: Requires permits for construction activities, ensuring they comply with environmental standards and social safeguards.
- **Law on Protection of the Rights of Persons with Disabilities (2009)**: Ensures that development projects consider the needs and rights of persons with disabilities.
- **Law on Social Security Schemes (2002)**: Provides social protection for workers, ensuring their well-being during project execution.
- **Sub-Decree on Health Care Scheme (2016)**: Extends social security and health care protection to workers involved in development projects.

- **Law on the Protection of Cultural Heritage (1996)**: Safeguards cultural heritage sites, ensuring that development projects do not damage or destroy culturally significant areas.
- **Expropriation Law (2010)**: Regulates land acquisition for public purposes, ensuring fair compensation and minimizing the impact on affected populations.
- **Sub-Decree on Land Acquisition and Resettlement (2018)**: Provides procedures for land acquisition and involuntary resettlement, particularly for externally financed projects.
- **Sub-Decree on Social Land Concession (2003)**: Allows for the allocation of state land to landless citizens, particularly when development projects displace communities.
- **Sub-Decree on State Land Management (2005)**: Regulates the management of state land, ensuring its sustainable use in development.
- **Sub-Decree on River Basin Management (2015)**: Promotes sustainable management of river basins, ensuring that development projects do not harm water systems and dependent ecosystems.

3.1.1.5 EIA Classification

In order to provide guidelines on effective implementation of sub-decree No 72 ANRK.BK on environmental impact assessment Procedures for development projects, MoE promulgated sub-decree No. 21 on Environmental Impact Assessment Classification for Development Projects.

According to this sub-decree, environmental impact assessment for projects is classified into three categories.

- Appendix 1: Projects requiring full environmental impact assessment (full ESIA)
- Appendix 2: Projects that require initial environmental impact assessment (IEIA)
- Appendix 3: Projects requiring the Contract on Environmental Protection (EPC)

The sub-decree includes an annex listing projects under various sectors and their categorization on the basis of their nature, type and size. The sector and EIA classification for irrigation project is summarized in Table 12 below.

Table 12: ESIA Classification for Development Projects relevant

No	Project Type	ESIA (Equiv. to ADB's A)	ESIA (Equiv. to ADB's B)	Env. Protection Contract	Apply to CAISAR Project
1	Irrigation systems		≥5000ha	1000-5000ha	√
2	Water diversion systems		≥5000ha	1000-5000ha	√
3	All building construction	>45000m2	15000 – 45000m2	3000-15000m2	
4	Road construction (new)	>100km	≥ 30 – 100km	10-<30km	√
5	Railroad and road expansion	>100km	≥50 – 100km	10-<50km	√

6	Road in protected areas	>30km	≥ 10-30 Km	10km	
7	Road widens or rehabilitation in protected area	>50km	≥ 10-50 km	10km	

Source: Prakas No. 021 PRK.BST dated 03 February 2020.

3.1.1.6 Applicable Ambient Quality Standards

Water quality standards in public water areas for biodiversity conservation are shown in Table 13 below. These are applied as the national standards on surface water quality.

Table 13: Water quality standards in public water areas for bio-diversity conservation

No	Parameter	Unit	Surface water Standard	
			River	Lake etc
1	pH	mg/l	6.5-8.5	6.5-8.5
2	Total suspended solids (TSS)	mg/l	25-100	1-15
3	Dissolved oxygen (DO)	mg/l	7.5-2.0	7.5-2.0
4	Biochemical oxygen demand (BOD5)	mg/l	1-10	<30
5	Chemical oxygen demand (COD)	mg/l	<50	1-8
6	Total Nitrate (TN)	mg/l	0.1-0.6	0.1-0.6
7	Total phosphorous (TP)	mg/l	0.005-0.05	0.005-0.05
8	Arsenic (As)	mg/l	<0.01	<0.01
9	Iron (Fe)	mg/l	<1	<1
10	Total Coliform	MPN/100ml	<5,000	<1,000

Note: Standard* = Surface water quality standards for lake, reservoirs and river of the MoE's Prakas on the adoption of terms of references for infrastructure and tourism sectors (2018).

The Royal Government of Cambodia has established a comprehensive policy on National Water Supply and Sanitation for both urban and rural water supplies. Based on this policy, and to ensure access to safe drinking water to all people, quality standards for both drinking water and groundwater are developed by an inter-ministerial process initiated by the Ministry of Industry, the Mines and Energy, and other concerned ministries with support from the World Health Organization (please see in table 14).

Table 14: Groundwater and Drinking Water Quality Standards.

No.	Parameters	Unit	Standard		
			River	Lake and reservoir	CDWQS*
1	Depth				
2	pH	-	6.5-8.5	6.5-8.5	6.5-8.8
3	Electrode Conductivity (EC)	mg/l	500-1500	500-1500	-
4	Arsenic (AS)	mg/l	<0.01	<0.01	0.05
5	Cadmium (Cd)	mg/l	<0.003	<0.003	<0.003
6	Lead (Pb)	mg/l	<0.01	<0.01	0.01
7	Total Nitrogen (TN)	mg/l	<3	<2	-
8	Total Phosphorus (TP)	mg/l	<0.25	<0.15	-
9	Total Dissolved Solid (TDS)	mg/l	<1000	<1000	<800
10	Total Suspended Solid (TSS)	mg/l	<100	<100	-
11	Dissolved Oxygen (DO)	mg/l	>3	>4	-
12	Total Coliform	MPN/100ml	<1000	<1000	0

*. Cambodia Drinking Water Quality Standard

Ambient Air Quality Standards are presented in Table 15. Maximum permitted noise levels in public and residential areas are shown in Table 16.

Table 15: Ambient Air Quality Standards.

Parameters	Cambodia				WHO Air Quality Guideline 2021
	Period 1h Average mg/m^3	Period 8h Average mg/m^3	Period 24h Average mg/m^3	Period 1year Average mg/m^3	
Carbon monoxide (CO)	40	20	-	-	4mg/m^3 (24h Average)
Nitrogen dioxide (NO2)	0.3	-	0.1	-	10 ug/m^3(1 year average) 25 ug/ m^3 (24h average)
Sulfur dioxide (SO2)	0.5	-	0.3	0.1	40 ug/ m^3 (24 h average)
Ozone (O3)	0.2	-	-	-	100 ug/ m^3 (8h average)
Lead (Pb)	-	-	0.005	-	-
Particulates	-	-	0.33	0.1	5 ug/m^3 (PM2.5, 1year) 15 ug/m^3

					(PM2.5, 24h average)

Note: 1. Sub-decree N0 42 ANRK.BK on Air Pollution Control and Noise Disturbance. Source: https://www.who.int/news-room/feature-stories/detail/what-are-the-who-air-quality-guidelines.

Table 16: Maximum permitted noise levels in public and residential areas (dB (A))

Location	**Cambodia Standard**			**IFC-EHS Guideline**	
	06:00 to 18:00	**18:00 to 22:00**	**22 to 6:00**	**Day 7:00 to 22:00**	**22:00 to 7:00**
Silence Area Hospital; Library, School, Nursery	45	40	35	55	45
Resident Area Hotel; Administration place, House	60	50	45	-	-
Commercial, Services Areas and mix	70	65	50	70	70
Small Industrial factories intermingling in residential areas	75	70	50		

Note: This is permitted noise level of any source of activity at the public and residential areas. Source: Sub-Decree on Air Pollution Control and Noise Disturbance, 2000.

3.2 AIIB'S ENVIRONMENTAL AND SOCIAL FRAMEWORK (ESF)

The Environmental and Social Framework (ESF) of the AIIB outlines the principles and standards to ensure environmentally and socially sustainable development practices for projects it finances. The framework consists of several Environmental and Social Standards (ESS) that provide comprehensive guidance on managing potential impacts and risks associated with AIIB-financed projects. The following AIIB's Environmental and Social Framework (ESF) apply to CAISAR.

- **Environmental and Social Standard 1: Environmental and Social Assessment and Management**: This ESS guides the assessment and management of environmental and social risks, requiring projects to evaluate alternatives, mitigate impacts, and disclose information. It emphasizes protecting the natural environment, particularly biodiversity and critical habitats, while addressing pollution, resource efficiency, and climate change. Social risks, including impacts on vulnerable groups, gender, and access to resources, must be considered. The standard also covers labor conditions, community health and safety, child labor, and security, ensuring proper grievance mechanisms, monitoring, and implementation plans.
- **Environmental and Social Standard 2: Land Acquisition and Involuntary Resettlement.** The ESS provides guidance to avoid Involuntary Resettlement where

possible. The requirements under the standard contain 18 points of action to which the executing agency needs to follow.

- **Environmental and Social Standard 3: Indigenous Peoples.** The ESS aims to design and carry out projects in a way that fully respects Indigenous Peoples' identity, dignity, human rights, economies, and cultures. This ensures that Indigenous Peoples: (a) receive social and economic benefits that are culturally appropriate; (b) do not experience negative impacts from the projects; and (c) can actively participate in projects that affect them. The standard contains 15 points to follow.

3.3 IFADs' SECAP

The International Fund for Agricultural Development's (IFAD) Social, Environmental, and Climate Assessment Procedures (SECAP) provide a framework to ensure that IFAD-financed projects are sustainable, socially inclusive, and environmentally sound. The following Standards apply to CAISAR:

- **Standard 1: Biodiversity Conservation**: This standard ensures the protection of biodiversity by requiring projects to assess and mitigate biodiversity risks, avoid critical habitats, and provide compensation for unavoidable damages. It promotes sustainable use of genetic resources, discourages invasive species, and emphasizes expert advice and adherence to protected area laws.
- **Standard 2: Resource Efficiency and Pollution Prevention**: Focuses on efficient use of resources and pollution control. It requires projects to reduce energy, water, and material use, manage hazardous materials safely, and prevent pollution, with an emphasis on sustainable natural resource management, including water, soil, fisheries, and forests.
- **Standard 3: Cultural Heritage**: This standard ensures the protection of tangible and intangible cultural heritage by screening and managing impacts, consulting local communities, and preserving access to cultural sites. Projects must avoid, minimize, or mitigate damage and follow legal requirements in protected areas.
- **Standard 4: Indigenous Peoples**: Supports and empowers indigenous communities by requiring free, prior, and informed consent (FPIC), promoting equitable resource access, and protecting cultural heritage. Projects must involve indigenous peoples in decision-making, ensure fair benefits, and avoid involuntary resettlement.
- **Standard 5: Labor and Working Conditions**: Sets requirements for safe, non-discriminatory workplaces, prohibiting forced and child labor. It requires the establishment of grievance mechanisms, safety protocols, and equal opportunities, with contractors and suppliers adhering to these standards.
- **Standard 6: Community Health and Safety**: Requires projects to assess and manage health risks, prevent exposure to hazards, and ensure infrastructure safety. It includes emergency preparedness, traffic and security management, and protection against gender-based violence.

- **Standard 7: Physical and Economic Resettlement**: Ensures resettlement is conducted legally and fairly, avoiding forced evictions. It requires special consideration for vulnerable groups, economic displacement, and establishing grievance mechanisms for affected communities.
- **Standard 9: Climate Change**: Ensures projects address climate risks and reduce GHG emissions. It mandates climate risk screening, adoption of climate-smart practices, and GHG accounting to guide project design towards reducing environmental impacts.

3.4 GEF'S ENVIRONMENTAL AND SOCIAL SAFEGUARDS POLICIES

GEF adopts the interim environmental and social safeguards to identify, measure, and mitigate environmental and social risks based on IFC Performance Standards (PS). Under CAISAR, the following PSs are applied:

- Performance Standard 1 – Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2 – **Labor and Working Conditions**
- Performance Standard 3 – **Resource Efficiency and Pollution Prevention**
- Performance Standard 4 – Community Health, Safety, and Security
- Performance Standard 5 – Land Acquisition and Involuntary Resettlement
- Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7 – Indigenous Peoples
- Performance Standard 8 – Cultural Heritage

3.5 International Conventions and Treaties

Cambodia has ratified all eight (8) of the International Labor Organisation (ILO)'s conventions which cover core labour standards recognized as human rights. These conventions focus on issues such as freedom of association, elimination of forced labour, abolition of child labour, and elimination of discrimination in employment.

- **Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)**: Ratified by Cambodia in 1999, this convention protects workers' and employers' rights to freely form and join organizations without interference, ensuring autonomy and safeguarding against dissolution by authorities.
- **Right to Organise and Collective Bargaining Convention, 1949 (No. 98)**: Ratified in 1999, it protects workers' rights to organize, engage in collective bargaining, and prevents discrimination for union activities, promoting fair wage negotiations and just working conditions.

- **Forced Labour Convention, 1930 (No. 29)**: Ratified in 1969, this convention aims to eliminate all forms of forced labour, including coercive work for public works or political purposes, protecting workers' rights and dignity.
- **Abolition of Forced Labour Convention, 1957 (No. 105)**: Ratified in 1999, it strengthens the prohibition of forced labour for political coercion, discipline, or discrimination, ensuring freedom and justice in the workplace.
- **Minimum Age Convention, 1973 (No. 138)**: Ratified in 1999, it sets a minimum age for employment (usually 15) to prevent child labour, promoting access to education and protection from hazardous work.
- **Worst Forms of Child Labour Convention, 1999 (No. 182)**: Ratified in 2006, this convention seeks to eliminate extreme forms of child labour like slavery, trafficking, and hazardous work, prioritizing children's safety and rehabilitation.
- **Equal Remuneration Convention, 1951 (No. 100)**: Ratified in 1999, it promotes equal pay for men and women for work of equal value, combating gender-based wage discrimination and fostering economic justice.
- **Discrimination (Employment and Occupation) Convention, 1958 (No. 111)**: Ratified in 1999, this convention addresses workplace discrimination based on race, gender, religion, and other factors, promoting equal treatment and opportunities for all workers.
- **Employment Policy Convention, 1964 (No. 122)**: Ratified in 1971, it requires active employment policies to promote full, freely chosen employment, aiming to reduce unemployment and support economic and social development.
- **Weekly Rest (Industry) Convention, 1921 (No. 14)**: Ratified in 1969, this convention guarantees a weekly rest period of at least 24 consecutive hours for workers, helping protect their health and well-being.
- **Labour Inspection Convention, 1947 (No. 81)**: Ratified by Cambodia in 1974, this convention establishes labour inspections in industrial and commercial workplaces to ensure compliance with national labour laws, promoting safe, fair, and decent working conditions.
- **Labour Inspection (Agriculture) Convention, 1969 (No. 129)**: Ratified in 1999, it extends labour inspection to agriculture, ensuring workers in this sector, including migrant and seasonal labourers, are protected by labour laws and safe working conditions are maintained.
- **Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)**: Ratified by Cambodia in 2009, this convention promotes consultation between governments, employers, and workers on international labour standards. It ensures that all stakeholders are involved in the implementation of labour policies, enhancing social dialogue and cooperation for fair labour practices.

3.6 Good International Industry Practices (GIIP)

3.6.1 WBG General EHS Guidelines (2007)

The World Bank Group (WBG) General Environmental, Health, and Safety (EHS) Guidelines (2007) provide internationally recognized technical guidance on managing environmental, health, and safety risks. These guidelines are designed to support project developers and operators, particularly in emerging markets, by outlining best practices for environmental sustainability, worker health and safety, and community well-being.

Key sections include:

- **Environmental Guidelines:** Focus on pollution prevention and control, resource efficiency, and managing air, water, and soil impacts.
- **Occupational Health and Safety (OHS):** Address workplace hazards, accident prevention, and worker welfare.
- **Community Health and Safety:** Cover topics like traffic safety, emergency preparedness, and protecting communities from project-related risks.
- **Construction and Decommissioning:** Provide guidance on managing risks during the life cycle of a project.

The guidelines emphasize compliance with local regulations and international standards and are intended to be applied alongside sector-specific EHS guidelines.

3.6.2 WBG EHS Guidelines for Annual Crop Production (2016)

The World Bank Group (WBG) Environmental, Health, and Safety (EHS) Guidelines for Annual Crop Production (2016) provide technical guidance on sustainable practices for cultivating annual crops, such as grains, legumes, and vegetables. These guidelines aim to minimize environmental impacts, ensure worker safety, and promote efficient resource use.

Key focus areas include:

- **Environmental Management:** Guidance on soil conservation, water use efficiency, pest management, and biodiversity preservation.
- **Occupational Health and Safety (OHS):** Measures to prevent injuries, promote safe pesticide handling, and protect workers from physical and chemical hazards.
- **Community Health and Safety:** Recommendations to prevent risks like pesticide drift, water contamination, and traffic safety concerns related to agricultural operations.
- **Sustainable Practices:** Emphasis on integrated pest management (IPM), crop rotation, and efficient irrigation techniques to maintain productivity and environmental health.

These guidelines align with international standards and are designed to support sustainable agricultural development.

Table 17: Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
1	ESS1		PS1	Environmental and Social Assessment and Management	• Environmental Code and Natural Resource Management (2023), • Law on Water Resource Management (2007), • Law on fisheries (2026), • Sub-Decree on Water Pollution Control (1999), • Sub-Decree on Environmental Impact Assessment (1999), • Sub-Decree on Air Pollution Control and Sound Disturbance (2000), • Sub-Decree on Solid Waste Management (1999), • Prakas on the General Guideline for Preparing the Initial and Full Environmental Impact Assessment Reports (1999), • Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed (2015)	The RGC has established a wide range of regulations especially in the recent Environmental Code and Natural Resource Management (2023) that aim to environmental protection and natural resource management are well aligned to the provisions of the AIIB ESS1.	This ESCIA covers both direct, indirect, and cumulative impacts and mitigation measures, taking a holistic approach to the project and looking at impacts in an integrated way.
2	ESS2	S7	PS5	Land Acquisition and Involuntary Resettlement	• Law on Land Management, Urban Planning and Construction (1994), • Land Law (2001), • The Expropriation Law (2010), • RGC's Sub-Decree No. 22 ANK/BK (2018) on the Promulgation of the Standard Operating Procedures for Land Acquisition and Involuntary Resettlement (SOP-LAR) for Externally Financed Projects in Cambodia, • Sub-Decree No.19 on Social Land Concession of March 2003, • RGC's Sub-Decree No.118 ANK/BK (2005) on State Land Management, • RGC's Sub-Decree No.98 ANK/BK (2015) on River Basin Management	The RGC has the SOP-LAR which is well aligned with the provisions in the AIIB ESS 2. The AIIB ESS 2 on land acquisition and involuntary resettlement recognizes that project related land acquisition and land use can have impacts on communities. The RGC's SOP-LAR is consistent with the specific requirements under the AIIB ESS 2 on consultation, grievance redress, social support, resettlement assistance, standard of living of poor and vulnerable, entitlements for persons without title or legal rights except for land, information disclosure, payment of compensation and entitlements prior to	According the RGC's SOP-LAR, an income restoration program would be provided in order to re-estalbish sources of livelihoods for those affected households who have permanently lost their sources of livelihood. In this CAISAR project, the DRPs will include provisions to ensure livelihood restoration program are robust and can accurately meet the aim of livelihood restoration in line the AIIB ESS2.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
						physical displacement, and the supervision and monitoring of implementation of resettlement plans. However, there are gaps on negotiated settlement and livelihood restoration. The SOP-LAR does not describe procedures for negotiated settlement and lack of clear benchmark to assist monitoring and evaluation to confirm if the affected households restore their livelihood to the level prevailing prior to the beginning of the project implementation.	
3	ESS3	S4	PS7	Indigenous Peoples	• The Constitution of Cambodia (1993) • Land Law (2001)	No detailed regulations on how to avoid impacts to Indigenous Peoples or how to include them in project benefits. Lack of requirement to consult IP(s) in a manner that is culturally appropriate and special disclosure and consultation requirements as described in the AIIB ESS3.	An IPPF has been prepared on the basis of the AIIB ESS3. The IPPF details procedures on the preparation of IPP(s) and how to conduct meaningful consultation and disclose that is culturally appropriate.
4	ESS1	S1	PS6	Biodiversity conservation	• Environmental Code and Natural Resource Management (2023),	The code requires a proper consideration of biodiversity resources and payment of ecosystem services which support the conservation process. There is limited guidance on how to compensate in the ecosystem services once its pristine condition is affected.	This ESCIA include the biodiversity assessment and management plan.
5	ESS1	S2	PS3	Resource efficiency and pollution prevention	• Environmental Code and Natural Resource Management (2023), • Sub-Decree on Environmental Impact Assessment (1999), • Sub-Decree on Air Pollution Control and Sound Disturbance (2000),	The RGC has in place a set of separate provision and requirements for pollution prevention and management that are well align with the AIIB ESS 1 that aims to promote the sustainable use of	This ESCIA has included all relevant national laws and regulation as well as the requirement for AIIB ESS1.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
					• Sub-Decree on Solid Waste Management (1999), • Prakas on the General Guideline for Preparing the Initial and Full Environmental Impact Assessment Reports (1999), • Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed (2015)	resources and avoid or minimize the pollution from sources/project activities.	
6	ESS1	S3	PS8	Cultural heritage	• Environmental Code and Natural Resource Management (2023), • Law on the Protection of Cultural Heritage (1996)	The RGC has in place the law on protection of cultural heritage aligns with the requirement of the AIIB ESS1. However, there is lack of detail procedures for protection of the intangible cultural heritage.	This ESCIA provided details procedures and requirement to protect both tangible and intangible cultural heritage through Chance Find Procedure (Annex xx).
7	ESS1	S5	PS2	Labor and working conditions	• Labor Law (1997), • Law on Taxation (1997), • Sub-Decree on Construction Permit (1993), • Law on Social Security Schemes for Persons defined by the Provision of the Labor Law (2002), • Sub-Decree on Establishment of Social Security Scheme "Health Care Scheme" for Persons Defined by the Provisions of the Labor Law (2016)	The RGC has in place a set of law and regulations on labour and working conditions which is consistent with the requirement of the AIIB ESS1. However, the enforcement of these law and regulation is still limited. For example, regulation against forced labor and using child labor are not strictly enforced.	The ESCIA provides provisions to monitor compliance by contractor and of their primary suppliers in bidding documents and supervision contracts in order to prohibit using forced labour and child labour.
8	ESS1	S6	PS4	Community health and safety	• Law on Road Traffic (2014), • The Law on Suppression of Human Trafficking and Sexual Exploitation 2008, • Law on the Protection and the Promotion of the Rights of Persons with Disabilities 2009,	The RGC has established Labor Law the protect the health and safety of the workers. However, the concern and mitigation are more on individual rather than community as a whole. The AIIB ESS1 aims on protection of both individual and community for health and safety.	The ESCIA provides provisions to monitor compliance by contractor on community and health safety in bidding documents and supervision contracts. The requirement on raising awareness to local community on health and safety are also included in the bidding documents.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
9	ESS1	S9	PS1	Climate change	• Environmental Code and Natural Resource Management 2023	The newly adopted code requires all relevant sectors to integrate climate resilient concepts into their strategic action plan along with different measures to tackle the issues. No gap being identified.	

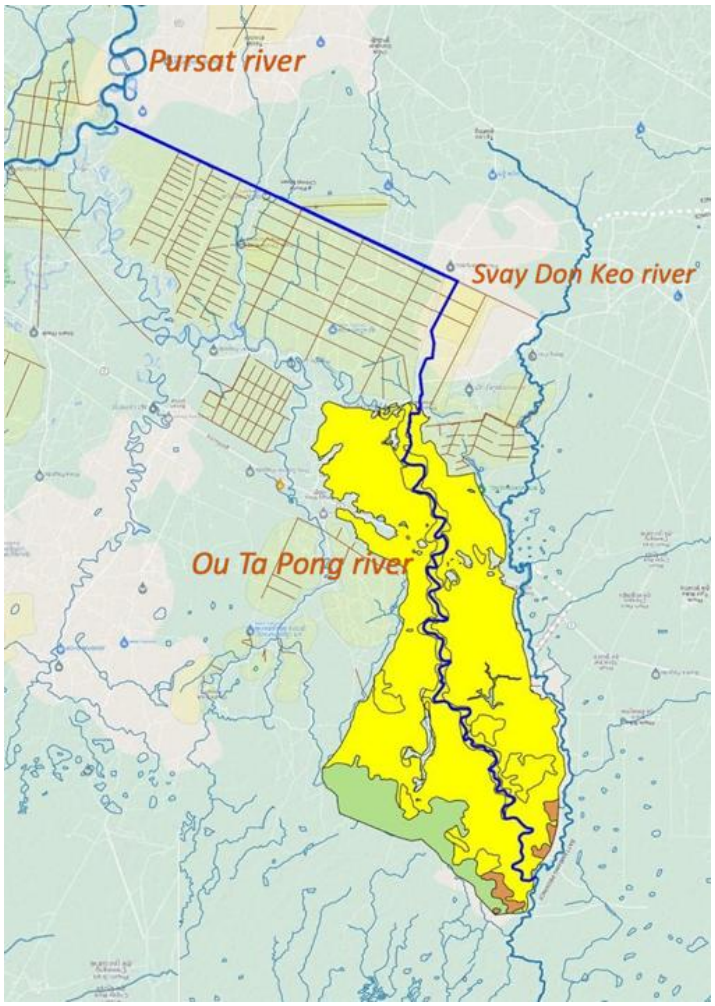
4. BASELINE CONDITIONS

4.1 Physical Conditions

4.1.1 Existing Infrastructure (Irrigation and drainage facilities)

The Ou Ta Paong scheme draws its water supply from various sources. These sources comprise the Pursat River, Svay Donkeov River, and several other rivers that traverse the scheme, including the Ou Ta Paong River itself. This complex water supply system results in the creation of distinct hydraulic zones within the scheme, each characterized by specific water availability levels, which in turn have a direct impact on agricultural output.

Figure 10: Damnak Ampil Main canal and Ou Ta Paong Sub-scheme



The Pursat river is located on the right side (river flow) while Svay Don Keo river on the left side. Water from Pursat river is diverted into the OTP through the Damnak Apil main canal, then feed into a smaller river called Ou Ta Pong. Both Ou Ta Pong River and Svay Don Keo river run down through the OTP command area in almost parallel until they meet at lower downstream part of the OTP command area (see picture below). A more description of the above rivers is provided below. The OTP is a mixture of both irrigated and rainfed areas (mostly is irrigated). Areas irrigated obtain water from the current network of 46 km of secondary canals and 27 km of tertiary canals (based on WAPCOS asset survey in 2023).

Water for irrigation is mainly collected from two main rivers: Pursat river and Svay Don Keo river (Figure 10). The Pursat river is located on the right side (river flow) while Svay Don Keo river on the left side. Water from Pursat river is diverted into the OTP through the Damnak Apil main canal, then feed into a smaller river called Ou Ta Pong. Both Ou Ta Pong River and Svay Don Keo river run down through the OTP command area in almost parallel until they meet at lower downstream part of the OTP command area (see picture below). A more description of the above rivers is provided below.

Boeng Khnar River is the principal natural drain for the area under command of the first 17 km of DAMC and an important water source for the area North of the road. The National Road and railway are the second and rather forbidding obstacles for irrigation water from DAMC to reach the Northern areas. Water can only pass to the other side under the bridges. The third problem is that farmers of upstream villages divert as much water as they can manage from the canals, so that little of nothing remains for the downstream villages.

4.1.2 Rivers and Hydrology

For Pursat river, water in this river constituted from three main tributaries — located about 25–35 km to the upstream. Water collected for these attributes are from a combined three catchments area of about 4,245 km^2). Water released downstream from these three tributaries are controlled by three dams: Dam No. 3 and Dam No. 5 (which is under the management of MOWRAM), and Dam No.1 (an 80MW hydropower plant being built by a private company and is under the management of the Ministry of Mines and Energy[5]). The storage capacity of Dam No. 3 and Dam No. 5 is almost similar: 24.5 MCM and 25.5 MCM, respectively. Dam 1 (Hydropower) is expected to store 1,014 MCM (max) once completed but the purpose is for hydropower plant. It is noted the Dam 3 and No.5 have been put into operation since 2013 while Dam 1 is still under construction and is scheduled to operate in 2026. According to the report prepared by WAPCOS for AIIB (dated 8 March 2023), neither of the above reservoirs pose a flood risk to the OTP as it is far from the Pursat river. However, dam failure could decrease water availability to the OTP.

For Ou Ta Pong (OTP) river. OTP river is located within the OTP command area. Originally, the Ou Ta Pong River drained the Pursat River's flood plain. However, currently, this river is mainly a string of ponds. The river has lost its original conveyance function for both water drainage and supply function. The OTP River is estimated to be 38 km, counting from Danmak Apil Headwork to Ta Nai dam – in a straight line. However, the waterway from Damnak Apil Headwork to Ta Nai Dam is as far as 56 km. Water that feed the OTP is mainly from Pursat river which goes into the river through Damnak Apil Headwork.

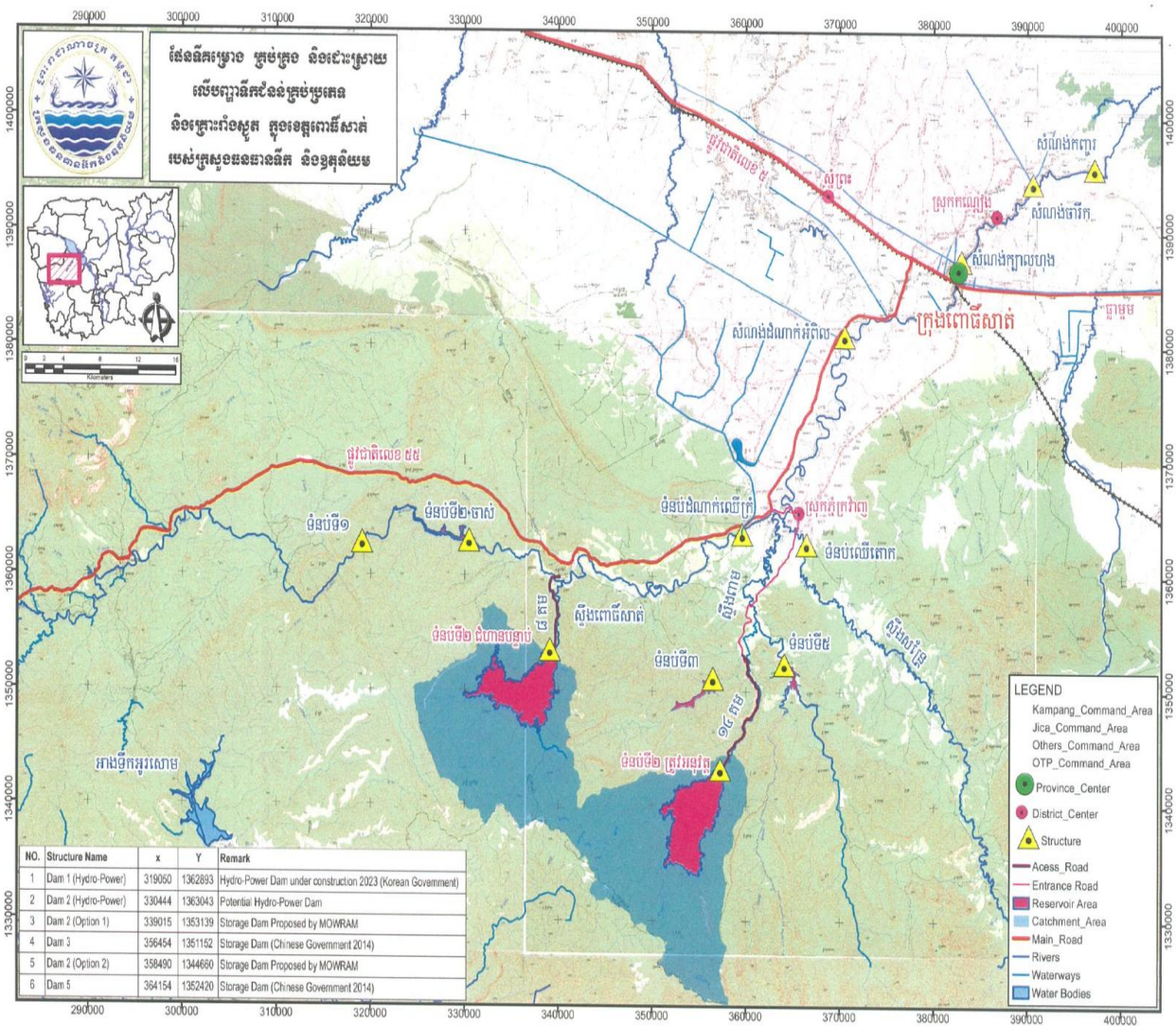
For Svay Don Keo river, the water is fed by a catchment of 322km^2 located upstream. The river is about 61.7 km long in total. The river makes its way into OTP at the point where (orange dot) where it intersects the Damnak Apil Main Canal (See picture below). The Svay Don Keo river runs roughly parallel to OTP river – to the West (See picture below) that depict water flow from Dam 1,3, 5 to form Pursat river.

[5] The project is being developed by Asia Energy Power, Erex, ISDN Holdings and SPHP (Cambodia). Erex, Asia Energy Power and ISDN Holdings are currently owning the project having ownership stake of 34%, 33% and 33% respectively.

The CAISAR Feasibility Study reported that water availability will be adequate at the time that Dam No. 1 is completed, provided there is proper coordination among the stated dams. At the current stage, Pursat PDoWRAM has reported that the available water is insufficient for irrigation purposes within the province, with a shortfall of approximately 700 MCM. Additionally, PDoWRAM acknowledged that the water from Dam No. 1 is designated solely for hydroelectric purposes, which may limit the amount available for agriculture or irrigation. There is, however, another dam, Dam No. 2, which was approved by the government in late June 2024. PDoWRAM also reported that the construction is in the process of mobilizing equipment to the site. The reservoir for this dam covers 4,016 hectares, with a storage capacity of 861.75 MCM. The dam is expected to be completed by the end of 2026 (Figure 11). Earlier projections indicated that the combined water supply from Dam No. 1, Dam No. 3, and Dam No. 5 would likely be sufficient. With the addition of Dam No. 2, it is highly likely that the province's water needs will be fully met.

The current discussion with farmers on water availability at Ou Ta Paong showed that during the periods that the crop requires irrigation, conflicts about water tend to arise. The available water along the river was diverted into the rice field via secondary canals along the river. The limited availability of water regulated from the upstream, mainly the Damnak Ampil canal cannot flow until the end of the river where the river has become a string of ponds, causing some locations of the rivers to have been turned into backyard garden of the residents along the river. As water is limited, water shortage has become the main cause for financial losses. This causes much stress, because of the risk of drought damage to the crops, and the cost of pumping from low water levels. The risks reduce farmers' motivation to invest in new technologies and climate-smart agriculture.

Figure 11: Map with Illustration of Dam No. 2



(Source: Pursat PDoWRAM, 2024)

4.2 Environmental Conditions

4.2.1 Air Quality and Noise

At provincial level, the air pollution level is considered moderate[6]. The AQI is 58, which is equivalent to 13.1 µg/m^3. The ambient air quality, noise, and vibration is being linked to increases in industrial development, and the rapid urbanization. However, the Ou Ta Paong sub-scheme is located in the rural settings and about 35km from the major population centers and industrial areas in Pursat town. The baseline ambient air quality, noise and vibration in Ou Ta Paong scheme is considered generally good. Ambient air quality is sometime affected by dust from tillage and unpaved road users, including smoke from burning of rice stubble after harvest. Whilst noise and vibration disturbance are sometime affected by motorist. However, the impacts are minor and short time. In addition, the air testing results from the Damnak Chheu Krom irrigation system in Ta Lou commune, Bakan district, Pursat province located about 15 km from Ou Ta Paong reported that all five parameters (CO, NO2, SO2, TSP, and

[6] https://www.iqair.com/cambodia/pursat, accessed on 23rd September 2024

PM10) followed the standard of the Ministry of Environment at all durations (8 and 24 hours) (See Table below). The result can be referenced as the baseline for the sub-scheme since it is located within the same district and the environment of the area is the same. Further air quality tests can be conducted during the preparation of the domestic EIA.

Table 18: Air quality testing result of Damnak Chheu Krom project

No.	Parameter	Unit	Result	Standard
1	Carbon Monoxide (CO)	mg/m^3	0.35	<20 (8 hrs)
2	Nitrogen Dioxide (NO2)	mg/m^3	0.028	<0.1 (24 hrs)
3	Sulfur Dioxide (SO2)	mg/m^3	0.020	<0.3 (24 hrs)
4	Total Suspended Particles (TSP)	mg/m^3	0.088	<0.33 (24 hrs)
5	PM10	mg/m^3	0.044	<0.05 (24 hrs)

(Source: Ministry of Environment, June 2020)

4.2.2 Soil Quality

The soil quality study for this sub-scheme was represented by two sites (SS.01 & SS.02). The analysis results, presented in the table below, provide valuable insights into the physical, chemical, and biological properties of the soils at these locations, which can inform agricultural management practices and decision-making.

Soils in Ou Ta Paong can be classified as loam, a texture ideal for agriculture due to its balanced mix of sand, silt, and clay. The relatively high proportion of fine silt and fine sand further enhances water retention and nutrient availability, supporting plant growth. The soils are slightly acidic, with pH levels ranging from 4.12 to 5.36, which may affect nutrient availability. However, this acidity is manageable for crop production with proper soil management. Organic matter content is moderate (3.16% to 3.82%), benefiting soil structure, water retention, and nutrient cycling. This level helps sustain long-term agricultural productivity by improving soil health.

Table 19: Soil analysis results in an agricultural context

No.	**Description Parameter**		**Result**	
			SS.01	**SS.02**
1	Particle Size (Pipette Method)	(<0.002mm), Clay %	9.90	14.01
		(0.002-0.02 mm), Fine Silt, %	37.65	35.55
		(0.02-0.05 mm), Coase Silt, %	21.71	22.69
		(0.05-0.2 mm), Fine Sand, %	30.59	32.75
		(0.2-2 mm), Coase Sand, %	3.22	2.32
2	Ninnu Moisture %, (Oven dry at 105 °C and 24 hours)		1.67	1.73
3	Total Carbon (Black & Walkey Method), C%		2.22	1.84
4	Total Nitrogen (Kjeldal Sulfuric Method),N%		0.19	0.17
5	C/N Ratio (Unit)		12	11
6	Organic Matter (0M) %		3.82	3.16
7	Total Phosphorus (Nitric Digestion) P %		0.051	0.043
8	Available Phosphorus (Bray II), P (ppm)		51	41
9	Cation Exchange Capacity C.E.C meq/100g Soil (Method,1M Ammonium Acetate at pH=7 & Leach with 10% NaCl)		13.00	12.40
10	Exchangeable Cation (meq/100g Soil), (Method, 1 M	Calcium (Ca)	3.06	3.77
		Magnesium (Mg)	1.28	1.38
		Sodium (Na)	1.42	0.75

No.	Description Parameter		Result	
			SS.01	SS.02
	Ammonium Acetate at H=7)	Potassium (K)	0.77	0.27
	Total Exchangeable Bases (meq/100g soil)		6.53	6.17
11	Bass Saturation %		50	50
12	Exchange Acidity meq/100g Soil, (1 M KCl Method)		20.00	15.00
13	Exchange Al meq/100g Soll, (1 M KCl Method)		0.20	0.12
14	Electrode Conductivity µS/cm, (1:5 Soil: water)		96.80	36.10
15	pH H2O (1:5 Soil: water)		5.36	5.29
16	pl KCL (1:5 (Soil: IN KCl)		4.21	4.12

(Source: Laboratory of the General Directorate of Agriculture, MAFF, 2024)

Nutrient analysis shows low nitrogen content (0.17% to 0.19%), which may limit plant growth. Phosphorus is low in total content (0.043% to 0.051%) but moderately available (41 ppm to 51 ppm), suggesting it's not a limiting factor. Potassium levels range from low to moderate (0.27 to 0.77 meq/100g), indicating that some locations may need supplementation. Calcium, magnesium, and sodium levels are adequate for plant growth. The soils have a moderate Cation Exchange Capacity (CEC) (12.40 to 13.00 meq/100g), indicating good nutrient retention, and the base saturation is balanced at 50%.

Overall, while the soils from all three locations are generally suitable for agriculture, there are areas that need attention, such as the low nitrogen and potassium levels in some samples and the slightly acidic pH. These factors suggest that, with proper nutrient management and soil amendments, the soils can effectively support healthy crop production.

4.2.3 Surface Water Quality

Water quality does not seem to be a critical issue for surface water, but the overuse of fertilizers and domestic wastewater are important threads. It is known to be a black market of all sorts of fertilizers, pesticides, insecticides, rodenticides, etc. sold at the borders with Viet Nam and applied indiscriminately by farmers to increase the numbers of crops a year[7].

The collected water samples were measured at the premises as well as at the laboratory, commissioned by Innovation Lab which is partner of Royal University of Phnom Penh (RUPP). Summary of the water quality testing is provided in Table below:

Table 20: Result of surface water quality

No	Parameter	Unit	Ou Ta Paong			Standard (MoE)	
			SW1	SW2	SW3	River	Lake and reservoir
1	Arsenic	mg/l	0.005	0.005	0.005	<0.01	<0.01
2	Cadmium	mg/l	0.001	0.001	0.001	<0.003	<0.003
3	Lead	mg/l	0.005	0.005	0.005	<0.01	<0.01
4	pH	-	6.32	6.2	6.44	6.5-8.5	6.5-8.5
5	Total dissolved solids	mg/l	30.76	38.07	40.71	<1000	<1000
6	Total suspended solids	mg/l	11	29	39	<100	<100
7	Total Nitrogen	mg/l	4.8	3.8	3.5	<3	<2
8	Total Phosphorus	mg/l	0.8	0.6	0.4	<0.25	<0.15

[7] The sustainable rice platform, supported by MAFF, is working towards controlling this market and training farmers on proper use (products' labels are not translated to Khmer). https://sustainablerice.org

No	Parameter	Unit	Ou Ta Paong			Standard (MoE)	
			SW1	SW2	SW3	River	Lake and reservoir
9	Total coliform	CFU/ 100mL	50,200	38,750	31,650	<1000	<1000
10	Electrical conductivity	µs/cm	61.4	76.12	81.43	500-1500	500-1500
11	Temperature	^{0}C	31.3	30.8	30.9	<45	<45
12	Dissolved oxygen	mg/l	5.34	5.6	5.7	>3	>4

(Source: Water Innovation Lab, 2024)

The water quality data of Ou Ta Paong compared to the Ministry of Environment (MoE) standards reveals several concerns. Key parameters such as arsenic, cadmium, lead, pH, total dissolved solids, and electrical conductivity are within acceptable limits, meeting the MoE standards for rivers and lakes/reservoirs. However, total nitrogen, total phosphorus, and total coliform levels exceed the standard limits, with nitrogen levels (3.5-4.8 mg/l) surpassing the river and lake limits (<3 and <2 mg/l, respectively), and total phosphorus (0.4-0.8 mg/l) significantly higher than the allowed levels (<0.25 and <0.15 mg/l). Additionally, total coliform levels are alarmingly high, far exceeding the permissible limit of 1000 CFU/100mL. Dissolved oxygen levels are adequate, remaining above the minimum requirement (>3 and >4 mg/l). These results indicate potential nutrient pollution and microbial contamination in the water.

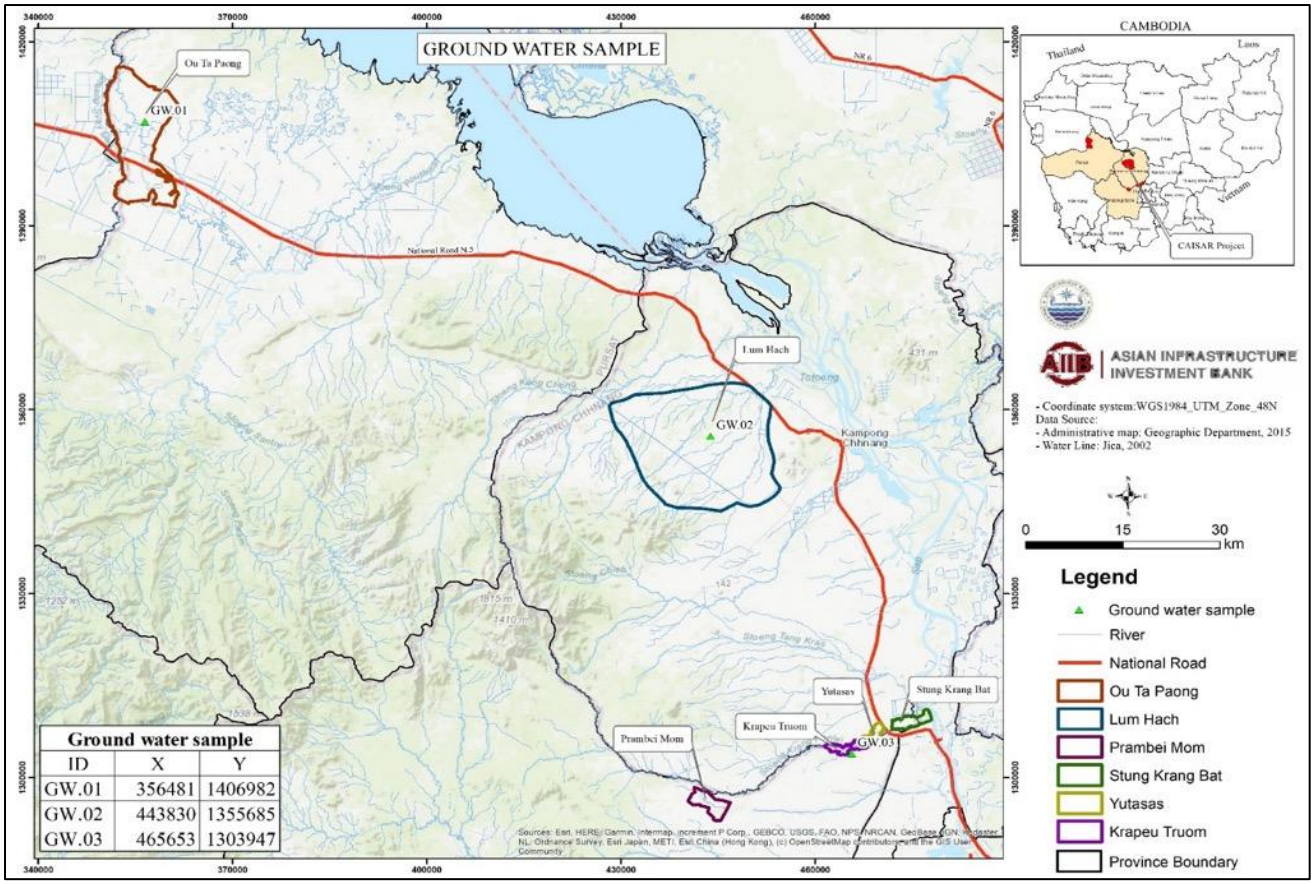
4.2.4 Groundwater Quality

Groundwater quality was collected from various locations within the project sites. Water testing is used to determine the existing groundwater quality at the project sites before construction and operation. Note that the GW1 is a dug well with a depth of up to 40 meters that can be used in both dry and wet seasons. In the dry season, the water level is about 25 meters, while in the rainy season, the water level is about 7 meters above the surface. The geographical positions and descriptions of the groundwater sampling points are given in Table 20. The results of the groundwater quality analysis are summarized in Table 21.

Table 21: Groundwater sampling locations

No.	Location				UTM	
	Province	District	Commune	Village	X	Y
GW1	Pursat	Bakan	Ou Ta Paong	Oknha Moan	356481	1406982

Figure 12: Map of groundwater sampling locations



The selected samples were analysed and the results of the testing both at the field and at laboratory is provided in Table 9 below.

Table 22: Result of groundwater quality

No	Parameter	Unit	GW1	CDWQS
1	Arsenic	mg/l	0.005	0.05
2	Cadmium	mg/l	0.003	0.003
3	Lead	mg/l	0.0004	0.01
4	pH	-	**6.01**	6.5-8.8
5	Total dissolved solids	mg/l	345.8	800
6	Total suspended solids	mg/l	13	-
7	Total Nitrogen	mg/l	6.4	-
8	Total Phosphorus	mg/l	0.3	-
9	Total coliform	CFU/ 100mL	14,065	0
10	Electrical conductivity	µs/cm	691.4	-
11	Temperature	^{0}C	30.4	-
12	Dissolved oxygen	mg/l	1.92	-

(Source: Water Innovation Lab, 2024)

The groundwater quality test for Ou Ta Paong (GW1) reveals mixed results when compared to the Cambodian Drinking Water Quality Standards (CDWQS). The levels of arsenic, cadmium, lead, and total dissolved solids (TDS) all fall within the acceptable national limits, ensuring that these parameters pose no immediate health risks. However, the slightly acidic pH of 6.01 is below the recommended range (6.5–8.8), indicating that the water is somewhat

corrosive, which could affect its taste and the condition of piping systems over time. Though the total suspended solids are not regulated by the CDWQS, their presence might affect water clarity, requiring filtration.

One of the most concerning findings is the high total coliform count, which reaches 14,065 CFU/100 mL, far exceeding the standard of 0 CFU/100 ml. This result indicates significant bacterial contamination, making the groundwater unsafe for direct human consumption without proper treatment. Immediate measures, such as disinfection, are necessary to eliminate pathogens and ensure the water meets health safety standards. Additionally, while there are no specific standards for total nitrogen and phosphorus, the moderate levels recorded could pose a risk if left unchecked, particularly in terms of environmental impacts.

Other parameters, such as electrical conductivity, temperature, and dissolved oxygen, though not regulated by CDWQS, also provide insights into water quality. The electrical conductivity and moderate temperature suggest the presence of dissolved ions and potential microbial growth. The low dissolved oxygen level may further indicate organic contamination, suggesting the need for continued monitoring. Overall, while certain aspects of the groundwater quality are within safe limits, significant attention is required to address bacterial contamination and pH levels to make the water suitable for human use.

Figure 13: Groundwater sampling activities





4.3 Biological Resources

The result of the biodiversity assessment which are used as the baseline information is presented in below sub-sections. The baseline information covers three steps of the biodiversity assessment including the analysis for determining Critical Habitat status (Steps 1 & 2); and Determining Critical Habitat status (Step 3) of the biodiversity assessment.

4.3.1 Analysis to prepare for determining CH status

4.3.1.1 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for OTP. The coordinates of OTP (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme

area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 11 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 4 reptile species, 2 mammals, 2 fishes, and 3 birds (See list of 11 EN and CR species in Table 6.19 below).

4.3.1.2 Description of screening for narrowing down

For Ou Ta Paong, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2025. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the OTP area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 17 EN and CR species were identified in the OTP area of influence (See Table below). In the 3rd round of screening (in August 2024), however, 11 (out of a total of 17 species) were confirmed as “potentially present” in the OTP’s area of influence.

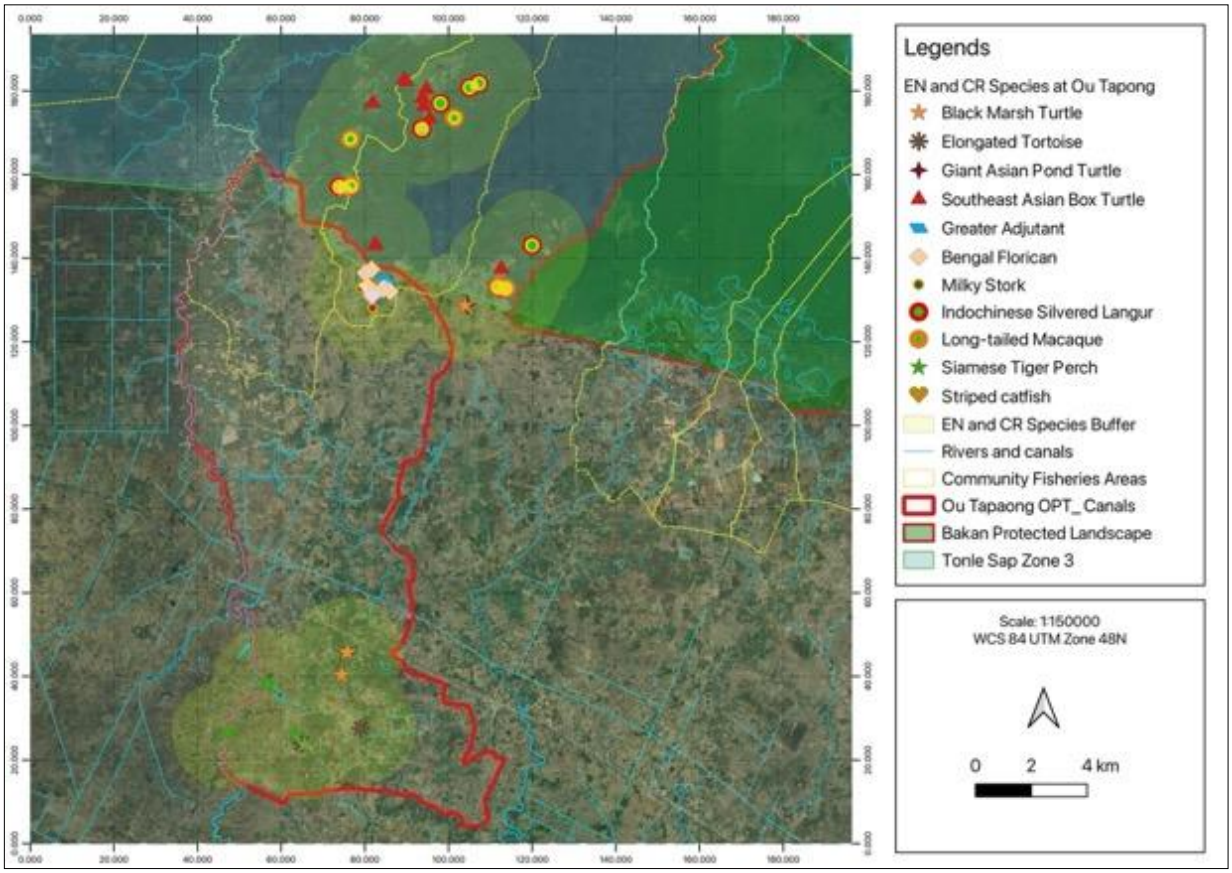
So, the assessment for Ou Ta Paong focuses on the confirmed list of **11 species** that are categorized by IUCN as EN and CR species, including 4 reptile species (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise), 2 mammals (Indochinese Silvered Langur and Long-tailed Macaque), and 2 fishes (Striped catfish and Siamese Tiger Perch), and 3 birds (Greater Adjutant, Milky Stork, and Bengal Florican) See Table 22 below for the list of confirmed species and see Figure 14 for potential locations of these species in the projects are of influence.

Table 23: Confirmed List of endangered and critically endangered species for the Ou Ta Paong sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=17)	Confirmed Species in Round 3 (Total = 11)
I. Reptile spices						
1	អណ្តើកឆ្អែក	Black Marsh Turtle	*Siebenrockiella crassicollis*	EN	Yes	Yes
2	អណ្តើកសោម	Giant Asian Pond Turtle	*Heosemys grandis*	CR	Yes	Yes
3	អណ្តើកបិទមុខ	Southeast Asian Box Turtle	*Cuora amboinensis*	EN	Yes	Yes
4	អណ្តើកព្រាច	Elongated Tortoise	*Indotestudo elongata*	CR	No	Yes

	II. Mammal species					
5	ភេរោមច្រមុះ	Hairy-nosed Otter	*Lutra sumatrana*	EN	Yes	No
6	ស្វាក្រមា	Indochinese Silvered Langur	*Trachypithecus germaini*	EN	Yes	Yes
7	ស្វាក្តាម	Long-tailed Macaque	*Macaca fascicularis*	EN	Yes	Yes
	III. Fish species					
8	ត្រីជ្រោងំ	Striped catfish	*Pangasianodon hypophthalmus*	EN	Yes	Yes
9	ត្រីកន្ត្រៀប ខ្លា	Siamese Tiger Perch	*Datnioides pulcher*	CR	Yes	Yes
	IV. Bird species					
10	ត្រដក់ធំ	Greater Adjutant	*Leptoptilos dubius*	EN	Yes	Yes
11	រនៀលស	Milky Stork	*Mycteria cinerea*	EN	Yes	Yes
12	ចាបព្រៃវែង	Yellow-breasted Bunting	*Emberiza aureola*	CR	Yes	No
13	ខ្ទីប ឬ ទ្រមាក់អណ្តើក	Bengal Florican	*Houbaropsis bengalensi*	CR	Yes	Yes
14	ពពូលទឹក	Masked Finfoot	*Heliopais personatus*	CR	Yes	No
15	ទាព្រៃស្លាបស	White-winged Duck	*Asarcornis scutulata*	EN	Yes	No
	V. Amphibians, and aquatic plants					
16	កញ្ជាញ់ចេក ភ្នំក្រវាញ	Cardamon Shrub Frog	*Philautus cardamonus*	EN	Yes	No
17	ស្មៅស្ទឹង/ទន្លេ	River-weed	*Terniopsis chanthaburiensis*	EN	Yes	No

Figure 14: Map showing the observed distribution of identified EN and CR species (with the potential movement of 1-2 km within and around suitable habitats (2020 to 2024)



4.3.1.3 Ecological State of Habitats within the Area of Analysis (AoA)

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 11 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants[8].

The OTP command area, therefore, the ecosystem within the OTP command area has been subject to human-induced changes over the past several decades. Previously, the zoning areas of OTP contains Zone 1 (transition zone), Zone 2 (buffer zone) and Zone 3 (core zone)

[8] Community councils and committees, including community fisheries (CFi) and farmer water user community (FWUC), were convened on July 25 and August 4, 2024. These meetings aimed to identify potential field assessment areas and select individuals with deep local ecological knowledge and experience for interviews. A total of 13 key informants were interviewed in Ou Topaong. Five of these individuals were from the upper command area, while seven were from the lower command area. Additionally, one representative from Punleu Komar Organization, which supports the Samraong Muk Yeik Community Forest Initiative, was included. Notably, the Samraong Muk Yeik and Sdok Khlouk Community Fisheries locations overlaps with portions of the Lower Ou Tapaong Command Area.

which does not exist anymore for Zone 2 and Zone 1. As such, the OTP command area is a modified habitat.

❖ **Reptiles (4 species)**

The Black Mash Turtle was observed in both upper and lower sections of the command area, as well as along the main Ou Ta Paong River (which is being used as a key canal feeding irrigation water for the command area). Conversely, the Elongated Tortoise was only found in the upper reaches while the Giant Asian Pond Turtle and Southeast Asian Box Turtle were found only in the lower section within Tonle Sap Zone 3 (figure 15). Details are below:

- **The Black Mashed Turtle *(Cuora galbinifrons)*** was confirmed to be present in the area of influence based on the accounts of four local informants. Residents from the upper reaches of Ou Tapaong reported historical sightings of this species within the past 10-20 years although recent spotting has been scarce. Key informants who live in the lower part of the command area and had livelihoods closely intertwined with the Tonle Sap Management Zone indicated that there have been ongoing efforts to bring the **Black Mashed Turtle back** to the region albeit its rarity. One informant successfully captured a Black Mashed Turtle just before the interview. This species is highly valued in the local market, particularly among middlemen, and is often used for traditional medicinal purposes. The Black Mashed Turtle is listed as Critically Endangered by the IUCN Red List, and its presence in the area of influence indicates that the habitat is essential for its survival and reproduction. Therefore, the habitat meets the criterion of being significant for a Critically Endangered species of criteria 1a of IFC PS6.
- **Elongated Tortoise:** This species wasn't initially screened for the interview, but it was identified and spotted by two key informants at the upper section of the Ou Tapaong based on the turtle images that were shown to facilitate the identification of species. No such sightings have been documented in the lower portions of the command area. One informant, a local resident near Ou Tapaong, provided a firsthand account of capturing this species. After a thorough examination of the accompanying photographs and a comparison with verified identifying features, this species is confirmed present as reported by the local informant. The Elongated Tortoise is listed as Critically Endangered by the IUCN Red List. The presence of this species within the project area indicates that the habitat is essential for its survival and reproduction, meeting the requirements of Criterion 1a.
- **Giant Asian Pond Turtle:** Three local informants who were interviewed in the lower Ou Tapaong River region confirmed the presence of the Giant Asian Pond Turtle. One informant reported spotting this species in Boeung Kum Traeng, a wetland within Tonle Sap Zone 3 while the other two informants indicated their encounters with this species in the mountainous regions of Kravanh District. Asian Pond Turtle is listed as Critically Endangered by the IUCN Red List. The reported sightings in Boeung Kum Traeng and the mountainous regions of Kravanh District indicate that these areas may be important habitats for the survival and reproduction of this species, meeting the requirements of Criterion 1a.
- **Southeast Asian Box Turtle:** During our survey in the lower section of the Ou Ta Paong, we obtained valuable information about the Southeast Asian Box Turtle. All

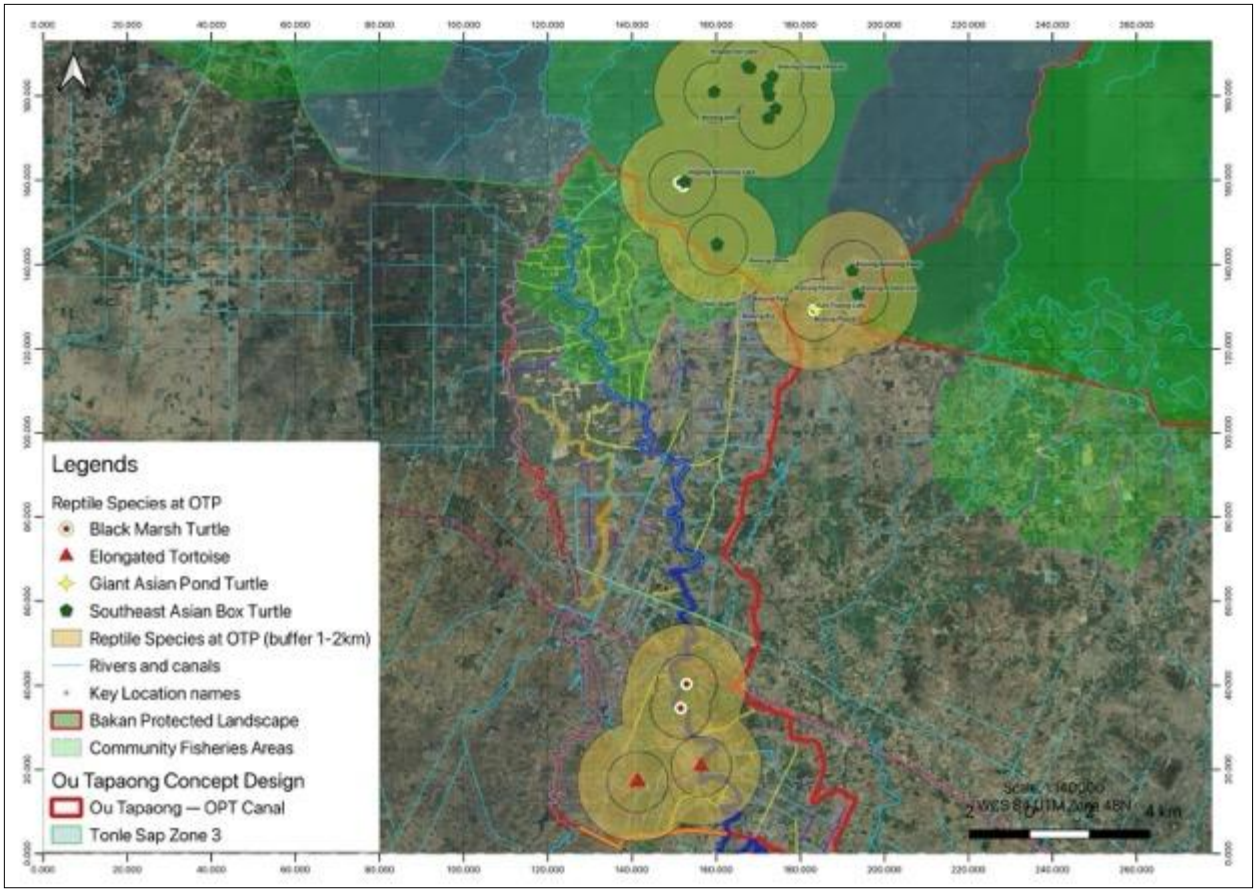
seven informants in this area confirmed the presence of this species in nearby wetlands and flooded forest areas within Tonle Sap Zone 3, which is close to the command area boundary. While three informants reported recent encounters with this species, the remaining four mentioned that they had encountered it 10 to 20 years ago. They explained that the turtle was once abundant but has become very rare in recent years.
Similarly, all turtle species, including the Southeast Asian Box Turtle, are threatened by ongoing illegal hunting for trading purposes. Some people were hesitant to share recent information about these species.

Mr. Pheoun Moeun, Deputy Chief of Samraong Muk Yeik Community Fishery (SMY-CFi) is exceptionally knowledgeable about wildlife species in his Cfi area. He has been actively participating in forest patrols and community activities. He mentioned that some people who go fishing in the forest occasionally bring back one or two turtles with them, but he preferred not to disclose this information.

One key informant admitted that they captureed a turtle from a nearby forest and sold it for income. Income was shared among the four individuals. While informants were willing to share their past incidents, they were reluctant to provide details about the recent events because these activities are illegal.

the Southeast Asian Box Turtle, a Critically Endangered species, is present in the lower section of the Ou Tapaong and nearby wetlands. These unique ecosystems are highly threatened. Therefore, Criteria 1a and 4 of IFC PS6. Additionally, Criteria 1b may also apply due to the high threat level and declining population. are potentially met.

Figure 15: Distribution of identified turtle and tortoise species in and outside the OTP Command Area



❖ **Birds (3 species)**

Despite extensive interviews with key informants residing in the upper reaches of Ou Ta Paong, numerous endangered or critically endangered bird species were reported within their community. Conversely, only three of six bird species were confirmed by both key informants and CFi committees in the lower section. The following paragraphs summarize the primary findings and justifications for each species' presence, along with the associated level of confidence. These conclusions are based on in-depth interviews, technical expertise, and consultations with relevant units, which provided valuable assistance in verifying species of high conservation significance. Several species were initially identified by local residents.

- **Bengal Florican:** Five informants confirmed the presence of the Bengal Florican in the area of influence. Two individuals reported sightings within the past 10-20 years while three others have observed the species within the last five years and in the past. Notably, one informant witnessed a pair (male and female) as recently as March 2024 (see Figure 16). The lower reaches of Ou Tapaong exhibit a diverse mosaic of habitats, including open wetlands, grasslands, flooded forests, and minimally intensified paddy fields, creating a relatively undisturbed environment that is potentially conducive to Bengal Florican populations. Notably, the Ou Tapaong Command Area is situated only 1 kilometre from the Bakan Protected Landscape (BPL), a region characterized by similar ecological conditions (figure 16).

Established in July 2023 through a joint effort by the Ministry of Environment and the Wildlife Conservation Society (WCS), the BPL aims to safeguard the southernmost Bengal Florican subpopulation within the Tonle Sap Great Floodplain. Moreover, the BPL serves as a critical wintering habitat for the Yellow-breasted Bunting, Manchurian Reedwarbler, and Cambodia's unique population of the Chinese Grassbird, along with other globally threatened avian and wildlife species (WCS 2023).

The project area likely meets Criterion 1a (habitat of significant importance to Critically Endangered species) due to the presence of the Bengal Florican. Additionally, it may meet Criterion 4 (highly threatened and/or unique ecosystems) given the diverse habitat mosaic. However, a detailed ecological assessment is crucial to confirm these findings and identify any other relevant criteria.

- **Greater Adjutant:** During field assessments within the study area, multiple informants reported sightings of Greater Adjutants. While most individuals were unable to definitively distinguish between the Greater Adjutant and the similar-looking bird, which is Lesser Adjutant), one informant positively identified a Greater Adjutant within the Ou Tapaong Command area. This sighting occurred in recent years (figure 16). Unfortunately, due to the time of the observation, the Greater Adjutant had likely already migrated to its breeding grounds at Prek Toal Ramsar Site, a protected wetland area situated in Koh Chiveang community, Ek Phnom District, Battambang province (MoE 2012).

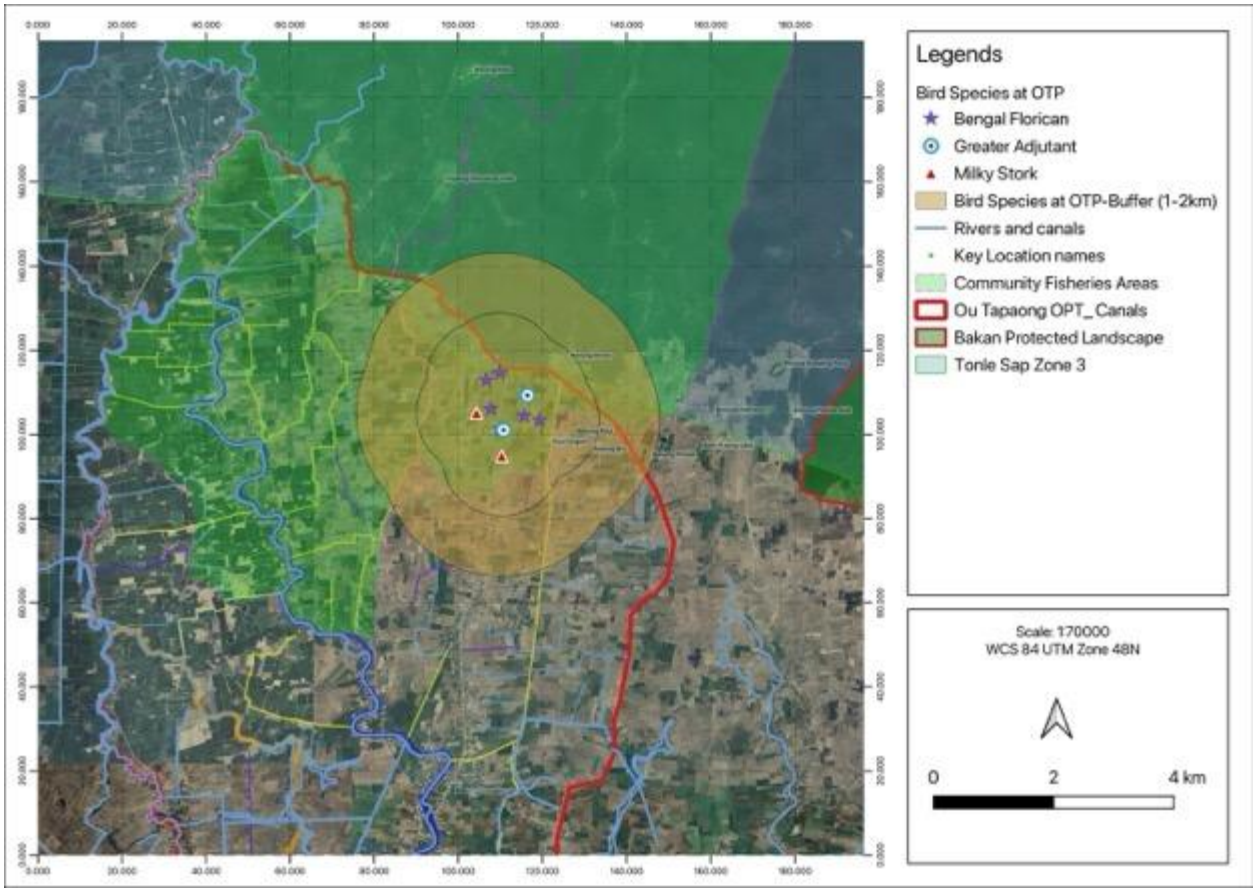
  Prek Toal Ramsar Site is the sole known breeding habitat for the greater adjutant in Southeast Asia and is recognized as the second-largest breeding colony for this species globally, following Assam, India. In December 2015, the Royal Government of Cambodia and the Ramsar Convention Secretariat designated the Prek Toal Core Area as a Wetland of International Importance due to its exceptional biological, social, and economic value. This designation solidified Prek Toal's status as Cambodia's fourth Ramsar Site (WCS 2016). Following the breeding season, greater adjutants migrate across the Tonle Sap Floodplain to their foraging habitats, with the lower section of Ou Tapaong serving as a critical foraging ground.

  Despite the challenges faced during the field observation due to the time of year, the confirmed sighting of a Greater Adjutant in the study area is a significant finding. It suggests that the species may still be present in the region and that a suitable habitat may exist for its continued survival.

  The findings indicate that the project area meets IFC PS6 Criteria 1a and 3. This is due to the presence of the Critically Endangered Greater Adjutant, a migratory species that utilizes the area as a critical foraging habitat, particularly during the non-breeding season.

Figure 16: A spatial distribution map was generated for three bird species—the Bengal Florican, Greater Adjutant, and Milky Stork—within the lower Ou Tapaong Command Area.

1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.



- **Milky Stork:** Despite repeated attempts to elicit accurate information, many key informants were unable to distinguish between the Painted Stork and the Milky Stork, two similar-looking bird species. This confusion is a common challenge in bird identification, especially for non-experts. While the Milky Stork is considered extremely rare in Cambodia, with sightings typically limited to 1-3 individuals, some informants claimed to have encountered larger groups. This discrepancy can be attributed to misidentification and the difficulty of accurately counting birds in the field.

  Based on my experience in bird identification and conservation, I was able to evaluate the credibility of the information provided. Two informants offered the most reliable accounts, describing sightings of 2-3 Milky Storks feeding alongside numerous Painted Storks in seasonal wetland areas near flooded forests (figure 17). These observations align with the limited available data on Milky Stork distribution and behavior in Cambodia. When the flooding season arrives, they migrate to degraded forest areas in the uplands. Milky Stork and Great Adjutant are migratory birds that move both locally and across international borders. The Prek Toal Ramsar Site serves as the only known breeding ground for Milky Stork and Greater Adjutant in Southeast Asia; after breeding, they migrate to other wetland areas throughout the country.

The Milky Stork's situation appears to align with several IFC PS6 criteria:

- **Species Level:** Endangered Species (Criterion 1a): The Milky Stork's rarity and the challenges in accurately assessing its population make it a strong candidate for this criterion. Its limited distribution and potential threats further emphasize its vulnerability.

  Migratory Species (Criterion 3): The migratory nature of the Milky Stork, particularly its reliance on the Prek Toal Ramsar Site as a breeding ground and its movements to other wetland areas, highlights its dependence on various habitats throughout its range.

  Ecosystem Level: Highly Threatened and/or Unique Ecosystems (Criterion 4): The wetland habitats used by the Milky Stork, especially the flooded forests and seasonal wetlands, are often threatened by human activities like deforestation, agriculture, and pollution. These ecosystems are essential for the survival of the species and other biodiversity.

Figure 17: Photograph of a Milky Stork foraging alongside a flock of Painted Storks (credit: Sang Mony, Sam Veasna Conservation Tour), and a map illustrating the distribution of Milky Stork sightings in Cambodia from 2020 to 2024, extracted from eBird data.



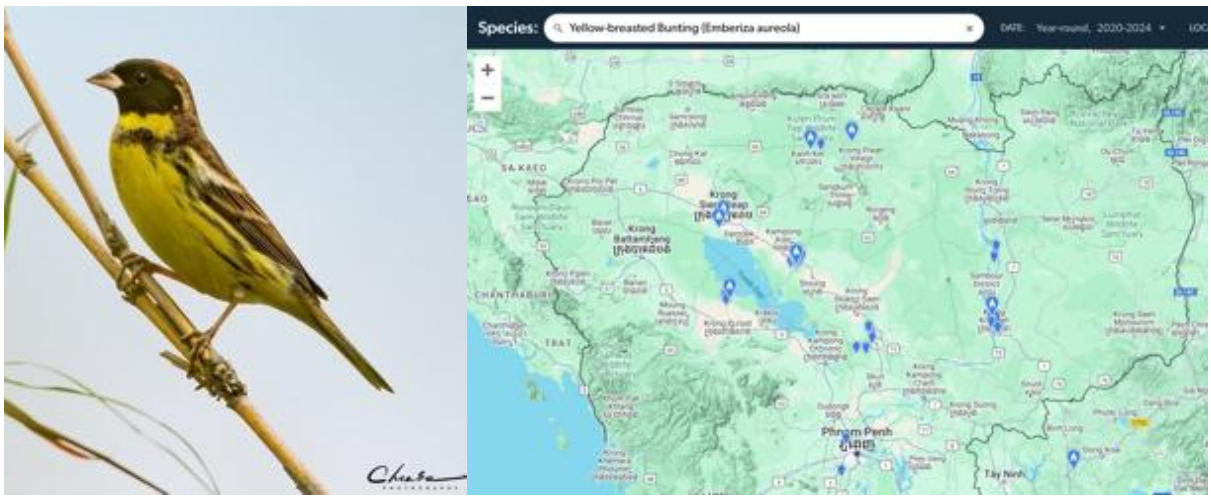
- **Yellow-breasted Bunting**: The Yellow-breasted Bunting is a small, migratory songbird found in Southeast Asia, including Cambodia. It is characterized by its bright yellow breast and throat, contrasting with its olive-green upperparts. The Yellow-breasted Bunting is a winter visitor and spring passage migrant in Cambodia, often found in rice fields, scrub, grasslands, and marshes in the lowlands. In Cambodia November to May, the species has been recorded in the Tonle Sap Floodplain and the Lower Mekong Delta. Yellow-breasted Buntings are typically observed in rice fields, scrublands, grasslands, and marshes in the lowlands of Cambodia (Ly et al. 2022).

  The local population often mistakenly identifies this species as a sparrow or a weaver due to their similar size, appearance, and shared habitats. After conducting inquiries, none of the locals could confirm whether they had observed this species in the area. This highlights a common gap in local ecological knowledge regarding small bird species like this one. Identifying such species typically requires individuals with advanced birdwatching experience, who can locate them in the appropriate habitat at the right time.

Based on an overall assessment of the habitat conditions in the lower part of Ou Ta Paong, we can confirm that this area has the potential to serve as a wintering habitat for this species. Additionally, the boundary of the Ou Tapaong Command Area is just 1 km away from the Bakan Protected Landscape.

The Yellow-breasted Bunting's Critically Endangered status and the Ou Tapaong area's potential as a wintering habitat potentially meet IFC PS6 Criteria 1a. Additionally, the species' restricted range and migratory behavior align with Criteria 2 and 3. The Yellow-breasted Bunting, a CR species, is known to inhabit such areas during its winter migration.

Figure 18: Photo of Yellow-breasted Bunting (Emberiza aureola) and its distribution map from eBird data (2020-2024) recorded by birdwatcher and wildlife overserves.



- **Wild-winged Duck:** Regarding the Wild-winged Duck, there was some confusion among informants who mistakenly identified it as the Knob-billed Duck (Sarkidiornis melanotos). However, after discussing key identification features and ecological characteristics, such as breeding and nesting habitats, we determined that none of them had actually encountered the Wild-winged Duck before. Due to it's tiny population, Wild-winged Duck is very sensitive, and live in the forest close to the lake, wetland, river and waterhold with less disturbance. Due to its limited population, the Wild-winged Duck is particularly sensitive to disturbances and prefers to reside in relatively undisturbed forests adjacent to lakes, wetlands, rivers, and watering holes. This preference for quieter, less populated areas help to ensure the survival of this vulnerable species.

❖ **Mammals/ primates (2 species)**

No suitable habitats or sightings of three mammal species were identified in the upper section of Ou Ta Paong. Two primate species (Indochinese Silvered Langur and Long-tail Macaque) were confirmed at the lower section in the Flooded Forest habitat of the Tonle Sap Zone 3 and CFi Areas. Additionally, multiple reports indicated the presence of Hiary-nosed Otters in the region, particularly in the deep waters of the flooded forest near the Tonle Sap Great Lake's mouth. The following paragraphs summarize the key findings and justifications for the presence of these two primate species, along with their associated confidence levels. These

conclusions are based on comprehensive interviews, technical expertise, and consultations with relevant units, which contributed to the verification of species with high conservation importance.

- **Indochinese Silvered Langur:** Six local informants (86%) reported frequent encounters with Indochinese Silvered Langurs within the flooded forests of Tonle Sap Zone 3 which is outside of the OTP command area. These sightings, primarily near natural lakes, have been confirmed by multiple individuals engaged in livelihood activities within these areas. While the population of Indochinese Silvered Langur was once plentiful, informants noted a significant decline in recent decades, with only smaller troops now being observed. The species is known to inhabit areas near rivers and large bodies of water.

  Mr. Chem Sophal from Punleu Komar Organization highlighted that his organization provides support for the Samraong Muk Yeik Community Fishery (SMY-CFi) and Sdok Khlouk Community Fishery (SK-CFi) in managing and protecting fisheries resources and flooded forests within their Community Fishery Area (figure 19). Portions of these CFi Areas overlap with the Lower section of Ou Tapaong Command Area. This effort is part of the EU “Our Tonle Sap” Project, led by the Wildlife Conservation Society and funded by the European Union. Mr Sophal emphasized the presence of numerous endangered and critically endangered species, including the Indochinese Silvered Langur, within this CFi Area. To confirm the presence of any Community Fisheries (CFIs) within the specified area, we interviewed the Chief of Pursat Fishery Administration Cantonment. Our inquiry revealed that two CFi areas overlap with the designated region, as illustrated in the accompanying map (see map below).

  Based on the provided information, the following IFC PS6 criteria are potentially met regarding the Indochinese Silvered Langur and the flooded forests of Tonle Sap Zone 3:

  Species Level:

  - Criterion 1: Critically Endangered and Endangered Species: The Indochinese Silvered Langur is an endangered species, making its habitat a potential candidate for this criterion. Criterion 2: Highly Threatened Species: Given the observed decline in the population and potential threats to its habitat, the species could be considered highly threatened.

  Ecosystem Level:

  - Criterion 5: Highly Threatened and Unique Ecosystems: The flooded forests of Tonle Sap Zone 3 represent a unique and threatened ecosystem, particularly due to factors such as habitat loss and degradation.

- **Long-tailed Macaque:** Indochinese Silvered Langurs and Long-tailed Macaques were commonly reported by key informants residing within the Tonle Sap Zone 3. These informants, who frequently engaged in fishing activities in the surrounding forests, encountered Long-tailed Macaques regularly. They added that these primates, known for their social nature, live in troops and communicate vocally to alert their group

members of potential threats or discoveries. Some troops inhabit flooded forests situated close near the command area.

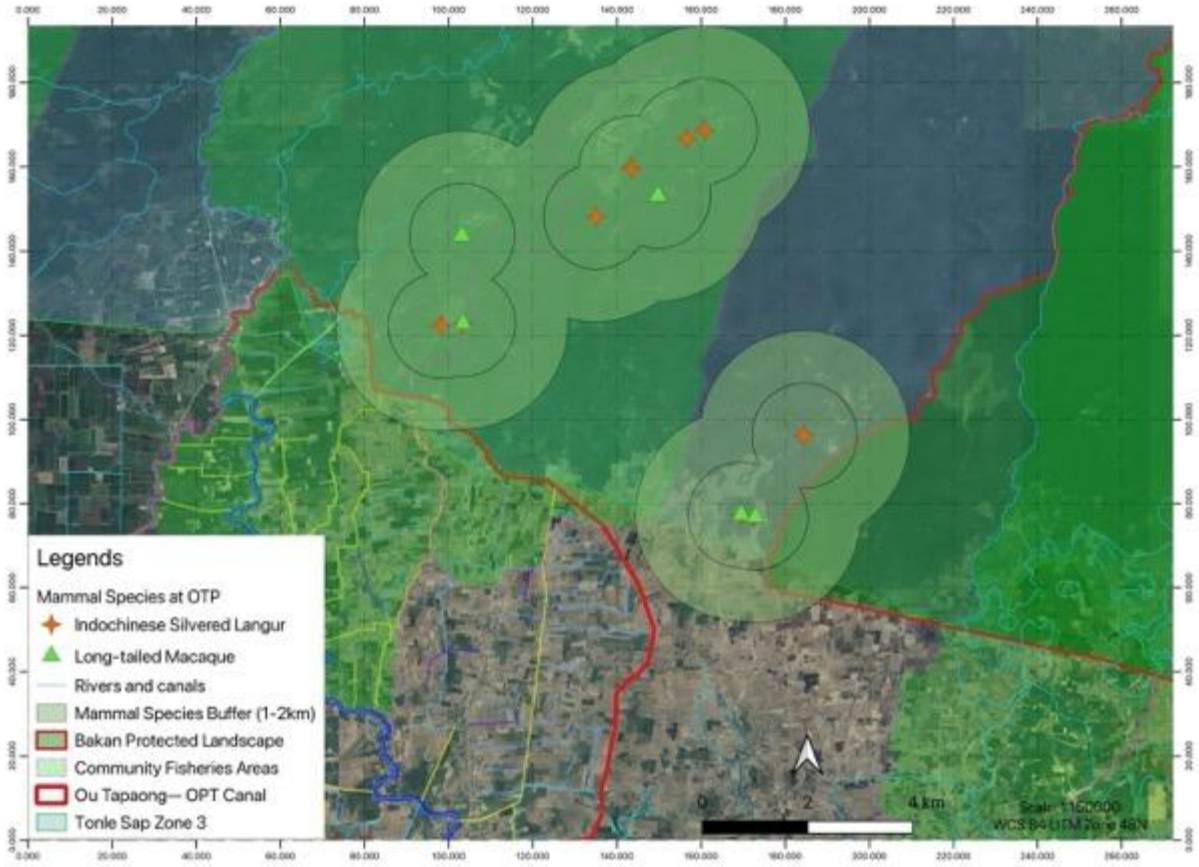
However, informants expressed deep concern over the significant decline in the population of Long-tailed Macaques over the past several years. This alarming trend has prompted urgent action from conservation organizations. In response to the deteriorating situation, the primate specialist group upgraded the conservation status of this species from Vulnerable to Endangered in March 2022. This elevated status underscores the urgent need for increased protection measures to mitigate the species' decline, which is primarily driven by the high demand for these primates in the illegal pet trade (*Primate Conservation Alliance. 2022)*

The provided information strongly suggests that the Tonle Sap Zone 3 adjacent to the OTP meets multiple IFC PS6 criteria related to the Critically Endangered Long-tailed Macaque:

- Criteria 1a: The recent uplisting of the Long-tailed Macaque to Endangered status by the IUCN Red List underscores the habitat's critical importance for the species' survival and reproduction. The frequent sightings of these primates by local informants, especially in the flooded forests, highlight the area's significance as a key habitat.
- Criteria 4: The flooded forests of the Tonle Sap Zone 3 represent a highly threatened and unique ecosystem. They face significant threats from habitat loss, pollution, and climate change. These forests provide a crucial habitat for the Long-tailed Macaque and other potentially threatened species.

Figure 19: A spatial distribution map was generated for two primate species—the Indochinese Silvered Langur and Long-tailed Macaque—within the lower Ou Tapaong

Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.



❖ **Fishes (2 species)**

Overall, these statements provide valuable insights into sightings and knowledge about Siamese Tiger Perch and Striped Catfish within different sections of the Ou Tapaong Command area. The following paragraphs summarize the key findings and justifications for the presence of these two fish species confirmed by key informants, along with their associated confidence levels and their ecological knowledge of fish diversity and migration.

- **Siamese Tiger Perch:** According to four key informants in the upper section of the Ou Tapaong Command area, Siamese Tiger Perch has been consistently observed in Boeng Kansaeng Lake, located in the southwest part of the Ou Tapaong Command Area. Three of them reported encountering a few individuals of this fish species in 2023 and 2024 (figure 20), while another informant saw them about 20 years ago during the fully flooded period. This particular informant stopped fishing for many years after becoming older.

  The Siamese Tiger Perch is believed to migrate from Tonle Sap Great Lake to the upstream through Svay Daun Kav River (along the western boundary of command area) and then move into Boeng Kansaeng through its tributary canal during flooding periods. Common fishing gear used includes line nets, cast nets, and small fish traps. The informants mentioned that catching this species is extremely rare, with only one to two individuals caught per season using line nets. They possess extensive knowledge about fish and make a living through fishing.

On the other hand, two key informants from the lower Ou Tapaong section stated that although they are familiar with Siamese Tiger Perch, they have never seen them in their area. One informant mentioned having seen this species in 1979 but not recently. Similarly, Mr. Chem Sophal from Punleu Komar Organization confirmed his awareness of this species but stated that it is not present in the lower Ou Tapaong Area.

The Criterion 1a of IFC Performance Standard 6 (PS6) is potentially met. The Siamese Tiger Perch, a Critically Endangered species, has been observed in Boeng Kansaeng Lake, a habitat within the Ou Tapaong Command Area. However, the frequency of sightings is low and historical, suggesting that further investigation is necessary to definitively establish the habitat's significance for the species' survival and reproduction.

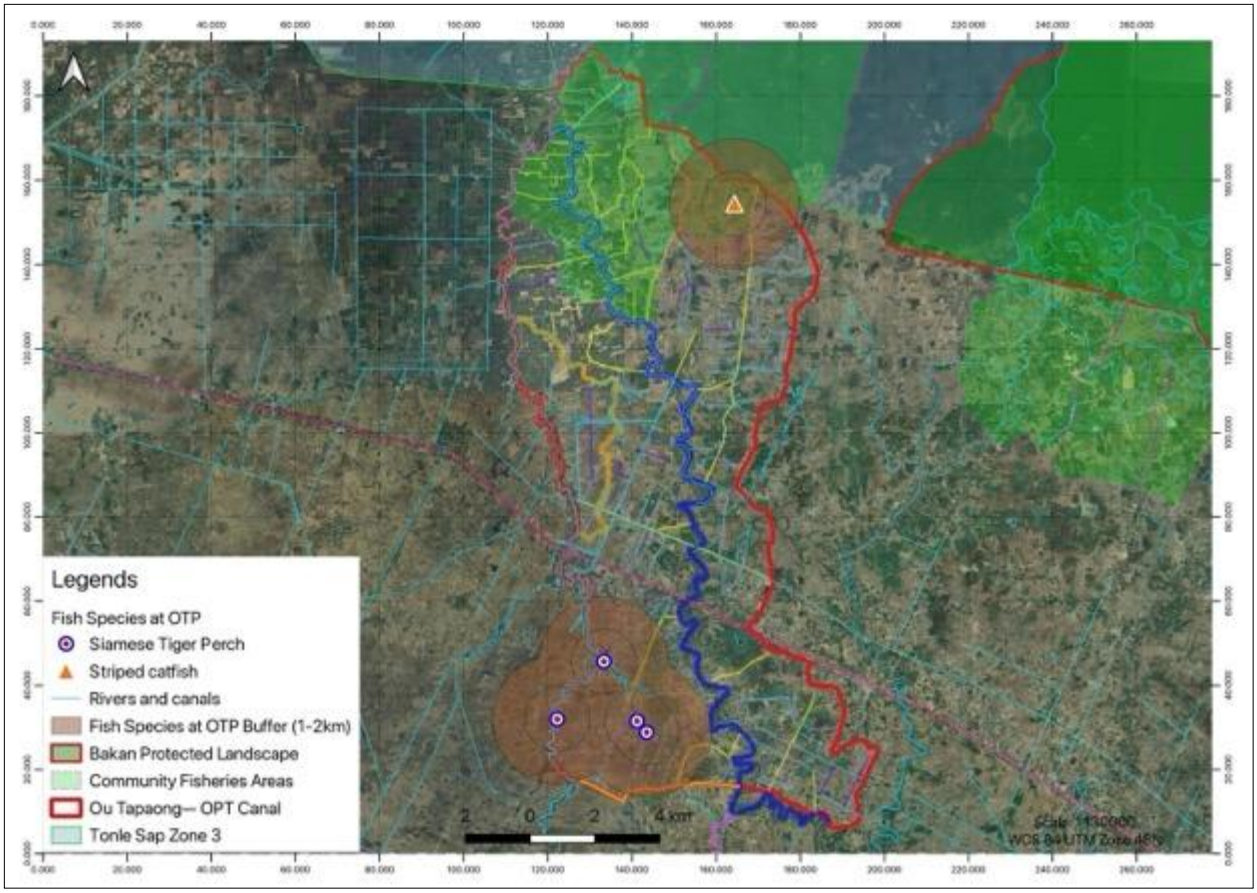
- **Striped catfish**: One informant recalled seeing the Striped Catfish approximately 7 years ago in a small wetland area during the peak of flooding. This species is exceptionally rare, and it is known to migrate to this specific area when the entire region becomes submerged in floodwater.

  Based on what we know, the habitat for the Critically Endangered Striped Catfish likely meets two of the IFC PS6 criteria:

  - Criterion 1a: This habitat is super important for the survival of this super rare fish. It's like their special breeding ground during floods.
  - Criterion 3: The fish migrates to this specific area when it floods, making it a key spot for this travelling species.

Figure 20: A spatial distribution map was generated for two fish species—the Siamese Tiger Perch, and Striped Catfish (old record-7 years ago)—within the lower Ou Tapaong

Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.



4.3.1.4 Occurrence of Protected Areas near the Sub-scheme Area

A review of protected areas in the vicinity of the sub-scheme has been conducted as a preparatory step before proceeding with Step 3 of the CHA. There are four areas located near and downstream of the OTP sub-scheme (See Table below). The preliminary assessment focuses on the two that are closest to the OTB: Flood Forest Conservation, b) Bakan Grassland Protected Area[9].

No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
1	Flooded Forest Conservation	Royal Government of Cambodia: Sub-decree No. 197 dated 29 August 2011	The Tonle Sap's flooded forests are a vital part of its unique ecosystem. During the wet season, the Mekong River's waters back up into the Tonle Sap, flooding vast areas and creating a rich habitat for diverse wildlife. This dynamic	0 (share the border)

[9] Bakan grassland is a protected area for birds designated by sub-decree No. 144 in 2023.

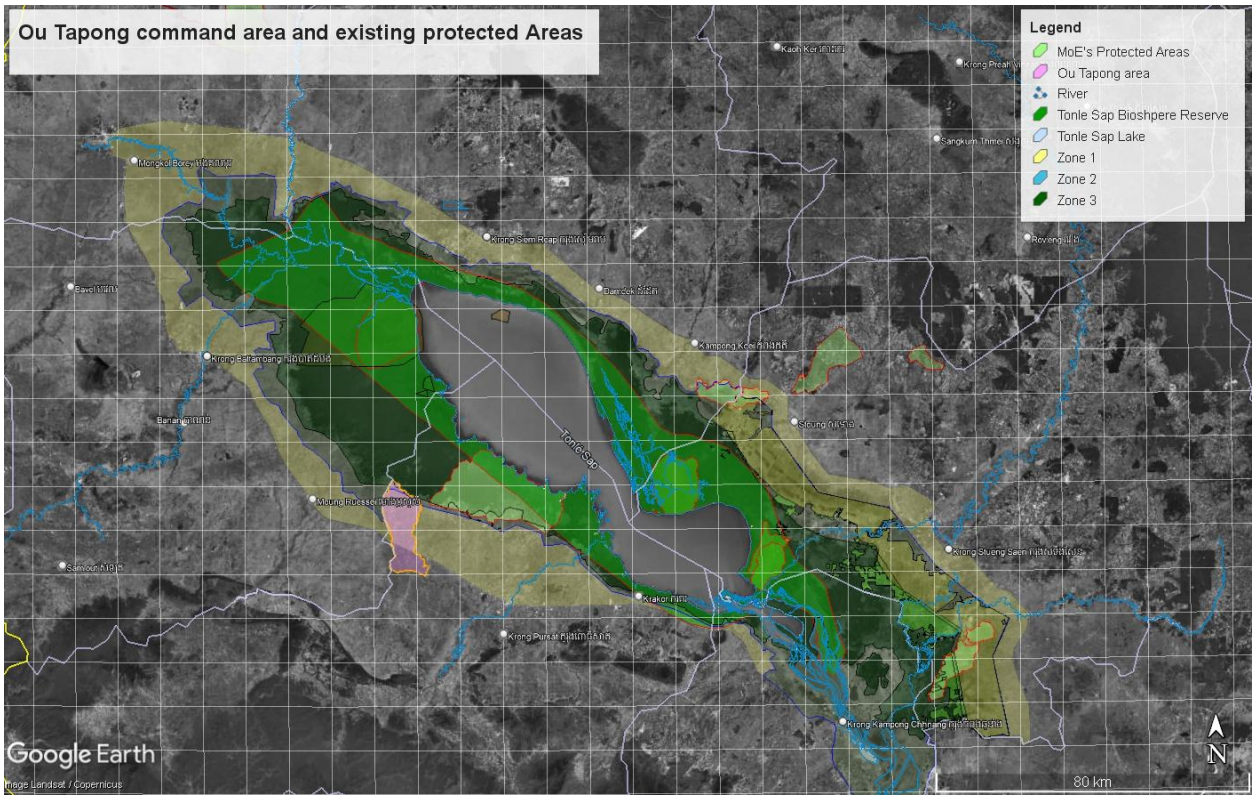
No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
			ecosystem supports a multitude of fish species, waterbirds, and other wildlife. However, it faces threats like deforestation, overfishing, and pollution, necessitating conservation efforts to protect this vital resource.	
2	Bakan Grassland protected area	Royal Government of Cambodia: Sub-decree No. 144, dated 04 July 2023	Bakan Grassland, a 38,430-hectare protected area in Cambodia, is a vital part of the Tonle Sap ecosystem. It's home to endangered bird species like the Bengal Florican and Chinese Grassbird. The Wildlife Conservation Society (WCS) and local communities are working together to protect this unique habitat.	2
3	Dei Roneat Important Bird Area (IBA)	BirdLife Internation	The IBA supports breeding colonies of important birds like the Darter, Lesser Adjutant, and Greater Adjutant. Its diverse habitat supports various bird species, but faces threats from human activities. Conservation efforts include monitoring, community engagement, habitat restoration, and policy advocacy to protect this crucial site.	12
4	Tonle Sap Biosphere Reserve (TSBR)	Royal Government of Cambodia: Royal Decree in 2001[10]	The Tonlé Sap Biosphere Reserve is a distinctive ecological region encompassing the Tonlé Sap, or Great Lake of Cambodia. The reserve was successfully designated a UNESCO Biosphere Reserve in 1997 and subsequently enshrined in the Cambodian Royal Decree in 2001.	16

[10] https://www.unesco.org/en/articles/national-conference-tonle-sap-biosphere-reserve-brings-together-stakeholders-discuss-sustainable

No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
5	Prek Toal Important Bird and Biodiversity Area (IBA), then designated at the core area of TSBR in 2001, and then promoted Prek Toal Ramsar Site in 2015	BirdLife Internation Royal Government of Cambodia: Royal Decree in 2001[11] Sub-decree in 2015	The area is well known as the largest waterbird breeding colonies in Southeast Asia, support a congregation of may globally threatened birds, fish and other wildlife specicis. It's the second world largest breeding habiatat for Greater Adjutant, and the only breeding habitat for Spot-billed Pelican, and Milky Stork in Southeast Asia. Prek Toal is only inland breeding population for Milky Stork in the world.	24

[11] https://www.unesco.org/en/articles/national-conference-tonle-sap-biosphere-reserve-brings-together-stakeholders-discuss-sustainable

Figure 21: Map of Ou Tapong Command Area and other existing protected areas under administered of the Ministry of Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministries of Water Resources and Meteorology



4.3.2 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species (identified in the list of 11 EN and CR species) qualify for Critical Habitat features.

All information presented in this study report has been meticulously verified against reliable sources, including key government research institutes, national and international organizations, and expert consultations. To ensure accuracy, fish, bird, mammal, and reptile species identification at Ou Ta Paong, Lum-Hach, Brambei Mom, Kraeu Trom, and Yutasas was confirmed through consultations as below:

Table 24: List of international and national key expert was consulted to check and verify each all target EN and CR species

Name	Position and institution	Key Area of expertise/ consultation	Contact
Dr. Ea Chitra	Head of the Aquaculture Faculty at the Kampong Speu Institute of Technologies	Key fish species were released by his faculty at Anlong Chrey and Brambei Mum Reserviors.	+855 14 388 694

Mr. Robert Tizard	Senior Project Lead for Tonle Sap Landscape, WCS Camodia	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme	rtizard@wcs.or
Mr. Tach Sovannara	Head of the Fisheries Lab at the Inland Freshwater Research and Development Institute of the Fisheries Administration	Identification and clarification of EN and CR species of fish and reptiles across all sub-schemes	
Mr. Khim Sokha	Chief of office of the Fisheries Conservation Department	Identification and clarification of EN and CR species of fish and reptiles across all sub-schemes	+855 12 784 687
Mr. Chuem Sophal	Program Manager, Punleu Komar Organization	Confirm present of birds and key wildlife species at Ou Ta Paong Sub-scheme	
Mr. Morn Ravy	Bakan Protected Landscape Project Coordination, WCS Cambodia	Confirm present of birds and key wildlife species at Ou Ta Paong Sub-scheme	morn@wcs.org
Mr. Somony Thay	Direct of Aquaculture Department, FiA	Fish identification, key fish species releasing data, and distribution range across all schemes	+855 12 829 971
Mr. Neang Ty	Conservation Program Manager, Wild Earth Allies	Internation and national expert on reptile	+855 12 864 409
Mr. Hong Chamnan	Director of the Freshwater Wetland Conservation Department, MoE	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme, national protected area data	+855 12 922 429
Mr. Sun Visal	Deputy Director of the Freshwater Wetland Conservation Department, MoE	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme, national protected area data	+855 12 708 836

All information concerning avian and other key wildlife species, including their behavioral patterns, was corroborated through sighting data verified by relevant experts from the Wildlife Conservation Society (WCS), a long-standing partner of the Ministry of Environment (MoE), Fisheries Administration, and Forestry Administration in conservation efforts spanning over 25 years. Additionally, consultations were held with Mr. Hong Chamnan, Director of the Freshwater Wetland Conservation Department, and Mr. Sun Visal, his Deputy Director and the head of the Tonle Sap Biosphere Reserve. Both individuals possess extensive experience,

ranging from 20 to 30 years, in avian ecology and protected area management within the Tonle Sap Lake region.

Finally, information related to reptiles and amphibians was validated through consultations with Mr. Neang Ty and his team from Wild Earth Allies, renowned experts who have made significant contributions to the discovery of new reptile and amphibian species in Cambodia, including the Cardamon Shrub Frog (Philautus cardamonus).

4.3.2.1 Overview of the current land use and land cover at OPT

The map below features the current land and use and land cover at Ou Tapaong Command Area in late 2023. The colour bands failed to distinguish between rice fields, grassland and shrubland areas. However, based on field assessment, the command area is dominated by existing rice fields and some modified habitats. There are some small and fragmented natural habitats like shrubland, and grassland along the natural streams, seasonal ponds and wetland habitat creating a mosaic habitat for many wildlife species to strive as the area is situated within the Tonle Sap Floodplain close to many protected areas and IBBAs. Residential areas are situated along the main roads, rivers, and streams.

The northern portion of the OTP Command Area is a dynamic landscape characterized by a varied mosaic of habitats. Here, agricultural lands coexist with modified habitats, wetlands, shrublands, and remnants of grassland, seamlessly transitioning into the vast expanse of the Tonle Sap Zone 3 flooded forest.

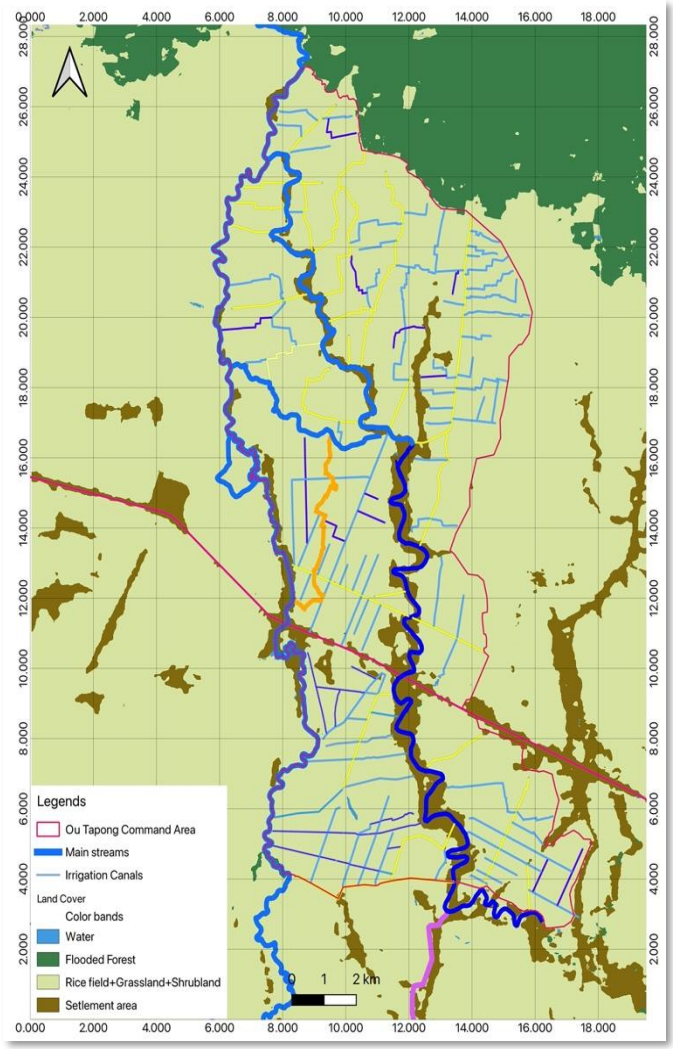
This diverse ecological mosaic plays a crucial role in supporting a rich array of biodiversity. The area serves as a vital foraging ground for numerous migratory bird species, providing them with abundant food resources. Additionally, it functions as a critical refuge and breeding ground for fish during the wet season, when the flooded forests and wetlands offer ideal conditions for spawning and juvenile development.

The intricate interplay of these habitats sustains a diverse community of wildlife, including birds, mammals, fish, and reptiles. These species rely on the unique characteristics of the flooded forest and wetland ecosystems for essential life cycle activities such as breeding, nesting, and foraging. The area's significance as a biodiversity hotspot is underscored by its role in supporting a wide range of Habitat of significant importance to CE and EN species

As presented in Section on Ecological State earlier, species that qualify as critical habitat features include:

- **Reptile** (4 species): Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise,
- **Mammals** (2 species): Indochinese Silvered Langur and Long-tailed Macaque),
- **Fishes** (2 species): Striped catfish and Siamese Tiger Perch, and
- **Birds** (3 species): Greater Adjutant, Milky Stork, and Bengal Florican.

Figure 22: Land use and land cover map based on the satellite image from Sentinel-2 with 10m resolution.

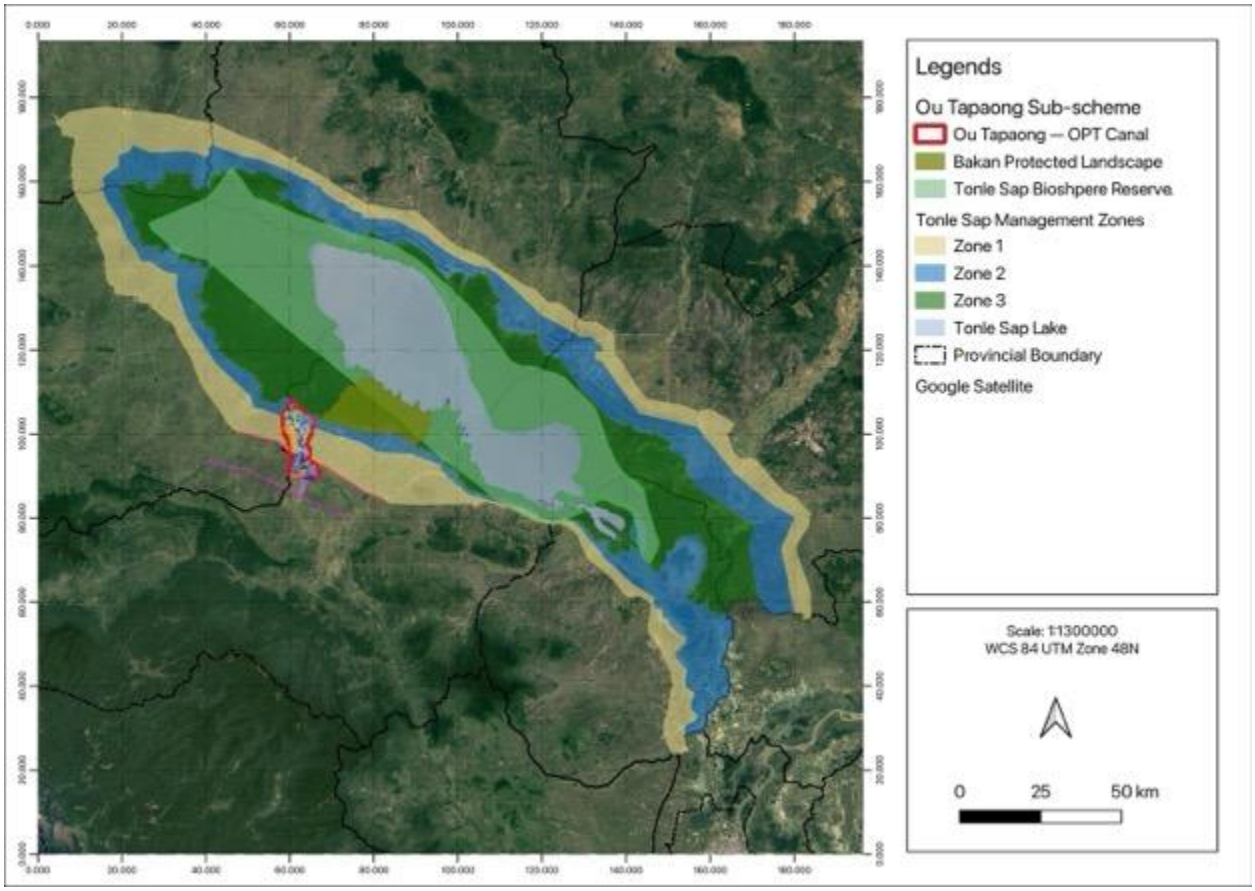


First of all, the Ou Tapaong command area was assessed as a modified habitat because the command area which is around 14,000 hectares is a mixture of paddy fields, rivers, shrubland, seasonal ponds, farmers, and houses. Rivers such as Ou Ta Paong River and Svay Donkeo River have been substantially modified at various locations of the river for water collection, storage, as well as for other living and farming purposes.

In this assessment, we divided Ou Tapaong Command Area into three parts: 1) the upper part to the south, 2) the middle part along National Road 5, and 3) the lower part to the north which is situated within the floodplain of Tonle Sap Zones 2 and adjacent to Tonle Sap Zone 3 for key informant interview and habitat assessment purposes as this command area is large and maintain different demographic and natural habitat conditions. On August 7, 2024, the Cambodian government discussed the decision to register two zones (Zone 2 and Zone 3) of the Tonle Sap Lake Basin as state land to protect the natural resources of the lake. This decision will prohibit any further requests for land concessions in these zones. The Ministry of Land Management, Urban Planning and Construction hopes that this will help to preserve the biodiversity of the lake[12]. The assessment focused on the upper and lower parts because these areas are known to have a diverse biodiversity landscape. While the survey revealed variations in knowledge about wildlife among local communities, it also highlighted the need for increased awareness and understanding across all areas.

[12] Land Management, Urban Planning and Construction, Cambodia (2024). Zones 2 and 3 of the Tonle Sap Lake will be registered as state land to preserve this precious natural resource for inheritance for all generations.

Figure 23: Map of Ou Ta Paong command area and other existing protected area within the Tonle Sap Basin



The southern part of the command area is predominantly agricultural, with limited remaining natural habitats. Boeng Kansaeng, the largest seasonal wetland, faces challenges in water retention during the dry season. While the command area mostly gets water for irrigation from the Svay Daunkaev and Pursat rivers, the water volume is insufficient to maintain natural flows (e.g. Ou Tapaung River). Additionally, human interventions such as earth dams and conversion of waterways into fishponds have fragmented the natural habitats and as such hindered the movement of aquatic species (Figures 24 and 25).

The northeastern part of the command area, though dominated by agriculture, includes a significant area of flooded forests. This diverse habitat supports a range of endangered and critically endangered species. However, the entire water system faces challenges that limit its suitability for species requiring extensive, interconnected habitats. The lowest part of this area is connected to a very healthy flooded forest habitat, consisting of many small and large waterholes, and wetland areas, creating a mosaic habitat that provides suitable ecological niches for many endangered and critical species in the area. This huge, flooded forest habitat is part of the Tonle Sap Multiple Use Area, Tonle Sap Biosphere Reserve under the Ministry of Environment, and Tonle Sap Management Zone under the administration mandate of the Tonle Sap Authority, and Flooded Forest Protected Area under the Fisheries Administration. Additionally, a portion of Ou Ta Paong's lower command area overlaps with two Community Fisheries (CFIs) areas.

The critical habitat for these bird species within the Ou Ta Paong Irrigation sub-scheme includes flooded forests, wetlands, lakes, rivers, grassland, abandoned and fellow rice fields, and waterways. The flooded forests in Tonle Sap Zone 3 serve as crucial habitats for several endangered and critically endangered primate species like the Indochinese Silvered Langur and Long-tailed Macaque and are characterised with lakes and wetlands inside that are crucial foraging habitats for birds. Based on this key finding we can identify and characterise critical habitats of various EN and CR species presence within and close the command area as below:

- Flooded forests, particularly those in Tonle Sap Zone 3, are particularly significant for biodiversity. These forests provide crucial habitat for endangered primates such as the Indochinese Silvered Langur and Long-tailed Macaque. Additionally, the lakes and wetlands within these forested areas offer essential foraging grounds for various bird species including Greater Adjutant and Milky Stork.
- Wetlands, such as Boeung Kansaeng, play a vital role in supporting aquatic and terrestrial biodiversity. These areas provide essential food, shelter, and breeding grounds for a variety of species including birds, reptiles, and fish.
- Rivers and waterways, like the Svay Daun Kav River, serve as important corridors for fish migration and connectivity between different habitats. This can indirectly benefit birds by providing a healthy aquatic ecosystem.
- Grasslands and open areas, while less diverse than forested habitats, can still support certain Bengal Florican, Yellow-breasted Bunting and other bird species. Abandoned and fallow rice fields may also offer temporary refuge for many bird birds including the Florican. The Bengal Florican utilizes this habitat for nesting and feeding during the dry season. The Yellow-breasted Bunting winters in this region before returning to its breeding ground in Siberia, Russia, from May to November

Based on the biodiversity assessment conducted at Ou Tapaong Irrigation Sub-scheme, several critical habitats have been identified, and described below. These habitats support a range of endangered and critically endangered species, highlighting their ecological significance. The critical habitat assessment activities that should be taken for the Ou Tapaong Command area, considering IFC PS 6 guidance on biodiversity conservation and sustainable management of living natural resources, are as follows:

1. Baseline Studies: Conduct comprehensive baseline studies to identify and understand the biodiversity values in the area. This should include a literature review, stakeholder engagement and consultation, field surveys, and other relevant assessments. The focus should be on identifying key species (such as Greater Adjutant, Milky Stork, Bengal Florican), fish (Siamese Tiger Perch and Striped Catfish), reptiles (Black Marsh Turtle, Southeast Asian Box Turtle, Giant Asian Pond Turtle, Elongated Tortoise), mammals (Indochinese Silvered Langur and Long-tailed Macaque), and their habitats.
2. Habitat Mapping: Map out the different habitats present within the Ou Tapaong Command area. This should include flooded forests, lakes (such as Boeung Kamsaeng Lake), rivers (Svay Daunkav River), waterholes, grasslands, and fellowed rice fields used by bird species for foraging.

3. Threat Assessment: Assess potential threats to critical habitats identified in step 2. Consider factors such as habitat loss due to infrastructure development or land-use changes related to irrigation system renovation.
4. Stakeholder Engagement: Engage with relevant stakeholders including local communities living in or around critical habitats to gather their knowledge about biodiversity values in the area.
5. Mitigation Measures: Develop mitigation measures specific to each identified critical habitat that aligns with IFC PS 6 guidance on avoidance of impacts whenever possible; implementation of measures to minimize habitat fragmentation; restoration activities during operations or after project completion; implementation of set-asides for protection; consideration of biodiversity offsets where appropriate based on no net loss principle.
6. Environmental and Social Impact Assessment (ESIA): Conduct an ESIA that considers all potential impacts on critical habitats identified through steps 1-5 above.
7. Monitoring Plan: Develop a comprehensive monitoring plan that includes regular monitoring of key species populations within critical habitats identified in step 2 above.

Figure 24: Boeung Kansaeng located in Ou Tampaong's upper reaches, offers sighted records of Siamese Tiger Parch. The area's upper part in this photo is a settlement along the Svay Daunkav River.



Figure 25: Overview of Boeung Kansaeng, located upstream of Ou Tapaong Command Area. A canal connects to Stueng Svay Daunkav River (left) and Ou Tapaong (right), a potential fish migration route during floods.



Figure 26: Aerial photograph depicting the Ou Tapaong Stream/canal fragmented by earth dams, roads, and ponds, illustrating its diversion for non-intended purposes.



Figure 27: Aerial photograph of intake flooded forest habitat within Tonle Sap Zone 3 and the continuous land encroachment, converting forest land for rice cultivation.



4.3.2.1.1 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Ou Ta Paong).

4.3.2.1.2 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for OTP, therefore is expected to qualify as critical habitats under this criterion.

4.3.2.1.3 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

4.3.2.1.4 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

Boeung Kansaeng Lake still maintains hydrological connectivity for fish migration from Stueng Svay Daunkav River through its canals, where the Siamese Tiger Perch was confirmed. Some small wetland areas at the lower part of the OTP command area support ecological functions and connectivity for confirmed birds, reptiles and fish species for their local movement, nesting, and foraging ground. So, that is necessary to support biodiversity values that require applying biodiversity mitigation measures and protection efforts (described under the above criteria) have been identified. Pumping, drainage, and discharge of chemical inputs into that

wetland can have a significant impact on the biodiversity and survival rate of EN and CR species present in that area.

4.4 Socio-Economic and Cultural Conditions

4.4.1 Administrative and Social Structure

4.4.1.1 Administrative System

Cambodia's administrative system at sub-national level is organized into three (3) tiers: capital city/province, district/municipality/khan, and sangkat/commune. Phnom Penh, the capital, is divided into khans and further into sangkats, while provinces are divided into municipalities and districts, with municipalities subdivided into sangkats and districts into communes and sangkats. The sub-national government is guided by organic laws, including the Law on Administration of Commune/Sangkat and the Law on Administration of Capital City, Province, Municipality, District, and Khan, supporting decentralization and deconcentration. Commune/sangkat administrations operate with legal, financial, and administrative autonomy, governed by elected councils responsible for budgets, development, and public order. Higher levels, such as provinces and districts, are governed by councils (legislative) and boards of governors (executive), with council members indirectly elected by commune/sangkat councils and supported by technical committees. Boards of governors, nominated by the Ministry of Interior, implement policies and supervise ministry units in their jurisdiction. Recent legal amendments aim to expand local administrations' authority over civil servants from national bodies, awaiting implementation through sub-decrees.

4.4.1.2 None-Governmental Organizations

Another institution which are playing an important role in the development of the country at sub-national level is the civil society. The civil society in Cambodia, particularly the NGOs plays a vital role in development and democratization. These organizations address challenges such as poverty, education, human rights, gender equality, and environmental conservation, filling gaps in governance and social services. NGOs contribute by providing microfinance, vocational training, and livelihood programs to alleviate poverty; supporting education through school construction, scholarships, and inclusive learning; and improving health outcomes with maternal health programs, HIV/AIDS awareness, and mental health support. They advocate for human rights, labor rights, and good governance, engaging in election monitoring and raising awareness about corruption and land rights. Additionally, NGOs promote environmental sustainability and climate resilience while advancing gender equality by combating violence and discrimination and empowering women in leadership. Within the project area, there are a number of NGOs being identified within the area in different sectors including environment, community development, such as Wildlife Conservation Society (WCS), and Adventist Development Relief Agency (ADRA).

4.4.1.3 Community-Based Organizations

Another social organization is Community-based organizations (CBOs). Cambodia, CBOs play a critical grassroots role, directly addressing local needs. Unlike NGOs, they are often less formalized and focus on mobilizing local resources for infrastructure, livelihood improvements, and strengthening community networks. CBOs contribute significantly to

disaster resilience, especially in flood-prone areas, and foster cultural preservation and social cohesion through community events and initiatives. Together, NGOs and CBOs empower communities, protect rights, and promote inclusive development, offering hope for a more equitable and sustainable future despite ongoing challenges. Types of CBOs include Community Fishery, Forestry Community, Agricultural Cooperatives, and social organizations such as saving groups, old age association, etc. All of these types are reported within the project target areas.

The identified agriculture-related community-based association is provided in Table below:

Table 25: Status of relevant CBOs within the project area

No.	Types of Associations	OTP
1	Agricultural Cooperatives	There are three (3) agricultural cooperatives in OTP focusing on vegetables, and rice.
2	Farmer Water User Community	There is a farmer water users' community. However, it is nonfunctional due to insufficient water supply for farmers.
3	Community Forestry	No community forestry in the command area.
4	Community Fishery	There is one community fishery in Ou Ta Paong sub-scheme, located in this sub-command area covering a total area of 60 hectares.

4.4.2 Demographic and Facilities

According to the commune database in 2023, the total number of households who are residing within and nearby Ou Ta Paong command area is 8,310 HH (out of which 1,397 HHs (17%) are female headed), giving the total population of 34,189 people (17,602 females). Moreover, the population are young with 62% of them are aging below 34 years old. More than half of the people (45%) completed education at primary school and below whereas those with secondary, high school, and higher education is only 22%, 16%, and 6%, respectively. It is noticeable that illiterate people have still existed at 10%.

Table 26: Administrative and population coverage of Ou Ta Paong sub-scheme

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
1	Pursat/ Bakan	Beung Khnar	1	254	1040	516
		Ou Ta Paong	19	3,973	17,263	8,949
		Rumlech	1	263	960	503
		Svay Doun Keo	6	1,178	2,691	5,143
		Me Teok	8	2,176	4,385	8,686
		Khnar Torteung	3	286	1,097	558
	Total	**6**	**38**	**8,130**	**34,189**	**17,602**

(Source: Ministry of Planning, Commune Database, 2023)

Overall, it is apparent that the Ou Ta Paong sub-schemes contain young population indicating its high potential in future development activities. However, it is a concern as the population have very limited higher education.

Table 27: Demographic information of the HH living within and the vicinity of the command areas

Parameters	Percentage	Parameters	Percentage
Overall		**Educational Level**	
Total HH	8,130	Kindergarten	23%
Female HH Head	1,397 (17%)	Primary school	22%
Total Population	34,189	Secondary school	22%
Female	17,602	High School	16%
Age		College/University	6%
<18 years old	37%	TVET	2%
18 – 34 years old	25%	Illiterate	10%
35 – 60 years old	26%		
> 60 years old	12%		

(Source: Ministry of Planning, Commune Database, 2023)

Energy access of the population within the target area was found to be high, giving its proportion at 99.8% access to electricity and only a minority of them continue using battery (0.1%), and biogas (0.1%). However, the sources of water for domestic consumption were low with only 19% of them having access to water supply system while the rest continue using pump well, tube-well, opened-well, pond, rainwater and river, indicating the access to clean water continue to be a huge constraint within the project target areas. A good sign for the people is how they are using water for drinking purposes which was found to be almost all using safe water for drinking (tape water 30%, filtered water 61%, and boiled water 9%). There is a concern, however, regarding the reliability of the tape water quality which may create a significant impact on people's health, if they are not properly monitored. Interestingly, almost all the people within the target areas own a toilet showing their understanding of the importance of water, sanitation and hygiene.

Table 28: Access to energy and water and sanitation facilities

Parameters	Percentage	Parameters	Percentage
Source of Energy		**Drinking Water**	
Electricity	99.8%	Tape water	30%
Battery	0.1%	Filtration	61%
Solar	0%	Boiled	9%
Biogas	0.1%		
Water Source for HH consumption		**Toilet**	
Tape water	19%	Pour Toilet	99%
Pump well	13%	Flush toilet	1%
Wells	4%	Total toilet	100%
Opened Well	3%		
Pond	27%		
Rainwater	22%		
River	11%		

(Source: Ministry of Planning, Commune Database, 2023)

4.4.3 Socio–economic Conditions of the Beneficiaries

Agriculture is reported as the primary occupation for the population within the command areas, with full-time private sector employment accounting for the second largest proportion (10%).

As for secondary occupations, rice and crop production remains the most common, followed by full-time private sector work.

Table 29: Occupation of the HHs living within and the vicinity of the Ou Ta Paong

Parameters	Percentage	Parameters	Percentage
Main Occupation		**Secondary Occupation**	
Rice and crop production	37.82%	Rice and crop production	22.42%
Animal production	0.30%	Animal production	5.08%
Fishing/aquaculture	0.30%	Fishing/aquaculture	0.75%
Trade	4.48%	Trade	3.89%
Service	1.94%	Service	3.29%
Government staff	2.24%	Handicrafts	0.45%
Workers (full-time, private sector)	10.01%	Government staff	1.79%
Workers, (seasonal, private sector)	1.35%	Workers (full-time, private sector)	9.87%
Housewife	2.39%	Workers, (seasonal, private sector)	3.14%
Student	24.36%	Housewife	3.14%
Other	1.20%	Student	24.36%
No job	13.60%	Other	2.24%

(Source: ESCIA Field Survey, 2024)

A significant proportion of the population with poor 1 & 2 is reported at 9%, indicating the level of economic condition of the areas while the proportion of the people with disability (PWD) is at 1.1%. People are migrated to both inside and outside the country with the highest one is within the country (16%) while 13% migrated to abroad. This makes the total migration of 29%.

Table 30: Migration and vulnerability of the people within the sub-schemes

Parameters	Percentage	Parameters	Percentage
Vulnerability		**Migration**	
Poor 1	1%	Inside the country	16%
Poor 2	9%	Out of the country	13%
Total	**9%**	**Total**	**29%**
Disable person	1.1%		
Old people	0.2%		
Orphan	0.2%		
Total	**1.5%**		

(Source: ESCIA Field Survey, 2024, Ministry of Planning, Commune Database, 2023)

Wooden houses are the most dominated shelter of the people comprising of 57% of the total settlement. Semi-permanent is the second most popular (30%) while the rest belong to one floor or more brick walls, temporary houses and others. Interestingly, about 4% of them live in temporary houses. The assets that people own the most are Television (80%), followed by motorbike (59%), and bicycle (51%), and power tiller (25%) while the rest are in small proportion.

Table 31: Houses and Assets of the HHs within Ou Ta Paong

Parameters	Percentage	Parameters	Percentage
Assets		**Type of Houses**	
HH with Tractor	1.4%	One floor or more/brick wall	8.6%
Power Tiller	25.4%	Semi-permanent	30%
HH with Rice Harvester	0.8%	Wooden house, thatched	57%
Threshing Machine	0.0%	Temporary houses	3.6%
Harvest and Threshing Machine	0.2%	Other	0.7%
Mobile rice mill	0.0%		
Car	6.2%		
Other Machinery	0.3%		
Motorbike	59.2%		
Tricycle	0.2%		
Bike cycle	51.0%		
Boat	7.0%		
TV	80%		

(Source: ESCIA Field Survey, 2024, Ministry of Planning, Commune Database, 2023)

The data highlights family violence (0.71%) and drug use (0.36%) as the most pressing issues, followed by land disputes (0.28%). In contrast, sexual harassment, human trafficking, and crime report no cases, suggesting potential areas for further investigation into reporting mechanisms or community dynamics.

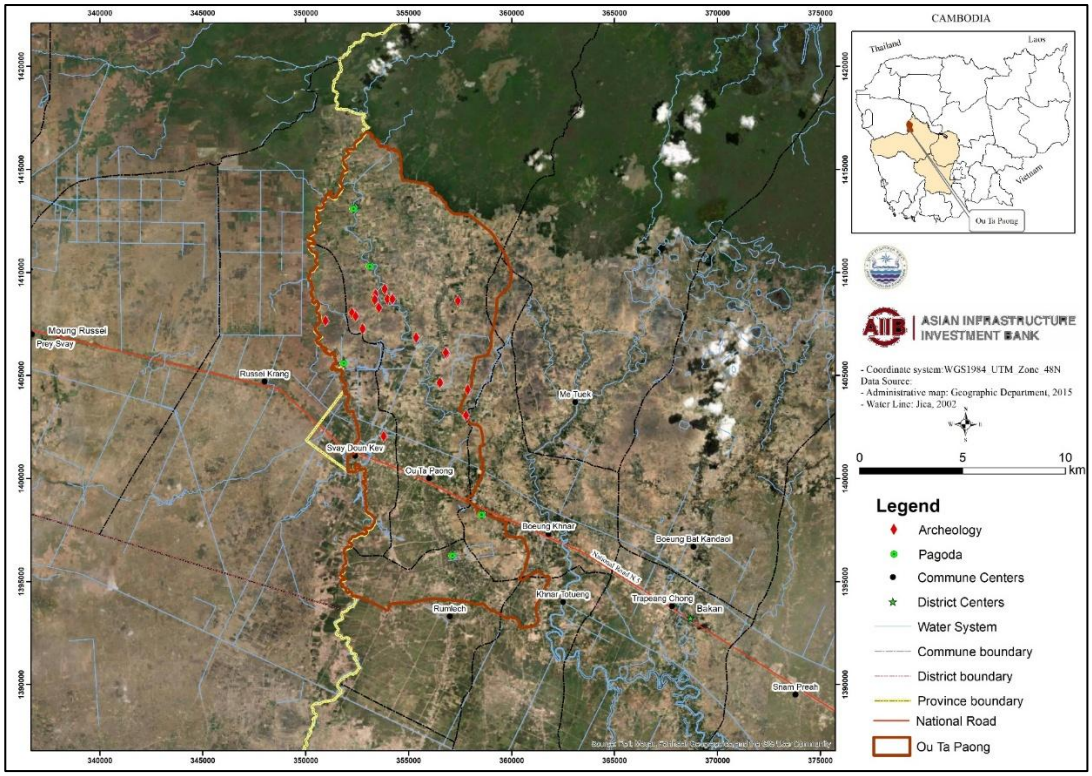
Table 32: Issues in the project communities

Parameters	Ou Ta Paong	Total
Sexual Harassment	0.00%	0.0%
Human Trafficking	0.00%	0.0%
Violence in the family	0.71%	0.71%
Drug using	0.36%	0.36%
Crime	0.00%	0.0%
Stolen Cases	0.02%	0.2%
Land Issues	0.28%	0.28%

4.4.4 Cultural Sites

A key aspect of the environmental and social safeguards assessment (SECAP) includes the consideration of sites of cultural importance and heritage. Cultural heritage is an important component of the cultural identity of local communities, groups and individuals. It is key to social cohesion and therefore cultural heritage sites, structures and values should be protected, where possible, from construction of project components which could cause disturbance or disruption. Sites of cultural and heritage importance within the Ou Ta Paong command areas shall be not affected during or after the irrigation system design and construction phases.

Figure 28: Maps of archaeological and cultural sites in and near Ou Ta Paong Sub-scheme



4.4.5 Gender

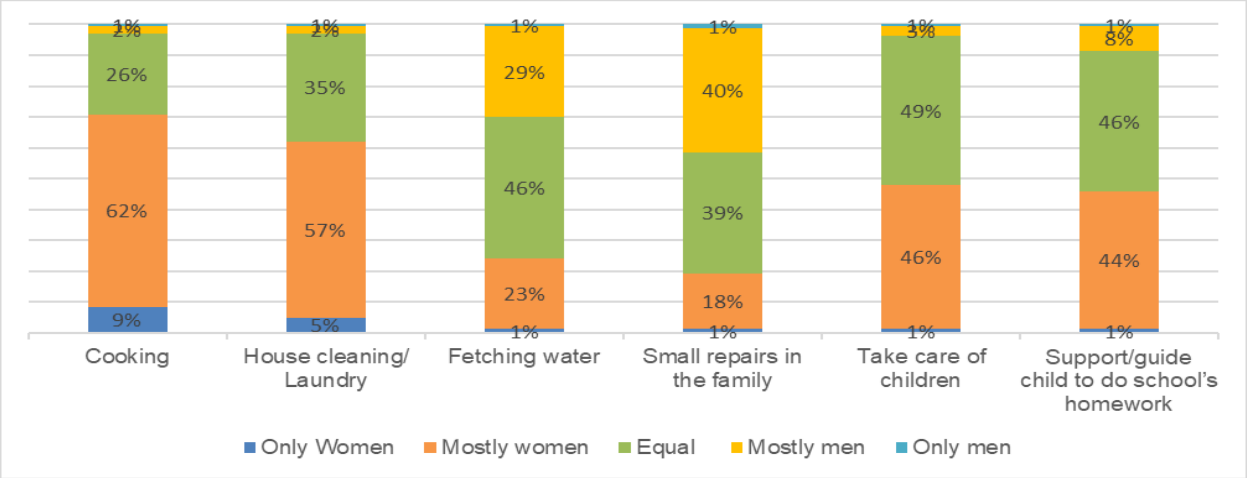
4.4.5.1 Labor Division

CAISAR Gender Assessment and Social Inclusion Plan reported that men spend on average of 59.4% of their time for farming whereas women spend only 40.5%. In traditional farming context, men involve the most during cultivation stage while women are more engaged in the later production. Heavy duty tasks such as land preparation are designated to men while seedling preparation and weeding are commonly assigned to women. Transplanting, uprooting, harvesting, and marketing are generally shared by both. However, the practices have been changed lately due to the presence of mechanization where land preparation, harvesting and threshing have been replaced by machinery.[13]

Coming to household chores; women handle 90% of the workload. During the COVID-19 outbreak, women spent even more time on domestic and caregiving tasks. Elderly family members bear the full responsibility for raising grandchildren when their mothers have migrated. In the project area, similarly, in families where women work in nearby garment factories or migrate for paid employment, domestic duties are often shifted to young girls and the elderly. [14]The ESCIA field survey showed that cooking, housing and cleaning, child caring and schooling are mainly at the hand of women, except repairing in the household and fetching water where men involve the most (Figure 29).

Figure 29: Division of Roles in Household Chores (n=140)

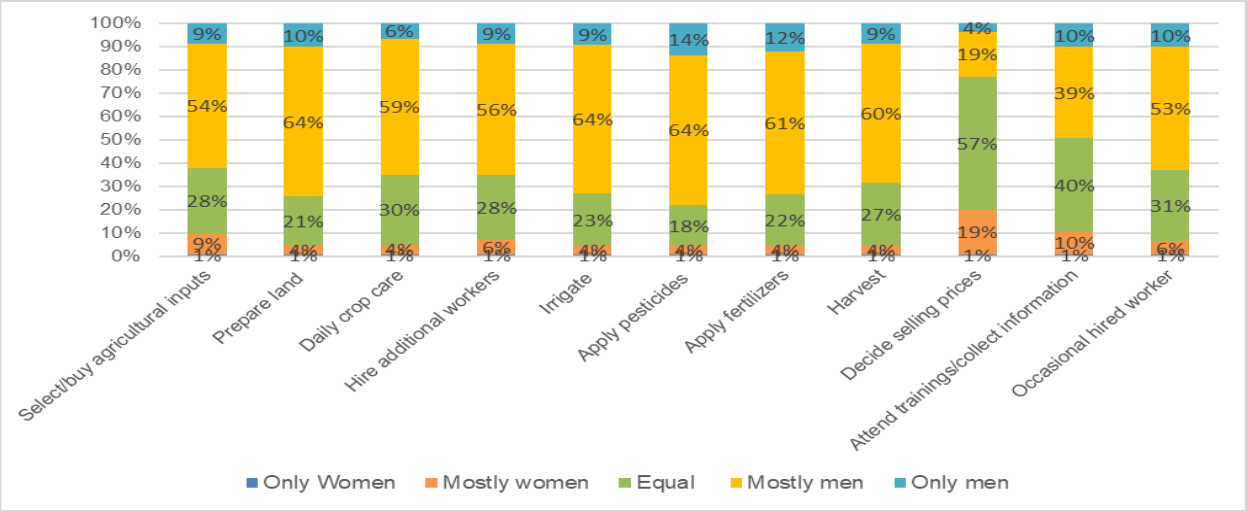
[13] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.
[14] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.



(Source: ESCIA Field Survey, 2024)

In crop production, the majority of tasks, particularly during the production phase, were found to be dominated by men. However, men and women were more equally involved in attending trainings and deciding the selling price of their produce. Interesting, women only are less participation in the cultivation at all stage. This reduced participation of women in agricultural production may be attributed to their employment in factories (Figure 30).

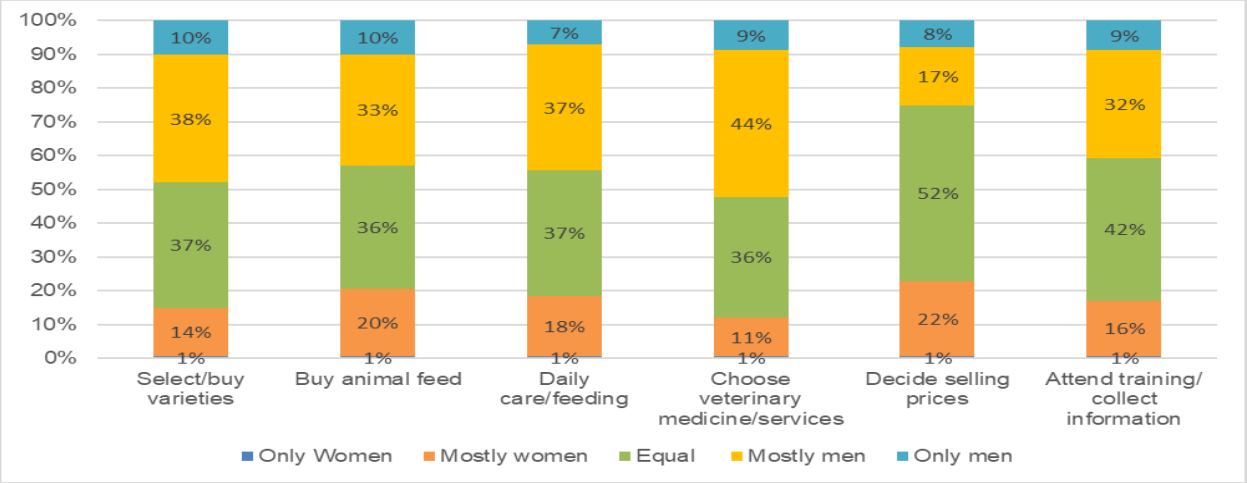
Figure 30: Share of Roles in Crop Cultivation (n=140)



(Source: ESCIA Field Survey, 2024)

In animal production, labor distribution is relatively balanced between mostly men and equally shared. However, tasks such as selecting animal breeds and choosing treatments for curing are predominantly handled by men, while the rest of the production tasks are done collaboratively. Women were found to have a slight dominance in animal raising, likely due to the same reason mentioned earlier_their greater involvement in factory employment (Figure 31).

Figure 31: Share of roles in Animal Husbandry (n=140)



(Source: ESCIA Field Survey, 2024)

4.4.5.2 Income

The CAISAR Gender Assessment and Social Inclusion Plan revealed notable findings regarding income differences by gender. On an individual level, the average monthly income for female household members is $121.4 (n=238), which is lower than the $166.6 earned by male members (n=366), showing a statistically significant income gap of $45.2. However, at the household level, there is no significant difference in average income between female-headed and male-headed households, with a small mean difference of $17.3. Nationally, 48% of married men (aged 15–49) reported making joint decisions with their wives on income use, 46% said their wives mainly make these decisions, and 6% said they decide alone. Additionally, 97% of married women (aged 15–49) who earn cash from employment participate in decisions about their earnings, with 63% making these decisions mainly on their own.[15]

4.4.5.3 Decision Making

Regarding decision-making, the matters related to children, such as education, childcare, and marriage, are typically decided by both husband and wife. However, a significant number of households have women as the sole decision-makers on child-related issues. When it comes to daily livelihoods, decisions such as household expenses, sales of home-produced goods, and visiting friends or family are usually made jointly. Still, a notable portion of respondents indicated that women alone make decisions regarding their own livelihoods, family expenses, attending trainings, and similar matters. While women tend to take the lead on child and livelihood issues, decisions concerning agricultural activities, like cultivation and animal husbandry, are mostly handled by men. This is largely due to the physically demanding and sometimes hazardous nature of agricultural work, such as pesticide application.[16]

4.4.6 Agricultural Production

4.4.6.1 Rice Production

A significant portion of the Ou Ta Paong is flooded by waters from the Tonle Sap Lake for about three months each year, requiring farmers to adapt their agricultural activities to this

[15] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.
[16] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

seasonal flooding. In areas prone to shallow flooding, farmers often plant long-duration varieties that can withstand flooding better, relying on deep-rooted crops to survive potential droughts. In areas experiencing more severe flooding, farmers may still attempt to two crops, but with higher risk. An early, short-duration, rain-fed crop is planted before the flood, with fields benefiting from minimal flood protection, such as low dikes or natural riverbanks, to delay floodwater and allow harvest. When rainfall is abundant, all areas are used for paddy cultivation. After the flood recedes, typically in October or November, a second, short-duration crop (non-photo-sensitive) is planted. This "flood recession rice" grows into the dry season, but without irrigation, it is vulnerable to drought. Flood recession rice cultivation is common in the tail-end areas of the Ou Ta Paong scheme.

Monoculture rice cultivation dominates almost all fields with an average production area of about 2.15 hectares per household. Typically, farmers grow one short-duration rice variety before the floods arrive and another after the waters recede, using grain from the previous harvest as seed while some households also reported buying seed from other farmers. Currently, about 40% of the area relies entirely on rain, while 60% benefits from irrigation, with water sourced from adjacent canals or ponds. Varieties planted are either early maturing approximately 90 days or medium maturing (110–150 days), with land preparation starting in early May once the soil softens with the rain.

Farmers in Ou Ta Paong typically plow in May, seed between May and June, and harvest in September. The FGD confirmed that wet season rice yield per hectare is between 4 and 5.5 tons per hectare a slightly higher than dry season which yield between 4 and 5 tons per hectare. However, some parts of the command area reported the yield of dry season around 4 tons per hectare whereas wet season yielded around 3.5 tons per hectare.

About 5% of farmers plant long-duration varieties (150–160 days), favoring traditional fragrant and aromatic rice types that are photo-period sensitive, yielding around 2.5 to 3 tons per hectare. These traditional varieties are more drought-tolerant, with deeper root systems that tap into residual moisture and nutrients. Photo-period sensitive varieties, such as Somaly, Phka Romdoul, and Pkha Malis for medium maturing rice, and Sen Kro Ob, OM50-54, OM 5451, and Sra Ngae for early maturing rice, must be planted in late May or June to match the short-day flowering period.

In areas with irrigation access and no annual flooding, farmers can produce two wet-season crops. An early WS crop is planted just before or at the start of the rainy season, followed by a late WS crop that remains in the field for a few weeks after the rain stops. For this, short-growth varieties like OM 5451 are popular. OM 5451, a high-yielding fragrant rice variety with strong pest and disease resistance, is also cultivated in the dry season (DS), particularly in areas near streams or ponds. Some farmers also grow dry-season paddy crops, usually short-maturing varieties like Sen Kro Ob and OM 5451. As farmers apply direct seeding, the volume of seeds being used is relatively high, giving the amount between 200 to 300 kg per hectare. The sources of seeds that farmers practice is both from keeping from the previous harvesting and buying from external sources.

The focus group discussion with rice farmers reported that the rate of fertilizer application for wet season rice is slightly below the dry season rice giving the rate of fertilizer application is between 100 and 150 kg/ha whereas the pesticide application is provided around 3 to 4 times based on pest and disease condition. The application of fertilizer and pesticides during dry

season is slightly higher as the rate of fertilizer is between 180 and 250 kg/ha while the application of pesticide is around 3 to 5 times. According to the AF screening report of CAISAR, the common fertilizers include urea and di-ammonium phosphate (DAP, 16-48-0), applied at rates of 100 kg/ha and 50 kg/ha, respectively. Although muriate of potash (KCl) is unavailable locally, farmers understand the need for occasional potassium supplementation. In non-irrigated areas, only one crop is grown, with medium-growth rice varieties (120–150 days), which are photo-sensitive and typically harvested in early November. These varieties have a better local market value and are less prone to drought damage, as they flower in mid-October when rainwater is still abundant.

The main challenges that farmers reported are lack of water during dry season where the irrigation water cannot meet the demand of rice production. In addition, the riverbed became very shallow and could not facilitate water flow at some sections of the river. Water conflicts were also reported as the demand rose. In addition, high input costs including fertilizers, seeds and pesticides were also reported while labor shortage has also been an issue for them. Generally, farmers use the labor within their household but there are still households that hired people to help in seeding, pesticide spraying while soil preparation, harvesting and threshing, and transporting rice to home depending on the services of machinery. The total expenditure of rice production was reported to be approximately 615$ per hectare. The remaining straw is left in the field while some farmers take animal feed. Some farmers continue to burn the straw as it helps reduce the strength that is required during the ploughing. Farmers reported receiving limited agricultural extension and technical services.

In addition to paddy rice, around 5% of farmers diversify into non-rice crops such as watermelon and sweet corn during the dry season, with plans to expand non-rice crop production once irrigation systems improve. Ou Ta Paong farmers have the potential to grow exportable crops such as soybeans, mung beans, maize, and sesame, planted sequentially with early maturing rice in May, provided that reliable irrigation becomes in place.

Table 33: Rice production during wet and dry season

Parameters	Number	Parameters	Number
Wet season		**Dry season**	
Land size (m^2)	29,529	Land size (m^2)	32,945
Yield (kg/year)	11,517	Yield (kg/year)	14,304
Income (USD/year)	3,233	Income (USD/year)	3,467

(Source: ESCIA Field Survey, 2024)

4.4.6.2 Vegetable Production

In the area, very few households are involved in vegetable production for the market, with small-scale horticulture activities taking place around homesteads during the dry season. These activities are supported by water from wells and ponds and are observed in two 'Agriculture Communities' (AC): Psar Andeth AC and Chamkar Khluy AC, as well as in the neighboring Rumlech Commune, where farmers grow crops like watermelon on dry paddies.

The most popular vegetables grown in the area include pumpkin, cucumber, eggplant, wax gourd, long bean, luffa gourd, morning glory, mustard, and green onion. The average land size for vegetable cultivation ranges from 450 to 600 square meters. Farmers use both organic and chemical cultivation practices, applying compost and chemical fertilizers. Seeds are typically

purchased from the market, and water sources for irrigation include canals, ponds, rainwater, and rivers.

Farmers spend between 250$ and 450$ on vegetable production, covering expenses for seeds, pesticides, water, fertilizers, labor, and land preparation. The income from vegetable sales is approximately 500 USD per year, which constitutes about 10% to 30% of their total income. The main markets for these vegetables are local markets and brokers. Key challenges faced include a lack of water during the dry season, extreme heat, insect pests, low prices, poor soil fertility, diseases, and climate change. Farmers have received agricultural services related to seed variety selection, nursery management, crop irrigation, and the use of fertilizers and pesticides.

Table 34: Rice production during wet and dry season

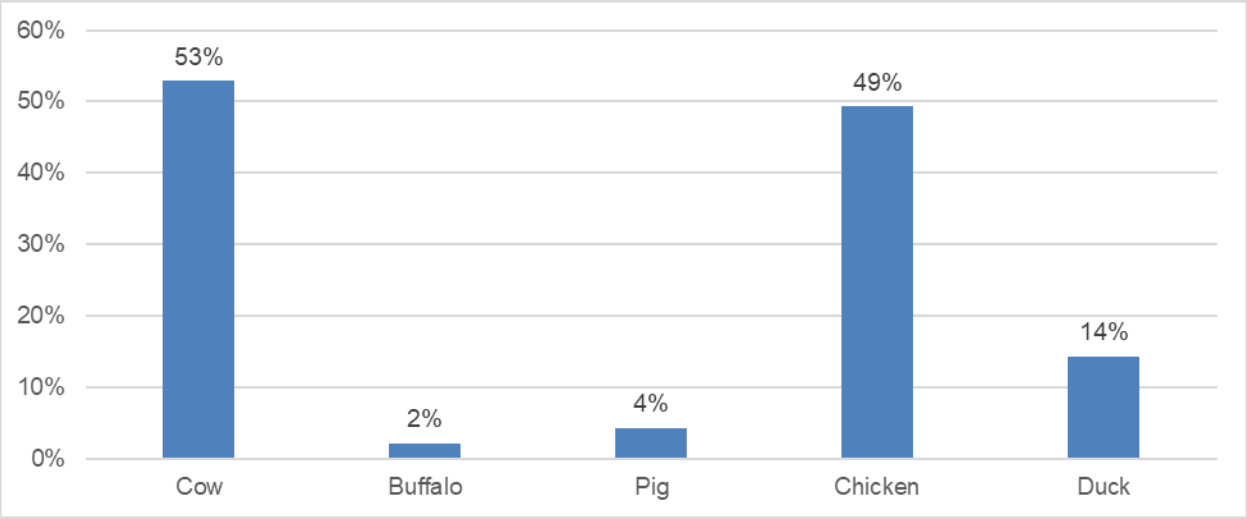
Parameters	Number	Parameters	Number
Wet season		**Dry season**	
Land size (m^2)	948	Land size (m^2)	1,617
Yield (kg/year)	473	Yield (kg/year)	497
Income (USD/year)	247	Income (USD/year)	174

(Source: ESCIA Field Survey, 2024)

4.4.6.3 Animal Production

In Ou Ta Paong, animal production is common among local households, with over half raising cows (53%), followed by chickens (49%) and ducks (14%). Buffaloes and pigs are raised in smaller numbers. This distribution reflects the diversity of livestock practices in the area, with a particular focus on cattle and poultry (Figure 32).

Figure 32: Type of animal in Ou Ta Paong command area



(Source: ESCIA Field Survey, 2024)

Please see Annex 6 – Biodiversity Assessment and Management Plan for details.

5. ASSESSMENT OF ENVIRONMENTAL & SOCIAL RISKS, IMPACTS, AND MITIGATION

In this section, the E&S risks and impacts (that potentially arise during activity implementation and operationalization) are identified, analysed, and evaluated at project level — with regards to the nature, scope, scale, and the potential extent of activity impacts — through classification of such risks and impacts as direct, indirect, and cumulative. The assessment of E&S risks and impacts in this chapter is based on the following grounds that is fundamental to proposing measures to avoid, minimize, and mitigate for the impacts in the next chapter:

Project's original technical reports

- Feasibility Studies (August 2023)
- Feasibility Studies (updated by November 2023).
- Additional Pre–Feasibility for Ou Ta Pong Sub–scheme.
- Environmental and Social Management Framework – ESMF (Updated by September 2024)
- IBAT reports for Ou Ta Pong.

Stakeholder Consultations (national, provincial, district, commune, and village levels)

- Community Meetings
- Focus Group Discussions
- Key Information Interview.

Field observation, using

- Transect walks.
- Drones (for E&S screening and biodiversity assessment)

External technical reports

- Statistical reports/database.
- Publications and Technical Reports from national and internation institutions.

5.1 Environmental Risks, Impacts, and proposed Mitigation Measures at the Preparation and Construction Stage

Prior to the implementation of the construction, National EIA is required to be conducted to ensure the compliance with the national legal framework.

5.1.1 UNEXPLODED ORDNANCES (UXO)

Construction and rehabilitation activities, particularly those involving earthworks, soil excavation, and river dredging, pose a significant risk of unexploded ordnance (UXO). Despite past demining efforts and clearance of the UXO existence in some sub-scheme as per the report in the Baseline, mortar shells, aerial bombs, and other UXO may still be present within the subproject area. This risk is particularly high in areas where deep excavation is required for structural upgrades or dredging.

The potential detonation of UXO poses a substantial threat to residents, construction workers, animals, and any other entities located near the construction sites. The risk of encountering

UXO is considered moderate due to the country's long history of civil war and the limitations of past demining operations, which are often focused on surface-level clearance. While consultations with local authorities and communities on the incidents and presence of UXO were reported in Ou Ta Paong, the case should be put on alert.

❖ **Mitigation Measures**

- Carry out UXO screening/assessment by certified UXO experts before any physical/ construction activities are allowed.
- In case UXOs are found by certified experts during on-site screening, removal of UXO will be carried out by certified experts.
- A UXO clearance certificate shall be obtained from related authority for each sub-project prior to commencing any subproject activities.

5.1.2 ENVIRONMENTAL, HEALTH, AND SAFETY

5.1.2.1 Noise and Vibration

During construction phase, noise and vibration will be generated where machineries such as excavator, bulldozer, cement concrete mixing, and trucks are operated. While noise will be a nuisance to construction workers and nearby residents, these impacts are anticipated to local and intermittent during mostly during daytime. During nighttime, noise may be occasionally generated from workers' camps due to living activities and occasional maintenance of machinery and equipment. These impacts are expected to have no or minimal impact on local residents as workers' camps will be located near construction site and far away from residential area. The construction of small-scale hydraulic structures is mostly located in the cultivation area and as such far away from residential areas (except for construction work along the main canals, which have many residential areas). Given the nature and scope of physical works under the OTP scheme, impact of noise on local residents is expected to be none to minor, and temporary.

❖ **Mitigation Measures**

- Before commencing the irrigation system restoration, the Ministry is requested to organize public forums in collaboration with the commune to gather feedback from the local population, especially from residents who may be affected by the project. Moreover, training sessions for the commune help them understand the project's processes, including the size of the infrastructure systems and the standards for excavation and construction. This will ensure that the commune is well-informed about the project
- Right before the construction, conduct noise testing at the sensitive locations as per the detail engineering design comparing to the national and IFC EHS Guideline
- Locate the workers' camp far away from the residential area as much as possible
- Avoid night-time construction in populated/village areas.
- Minimize project transportation through community areas where possible.
- Ensure proper maintenance and proper operation of construction machinery to minimize noise generation.

- No construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and during religious or cultural events near the subproject
- All construction equipment and vehicles must be well maintained, regularly inspected for noise emissions
- Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located (houses, schools, temples, hospitals, etc.
- Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.

5.1.2.2 Air pollution

During construction phase, a number of project activities may cause air pollution. These include physical activities such as movement of trucks (for transportation of materials), clearing & grubbing, grading, excavation, leveling, truck hauling, stockpiling, disposal of solid waste, dredging which may generate dust and particulate matter (PM10 and PM2.5) (if water spraying does not apply). Exhaust emissions from trucks and heavy machinery will release nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO2), and volatile organic compounds (VOCs) which may contribute to smog formation and greenhouse effect. Burning of waste (by contractors) may release harmful pollutants into the air. While air pollution due to dust, particulate matter, and exhaust emissions from trucks and engines, are anticipated, location where pollution is generated vary and impact for one (1) location is temporary, intermittent, and minor, and are particularly for residents who live along the project's roads.

❖ **Mitigation Measures**

- Avoid burning solid waste or construction waste
- Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition
- Conduct proper maintenance of machineries and equipment
- Place sitting concrete mixing plants, crushing plants, quarries and other facilities far from settlement and other sensitive receptors
- Use cover for vehicles that transport all construction materials such as cements and excavated soils
- Test air quality (NO2, SO2, CO, TSP, PM10, PM2.5) prior and during the construction to assess the level of impact

5.1.2.3 Impact on Water

Water pollution is anticipated, primarily due to physical activities that involves dredging and excavation near or in water course/ source. Such activities do not only cause turbulence for water but also cause increased sedimentation. Disturbed soil – caused by excavation to improve irrigation canal, for instance, may contaminate water at places where water is collected for domestic purpose (e.g. along Ou Ta Paong river which serves as the main canal). The impact is anticipated particularly for planned dredging operation at the upper part of Ou Ta Paong canal. However, water pollution would be minimized through construction methods

and time. For example, dredging operation of Ou Ta Paong river could be concentrated during dry season when water on Ou Ta Paong and other canals are minimal, and some Ou Ta Paong river sections are completely dry.

Wastewater (released from workers' camps) and leaks of hazardous materials (e.g., oil, diesel, chemical) could make their way into nearby water bodies and during rainy season which cause water contamination and leave varying level impacts on the receptors. The main receptors vulnerable to water pollution during construction include nearby residents and construction workers. Due to the scope and scale of physical works anticipated for OTP scheme, project impact due to water pollution is anticipated to be minor and localized.

Surface Water: During the construction phase, sedimentation due to excavation, dredging, and earthworks is a primary cause of water quality degradation. Loose soil can be washed into nearby water bodies, increasing turbidity, reducing light penetration, and altering the aquatic habitat. Additionally, the use of machinery and equipment introduces risks of oil spills, fuel leaks, and chemical contamination, which can enter water sources through surface runoff, affecting aquatic life and water usability downstream.

Groundwater: Construction activities, such as drilling and excavation, can disrupt the soil and rock layers, potentially allowing contaminants from surface activities, such as chemicals, to infiltrate groundwater. Chemical spills or leaching from construction materials can further degrade groundwater quality. Additionally, the disruption of natural flow patterns in the subsurface may allow pollutants to spread more easily, threatening water quality over a wide area.

❖ **Mitigation Measures:**

- Implement a waste management plan to ensure the proper disposal of all construction waste, including wastewater
- Use environmentally friendly construction materials and techniques to reduce the amount of pollutants that are released into the environment
- Install erosion and sediment control measures, such as silt fences, sediment basins, and check dams
- Properly manage construction chemicals, fuels, and waste to prevent water pollution.
- Regularly inspect and maintain construction equipment to prevent leaks and spills.
- Wash construction vehicles and machinery only in designated areas where runoff will not pollute natural surface water bodies.
- Train construction workers on the importance of preventing water pollution.
- Construct of retaining structures.
- Test surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform)

5.1.2.4 Solid and Hazardous Waste

During project implementation, solid wastes – both non–hazardous and hazardous, are anticipated to be generated, primarily due to rehabilitation of irrigation canals and rural roads. In particular, solid waste could be generated from operations that involved site clearing, excavation, trenching, demolition of existing cement and earthworks structures, construction

and disassembly of worker camps, maintenance of machineries, and so forth. Regarding dredged and excavated material, the construction activities can lead to surface erosion and sedimentation, particularly in water bodies. However, the estimates for the amount of dredged or excavated material per scheme do not estimate amounts for reuse or disposal. Improper handling of solid waste generated from the above operation may result environmental pollution that may include soil and water contamination, habitat disruption, visual pollution and give rise to concerns of public health.

❖ **Mitigation Measures**

- All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering.
- The Contractor will be required to train the workers in proper waste management.
- Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum).
- Non-hazardous, non-recyclable solid waste will be temporarily deposited and managed together at existing landfill/dumpsite.
- Safe temporary storage of hazardous waste as required.
- Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations.
- Vehicles, machinery, and equipment maintenance and re-fueling will be carried out in such a way that spilled materials do not seep into the soil.
- Oil traps will be provided for service areas and parking areas.
- Fuel storage and refilling areas will be located at least 50m from canals and channels and will be protected by temporary drainage bunds to contain spills.
- Use or reuse the dredge material on properties with a residential or recreational use (dredging material, if planned for reuse, will be subject to testing to ensure the material is safe for reuse).

5.1.2.5 Wastewater

During construction phase in OTP, generation of wastewater is expected, mainly from a) workers' camp (e.g. domestic wastewater), b) cleaning and washing of machinery, c) treatment of leakage and spill, etc. Depending how wastewater is managed, receptors of wastewater may include immediate receiving environment which may include soil, water bodies which may subsequently affect human including construction workers, residents nearby, and fauna and flora along the way wastewater goes.

❖ **Mitigation Measures**

- Reduce, recycle, and reuse waste [e.g. plastic waste, electronic waste, agricultural waste (natural, animal faces for later use as manure, plant waste)] wherever and whenever possible.
- Latrines must be built at construction sites and camp sites for appropriate domestic waste management.
- Hazardous waste, including any spills of chemicals or fuels, should be collected separately and disposed of following environmental regulations.

- Ensure construction sites have enough well-maintained sanitation facilities to prevent the direct discharge of untreated wastewater.
- Promote clean living practices, reduce plastic usage, and improve waste management.
- The company provides education and guidance on maintaining cleanliness and hygiene for the workers (such as proper waste disposal and handling of oil) and prohibits activities like fish poaching and hunting.

5.1.3 OCCUPATIONAL HEALTH AND SAFETY

5.1.3.1 Physical Hazards

The construction or rehabilitation of irrigation canals and farm roads during the construction phase of the project presents significant physical hazards to workers and those in close proximity to the construction site. These hazards can result in a range of consequences, from minor injuries requiring medical attention to severe and potentially fatal accidents. The sources highlight several specific types of physical hazards, including Falls from Heights, Drowning and Water-Related Injuries, Falling Objects, Falls into Open Holes, and Injuries from Heavy Equipment.

The impact receptors for physical hazards are primarily construction workers, but also include inspectors, visitors, and nearby residents and children, as well as domestic animals. The sources assess the risk of physical hazards as high, acknowledging that working in the construction field can result in injuries or fatalities if safety standards are not met. The sources emphasize that unsafe practices by construction companies can lead to accidents, injuries, illnesses, and fatalities. While the overall risk might be lower due to the anticipated number of workers involved, stakeholders at the community, district, and provincial levels have expressed concerns about the potential hazards posed to both workers and community members.

❖ **Mitigation Measures**

- Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines.
- Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements.
- Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks.
- Install appropriate fencing and control access to the site.
- Install appropriate safety signage and markings.
- Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m.
- Ensure there are safe ways to enter and exit the excavation.
- Provide safety precautions when using high voltage electric power tools.
- Carry out daily toolbox meetings (safety briefings).

- Maintain an accident record book where all major or minor accidents and incidents are recorded with actions taken.
- Educate the workers on construction hazards.
- Train drivers in safe driving skills and traffic regulations.
- Appoint an Environment, Health and Safety Officer who is a qualified engineer.
- Make adequate first aid equipment available on site.
- Carry out training and awareness of the workers on HIV-AIDS prevention.
- implement emergency preparedness and response procedures Response Plan as planned in the CEMP.
- Ensure that all workers are equipped with and use Personal Protective Equipment (PPE).
- The Contractor will set out an Emergency Response Plan

5.1.3.2 Heat Stress

The construction phase in OTP, presents potential risks of heat stress to workers. This is particularly concerning given Cambodia's tropical climate, characterized by high temperatures and humidity. Construction activities are often physically demanding and performed outdoors, increasing the risk of heat-related illnesses.

Construction workers exposed to prolonged high temperatures and humidity may experience heat stress, potentially leading to heat exhaustion or heat stroke. This can result in reduced productivity, increased accidents, and even fatalities. Heat stress can also exacerbate existing health conditions. The project's Environmental and Social Management Framework (ESCMF) highlights the importance of considering temperature extremes during the construction phase, emphasizing the need for mitigation measures to ensure worker health and productivity.

❖ **Mitigation Measures**

- Providing regular breaks and shaded rest areas for workers to cool down and rehydrate.
- Ensuring access to cool drinking water throughout the workday.
- Adjusting work schedules to avoid the hottest hours of the day, if feasible.
- Providing training to workers and supervisors on recognizing the signs and symptoms of heat stress and appropriate first aid measures.
- Encouraging the use of personal protective equipment, such as light-colored, loose-fitting clothing and wide-brimmed hats, to minimize heat absorption.
- Monitoring weather conditions and adjusting work practices accordingly.
- Developing and implementing an emergency response plan for heat-related illnesses.
- Providing adequate ventilation and cooling systems in worker accommodations.
- Encouraging workers to maintain good physical fitness and hydration levels.
- Regularly monitoring workers for signs of heat stress and taking appropriate action.

5.1.4 COMMUNITY HEALTH AND SAFETY

The construction activities on rehabilitating existing irrigation canals in OTP may disrupt local transportation networks and increase traffic volume, including heavy trucks and machinery, impacting communities and businesses along transportation routes. Construction sites pose health and safety risks to workers and nearby communities. Accidents and exposure to construction-related hazards can have serious consequences. The influx of construction workers from different regions may increase the risk of spreading communicable diseases such as HIV/AIDS to the local community.

Open canals and ponds during rehabilitation work pose a risk of drowning, particularly to children and individuals unfamiliar with the area. Construction activities may increase the depth or alter the flow of water, further increasing the risk. Construction sites can attract curious individuals, particularly children, who may be unaware of the potential hazards. This includes the risk of falls, being struck by moving machinery or vehicles, and contact with hazardous materials. It is important to secure construction areas, implement safety awareness campaigns, and enforce hygiene and sanitation standards at construction camps.

❖ **Mitigation Measures**

- Prior to start of construction work, the contractor in cooperation with the PIU will consult with the local authorities and potentially affected residents/private landowner. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM).
- The contractor shall fence off the construction area and control access to the site.
- A speed limit of 30 km/h for construction related traffic through inhabited areas.
- The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities.
- The contractor in cooperation with the local authorities shall implement traffic management to ensure a smooth traffic and prevent congestion.

5.1.5 BIODIVERSITY

5.1.5.1 Habitat Loss and Fragmentation

During the construction phase of the irrigation infrastructure project, habitat loss and fragmentation pose some risk to biodiversity. The primary activity contributing to this risk is the rehabilitation of irrigation canals and farm roads. This process often necessitates the clearance of bushes and vegetation along the areas designated for rehabilitation, leading to the direct removal of farm-level habitats. Additionally, activities like river dredging and rehabilitation, as well as the construction and upgrading of Main Canals along the Ou Ta Paong River, can further contribute to habitat loss and fragmentation.

In the Ou Ta Paong (OTP), the receptors include avian species such as the Greater Adjutant, Milky Stork, and Bengal Florican. Construction activities such as canal rehabilitation and farm road development, as well as land use changes and altered water management practices, may lead to habitat loss and fragmentation. These activities involve digging, dredging, or changing existing waterways and infrastructure. This can destroy habitats, make it harder for animals to find places to nest and eat, and mess up the natural flow of water, which can have an effect on life on land and in water.

❖ **Mitigation Measures**

- Establishing and maintaining guard posts on access roads near residential and biodiversity priority areas.
- Implementing measures such as habitat restoration, creating wildlife corridors, and ensuring that water management practices are sustainable and supportive of biodiversity.
- Creation of fish passageways, wetland restoration, and reforestation of riparian areas to facilitate fish migration and provide suitable habitats for endangered species.
- Installing signage to restrict access and prohibit harmful activities.
- Reporting illegal activities to the appropriate authorities.
- Implementing and enforcing policies against poaching and illegal collection of wildlife by workers and subcontractors, with appropriate penalties.
- Implement erosion control measures to prevent sedimentation in water bodies and downstream impacts.
- Rescuing and properly handling wildlife encountered during land clearing and construction, following SOPs.
- Implement habitat management measures to improve the quality and suitability of habitats for species.
- Consider restoration of the Boeng Kanseng, Boeung Pak Dong, and Boeung Chhouk for Ou Ta Paong to enhance ecological condition of the areas as well as increasing water storage of the area
- Please see Annex 6 – Biodiversity Assessment and Management Plan for details.

5.1.5.2 Hunting, trading, and consumption of wildlife

During the construction phase of the irrigation infrastructure project, the influx of a new labor force presents a significant risk to hunting, trading, and consumption of wildlife. The arrival of workers from other regions can increase the demand for exotic local foods, including wildlife and endangered species, which are often perceived as interesting delicacies or possessing health-promoting properties. The hunting may be done for relaxation or belief that wildlife is tasty or making people healthy. This heightened demand can drive illegal hunting and trading activities, posing a severe threat to biodiversity and the stability of local ecosystems.

The impact receptors of this risk are primarily aquatic and terrestrial species, particularly those already threatened or endangered. The potential impact on rare and endangered species, as their rarity often increases their market value, further incentivizing unsustainable hunting and trading practices that can lead to their extinction. The lower section of the Ou Ta Paong sub-scheme and adjacent Tonle Sap Zone 3 support diverse endangered and critically endangered species, including:

- Reptiles: Black Marsh Turtle, Elongated Tortoise, Giant Asian Pond Turtle, Southeast Asian Box Turtle
- Mammals: Indochinese Silvered Langur, Long-tailed Macaque
- Fish: Siamese Tiger Perch, Striped Catfish
- Birds: Greater Adjutant, Milky Stork, Bengal Florican

❖ **Mitigation Measures**

- Develop and enforce a strict Code of Conduct/ethics against wildlife collection, possession, and trafficking. This includes clear policies and sanctions for employees and subcontractors.
- Conduct thorough biodiversity inspections along access roads and at quarry sites before starting land clearing works to identify habitats or nesting sites of endangered/protected species.
- Provide mandatory training for contractors' management staff and site workers on the Code of Conduct, Standard Operating Procedures (SOP) for wildlife protection and handling, and human-wildlife conflict management.
- Incorporate a policy in the Project Administration Manual (PAM) and Worker's Agreement that prohibits employees and/or subcontractors from possessing, purchasing, trading, or collecting wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List.
- Undertake regular monitoring of all access roads to prevent poaching activities.
- Properly handle and rescue wildlife encountered during land clearing and construction, following the SOP for wildlife protection and handling.
- Establish a rapid response unit to address human-wildlife conflict effectively.
- Educate the community on local wildlife behavior, avoidance techniques, and deterrent methods.
- Report observed/recorded incidents of illegal activities to relevant authorities.
- Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species.
- Implement strict penalties for violating wildlife protection laws.
- Collaborate with local communities to monitor wildlife populations and report any suspicious activities.

5.1.5.3 Loss of fauna and flora

Construction activities (rehabilitation of canals and farm roads), land use changes, and water management practices can lead to habitat loss and fragmentation, affecting species' survival and connectivity. This may involve dredging, excavation, or modification of existing water channels. Increased human activities during project construction can disrupt wildlife behavior (nesting/foraging) and increase poaching or predation risks if not properly managed. There is a potential for wildlife collisions with construction and quarry vehicles due to increased vehicle movements, especially in quarry areas and access roads.

The impact receptors for the loss of fauna and flora are avian species, such as the Greater Adjutant, Milky Stork, and Bengal Florican, rely on seasonal wetlands, lakes, waterholes, grasslands, and rice fields for foraging. Critically endangered Siamese Tiger Perch and Black Mash Turtle inhabit Boeung Kamsaeng Lake and Svay Daunkav River, respectively. Four critically endangered reptile species (Black Mash Turtle, Southeast Asian Box Turtle, Giant Asian Pond Turtle, and Elongated Tortoise) reside in the flooded forest habitat and natural lakes. Two critically endangered mammal species, the Indochinese Silvered Langur and Long-tailed Macaque, are also found in the area.

❖ **Mitigation Measures**

- Develop a code of conduct against wildlife collection, possession, and trafficking.
- Provide biodiversity awareness training to site workers to raise awareness of the ecological sensitivity of the site.
- Minimize forest encroachment, wildlife poaching, and tree cutting by developing and implementing a community-based management plan.
- Establish and maintain guard posts on temporary access and inspection roads near residential areas and priority biodiversity areas.
- Install and maintain signs banning unauthorized access and prohibiting hunting near priority biodiversity areas and working zones.
- Regularly monitor all access roads to secure them from poaching activities.
- Implement speed limits (less than 40km/hour) to reduce the likelihood of collisions.
- Develop a system in which drivers report locations of wildlife crossing and wildlife sightings.
- Install and maintain signs in areas of frequent wildlife crossings, saying "beware of animal crossing".
- Properly handle and rescue wildlife encountered during land clearing and construction by relocating them to safer habitats, following the SOP for wildlife protection and handling.
- Conduct thorough biodiversity inspections along the access roads and at quarry sites before commencing construction.
- Provide features such as tunnels or rope bridges along temporary roads to enable wildlife movement and to reduce potential traffic incidents.
- Prior to wildlife shepherding activities, undertake briefing with all involved personnel so they are aware of their roles and responsibilities.
- Clearly demarcate areas that will not be cleared.
- Mark any trees with endangered or protected wildlife.
- Apply Find Chance Procedure

5.1.6 CLIMATE CHANGE

5.1.6.1 GHG emission

The main activities that contribute to this risk is the use of heavy machinery and trucks for excavation, transportation, and rehabilitation of irrigation canals and farm roads. The operation of these machineries releases carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) into the atmosphere. Waste burning at worker campsites may also contribute to GHG emission.

❖ **Mitigation Measures**

- Construction vehicles and machinery will be maintained to a high standard to minimize emissions and ensure compliance with the National exhaust emission standards. All mobile equipment should be fitted with catalytic converters.

- Use energy-efficient machinery and equipment during construction to reduce fuel consumption and emissions.
- All open burning of construction and demolition of waste material and refuse will be prohibited.
- Implement proper maintenance programs for equipment and vehicles to ensure they operate efficiently and with lower emissions.
- Engage with local communities and stakeholders to raise awareness of emission reduction practices and encourage their participation in sustainability efforts.

5.2 Environmental Risks and Impacts at Operation Stage

5.2.1 ENVIRONMENTAL, HEALTH AND SAFETY ASPECT/ISSUE

5.2.1.1 Water Management

During the operation phase of the irrigation infrastructure project, alterations to hydrology present potential risks. The main activity that causes these risks is increased irrigation. This can lead to the depletion of water sources if proper management practices are not implemented.

The impact receptors for these risks include the Tonle Sap Lake, upstream watersheds, wetlands, aquatic ecosystems, and downstream communities. The assessment of the impact of hydrology changes during operation is moderate. This takes into consideration the potential for both positive and negative impacts of irrigation systems. Poor water management can result in downstream water scarcity, altered hydrology, and damage to aquatic ecosystems. However, well-designed and properly managed irrigation systems can contribute to improved agricultural productivity and water resource management.

❖ **Mitigation Measures**

- A water user community should be organized prior to construction to participate in identifying key locations and ensure there are caretakers in place.
- Establish detailed water management plans that ensure equitable water distribution and allocation, considering the needs of various users and the environmental flow requirements to maintain healthy aquatic ecosystems.
- Design and construct robust irrigation infrastructure, including canals, ponds, and storage areas, capable of withstanding extreme weather events like floods and droughts. This investment should also include lining canals and refurbishing storage areas to reduce water losses and improve water storage capacity.
- Establish and provide training to FWUCs on sustainable water management practices, equitable water rights, and allocation procedures. These communities play a vital role in the operation and maintenance of the irrigation system, ensuring its long-term sustainability.

5.2.1.2 Water pollution

The primary activity in the operation stage that causes the water pollution is the intensification of agricultural production in the OTP scheme as irrigation water becomes readily available. This intensification can lead to an increased use of chemicals, such as fertilizers and

pesticides, to enhance crop yields. These chemicals infiltrate the soil and reach groundwater aquifers, leading to long-term contamination. The excessive application of these chemicals can result in contamination of both surface and groundwater resources. Furthermore, changes in water table levels due to extensive irrigation can alter the flow patterns of groundwater, potentially mobilizing contaminants that would otherwise remain contained. The impact receptors for water pollution include farmers, nearby residents who rely on water resources for domestic use, and aquatic ecosystems within the command areas and downstream, including the Tonle Sap Lake. The assessment of the impact of water pollution during operation is moderate.

❖ **Mitigation Measures**

- Implement Simplified Pesticide Management Plan
- Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing.
- Encourage farmers to adopt IPM techniques that minimize pesticide use and rely on biological control methods, thereby reducing the increased risk of chemical contamination of water resources.
- Provide training and extension services to farmers on the judicious use of fertilizers and, ensuring they apply the correct type and amount based on soil nutrient levels.
- Promote the adoption of organic fertilizers and soil amendments, such as cover crops and green manures, which can improve soil fertility and reduce the need for chemical fertilizers.
- Implement a robust water quality monitoring program to track the levels of pesticides, nitrates, and other pollutants in surface and groundwater resources within and around the command areas.
- Encourage the adoption of water-saving irrigation methods, such as alternate wetting and drying (AWD) in rice cultivation, which can reduce water consumption and minimize the leaching of agrochemicals.

5.2.1.3 Soil pollution

During the operation phase of the irrigation infrastructure project, soil pollution/quality reduction poses a considerable risk. The primary activity contributing to this risk is the increased agricultural production facilitated by the improved irrigation infrastructure. This intensification can lead to the overuse of agri-chemicals, such as chemical pesticides and fertilizers, if farmers lack adequate training or support in adopting environmentally friendly practices. The excessive application of these chemicals can lead to various detrimental effects on soil health:

- Nutrient Depletion: Over-reliance on chemical fertilizers can disrupt the natural nutrient cycle in the soil, leading to nutrient imbalances and depletion of essential elements necessary for plant growth.
- Salinization: In areas where irrigation water is not properly managed, the accumulation of salts in the soil can occur, leading to soil salinization. This condition makes it difficult for crops to absorb water and nutrients, reducing productivity.

- Pollution from Chemical Residues: The persistent use of chemical pesticides can result in the accumulation of harmful residues in the soil. These residues can contaminate food crops, pose risks to human health, and disrupt the balance of soil microorganisms essential for soil fertility.
- In the lowland regions, soil erosion is prevalent, and rice yields decrease annually due to rising temperatures and water shortages.

The impact receptors for soil pollution/quality reduction are multifaceted, encompassing such as soil health, water quality, and biodiversity.

❖ **Mitigation Measures**

- Implement Simplified Pesticide Management Plan
- Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing

5.2.2 BIODIVERSITY

- Potential Impacts & Feasibility of Net Gain Requirements

The species that are assessed as “Present” or “Possible” in sub-scheme AoI are included in the impact assessment. These include the following 8 species: 1) Four reptiles (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, Elongated Tortoise), 2) Three birds (Greater Adjutant, Milky Stork, and Bengal Florican), and 3) One fish (Siamese Tiger Perch).

- Potential impacts

Reptiles (Substantial risk)

All four species of reptiles are found in the upper and lower part of the OTP command area, particularly in areas near natural water courses (rivers and streams). During construction, these reptiles are potentially affected directly due to a) disturbances from noise and vibration due to increased vehicle activity and human presence, b) being hit by vehicles, equipment from increased traffic movement and river dredging/training at Ou Ta Paong river, excavating of the extended canal of Kbal Hong and other relevant canals, c) caught by workers, local people, and hunters. During project operation, these reptiles may be directly affected, including a) being caught by local people and hunters, and b) pesticide residues from intensified crop production.

Birds (Moderate risk)

Greater Adjutant, Milky Stork, and Bengal Florican are found seasonally in the command area, mainly in the lower/downstream part which is subject to annual flooding. These birds are migratory and as such are rare. Local people don’t catch these birds for food. However, since these birds feed on aquatic species available from the command area, they may be affected by the feeds that are contaminated with pesticide residues.

- Net gain assessment

Additionally, during construction activities, these birds may be indirectly affected through disturbance and habitat loss caused by increased human activity and changes in water levels. It is important to note that the Ou Tapaong Command Area serves as a critical habitat for these endangered bird species, making it crucial to minimize any potential negative impacts.

Based on the potential impacts identified above, it is evident that measures need to be implemented to achieve a net gain in biodiversity within the Ou Tapaong Command Area. These measures should focus on minimizing direct disturbances and habitat loss during construction activities, as well as implementing sustainable agricultural practices to prevent pesticide contamination of food sources for these bird species.

In conclusion, based on the assessment results, it is recommended that comprehensive actions be taken to protect critical habitats for species such as reptiles (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle Elongated Tortoise), birds (Greater Adjutant, Milky Stork, Bengal Florican), ensuring their survival alongside irrigation system renovation projects.

5.2.2.1 Habitat loss and fragmentation

During the operation phase of the irrigation infrastructure project, habitat loss and fragmentation are significant risks to biodiversity. The primary activity that drives this risk is the intensification of farming made possible by the increased availability of irrigation water. This often leads to the conversion of land for agricultural purposes. Flooded forests and wetlands, or Zone 3 in Ou Ta Paong sub-scheme, which provide crucial habitats for various species, may be deforested, drained or filled to create more arable land.

The impact receptors for habitat loss and fragmentation are aquatic and terrestrial species, particularly those that rely on flooded forests and wetlands for their survival. The sources specifically mention the potential for habitat conversion to extend beyond the local level and impact on the region, particularly with the possible expansion of agricultural land into protected areas. In Ou Ta Paong, a mix of paddy fields, rivers, and shrubland provides foraging habitat for avian species such as the Greater Adjutant, Milky Stork, and Bengal Florican.

The assessment of the impact of habitat loss and fragmentation during the operation phase is considered moderate. There is also concern that the increased accessibility to water for irrigation provided by the new infrastructure could encourage further encroachment into the protected areas, potentially leading to more extensive habitat loss in the long term.

❖ **Mitigation Measures**

- Identify and protect critical habitats, such as flooded forests and wetlands, ensuring their preservation against conversion for agricultural land.
- Implement measures to restore degraded habitats and improve their suitability for biodiversity.
- Promote sustainable agricultural practices to minimize negative impacts on biodiversity and water quality. This can include encouraging practices that reduce the need for land conversion.
- Implement sustainable water management practices to ensure adequate water availability for both human needs and ecological functions, avoiding excessive water extraction that could harm wetland habitats.
- Establish a long-term monitoring program to track changes in habitat quality, species populations, and the effectiveness of mitigation measures.
- Raise awareness and educate the community on the importance of protecting fish populations and aquatic ecosystems.

5.2.2.2 Invasive Species

The activity that causes this risk is the intensification of farming, which can lead to changes in land use and water management practices. The key change in land use is the increased cropping intensity and the introduction of dry-season irrigated crops made possible by the rehabilitated irrigation infrastructure. The project aims to increase the cropping intensity up to 270% in the Ou Ta Paong scheme and introduce a second irrigated rice crop during the dry season in other areas. This shift from rain-fed or flood recession agriculture to irrigated cultivation will significantly alter water management practices and create conditions that may be favorable to invasive species. These changes can create favorable conditions for non-native plant and animal species to establish themselves in the command areas. For instance, altered water flow and flooding patterns due to the new irrigation infrastructure can disrupt the natural balance of wetlands, making them more susceptible to invasion. Moreover, Introduction of invasive species through irrigation canals Irrigation canals may facilitate the introduction of invasive plant or animal species into native aquatic ecosystems. Examples of invasive species mentioned in the Biodiversity Impact Assessment report are Water Hyacinth, Mimosa Pigra, and Tilapia. These invasives can outcompete native species for resources such as food and habitat space. Invasive species can introduce plant and animal species that outcompete native species and alter ecosystem dynamics.

The impact receptors for invasive species are aquatic and terrestrial species, particularly those native to the affected ecosystems. The risk of invasive species spreading through waterways in the Ou Ta Paong, where water flows in both directions from and to the Tonle Sap Lake.

The assessment of the impact of invasive species during the operation phase is considered minor overall. However, the sources note that the scale of the impact can vary depending on the specific location and the types of invasive species introduced. The impact is expected to be more significant in Ou Ta Paong due to the larger scale of the irrigation infrastructure and the increased risk of invasive species spreading through the connected waterways.

❖ **Mitigation Measures**

- Implement a robust monitoring system, including regular surveys of waterways and terrestrial habitats, to detect invasive species early. Train personnel to identify and map invasive species, and establish rapid response protocols for eradication or control, such as manual removal, targeted pesticide application, or biological control agents.
- Implement specific water management practices to minimize the risk of invasive species spreading through waterways.
- Foster collaboration among government agencies, research institutions, local communities, and NGOs for effective invasive species management. Facilitate information sharing, coordinate efforts, and leverage resources for maximum impact.
- Educate farmers, local communities, and other stakeholders about the risks of invasive species, their identification, and prevention measures.
- Establish a system for reporting suspected invasive species to enable rapid response and prevent spread. Set up a hotline or a reporting mechanism accessible to all stakeholders

- Collaboration with the Department of Environmental.

5.2.3 CLIMATE CHANGE

5.2.3.1 GHG emission

During the operation phase, the intensification of farming activities is expected to result in a rise in greenhouse gas (GHG) emissions. This increase will stem primarily from the greater energy requirements associated with boosting agricultural production. The operation of machinery and equipment for various farming tasks, including tillage, irrigation, harvesting, and transportation, will demand a substantial amount of energy. If this energy comes from fossil fuels, it will lead to higher carbon emissions. The practice of burning rice straw after harvest, a common agricultural method in the region, also releases significant amounts of GHGs, such as carbon dioxide and methane, into the atmosphere. Additionally, the intensification of farming often results in greater use of chemical fertilizers, and the production and application of these fertilizers also contribute to GHG emissions.

The main impact receptor for GHG emissions is the atmosphere. The increase in GHG emissions adds to the problem of global climate change, which can have a wide range of negative consequences. These consequences include rising temperatures, shifts in weather patterns, sea-level rise, and an increase in the frequency and intensity of extreme weather events. The impact of GHG emissions during the operation phase as minor.

❖ **Mitigation Measures**

- The project needs to introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production.
- The project needs support training farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution.
- The project promotes the utilization of efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions.
- The project needs to advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.

5.2.4 ANNUAL CROP MANAGEMENT PLAN

5.2.4.1 Water resource efficiency

In this phase, inefficient irrigation practices can lead to a reduction in water resource efficiency. Moreover, people in community faced with flooding in wet season and drought in dry season generally. Additionally, farmers also pose with climate change issue which harm to their crop. The increased demand for irrigation, coupled with poor water management practices and lack of infrastructure, can result in the over-extraction of water resources. This over-extraction can have several detrimental effects on the surrounding environment and communities:

- Downstream Water Scarcity: Excessive withdrawal of water for irrigation can deplete water sources downstream, leading to water shortages for other users, such as communities, industries, and ecosystems.
- Altered Hydrology: Over-extraction can disrupt the natural flow patterns of rivers and other water bodies, affecting the balance of aquatic ecosystems and the services they provide.

- Damage to Aquatic Ecosystems: Reduced water flow and altered water levels can harm fish populations, other aquatic organisms, and the overall health of downstream ecosystems.

The impact receptors for inefficient water resource use are downstream communities and aquatic ecosystems, including those in the Tonle Sap Lake and its surrounding watersheds, this impact as the moderate.

❖ **Mitigation Measures**

- Project need to implement efficient water management practices to prevent over-extraction and ensure equitable water distribution. This can include:
- Water use monitoring system to track consumption and identify areas for improvement.
- implementing appropriate irrigation scheduling based on crop water requirements and weather conditions.
- Utilizing efficient irrigation systems, such as drip irrigation or sprinkler systems, to minimize water loss.
- Exploring opportunities for water reuse, such as capturing and reusing runoff water.

5.2.4.2 Soil erosion and soil erosion risk

The various agricultural activities can elevate the risk of soil erosion and contribute to the degradation of soil health. Land preparation practices, such as tillage and site clearing, along with the use of heavy machinery, can disrupt the soil structure, making it more vulnerable to erosion by wind and water. Additionally, the intensification of farming can lead to changes in vegetation cover, reducing the natural protection against erosion.

Soil erosion poses significant threats to both the environment and agricultural productivity. The loss of topsoil, the fertile upper layer of soil rich in nutrients and organic matter, is a primary concern. This loss diminishes soil fertility, impacting its ability to retain water and nutrients crucial for plant growth. Consequently, agricultural yields decline, and farmers may experience reduced productivity. Furthermore, eroded soil particles contribute to increased sedimentation in water bodies such as rivers and lakes. This sedimentation can harm aquatic ecosystems and degrade water quality, increasing the costs associated with treating water for human consumption. The impact receptors for soil erosion are soil health, water quality, and agricultural productivity.

❖ **Mitigation Measures**

- Minimize soil compaction and disturbance by using appropriate machinery and timing land preparation activities.
- Consider erosion management practices such as contour planting, terracing, and grass barriers.
- Adopt reduced tillage or no-till farming practices to minimize soil disturbance.
- Establish cover crops during fallow periods or in rotation with main crops to protect the soil from erosion.
- Practice contour farming on sloping land to reduce runoff and erosion.
- Construct terraces on steep slopes to prevent soil loss.
- Establish windbreaks or shelterbelts to reduce wind erosion.

- Install erosion control structures, such as grassed waterways or sediment basins, to manage runoff.
- Apply much to the soil surface to protect it from rainfall impact and erosion.

5.2.4.3 Nutrient application and management

The excessive or improper application of fertilizers poses a significant risk to water quality and the health of aquatic ecosystems. The intensification of agricultural production, driven by improved irrigation, can lead to an increased reliance on chemical fertilizers to enhance crop yields. However, if these fertilizers are not applied judiciously and managed effectively, they can have detrimental effects on the environment:

- Nutrient Runoff: When fertilizers are applied in excess or at inappropriate times, such as before heavy rainfall, a significant portion of the nutrients can be washed away from the fields and carried into nearby water bodies.
- Nutrient Leaching: Fertilizers can also leach through the soil and contaminate groundwater resources.

The impact receptors for nutrient runoff and leaching are water quality, aquatic ecosystems, and human health. High levels of nutrients, particularly nitrogen and phosphorus, in water bodies can lead to eutrophication, a process that causes excessive growth of algae. This algal bloom can deplete oxygen levels in the water, harming fish and other aquatic organisms. Additionally, contaminated water sources can pose risks to human health if used for drinking or recreational purposes.

❖ **Mitigation Measures**

- Conduct periodic soil analysis to determine nutrient needs and avoid over-fertilization.
- Establish buffer zones near watercourses to filter nutrient runoff.
- Consider using green manures and cover crops to replenish soil nutrients and reduce leaching.

5.2.4.4 Use and effectiveness of pesticides

The use of pesticides to protect crops from pests and diseases can pose significant risks to human health, biodiversity, and the environment. The intensification of farming often leads to an increased reliance on pesticides to maintain high crop yields. However, the effectiveness of pesticides can decline over time as pests develop resistance, requiring farmers to apply higher doses or switch to more potent chemicals.

This cycle of pesticide use, and resistance can have several negative consequences. Pesticide exposure can pose health risks to both farmers who handle and apply these chemicals and consumers who ingest pesticide residues on food. Pesticides can harm non-target organisms, including beneficial insects, pollinators, and soil organisms, disrupting the balance of ecosystems. Environmental Contamination: Pesticides can contaminate soil and water resources, potentially affecting water quality and the health of aquatic ecosystems.

❖ **Mitigation Measures**

- Promote Integrated Pest Management (IPM) strategies to minimize pesticide use.

- Implement training and awareness programs for farmers on the safe handling and application of pesticides.
- Providing training materials that are user-friendly and accessible to farmers with varying literacy levels.
- Including climate information and agrometeorology services in training materials when available.
- Preparing training materials for rice and other crops such as vegetables, poultry, and aquaculture.
- Organizing trainings on "climate-informed agriculture decisions and planning" and having trained individuals disseminate information.

5.2.4.5 Pesticide residues on site soil

The repeated application of pesticides, especially persistent pesticides, and the improper disposal of pesticide containers can lead to the accumulation of pesticide residues in the soil. This accumulation can have several detrimental effects on the environment such as contamination of Groundwater and impacts on Soil Organisms.

The impact receptors for pesticide residues on-site soil are soil health, biodiversity, and water quality. The sources assess the risk of pesticide residue accumulation in the soil as high, emphasizing the need for judicious pesticide use, proper disposal of pesticide containers, and integrated pest management strategies to minimize the risks associated with pesticide contamination.

❖ **Mitigation Measures**

- Promote the use of pesticides with low persistence and mobility in the environment.
- Implement a soil monitoring program to assess pesticide residue levels.
- Consider crop rotation and the use of cover crops to help break down pesticide residues.
- Minimize pesticide use by adopting IPM strategies.
- Conduct soil testing to monitor pesticide residue levels.
- Utilize cover crops to improve soil health and enhance pesticide degradation.

5.2.4.6 Pesticide residues on produce

During the operation phase of the irrigation project, the application of pesticides close to harvest, improper pesticide application techniques, and inadequate pre-harvest intervals can lead to pesticide residues on produce, posing risks to consumer health. Consuming produce with pesticide residues can have adverse effects on human health.

The main impact receptor for pesticide residues on produce is human health, specifically consumers who ingest the contaminated food. The assess the impact of pesticide residues on produce as moderate. This assessment highlights the importance of implementing safe pesticide application practices, adhering to pre-harvest intervals, and promoting alternative pest control methods to minimize the risks to consumer health.

❖ **Mitigation Measures**

- Enforce pre-harvest intervals to allow for pesticide breakdown before harvest.

- Promote the use of pesticides with low toxicity to humans.
- Properly wash and handle produce to remove surface residues.
- Implement a monitoring program to test produce for pesticide residues.
- Ensure compliance with established MRLs for pesticide residues on produce

5.3 Social Risks, Impacts, and proposed Mitigation Measures at the Preparation Stage

5.3.1 LAND ACQUISTION

5.3.1.1 Land acquisition and resettlement

The rough estimate of land acquisition and resettlement were conducted in four steps. Firstly, the assessment was based mainly on the result of the consultations between the AIIB Social Development Specialist and the PMU engineering team to come up with more practical and latest conceptual design options to use as the basis for the land acquisition and land resettlement estimations. Then, rough calculations of the scale of the impacts were conducted using the agreed engineering designs to obtain the impacted figures. At the same time, google earth with the specific types of infrastructure locations were also used to indicatively determine the affected areas at each subproject location along the canals. Thirdly, the estimates were also consulted with relevant Provincial Departments of Land Management Urban Planning and Construction (PDLMUPC) and local authority representatives to confirm the estimated land titling at the impacted project sites. Lastly, the results were then brought back to consult with the PMU engineering team to verify the estimated figures. Although the consultation and the process had covered various aspects, the estimates were considered as a rough figure subjected to the final detailed engineering design (DEDs) outcomes. In addition, the estimation based on the google earth has its limitation on the accuracy, and the impact may differ from the actual impacts resulting from the upcoming DEDs to be carried out at a later stage.

The rough estimation of the land acquisition impacts was encountered mainly at Ou Ta Paong, as there are the canals being planned to expand. The impact of the land acquisition is expected to encounter mostly at the Ou Ta Paong sub-scheme within the proposed Feeder canal 1, feeder canal 2, main canals (mainly from Kbal Hong to Ou Ta Paong, and the secondary canals due to possible expansion of the design width in order to adequately provide water distribution and water carrying capacity to feed the entire irrigation system (Table 34). The impact includes the expansion of the canal body as well as the rural road along the canals. However, due to limited number of households living along these planned expanding canals, the affected number of households are few.

Table 35: Indicative figure of canal expansion at Ou Ta Paong

No	Structures	Designed Length (km)	Existing Width (Average) (m)	Expansion (L) (m)	Expansion (R) (m)	Total Width (m)
1	Feeder 1	8.80	16.00	7.00	7.00	30.00
2	Feeder 2	6.10	29.10	1.50	1.50	32.10
3	Main Canals	37.50	37.10	5.00	5.00	47.10
4	Creek Re-shape	27.60	61.00	0.00	0.00	42.00

5	Main Drainage	11.70	52.00	Reshape	Reshape	42.00

L = Left, R = Right.

Using this figure, the land acquisition is estimated at 516,500m^2. The consultations with Provincial Departments of Land Management, Urban Planning and Construction (PDoLMUPC) indicated that with this size, all of the acquired land are the public land. There are, however, 50 households and 288 trees apparently to be affected due to the irrigation expansion as the households have been located within the expended locations (Figure 7.4). There are seven (7) households along the Ou Ta Poung River observed to be affected entirely which may require displacement or a full resettlement. The cost for compensation to the affected households are projected at 121,119 USD as per the government rate, derived from official rate at the PDoLMUPC website. The seven (7) entirely affected households may need to be resettled. Specific measures and solutions needed may include reconsideration of the canal design width at the spots (Table 35). However, the PMU engineering team confirmed that technical and strategic consideration can only be provided at the time of the DED stage since possible reduction of the irrigation infrastructure design width will result in the reduction of water flow and water carrying capacity of the canal which may affect the required water distribution and requirements to effectively and efficiently deliver the irrigation purpose and project objective.

Table 36: Land Acquisition and Asset Impacts in the Ou Ta Paong sub-scheme

No	Structures	Affected public land (m^2)	Affected Assets (Tree)	Affected Households	Physical Displacement (HHs)
1	Feeder 1	123,200	5	7	-
2	Feeder 2	18,300	-	-	-
3	Main Canals	375,000	130	9	-
5	Creek Re-shape	-	100	34	7
6	Main Drainage	-	-	-	-
Total		516,500	235	50	7

HHs = Households.

❖ **Mitigation Measures**

- Since the affected households are only 50 in Ou Ta Paong, Abbreviated Land Resettlement Plan is required to be prepared.

5.3.1.2 Economic displacement

The risk of economic displacement is linked to activities like the rehabilitation of irrigation canals and farm roads, and land acquisition. These activities can disrupt existing economic activities and displace households and businesses. The upgrading of irrigation systems may result in the removal of informal farming areas due to dredging, impacting those who rely on these areas for income. Additionally, during the construction phase, local businesses and transportation routes might face disruptions due to construction activities, affecting the community's daily life and economic activities.

The impact receptors for economic displacement include households in Ou Ta Paong who have production land along the water bodies, informal land users, informal settlers, and nearby construction site business owners. The sources assess the impact of economic displacement

as moderate, recognizing that while it is a significant concern, the scale of the impact is still uncertain. The upgrading of irrigation systems may lead to the removal of informal farming areas, impacting the livelihoods of households who rely on these areas for food and income

The Ou Ta Paong Sub-scheme includes various infrastructure components such as Feeders, Main Canals, Creek Re-shaping, and Main Drainage. These structures span a total length of 91.7 km. A total of 41 households estimated as the shop owners and 1,012 households use the land along these infrastructure components while the other 10 households are estimated to be engaged for land acquiring for contractors' operation. The proper informing to these households is required to ensure that their production and economic activities will not be severely affected (Table 36).

Table 37: Affected and Vulnerable Households in Ou Ta Paong Sub-scheme

Structures	Number of households own the affected rice field	Vulnerable HHs	Total Households temporarily affected during construction	Land acquisition for contractors' operation
Feeder 1	346	48	3	
Feeder 2	174	24	4	
Main Canals	492	71	6	10
Creek Re-shape	-	6	28	
Main Drainage	-	-	-	
Total	**1,012**	**149**	**41**	**10**

HHs = Households.

The proper informing to these households is required to ensure that their production and economic activities will not be severely affected.

❖ **Mitigation Measures**

- The households who own the land along the rehabilitated canals which will be expanded at the public land should be properly informed prior to the construction to avoid their crops will be damaged at the time of construction.
- Although the acquired land are the public land, there are a need of a proper consultation and information to be conducted to inform and obtain agreement from the affected households.

5.4 Social Risks and Impacts and Mitigation Measure at Construction Stage

5.4.1 ROTECTING THE WORKFORC

5.4.1.1 Child Labor

The risk of child labor emerges due to the demand for unskilled labor in rural areas where the use of child labor is prevalent. Contractors and subcontractors involved in the project's construction activities may employ children or youth under the legal working age due to labor shortages or the drive to minimize costs. This practice exploits vulnerable children, depriving them of education and opportunities, and perpetuates a cycle of poverty.

The risk of child labor, particularly due to the influx of labor and pre-existing societal inequalities. Vulnerable groups, such as poor and near-poor households, female-headed households with dependents. Children from these groups are often driven to work due to economic hardship, and the increased demand for labor during project construction can exacerbate this situation. Migrant workers, often facing precarious working conditions and separated from support systems, are also highly vulnerable to exploitation, including child labor. The project's Gender Assessment identifies the lack of local wage jobs and increasing migration as key challenges that could further heighten the risk of child labor.

❖ **Mitigation Measures**

- Apply LMP for age check prior to engagement of labor with regular monitoring through proper screening and registering all workforce for the work
- To mitigate the risk of child labor, the project will implement strict measures to ensure compliance with national and international labor laws. Regular monitoring and inspections will be conducted to identify and address any instances of child labor.
- Additionally, awareness-raising campaigns will be implemented to educate communities about the harmful effects of child labor and the importance of sending children to school. The project will also collaborate with local authorities and NGOs to strengthen law enforcement and provide support services to vulnerable children and their families.

5.4.1.2 Forced Labor

In the construction phase, the risk of forced labor is anticipated, especially for vulnerable individuals who may be coerced into working against their will. Forced labor can manifest in various ways, including:

- Economic Coercion: Individuals may be forced to work due to financial pressures, such as the need to repay debts or support their families.
- Exploitation of Young People: Young people, particularly those from impoverished backgrounds, may be forced to work to contribute to family income or due to a lack of educational opportunities.
- Debt Bondage: Workers may be trapped in a cycle of debt by unscrupulous employers who advance them loans with exploitative terms, effectively binding them to work until the debt is repaid.
- The rehabilitation of irrigation canals and farm roads creates a demand for local labor which can be exploited by those who seek to profit from forced labor.

❖ **Mitigation Measures**

- Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children
- The Project Owner and Sub-Contractors will collaborate with the relevant Government Agency to disseminate information to local communities. This information will include the Contractor's Code of Conduct and the minimum working age as mandated by national laws and international standards.
- The Ministry of Water Resources and Meteorology (MOWRAM) will provide information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.

5.4.2 COMMUNITY HEALTH AND SAFETY

5.4.2.1 Disease transmission

During construction phase, the risk of disease transmission is anticipated due to the influx of construction workers, the potential for their lack of hygiene in living conditions, and their interaction with local community members. The influx of workers increases the likelihood of spreading and contracting communicable diseases, both among the workers themselves and between workers and the local community. Workers may experience poor eating habits, homesickness, stress, and unhygiene living conditions which make them susceptible to diseases.

❖ **Mitigation Measures**

- Conduct public awareness raising activities (IEC) to ensure local people and contractors know about the risks of contracting and spreading communicable diseases such as COVID-19, HIV/AIDS, and water-borne diseases (e.g., amoebiasis, giardiasis, and toxoplasmosis. etc.
- In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising to the risk groups.
- Conduct training to workers on communicable diseases prior to mobilization to construction sites.
- For water-borne diseases that arise due to polluted or contaminated water, mitigations measures may include:
- Implement filtration, chlorination, or UV disinfection to ensure safe drinking water.
- Build and maintain proper sewage systems and latrines to prevent water contamination.
- Promote handwashing, safe food preparation, and proper sanitation practices in communities.
- Control and properly dispose of waste to prevent water pollution.
- Test water sources frequently for contamination and take corrective actions promptly.

5.4.2.2 Sexual Exploitation and Abuse, Sexual Harassment

The risk of Sexual Exploitation and Abuse/ Sexual Harassment (SEA/SH) is envisaged due to several factors. The influx of workers estimated to be approximately 393 (Table 37), frequent visits by project personnel, and pre-existing SEA/SH issues in the area all contribute to this risk. This risk is primarily associated with the rehabilitation of irrigation canals and farm roads. The influx of labor includes not only construction workers but also individuals who provide logistical services, increasing the potential for exploitation. The sources highlight that approximately 238 workers are estimated to be involved, and their isolation and potential loneliness may increase their vulnerability to SEA/SH. However, the figure varies based on actual arrangement of the contraction companies.

Table 38: The estimated influx labor within the sub-schemes

Type of project workers	Characteristics of project workers	Duration of Labor Requirements	Ou Ta Paong
Direct Workers			

PIU's member MoWRAM & NCDDS	Individual consultants (e.g., E&S Specialists, Design Engineers, Construction Supervision Engineers, etc.	From project preparation till project completion	20
Contracted Worker			
Engaged by PIU			
Detailed Design Consultant	National specialists	From project preparation until project completion	15
Construction Supervision consultant	National specialists		15
Independent E&S Monitoring Consultant		One (1) month in very six (6) months	10
Technical Assistance			15
Skilled workers	National specialists	Durations vary, depending on construction stages & needs.	80
Unskilled workers	Local workers (around subproject location)		150
Primary Supply Workers			
Workers producing materials for core project activities	Mostly local workers	Construction stage	30
Other Stakeholders Working in Connection with Project			
Civil servants of MoWRAM, PDWRAM at provincial & district level	SEO safeguard team	The construction stage of the project.	18
Civil servants of NCDDS	Staff of NCDDS	From project preparation until project completion	15
Civil servants of MEF	Staff of GDR	From project preparation until project completion	10
Civil servants of relevant Ministries	Staff	The construction stage of the project.	15
Total			**393**

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, E&S = Environmental and Social, NCDDS = National Committee for sub-National Democratic Development Secretariat, PDWRAM = Provincial Department of Water Resources and Meteorology, SEO = Social and Environmental Officer, MEF = Ministry of Economy and Finance, GDR = General Department of Resettlement.

People prone to the risk of SEA/SH are anyone but the most vulnerable group are women and children.

❖ **Mitigation Measures**

- Contractors need to explicitly state zero tolerance for sexual harassment, exploitation, and abuse within the workplace.
- Require Code of Conduct (CoC) to be signed by all construction workers.
- For victims coming forward: referral to qualified SEA/SH service provider. The GRM will include a confidential channel for reporting SEA/SH.

- Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children
- Training to workers on maintaining good community relations, with emphasis on proper conduct around women and children.
- Training on SEA/SH and VAC for community members, in particular women and girls (may be done separately for men and women).
- Ensuring workers' sites are situated (at least 500m) from schools and/or other areas where children congregate.
- Children are prohibited from construction sites and worker's camp.
- Ensure access to grievance redress mechanisms for all project-affected persons, including both stakeholders and workers, to address Sexual Exploitation and Abuse, and Sexual Harassment. Support (in the form of training, awareness raising, etc.) to local law enforcement to act on community complaints regarding SEA/SH and VAC.
- Provision of information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.
- Provide counselling services for male and female workers, wives and other female partners of contractors' workers.
- Build partnerships with local health providers and SEA/SH service providers to conduct community awareness activities, and referrals.
- Implement public awareness campaigns to address sexual harassment in transport services and hubs, and training of police on women's security needs when using transport. This is included on GRM:
    - Accessibility for Workers
    - Multiple Reporting Channels
    - Confidentiality and Support
    - Contractor Accountability

5.4.2.3 Traffic safety & Security

The traffic safety in construction stage is among the local concerns. The rehabilitation of irrigation canals and farm roads necessitates increased transportation of construction materials and equipment, potentially leading to road accidents, especially if safety measures are not strictly enforced. Construction activities can also attract unauthorized individuals seeking to steal or vandalize equipment and materials, further compromising security. The influx of construction workers into the project area may also contribute to a perceived or actual increase in crime rates, impacting the sense of safety among residents.

People subject to risk of traffic accident include anyone which may include project workers and local people who live near the construction sites or travel on transportation routes.

❖ **Mitigation Measures**

- Arrange security guard or engage local authority to guard the construction sites
- Conduct public awareness raising activities (IEC) to ensure local people and road user are aware of road safety regulations and risks and act accordingly while using road.
- Monitor and observe speed limit.

5.4.2.4 Community Health and diseases

The community health and safety risks extend beyond disease transmission and include the potential for accidents and injuries related to construction activities. Rehabilitation work on canals and ponds poses drowning risks, especially for children and those unfamiliar with the altered water bodies. Trespassing in construction zones, which may contain storage areas, camps, lay down areas for construction materials, vehicles, and machinery, presents further risks of incidents and accidents for community members. Additionally, construction activities can lead to traffic and access disruptions that may cause safety issues for the community. The presence of construction workers and associated activities can also lead to potential conflicts with local communities. Construction sites also pose risks of accidents and exposure to construction related hazards.

❖ **Mitigation measures:**

- Establish clear and well-marked construction exclusion zones to prevent unauthorized access, especially to areas with open water, heavy machinery, and storage areas.
- Provide warning signs in local languages to inform communities about the dangers and restricted access to construction areas.
- Install safety barriers around construction sites to minimize risks to the community and workers.
- Develop and implement traffic management plans to minimize traffic and access disruptions and ensure pedestrian and vehicle safety.
- Conduct community awareness campaigns to educate the community about the potential risks and safety measures during construction.
- Establish and maintain a grievance mechanism to address community complaints and issues promptly.
- Implement safety measures around canals and ponds to prevent drowning incidents, such as installing safety barriers and providing warning signs in local languages.
- Create and enforce clear rules regarding access to canals and ponds during construction and post those rules.
- Implement strict health and safety regulations at all construction sites to protect both workers and the nearby communities.
- Provide training to workers on safety protocols, including how to work safely around water, avoid accidents and minimize risks to the community.
- Ensure all workers are provided with necessary personal protective equipment (PPE) and enforce its use.

5.4.2.5 Personal Protective Equipment

The construction or rehabilitation of irrigation canals and farm roads during the construction phase presents significant risks to worker safety and health due to the potential lack of personal protective equipment (PPE). These activities involve Canal Rehabilitation and Construction, Structure Construction and Rehabilitation, and Drainage Improvement, which expose workers to various hazards, such as Falling Debris, Sharp Objects, and Heavy Machinery.

The absence of proper PPE significantly increases the likelihood of injuries, such as cuts, fractures, or head trauma. Workers without respiratory protection may inhale dust, fumes, or toxic substances, potentially leading to respiratory problems. Similarly, inadequate eye and hearing protection can result in vision impairment or hearing loss due to flying particles and high noise levels. Furthermore, the lack of proper footwear and gloves increases the risk of slips, trips, and falls, and exposure to hazardous materials.

The impact receptors for risks associated with the lack of PPE are primarily construction workers but also include inspectors and visitors to the construction sites. The risk associated with inadequate PPE as high, particularly in rural construction settings where cost-cutting measures might compromise worker safety.

❖ **Mitigation Measures**

- Continue and active use of PPE at all time of construction.
- Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual
- Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out.
- Proper use of PPE should be part of the recurrent training programs for employees.

5.4.2.6 Working conditions and Management of Worker

The construction or rehabilitation of irrigation canals and farm roads during the construction phase of the project carries a risk of underpaid pay and unequal treatment for local workers hired by project contractors. This risk is exacerbated by the lack of written contracts for unskilled workers, particularly those recruited locally. Without a formal contract, these workers are vulnerable to being underpaid compared to the demands and scope of their work.

The potential for underpayment to occur based on gender and temporary work status, further marginalizing already vulnerable groups. The absence of clear contractual terms also increases the risk of late wage payments or even non-payment, jeopardizing the workers' livelihoods and potentially delaying the project's progress.

The impact receptors for underpaid pay and unequal treatment are primarily unskilled workers (mostly local people) and construction workers, particularly women. This risk associated with these issues is moderate.

❖ **Mitigation Measures**

- Implement a grievance mechanism for workers where workers can report issues related to underpayment or unequal treatment without fear of retaliation.
- Advise companies to provide equal opportunities for employment and promotions to all workers, regardless of gender, ethnicity, or background, to avoid discrimination.
- Regularly monitor and audit payroll and employment practices to ensure compliance with labor regulations and address any disparities.
- Offer training and capacity-building programs for all workers to enhance their skills and qualify them for higher-paying roles.

- Ensure that subcontractors and suppliers also adhere to fair wage and equal treatment policies.
- Set up worker committees or unions to allow collective bargaining and ensure workers have a voice in addressing wage and treatment issues.
- Provide accessible information to workers about their rights, entitlements, and the proper channels to address grievances through the establishment of the GRM for workers. This includes training on topics such as:
    - Environmental and Social Safeguards
    - Gender Awareness and the Gender Action Plan
    - Sexual Exploitation, Abuse, and Harassment (SEA/SH)
- Labor Rights and the Workers' Code of Conduct Regularly engage with labor rights organizations or third-party auditors to evaluate labor conditions and make improvements where necessary.

5.4.3 CULTURAL HERITAGE

The potential risk of the project during the construction phase to cultural heritage sites located within the project area. While the initial assessments indicate that the identified cultural sites in Ou Ta Paong are minimally associated with the construction areas, there is still a risk that smaller, undocumented sacred places within the command areas could be inadvertently damaged or destroyed during construction. Even though construction is expected to focus on existing canals, there is a possibility that construction activities might unearth archaeological artifacts buried deep in the soil.

The impact receptors for cultural heritage risks are primarily underground cultural sites, and the sources assess the risk as minor. However, the sources emphasize that the detailed design plans have not yet been released or discussed with the community, leaving a degree of uncertainty about the potential impact on these sites. The lack of detailed information and community consultation underscores the need for careful consideration and mitigation measures to ensure the protection of cultural heritage during the construction phase.

❖ **Mitigation Measures**

- Conduct archaeological surveys before construction in culturally sensitive areas.
- Implement Find Chance Procedure

5.4.4 CROSS-CUTTING

5.4.4.1 Loss access to land and other assets

In the construction phase, activities like upgrading existing main canal, Main Drainage, and Feeding canal, carries a moderate risk of temporarily or permanently restricting access to natural resources for local communities. This restriction will likely affect farmers and fishers along the main river of Ou Ta Paong, as well as feeder canals in Ou Ta Paong. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could strain local resources, including water sources and forest products, potentially leading to overexploitation and environmental degradation.

❖ **Mitigation Measures**

- The project will prioritize avoiding physical resettlement and minimizing land acquisition. Design adjustments will be made to avoid or reduce land requirements, especially on private land. Public land will be prioritized for any necessary acquisition.
- Where land acquisition is unavoidable, the project will employ a negotiated settlement process with affected households. This process, guided by the RGC's Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR), aims to ensure that affected households receive fair and adequate compensation for their losses and maintain or improve their income and livelihood status.
- All individuals with assets within the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation, regardless of their legal status. Compensation will be provided for various losses, including land, structures, crops, trees, and income-generating activities.
- Recognizing the potential disruption of income streams during relocation or construction, the project will provide transitional allowances to affected households. These allowances will help cover living expenses and bridge the gap until they can resume their livelihoods.
- A multi-tiered GRM will be established to address grievances from any project-affected person. The GRM will operate based on the principles of the Green Climate Fund (GCF) and be accessible at no cost to the complainant.

5.4.4.2 Loss access to natural resources

The activities like upgrading existing canals and implementing river training measures, carries a moderate risk of temporarily or permanently restricting access to natural resources for local communities. This restriction will likely affect farmers and fishers along the main streams of Ou Ta Paong as well as feeder canals. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could strain local resources, including water sources and forest products, potentially leading to overexploitation and environmental degradation.

❖ **Mitigation Measures**

- Implement efficient water management practices during construction and operation to prevent over-extraction of water resources from reservoirs and rivers and ensure equitable distribution for downstream communities and ecosystems.
- Use environmentally friendly construction materials and techniques to reduce the risk of pollution. Properly manage construction chemicals, fuels, and waste to prevent water pollution and contamination of natural resources. Prepare and implement a waste management plan to handle waste generated from construction activities and worker camps.
- Optimize construction material use and recycle, when possible, to minimize the extraction of new resources. Implement energy-efficient construction practices and use renewable energy sources where possible.
- Maintain ongoing communication with affected communities, including farmers, fishers, and downstream communities, to address concerns about natural resource

access. Provide information and education to construction workers about responsible use of local resources and respect for community access rights.

- Ensure the GRM is accessible to all community members to address complaints related to natural resource access.

5.4.4.3 Social inequality

The engagement and consultation processes during the design and construction phases of the irrigation project present a moderate risk of social inequality. The sources indicate that while landowners in the project areas are mainly from local communities, suggesting relatively equal access to the consultation process, vulnerable groups without farmland may have limited opportunities to participate and benefit from the rehabilitated irrigation system.

OTP is one of the other sub-schemes in CAISAR. According to the total number of households and vulnerable individuals in the sub-scheme was reported at 6,863 (25.4%), of which 3,523 are headed by women, 2,048 are classified as poor families (9%), 986 are disabled (1%), 151 are elderly (0.2%), and 155 are living without parents (0.2%). These individuals were thought to have little direct access to the project's benefits. Therefore, the local government should provide for these individuals and assign them to construction projects if they are capable. Project implementation should also consider avoiding areas where vulnerable homes or land are fully impacted. In line with the project component, this move might enable them to continue receiving water or other benefits from the irrigation system.

This potential for exclusion raises concerns about the fair distribution of project benefits. While the overall impact of social inequality during the construction phase is assessed as moderate.

❖ **Mitigation Measures**

- Conduct participatory planning and regular consultations with local communities, particularly marginalized groups (e.g., women, smallholder farmers, indigenous communities).
- Prioritize hiring local labor, with special provisions for disadvantaged groups (e.g., youth, women, minorities) in both skilled and unskilled positions.
- Develop and enforce water allocation plans that ensure fair access to water resources for all users, including small-scale and subsistence farmers, during and after construction.
- Implement fair and transparent compensation or resettlement plans for those displaced or affected by construction activities, especially vulnerable households.
- Establish accessible and responsive grievance redress mechanisms, ensuring all community members can raise concerns or complaints during construction.
- Conduct regular social impact assessments, with a focus on identifying inequality trends, and adjust project strategies to mitigate negative effects.
- Provide support and training for affected communities to diversify their livelihoods, especially for those whose livelihoods may be disrupted by construction (e.g., farmers, traders).
- Ensure transparency in the contracting process, including the selection of subcontractors and suppliers, with opportunities for local businesses, especially those run by marginalized groups.

5.4.4.4 Elite capture

The risk of elite capture is anticipated given the fact these local elite could potentially influence the project to provide them project benefits. While the majority of landowners within the command areas are from the local community, which reduces the likelihood of large-scale land grabbing by powerful individuals or groups, the sources acknowledge the potential for the wealthy to use their influence, connections, or resources to encroach upon protected areas for personal gain. The risk of elite capture is assessed as moderate.

❖ **Mitigation Measures**

- Consultation will be conducted farmers in potential command area, focusing on vulnerable/disadvantaged groups
- Alternative livelihoods for vulnerable group are identified based on their needs vis-à-vis project's investment eligibility
- Conduct consultation at community level (in the command area) to achieve a consensus on how water needs are balanced between different groups in one command area.
- During subproject design, water availability, storage capacity, and water needs of upstream and downstream population are calculated to inform design, and water use coordination during project operation.
- Water user groups should be established for upstream and downstream population and should be coordinated by a higher-level committee/group to negotiate and optimize water coordination
- Guidelines/Manual should be developed to provide guideline for upstream and downstream communities at subprojects to meet, discuss, and achieve consensus on how water is distributed for equal use between upstream and downstream population

5.4.4.5 Gender inequality

The risk of gender inequality due to limited access for women to training, resources, and decision-making processes related to irrigation and agriculture. This risk stems from pre-existing gender inequalities in Cambodia, where women often face barriers in accessing resources, technology, and leadership roles. The impact receptors for this risk are women farmers and laborers, who may be excluded from the full benefits of the project.

Regarding the A gender analysis was conducted in the CAISAR. Most income from project target group are generated from rice production, followed by animal husbandry, including chicken, cow, duck, and buffalo. Home-based fish farming and vegetable are rare: 1.7% (n=11) and 0.9% (n=6), respectively. Five key barriers are identified as current gender gap and potential constraint to promoting new technology adoption for improved adaptation. These include: 1) Traditional gender norms, 2) Burden of household chores, 3) Limited education and skills, 4) Lack of local wage jobs and increasing migration. Gender norms shape the gender division of labour in household chores, farming and income generation. Men generally take care of heavy works (physically heavy and poisonous) in farming and participate in social activities. Women bear the primary responsibility for child bearing and domestic works. Yet, they also play an important role in farming including home gardening, animal husbandry and rice production alongside men. Many women take care of rice during cropping season and

participate in harvesting in case they do not have access to machinery. This is particularly the case for women headed households who face chronic lack of labour and more limited access to machinery and equipment. From project survey (n=630), Overall, it is estimated that male workers spend, on average, 59.4% of their time for farming vis-à-vis female counterpart who spend 40.5% of their time. However, most women participate jointly with their husband in decision making related to finance and play a dominant role (over their husband) when it comes to daily home expense and child care. However, since rice is mainly considered to be a male crop, this can have negative implication to promoting sustainable adoption of new rice farming techniques for rice farming households for an estimated 40,000 hectare across six irrigation schemes in four project provinces. Indeed, men typically dominate decision making in rice farming such as selection of rice variety, use of pesticide and fertilizers as well as on-farm irrigation management. For instance, women tend to be under-represented in FWAC where key decisions on water management and irrigation use are made. This also means that extension activities targeting rice production are typically focused on male farmers.

❖ **Mitigation Measures**

- Implement the Gender Action Plan and measures to promote women beneficiaries' improved participation in project planning and implementation, and their economic empowerment.
- Ensure women have access to training, resources, and decision-making processes related to irrigation and agriculture. This includes providing training in local languages at times and locations convenient for women. Childcare provisions can facilitate women's attendance.
- Set targets for women's participation in all project activities.
- Raise awareness of the importance of sharing household chores and farming workloads. This can give women more time to learn new skills, attend training, and participate in project activities.
- Promote women's access to skills and business development training centered around project target value chains for commodities such as rice, poultry, vegetables, and fish.
- Encourage the use of labor-saving technologies that can help reduce women's workloads in farming and household activities.
- Support women's involvement in off-farm activities, such as processing and value addition as well as investments in green products and women-led green enterprises.

5.5 Social Risks and Impacts and Mitigation Measure at Operation Stage

5.5.1 COMMUNITY HEALTH AND SAFETY

The potential for water use conflicts during the operation phase, particularly between upstream and downstream users, and recognizes the risk of accidental drowning, especially among children. The introduction of irrigation infrastructure and increased agricultural activity may alter existing water allocation patterns, leading to disputes between upstream and downstream communities. Upstream users may prioritize their own irrigation needs, potentially reducing water availability downstream, affecting livelihoods and ecosystems. The construction

upgrading of main canals along the OTP river introduces open water bodies into the landscape, increasing the risk of accidental drowning, particularly for children.

❖ **Mitigation Measures:**

- The project will promote IWRM principles to ensure the equitable and sustainable allocation of water resources. This involves considering the needs of all stakeholders, including upstream and downstream communities, as well as environmental flow requirements for maintaining healthy ecosystems.
- Establishing a system for monitoring water use and enforcing water allocation regulations will help prevent over-extraction and ensure a reliable water supply for all users. This may involve installing flow meters, conducting regular water audits, and implementing penalties for non-compliance.
- The project will strengthen the capacity of FWUCs to manage water resources at the local level. This includes training on water allocation, conflict resolution, and operation and maintenance of irrigation infrastructure. Effective FWUCs can play a crucial role in mediating disputes and ensuring fair water distribution within their communities.
- Raising awareness about water safety and the risks associated with open water bodies, especially among children, is essential. Educational campaigns, signage, and community outreach programs can help promote responsible behaviour and prevent accidents. This information could be included in the training programs that will be provided to farmers and communities.

5.5.2 CROSS-CUTTING

5.5.2.1 Gender inequality

The sources emphasize that women are less resilient to climate change than men and face unique vulnerabilities in terms of income, housing, and access to information and support systems. Socially defined gender roles can also hinder the adoption of climate-smart technologies among women. As a result, women may experience unequal access to water resources, limited participation in Farmer Water User Communities (FWUCs), and a disproportionate burden of negative impacts on their livelihoods.

The OTP sub-scheme is one of the other sub-schemes in the CAISAR project. The social studies in this project show that, Women-led households made up 15% of all sub-schemes, which is seen as a significant percentage. There is still gender disparity, which makes it difficult for them to participate in and profit from the project. Men often overestimate, which diverts women's attention from the involvement. Increased gender-based trainings for men and increased support for all vulnerable groups should be proposed by the local government and project implementer. There are 6,863 households and vulnerable people in the sub-scheme overall (25.4%), 2048 poor families (9%), 986 disabled people (1%), 151 elderly people (0.2%), and 155 parentless people (0.2%).

❖ **Mitigation Measures**

- The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices.

- The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology.
- The project should monitor gender equality indicators and should make adjustments as needed to ensure that women are benefiting from the project.

5.5.2.2 Social inequality

In this phase, the concern the competition for water resources among different user groups (farmers, communities, industries) and the potential displacement or restricted access to land due to irrigation infrastructure expansion, presents a minor risk of social inequality. Although the project aims to engage and consult with communities during the design and construction phases, vulnerable groups may still face limited access to irrigation water during the operation stage. This risk is especially relevant for farming communities, indigenous populations (if present), landless or land-poor households, and other vulnerable groups.

The vulnerable groups without farmland might have limited opportunities to benefit from the rehabilitated irrigation system. The impact of this social inequality is considered minor due to the relatively small proportion of poor people within the command area. However, it is important to note that the limited access to resources and capacity could hinder the full potential of efforts to support these vulnerable groups.

❖ **Mitigation Measures**

- Ensure Equitable Water Access: Mechanisms should be in place to support vulnerable and marginalized communities in accessing water resources.
- FWUCs will manage the irrigation systems and ensure sustainability through fee collection. The project will invest in establishing and training FWUCs, emphasizing inclusivity and capacity building for vulnerable groups.
- Implement a Simplified Integrated Pest Management (IPM) Plan.

5.5.2.3 Elite capture

The operation of the irrigation system during the operation phase creates a minor risk of elite capture due to the potential for unequal distribution of project benefits. This could result in powerful individuals or groups gaining a disproportionate share of the benefits at the expense of the intended beneficiaries. This risk is linked to the engagement and consultations conducted during the design and construction phases, as those processes might not fully prevent elite capture during the operational phase.

The main impact receptors are smallholder farmers, marginalized communities, and other vulnerable groups. Despite the project's efforts to ensure equitable access to resources, the sources highlight that wealthy individuals or groups could potentially leverage their power, connections, and resources to secure a larger share of water resources or control over irrigation infrastructure. This situation could further exacerbate existing social disparities and undermine the project's goal of improving livelihoods for all community members. The sources assess the risk of elite capture during the operation phase as minor. This assessment considers factors like the predominance of local landowners within the command areas and the current high land prices, which make large-scale land grabbing economically unfeasible.

❖ **Mitigation Measures**

- Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress mechanisms are essential to prevent manipulation and ensure equitable water distribution.
- Regular monitoring and evaluation: Continuous monitoring of project impact, especially on vulnerable groups, can identify and address elite capture.
- Strengthened land tenure security: Clarifying land rights can protect smallholder farmers and marginalized communities from land grabbing.
- Community engagement: Active community participation, especially from vulnerable groups, empowers them and ensures their needs are met.

Summary of the impact mitigation measures is provided in the Table below. However, prior to the implementation of the construction, **National EIA** for the sub-scheme is required to ensure the compliance with the national legal framework.

Table 39: Preconstruction, Construction, and Operation Phase Environmental Mitigation Measures

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
Preconstruction phase				
1	Unexploded Ordnance (UXO) survey & removal			
	Risk of injuries or fatalities among workers or members of the public	• Carry out UXO screening/assessment by certified UXO experts before any physical/ construction activities are allowed. • In case UXOs are found by certified experts during on-site screening, removal of UXO will be carried out by certified experts. • A UXO clearance certificate shall be obtained from related authority for each sub-project prior to commencing any subproject activities. • As part of site-specific ESCMP, conduct training and awareness activities for local community with regards to UXO risks and chance finds.	PMU Contractor	Before construction
Construction phase				
ENVIRONMENTAL, HEALTH, AND SAFETY				
1	Noise and Vibration			
	• Earthmoving activities and operation of machineries at construction sites will generate dusts and exhaust fumes. • Construction activities, operation of vehicular movement, excavation machineries, concrete mixing, and other construction activities will generate noise and vibration and will be a nuisance to workers and residents near the site. • Noise may be generated from workers' camp, particularly during living activities or entertainment at nighttime, or due to certain maintenance /repair of equipment, machinery, vehicles.	• Maintain all exhaust systems in good working order and undertake regular equipment maintenance to ensure compliance with applicable regulations and manufacturers' instructions. • Implementation of operating and maintenance practices of equipment and machinery to ensure that they are well-maintained. • Ensure that noise control options such as silencers and mufflers are fitted to exhausts, compressors and fans for construction equipment (such as hydraulic excavator, bulldozer, front loader, backhoe and trucks). • Provide advance warning to the community on timing of noisy activities. Seeking suggestions from community members to reduce noise annoyance and notify the communities about how to raise their concerns (if any) through the Grievance Redress Mechanism. • Undertake noise monitoring at the closest residential area and other noise sensitive receptor during times with ongoing construction work to ensure compliance with the relevant noise standards. • The contractor shall provide all construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80 dB(A)), or any construction personnel who requests hearing protection, with hearing protection equipment. • A speed limit of 30 km/h for construction related traffic through inhabited areas. • The contractor shall conduct noise testing at the sensitive locations as per the detail engineering design comparing to the IFC EHS Guideline	• PMU • Contractor	Daily/ Every 06 months

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Avoid night-time construction in populated/village areas. • No noisy construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and during religious or cultural events near the subproject • Provide temporary noise barriers (3–5-meter-high barrier can reduce 5–10 dB(A)), as necessary, if site works will generate high noise levels that could disturb nearby households, hospital, school and other sensitive receptors. • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.		
2	**Air pollution**			
	• Dust and particulate matter (PM10 and PM2.5) generation from soil disturbances, stockpiles, and road works • Exhaust emissions from trucks and heavy machinery (NOx, CO, SO2, VOCs) • Waste disposal, particularly through burning	• Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition. • Select Borrow sites located as close as possible to the construction to reduce distances. • If Concrete batching facilities are in need, it will be located at least 500 m (0.5 km) downwind from the nearest dwellings to reduce the impact of dust and fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions. • Water will be regularly sprayed to suppress fugitive dust at construction sites, material handling areas, access road and borrow pits. • Trucks carrying dry construction materials such as earth or waste will be covered with tarpaulins or other suitable cover. • Construction vehicles and machinery will be maintained to a high standard to minimize emissions and ensure compliance with the National exhaust emission standards. All mobile equipment should be fitted with catalytic converters. • A speed limit of 30 km/h for construction related traffic through inhabited areas and on the access, road will be enforced. • All open burning of construction and demolition waste material and refuse will be prohibited. • Testing air quality (NO2, SO2, CO, TSP, PM10, PM2.5)	• SEO • E&S specialist consultants • PMU	Daily/ Every 06 months
3	**Impact on Water**			
	• Dredging and excavation can significantly increase sedimentation in water bodies. • Disturbed soil can enter rivers and lakes, potentially polluting domestic water sources. • Large-scale dredging projects, like the 30km Ou Ta Paong dredging, pose a	• Installation of temporary non-erodible ditches or bunds at the construction site to divert clean runoff away from exposed areas, and convey potentially dirty runoff to sediment control devises. • Stockpiles and materials will be stored at least 50 m from surface waters with drainage directed away from the canals and streams or water sources. • The sediment quality of the dredge spoil will need to be tested and assessed against an appropriate standard before re-use in the structure of	• SEO • E&S specialist consultants • PMU	Daily/ Every 06 months

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	significant risk to water quality throughout the excavation period. • Sedimentation can reach downstream areas, including the Tonle Sap Lake, if not properly mitigated. • Infiltration of wastewater from workers' camps can contaminate groundwater. • Leakage of hazardous materials like oil and diesel from machinery and vehicles can pollute both surface and groundwater.	embankments. The sediment testing results will confirm safe re-use of the material • No washing or repair of machinery within 50 m of surface waters. • Construction working areas will be clearly demarcated and encroachment onto adjacent areas avoided. • Portable toilets and small wastewater treatment units will be provided at the construction site and labour camps. All sanitary facilities will be located at least 50 m from surface water bodies. All workers must be instructed to use these facilities, which shall be kept clean at all times. • Pit latrines and septic tanks should be placed at least 2 m above the groundwater table must be located at least 50 m from surface water bodies and water wells and in areas of suitable soil profiles. • All hazardous materials including hazardous waste will be stored on an impervious surface, under cover, in adequate tanks or containers and within secondary containment. A bund will be provided around any above ground fuel storage tank with capacity of 110% of the largest single tank. Storage of hazardous materials shall be at least 50 m from surface water bodies with no direct drainage to surface water. • Areas where spills of fuel or oil may occur will be equipped with easily accessible spill control kits to assist in prompt and effective spill control. • Refueling of machineries by service vehicles will be conducted with measures preventing oil spillage during refueling including placement of buckets under refueling nozzles. • Runoff accumulating at the bottom of excavation pits during construction will be pumped out, reused where practicable or otherwise conveyed to appropriate sediment retention devises before being discharged to the environment. • Hazardous waste (oil waste) shall be properly collected and stored in closed containers under shelter for recycling or disposal by a duly authorizes enterprise. • Regularly inspect and maintain construction equipment to prevent leaks and spills. • Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform) and pesticide residues in water (to be conducted overseas).		
4	**Solid and Hazardous Waste**			
	• Hazardous wastewater, such as oil or fuel, polluting materials used for machinery and construction process at the construction site.	• Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations; • Vehicles and equipment shall be properly staged in designated areas to prevent contamination of soil and surface water;	• PMU • Contractor	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Vehicles, machinery, and equipment maintenance and re-fueling will be carried out in such a way that spilled materials do not seep into the soil; • Oil traps will be provided for service areas and parking areas; • Fuel storage and refilling areas will be located at least 50m from canals and channels and will be protected by temporary drainage bunds to contain spills.		
5	**Waste and Wastewater**			
	• Domestic wastewater comes from workers/staff's water consumption daily.	• Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum). • Safe temporary storage of hazardous waste as required • To the extent possible, a duly authorized waste company will be contracted to recycle hazardous waste. • Non-hazardous, non-recyclable solid waste will be temporarily deposited and managed together at existing landfill/dumpsite. • All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering. • The Contractor will be required to train the workers in proper waste management.	• PMU • Contractor	Daily
6	**OCCUPATIONAL HEALTH AND SAFETY**			
		• Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines; • Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements; • Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks; • Install appropriate fencing and control access to the site; • Install appropriate safety signage and markings; • Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m; • Ensure there are safe ways to enter and exit the excavation; • Keep excavations dry; • Provide safety precautions when using high voltage electric power tools; • Carry out daily toolbox meetings (safety briefings); • Maintain an accident record book where all major or minor accidents and incidents are recorded with actions taken; • Educate the workers on construction hazards; • Train drivers on safe driving skills and traffic regulations; • Appoint an Environment, Health and Safety Officer who is a qualified engineer; • Make adequate first aid equipment available on site; • Carry out training and awareness of the workers on HIV-AIDS prevention;	• PMU • Contractor	Daily/Weekly

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• implement emergency preparedness and response procedures Response Plan as planned in the CEMP. • Ensure that all workers are equipped with and use Personal Protective Equipment (PPE). • The Contractor will set out an Emergency Response Plan		
7	**COMMUNITY HEALTH AND SAFETY**			
		• Prior to the start of construction work, the contractor in cooperation with the PIU will consult with the local authorities and potentially affected residents/private landowner. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM). • The contractor shall fence off the construction area and control access to the site. • A speed limit of 30 km/h for construction related traffic through inhabited areas. • The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities. • The contractor, in cooperation with the local authorities shall implement traffic management to ensure a smooth traffic and prevent congestion.	• PMU • Contractor	Daily/Weekly
BIODIVERSITY				
1	**Habitat Loss and Fragmentation:**			
	• Conversion of forests and wetlands at micro or large may be needed for canal construction.	• Minimize the negative impact from land clearing on habitat connectivity by minimizing fragmentation and maintaining canopy connectivity across cleared areas. • Establishing and maintaining guard posts on access roads near residential and biodiversity priority areas. • Implementing measures such as habitat restoration, creating wildlife corridors, and ensuring that water management practices are sustainable and supportive of biodiversity. • Rescuing and properly handling wildlife encountered during land clearing and construction, following SOPs. • Identify and avoid sensitive areas, such as known habitat for Green Peafowl or other endangered species. • Implement habitat management measures to improve the quality and suitability of habitats for species. • Consider restoration of the Boeng Kanseng, Boeung Pak Dong, and Boeung Chhouk for Ou Ta Paong to enhance ecological condition of the areas as well as increasing water storage of the area	• SEO • PMU • Contractor	Daily/Weekly
2	**Hunting and trading, and consumption of wildlife**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• The influx of a new labour force can increase demand for exotic local foods, including wildlife and endangered species, which are often seen as interesting and delicious. This may be done for relaxation or belief that wildlife is tasty or making people healthy.	• Develop and enforce a strict Code of Conduct/ethics against wildlife collection, possession, and trafficking. This includes clear policies and sanctions for employees and subcontractors. • Provide mandatory training for contractors' management staff and site workers on the Code of Conduct, Standard Operating Procedures (SOP) for wildlife protection and handling, and human-wildlife conflict management. • Incorporate a policy in the Project Administration Manual (PAM) and Worker's Agreement that prohibits employees and/or subcontractors from possessing, purchasing, trading, or collecting wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List. • Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species. • Implement strict penalties for violating wildlife protection laws. • Collaborate with local communities to monitor wildlife populations and report any suspicious activities.	• SEO • PMU • Contractor	Daily/Weekly
3	**Loss of fauna and flora**			
	• Construction activities can impact micro-wildlife habitats. • New canals and roads require vegetation clearance, further fragmenting habitats. • Habitat loss poses a serious threat to endangered species like the Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise.	• Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction by relocating them to safer habitats, following the Standard Operating Procedure (SOP) for wildlife protection and handling. • Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur. • Train field workers to recognize and avoid wildlife. • Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur. • Develop a system in which drivers report locations of wildlife crossings and wildlife sightings. • Workers will receive training on frequently encountered wildlife. • The contractor shall install signs to ban hunting or catching wildlife in the area. • Apply Find Chance Procedure	• SEO • E&S specialist consultants • PMU	Daily/Weekly
	• The activity contributing to this risk is the rehabilitation of irrigation canals and farm roads.	• Implement Biodiversity Action Plan • Apply Find Chance Procedure	• PMU • Contractor	Daily/Weekly
4	**GHG emission**			
	• The construction and operation of heavy machinery, such as excavators and bulldozers, during these projects	• Use energy-efficient machinery and equipment during construction to reduce fuel consumption and emissions.	• SEO	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	release carbon dioxide (CO2) into the atmosphere, i.e. the energy requirements for construction works can result in increased carbon emissions • At the time of construction, there are possibility of smoke generated by burning of straw in the rice field.	• Optimize construction logistics to reduce the number of vehicle trips and machinery usage, minimizing fuel use and emissions. • Implement proper maintenance programs for equipment and vehicles to ensure they operate efficiently and with lower emissions. • Reduce deforestation and land-use changes that contribute to carbon emissions by preserving vegetation and replanting trees in affected areas. • Use low-carbon materials and construction techniques that reduce the embodied carbon in construction materials. • Offset unavoidable GHG emissions by investing in carbon offset projects, such as reforestation or renewable energy initiatives. • Engage with local communities and stakeholders to raise awareness of emission reduction practices and encourage their participation in sustainability efforts.	• E&S specialist consultants • PMU	
DURING OPERATION				
ENVIRONMENTAL				
1	**Water Management**			
	• Irrigation systems have both benefits and drawbacks. • Proper design and management are crucial. • Minimizing negative impacts on the natural water cycle is essential.	• Implement water-saving irrigation technologies like drip irrigation and sprinkler systems to reduce water consumption and minimize the strain on water resources. • Encourage the adoption of the AWD technique in rice cultivation to optimize water use and reduce water withdrawals for irrigation. • Establish detailed water management plans that ensure equitable water distribution and allocation, considering the needs of various users and the environmental flow requirements to maintain healthy aquatic ecosystems. • Design and construct robust irrigation infrastructure, including canals, ponds, and storage areas, capable of withstanding extreme weather events like floods and droughts. This investment should also include lining canals and refurbishing storage areas to reduce water losses and improve water storage capacity. • Integrate natural infrastructure, such as wetlands and forests, into water management strategies. Protect and restore degraded habitats to enhance their water regulation capabilities, improve water quality, and support biodiversity. • Establish and provide training to FWUCs on sustainable water management practices, equitable water rights, and allocation procedures. These communities play a vital role in the operation and maintenance of the irrigation system, ensuring its long-term sustainability.	• PMU	Annually
2	**Water Pollution**			
	• Increased use of chemicals, such as fertilizers and pesticides, to enhance crop yields. The excessive application	• Implement Simplified Pesticide Management Plan • Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing.	• PMU	Annually

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	of these chemicals can result in contamination of both surface and groundwater resources.	• Encourage farmers to adopt IPM techniques that minimize pesticide use and rely on biological control methods, thereby reducing the risk of chemical contamination of water resources. • Provide training and extension services to farmers on the judicious use of fertilizers, ensuring they apply the correct type and amount based on soil nutrient levels. • Promote the adoption of organic fertilizers and soil amendments, such as cover crops and green manures, which can improve soil fertility and reduce the need for chemical fertilizers. • Implement a robust water quality monitoring program to track the levels of pesticides, nitrates, and other pollutants in surface and groundwater resources within and around the command areas. • Encourage the adoption of water-saving irrigation methods, such as alternate wetting and drying (AWD) in rice cultivation, which can reduce water consumption and minimize the leaching of agrochemicals.		
3	**Soil Pollution**			
	• Increased production could lead to overuse of agri-chemicals if farmers are not adequately trained or supported in adopting environmentally friendly practices.	• Implement Simplified Pesticide Management Plan • Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing	• PMU	Annually
BIODIVERSITY				
1	**Habitat Loss and Fragmentation**			
	• Conversion of land: Flooded forests and wetlands may be drained or filled to create more arable land for agriculture, leading to significant loss of habitat. • Fragmentation: Remaining natural habitats may become isolated patches, making it difficult for species to migrate, find mates, and maintain healthy populations. • However, key biodiversity areas/species/habitats are not affected by the project but have been improved instead. Biodiversity areas are primarily located in the Tonle Sap region, which could face impacts if construction workers improperly dispose of waste.	• Identify and protect critical habitats, such as flooded forests and wetlands, ensuring their preservation against conversion for agricultural land. • Implement measures to restore degraded habitats and improve their suitability for biodiversity. • Promote sustainable agricultural practices to minimize negative impacts on biodiversity and water quality. This can include encouraging practices that reduce the need for land conversion. • Implement sustainable water management practices to ensure adequate water availability for both human needs and ecological functions, avoiding excessive water extraction that could harm wetland habitats. • Involve local communities in decision-making, monitoring, and conservation efforts to build ownership and support for protecting natural habitats. • Promote sustainable livelihoods that are compatible with biodiversity conservation, offering alternatives to activities that lead to habitat loss. • Establish a long-term monitoring program to track changes in habitat quality, species populations, and the effectiveness of mitigation measures.	• PMU	Annually

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Minimize forest encroachment and wildlife poaching by developing and implementing a community-based management plan. This includes establishing guard posts, conducting surveillance, and installing signage. • Implement and enforce policies against poaching and illegal collection of wildlife by workers and subcontractors, with appropriate penalties. • Raise awareness and educate the community on the importance of protecting fish populations and aquatic ecosystems.		
2	**Invasive Species**			
	• Changes in land use and water management can introduce invasive plant and animal species that outcompete native species and alter ecosystem dynamics	• Implement a robust monitoring system, including regular surveys of waterways and terrestrial habitats, to detect invasive species early. Train personnel to identify and map invasive species, and establish rapid response protocols for eradication or control, such as manual removal, targeted pesticide application, or biological control agents. • Implement specific water management practices to minimize the risk of invasive species spreading through waterways. • Foster collaboration among government agencies, research institutions, local communities, and NGOs for effective invasive species management. Facilitate information sharing, coordinate efforts, and leverage resources for maximum impact. • Public Awareness and Education: Raise awareness among all stakeholders. • Educate farmers, local communities, and other stakeholders about the risks of invasive species, their identification, and prevention measures. • Establish a system for reporting suspected invasive species to enable rapid response and prevent spread. Set up a hotline or a reporting mechanism accessible to all stakeholders.	• PMU	Annually
3	**GHG emission**			
	• Increased GHG emissions from farming activities: - Fertilizer use - Livestock production - Rice cultivation • Increased energy requirements: - Rice field preparation - Flood control systems - Other infrastructure	• The project is to promote sustainable practices like crop rotation and agroforestry to reduce energy consumption and improve soil health. • The project needs to introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production. • The project needs to support on training farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution. • The project promotes the utilization of efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions. • The project needs to advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.	• PMU • Farmer	Daily
ANNUAL CROP MANAGEMENT PLAN				
	❖ **WATER**			
1	**Water resource efficiency**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Over-extraction of water resources can lead to downstream water scarcity, altered hydrology, and damage to aquatic ecosystems.	• Project need to implement efficient water management practices to prevent over-extraction and ensure equitable water distribution. This can include: • water use monitoring system to track consumption and identify areas for improvement. • implementing appropriate irrigation scheduling based on crop water requirements and weather conditions. • Utilizing efficient irrigation systems, such as drip irrigation or sprinkler systems, to minimize water loss. • Exploring opportunities for water reuse, such as capturing and reusing runoff water.	• PMU • FWUC	Daily
	❖ **SOIL AND SOIL MANAGEMENT**			
2	**Soil erosion and soil erosion risk**			
	• Soil erosion can lead to loss of topsoil, reduced soil fertility, and increased sedimentation in water bodies.	• Minimize soil compaction and disturbance by using appropriate machinery and timing land preparation activities. • Consider erosion management practices such as contour planting, terracing, and grass barriers. • Adopt reduced tillage or no-till farming practices to minimize soil disturbance. • Establish cover crops during fallow periods or in rotation with main crops to protect the soil from erosion. • Practice contour farming on sloping land to reduce runoff and erosion. • Construct terraces on steep slopes to prevent soil loss. • Establish windbreaks or shelterbelts to reduce wind erosion. • Install erosion control structures, such as grassed waterways or sediment basins, to manage runoff. • Apply mulch to the soil surface to protect it from rainfall impact and erosion.	• PMU • Agricultural extension officers	After significant rainfall events Annually
3	**Nutrient application and management**			
	• Over-fertilization and nutrient runoff can contaminate water resources, negatively impacting aquatic ecosystems and potentially leading to eutrophication.	• Conduct periodic soil analysis to determine nutrient needs and avoid over-fertilization. • Establish buffer zones near watercourses to filter nutrient runoff. • Consider using green manures and cover crops to replenish soil nutrients and reduce leaching.	• PMU • Farmers	Before and after fertilizer application Regularly during the growing season
	❖ **PESTICIDE**			
4	**Use and effectiveness of pesticides:**			
	• Pesticide use can have adverse effects on human health, non-target organisms, and the environment. Pesticide resistance can develop, requiring increased application rates.	• Promote Integrated Pest Management (IPM) strategies to minimize pesticide use. • Implement training programs for farmers on the safe handling and application of pesticides. • Ensure proper disposal of pesticide containers and leftover products.	• PMU • Agricultural extension officers	Regularly during the growing season
5	**Pesticide residues on site soil**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Pesticide residues can accumulate in the soil, potentially harming soil organisms and affecting water quality.	• Promote the use of pesticides with low persistence and mobility in the environment. • Implement a soil monitoring program to assess pesticide residue levels. • Consider crop rotation and the use of cover crops to help break down pesticide residues. • Minimize pesticide use by adopting IPM strategies. • Conduct soil testing to monitor pesticide residue levels. • Rotate crops to break pest cycles and reduce the need for repeated pesticide applications. • Utilize cover crops to improve soil health and enhance pesticide degradation. • Consider bioremediation techniques to remove pesticide residues from contaminated soil.	• PMU • Third-party laboratories	Periodically (e.g., annually or before planting sensitive crops)
6	**Pesticide residues on produce**			
	• Pesticide residues on produce can pose a risk to consumer health.	• Enforce pre-harvest intervals to allow for pesticide breakdown before harvest. • Promote the use of pesticides with low toxicity to humans. • Properly wash and handle produce to remove surface residues. • Implement a monitoring program to test produce for pesticide residues. • Ensure compliance with established MRLs for pesticide residues on produce.	• PMU • Third-party laboratories	Before harvest

UXO = Unexploded Ordnance, PMU = Project Management Unit, SEO = Social and Environmental Officer, E&S = Environmental and Social, IFC = International Finance Corporation, EHS = Environmental, Health, and Safety, GHG = Green House Gas, FWUC = Farmer Water User Communities, ESCMP = Environmental, Social, and Climate Management Plans.

Summary of Mitigation Measures for the Social Risks and Impacts is provided in Below Table.

Table 40: Social Risks, Impacts and Mitigation Measures

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
BEFORE CONSTRUCTION				
LAND ACQUISITION				
1	**Land acquisition and resettlement**			
	• Land acquisition requirements differ significantly across the six sub-schemes. • Ou Tapaong is projected to have the highest land acquisition needs. • The specific land acquisition needs for each scheme will be determined by the final concept design.	• Since the affected households are 50 HHs, therefore Abbreviated Land Resettlement Plan is required to be prepared.	PMU Contractor	Before construction

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
2	**Economic displacement**			
	• The potentially disrupting existing economic activities and displacing households and businesses, including informal farmers and businesses. In Ou Ta Paong, 1,012 households using land along the infrastructure and 41 shop owners may be affected, with 10 households facing land acquisition.	• The households who own the land along the rehabilitated canals which will be expanded at the public land should be properly informed prior to the construction to avoid their crops will be damaged at the time of construction. • Although the acquired land is the public land, there are a need of a proper consultation and information to be conducted to inform and obtain agreement from the affected households.	PMU Contractor	Before construction
DURING CONSTRUCTION				
	CHILD LABOR & FORCED LABOR			
1	**Child Labor**			
	• Project activities will occur in rural areas where child labor is prevalent. • Construction contractors and subcontractors may employ children under 18 years old for unskilled labor. • Local children may be particularly vulnerable to exploitation due to poverty and limited educational opportunities.	• Apply LMP for age check prior to engagement of labor with regular monitoring through proper screening and registering all workforce for the work • To mitigate the risk of child labor, the project will implement strict measures to ensure compliance with national and international labor laws. Regular monitoring and inspections will be conducted to identify and address any instances of child labor. • Additionally, awareness-raising campaigns will be implemented to educate communities about the harmful effects of child labor and the importance of sending children to school. The project will also collaborate with local authorities and NGOs to strengthen law enforcement and provide support services to vulnerable children and their families.	• Contractors • PMU	Daily Screening prior to engaging services of primary supplier
2	**Forced Labor**			
	• The risk of forced labor, particularly for vulnerable individuals, due to economic coercion, exploitation of young people, and debt bondage. The increased demand for local labor during irrigation and road rehabilitation could exacerbate this risk.	• Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children • The Project Owner and Sub-Contractors will collaborate with the relevant Government Agency to disseminate information to local communities. This information will include the Contractor's Code of Conduct and the minimum working age as mandated by national laws and international standards. • The Ministry of Water Resources and Meteorology (MOWRAM) will provide information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.	• Contractors • Primary supplier • PMU	Daily Screening prior to engaging services of primary supplier
COMMUNITY HEALTH AND SAFETY				
3	**Disease transmission**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Disease transmission risks are anticipated due to the influx of construction workers, potentially exacerbated by unhygienic living conditions and interaction with the local community. This influx increases the risk of spreading communicable diseases among workers and between workers and residents, with workers' susceptibility potentially increased by factors like poor diet, stress, and unhygienic conditions.	• Conduct public awareness raising activities (IEC) to ensure local people and contractors know about the risks of contracting and spreading communicable diseases such as COVID-19, HIV/AIDS, and water-borne diseases (e.g., amoebiasis, giardiasis, and toxoplasmosis. etc. • In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising to the risk groups. • Conduct training to workers on communicable diseases prior to mobilization to construction sites. • For water-borne diseases that arise due to polluted or contaminated water, mitigations measures may include: o Implement filtration, chlorination, or UV disinfection to ensure safe drinking water. o Build and maintain proper sewage systems and latrines to prevent water contamination. o Promote handwashing, safe food preparation, and proper sanitation practices in communities. o Control and properly dispose of waste to prevent water pollution. o Test water sources frequently for contamination and take corrective actions promptly. o Provide access to clean water supplies, such as bottled water or tankers, during outbreaks or disasters. o Promote immunizations against water-borne diseases like cholera and typhoid in high-risk areas.	• PMU • Contractors • Local health authorities	• Monthly • During outbreaks • Periodic community health awareness campaigns
4	**Sexual Exploitation and Abuse, Sexual Harassment**			
	• The project's influx of approximately 393 workers, including construction and logistical personnel, along with frequent project staff visits and pre-existing SEA/SH issues, creates a risk of sexual exploitation and abuse/harassment, particularly during irrigation and road rehabilitation. These workers may be especially vulnerable due to potential isolation.	• Contractors need to explicitly state zero tolerance for sexual harassment, exploitation, and abuse within the workplace. • Require Code of Conduct (CoC) to be signed by all construction workers. • For victims coming forward: referral to qualified SEA/SH service provider. The GRM will include a confidential channel for reporting SEA/SH. • Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children • Training to workers on maintaining good community relations, with emphasis on proper conduct around women and children.	• Contractors • PMU	• Monthly and during subproject cycle • Reported to PMU within 48 hours if occurred

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Training on SEA/SH and VAC for community members, in particular women and girls (may be done separately for men and women). • Ensuring workers' sites are situated (at least 500m) from schools and/or other areas where children congregate. • Children are prohibited from construction sites and worker's camp. • Ensure access to grievance redress mechanisms for all project-affected persons, including both stakeholders and workers, to address Sexual Exploitation and Abuse, and Sexual Harassment. Support (in the form of training, awareness raising, etc.) to local law enforcement to act on community complaints regarding SEA/SH and VAC. • Provision of information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age. • Provide counselling services for male and female workers, wives and other female partners of contractors' workers. • Build partnerships with local health providers and SEA/SH service providers to conduct community awareness activities, and referrals. • Implement public awareness campaigns to address sexual harassment in transport services and hubs, and training of police on women's security needs when using transport. This is included on GRM: - Accessibility for Workers - Multiple Reporting Channels - Confidentiality and Support - Contractor Accountability • It is necessary to consider deploying specialists to educate and raise awareness about issues of violence. • Project should provide budget support to women affair provincial department during the project activities for sexual exploitation and abuse, sexual harassment monitoring.		
5	**Traffic safety & Security**			
	• Increased transport of materials and equipment in the construction stage raises the risk of road accidents, theft, vandalism, and a perceived or actual increase in crime, affecting project workers, community	• Arrange security guard or engage local authority to guard the construction sites • Conduct public awareness raising activities (IEC) to ensure local people and road user are aware of road safety regulations and risks and act accordingly while using road. • Monitor and observe speed limit.	• PMU • Contractors	• Daily during construction • Weekly during construction • Monthly during operation

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	members, and those living or traveling near construction sites.			
6	**Community Health and diseases**			
	• Construction activities, including canal and pond rehabilitation, pose community health and safety risks beyond disease transmission, encompassing drowning, accidents from trespassing in construction zones (including storage and laydown areas), traffic disruptions, potential community conflicts, and general construction site hazards.	• Establish clear and well-marked construction exclusion zones to prevent unauthorized access, especially to areas with open water, heavy machinery, and storage areas. • Implement fencing and barriers to prevent trespassing and ensure community safety around construction areas. • Provide warning signs in local languages to inform communities about the dangers and restricted access to construction areas. • Install safety barriers around construction sites to minimize risks to the community and workers. • Ensure proper storage of construction materials, with no materials left unsecured and scattered around the site. • Develop and implement traffic management plans to minimize traffic and access disruptions and ensure pedestrian and vehicle safety. • Conduct community awareness campaigns to educate the community about the potential risks and safety measures during construction. • Establish and maintain a grievance mechanism to address community complaints and issues promptly. • Implement safety measures around canals and ponds to prevent drowning incidents, such as installing safety barriers and providing warning signs in local languages. • Create and enforce clear rules regarding access to canals and ponds during construction, and post those rules. • Implement strict health and safety regulations at all construction sites to protect both workers and the nearby communities. • Provide training to workers on safety protocols, including how to work safely around water, avoid accidents and minimize risks to the community. • Ensure all workers are provided with necessary personal protective equipment (PPE) and enforce its use.	• PMU • Contractors	• Monthly • During outbreaks • Periodic community health awareness campaigns
7	**Personal Protective Equipment**			
	• The activities involve Canal Rehabilitation and Construction, Structure Construction and Rehabilitation, and Drainage Improvement, which expose workers	• Continue and active use of PPE at all time of construction. • Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual	• Contractors • PMU	• Regular inspections/training

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	to various hazards, such as Falling Debris, Sharp Objects, and Heavy Machinery.	• Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out. • Proper use of PPE should be part of the recurrent training programs for employees.		
8	**Working conditions and Management of Worker**			
	• The lack of written contracts for unskilled, especially locally recruited, workers increase their vulnerability to underpayment, unequal treatment based on gender and temporary status, and late or non-payment of wages, impacting their livelihoods and potentially hindering project progress.	- Implement a grievance mechanism for workers where workers can report issues related to underpayment or unequal treatment without fear of retaliation. - Advise companies to provide equal opportunities for employment and promotions to all workers, regardless of gender, ethnicity, or background, to avoid discrimination. - Regularly monitor and audit payroll and employment practices to ensure compliance with labor regulations and address any disparities. - Offer training and capacity-building programs for all workers to enhance their skills and qualify them for higher-paying roles. - Ensure that subcontractors and suppliers also adhere to fair wage and equal treatment policies. - Set up worker committees or unions to allow collective bargaining and ensure workers have a voice in addressing wage and treatment issues. - Provide accessible information to workers about their rights, entitlements, and the proper channels to address grievances through the establishment of the GRM for workers. This includes training on topics such as: • Environmental and Social Safeguards • Gender Awareness and the Gender Action Plan • Sexual Exploitation, Abuse, and Harassment (SEA/SH) - Labor Rights and the Workers' Code of Conduct Regularly engage with labor rights organizations or third-party auditors to evaluate labor conditions and make improvements where necessary.	• Contractors • PMU	• Regular payroll audits • Periodic worker satisfaction surveys • Prompt investigation of any reported grievances
9	**CULTURAL HERITAGE**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Some cultural sites may be minimally impacted. • Risk of overlooking and destroying smaller sacred places. • Detailed design is crucial to assess the full impact.	• Conduct archaeological surveys before construction in culturally sensitive areas. • Implement Find Chance Procedure	• Contractors • PMU	• Daily • Reported to PMU within 48 hours
CROSS-CUTTING				
10	**Gender inequality**			
	• Women are more vulnerable to climate change impacts due to unequal access to resources, information, and decision-making power, often hindered by social gender roles. While women-led households represent a significant portion of project sub-schemes, they still face barriers to participation and benefits. The project area includes a substantial number of vulnerable individuals, including the poor, disabled, elderly, and parentless, highlighting the need for targeted support.	• The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices. • The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology. • The project should monitor gender equality indicators and should make adjustments as needed to ensure that women are benefiting from the project.	• Contractors • PMU	• Daily/ weekly
11	**Social inequality**			
	• Risk of being unequally engaged and treated, during the design phase and construction. The vulnerable are likely to be limitedly consulted and having limited access to available irrigation water.	• Conduct participatory planning and regular consultations with local communities, particularly marginalized groups (e.g., women, smallholder farmers, indigenous communities). • Prioritize hiring local labour, with special provisions for disadvantaged groups (e.g., youth, women, minorities) in both skilled and unskilled positions. • Develop and enforce water allocation plans that ensure fair access to water resources for all users, including small-scale and subsistence farmers, during and after construction. • Implement fair and transparent compensation or resettlement plans for those displaced or affected by construction activities, especially vulnerable households. • Establish accessible and responsive grievance redress mechanisms, ensuring all community members can raise concerns or complaints during construction.	• Contractors • PMU	• Continuously

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Conduct regular social impact assessments, with a focus on identifying inequality trends, and adjust project strategies to mitigate negative effects. • Provide support and training for affected communities to diversify their livelihoods, especially for those whose livelihoods may be disrupted by construction (e.g., farmers, traders). • Ensure transparency in the contracting process, including the selection of subcontractors and suppliers, with opportunities for local businesses, especially those run by marginalized groups.		
12	Elite capture			
	• The rich have the resources to grab both available land and water resources, creating greater social disparities	• Consultation will be conducted farmers in potential command area, focusing on vulnerable/disadvantaged groups • Alternative livelihoods for vulnerable group are identified based on their needs vis-à-vis project's investment eligibility • Conduct consultation at community level (in the command area) to achieve a consensus on how water needs are balanced between different groups in one command area. • During subproject design, water availability, storage capacity, and water needs of upstream and downstream population are calculated to inform design, and water use coordination during project operation. • Water user groups should be established for upstream and downstream population and should be coordinated by a higher-level committee/group to negotiate and optimize water coordination • Guidelines/Manual should be developed to provide guideline for upstream and downstream communities at subprojects to meet, discuss, and achieve consensus on how water is distributed for equal use between upstream and downstream population	• PMU • Contractors	• Throughout project implementation • Regular community meetings and consultations
13	**Loss access to land and other assets**			
	• Construction activities, particularly land acquisition for canals and roads, can displace communities or restrict their access to land, homes, and other assets. • Temporary restriction of irrigation access during construction may occur in some areas, potentially impacting livelihoods, even though the project area is mainly rainfed.	• The project will prioritize avoiding physical resettlement and minimizing land acquisition. Design adjustments will be made to avoid or reduce land requirements, especially on private land. Public land will be prioritized for any necessary acquisition. • Where land acquisition is unavoidable, the project will employ a negotiated settlement process with affected households. This process, guided by the RGC's Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR), aims to ensure that affected households receive fair and adequate	• Contractors • PMU	• Before land acquisition • During land • After resettlement

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		compensation for their losses and maintain or improve their income and livelihood status. • All individuals with assets within the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation, regardless of their legal status. Compensation will be provided for various losses, including land, structures, crops, trees, and income-generating activities. • Recognizing the potential disruption of income streams during relocation or construction, the project will provide transitional allowances to affected households. These allowances will help cover living expenses and bridge the gap until they can resume their livelihoods. • A multi-tiered GRM will be established to address grievances from any project-affected person. The GRM will operate based on the principles of the Green Climate Fund (GCF) and be accessible at no cost to the complainant.		
14	**Loss access to natural resources**			
	• Construction activities and project operations can restrict communities' access to forests, fishing grounds, water sources, or other natural resources they depend on for livelihoods	• Implement efficient water management practices during construction and operation to prevent over-extraction of water resources from reservoirs and rivers and ensure equitable distribution for downstream communities and ecosystems. • Establish construction exclusion zones around sensitive habitats, such as wetlands and forests, to prevent disturbance and minimize impacts on fishing grounds and biodiversity. Implement habitat restoration programs in areas where construction has occurred. • Use environmentally friendly construction materials and techniques to reduce the risk of pollution. Properly manage construction chemicals, fuels, and waste to prevent water pollution and contamination of natural resources. Prepare and implement a waste management plan to handle waste generated from construction activities and worker camps. • Optimize construction material use and recycle when possible, to minimize the extraction of new resources. Implement energy-efficient construction practices and use renewable energy sources where possible. • Maintain ongoing communication with affected communities, including farmers, fishers, and downstream communities, to address concerns about natural resource access. Provide information and education to construction workers about responsible use of local resources and respect for community	• PMU • Contractors	• Regular water quality and quantity monitoring • During project implementation: Monitor the effectiveness of mitigation measures.

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		access rights. This suggestion is informed by the sources but is not directly stated in them. • Ensure the GRM is accessible to all community members to address complaints related to natural resource access.		
DURING OPERATION				
1	**COMMUNITY HEALTH AND SAFETY**			
	• Water use conflicts, especially between upstream and downstream users, are a potential risk due to altered water allocation from the new irrigation infrastructure.	• The project will promote IWRM principles to ensure the equitable and sustainable allocation of water resources. This involves considering the needs of all stakeholders, including upstream and downstream communities, as well as environmental flow requirements for maintaining healthy ecosystems. • Establishing a system for monitoring water use and enforcing water allocation regulations will help prevent over-extraction and ensure a reliable water supply for all users. This may involve installing flow meters, conducting regular water audits, and implementing penalties for non-compliance. • The project will strengthen the capacity of FWUCs to manage water resources at the local level. This includes training on water allocation, conflict resolution, and operation and maintenance of irrigation infrastructure. Effective FWUCs can play a crucial role in mediating disputes and ensuring fair water distribution within their communities. • Raising awareness about water safety and the risks associated with open water bodies, especially among children, is essential. Educational campaigns, signage, and community outreach programs can help promote responsible behavior and prevent accidents. This information could be included in the training programs that will be provided to farmers and communities. • The project will consider incorporating safety features into the design of irrigation infrastructure. This may include fencing around canals and reservoirs, installing safety ladders, and providing designated swimming areas away from irrigation structures.	• PMU • PDWRAM	• Daily for site inspections • Monthly for reports and consultations • Within 48 hours for reporting accidents, disease outbreaks.
CROSS-CUTTING				
2	**Gender inequality**			
	• Women are more vulnerable to climate change due to limited access to resources, information, and	• The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical	• PMU • PDWRAM	• Monthly for data collection and reporting

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	decision-making power, often exacerbated by gender roles, resulting in unequal access to water, limited participation in water management, and disproportionately negative impacts on their livelihoods.	decision-making roles and equipping them with the necessary skills and resources to amplify their voices. • The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology. • The project should monitor gender equality indicators and should make adjustments as needed to ensure that women are benefiting from the project.		
3	**Social inequality**			
	• The competition for water and land displacement, and despite project consultations, vulnerable groups, particularly landless or land-poor households, may still experience limited access to irrigation benefits, though the impact is lessened by the relatively small proportion of poor within the area.	• Ensure Equitable Water Access: Mechanisms should be in place to support vulnerable and marginalized communities in accessing water resources. • FWUCs will manage the irrigation systems and ensure sustainability through fee collection. The project will invest in establishing and training FWUCs, emphasizing inclusivity and capacity building for vulnerable groups. • Implement a Simplified Integrated Pest Management (IPM) Plan.	• PMU • PDWRAM	• Monthly for data collection and reporting
4	**Elite capture**			
	• The rich have the resources to grab both available land and water resources, creating greater social disparities	• Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress mechanisms are essential to prevent manipulation and ensure equitable water distribution. • Regular monitoring and evaluation: Continuous monitoring of project impact, especially on vulnerable groups, can identify and address elite capture. • Strengthened land tenure security: Clarifying land rights can protect smallholder farmers and marginalized communities from land grabbing. • Community engagement: Active community participation, especially from vulnerable groups, empowers them and ensures their needs are met.	• PMU • PDWRAM	• Regularly during FWUC meetings and project implementation • Continuously through the GRM.

PMU = Project Management Unit, LMP = Labour Management Plan, NGOs = Non-governmental Organizations, HIV/AIDS = Human immunodeficiency virus/Acquired immunodeficiency syndrome, UV = Ultraviolet, GRM = Grievance Redress Mechanism, SEA = Sexual Exploitation and Abuse, SH = Sexual Harassment, VAC = Violence Against Children, ESHS = Environmental Social Health and Safety, STDs = Sexually transmitted diseases, PPE = Personal Protective Equipment, IPM = Integrated Pest Management, PDWRAM = Provincial Department of Water Resources and Meteorology, FWUCs = Farmer Water User Communities.

6. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

6.1 Purpose and Process of Stakeholder Engagement

Public consultation is a key component of CAISAR, and it was pivotal in preparation of the Environmental, Social, Climate Impact Assessment report (ESCA) Report and the Environmental, Social, Climate Management (ESCM) Plan. The consultations were conducted with relevant institutions, non-governmental organizations, local authorities, and local people during the preparation of ESCIA and ESCMP for CAISAR project. The data collection and consultations were conducted in four periods:

- The first consultation was conducted between 26 and 28 July 2024 to capture information regarding biodiversity and environmental condition in the project area.
- The second consultation was conducted to consult with forestry and fishery communities, local authorities and key informants to understand the situation and concerns related to the presence of the project. The consultation was conducted between 03 and 09 August 2024.
- The third consultation was conducted at household, village, and commune level stakeholders focusing on status, concerns and feedback regarding the project implementation. This consultation was conducted between 10 and 18 August 2024.
- The last consultation was conducted between 21 and 23 August 2024 with the district and provincial stakeholders, mainly focusing on the opinion, and feedback regarding the implementation of the project.

In addition to the stated consultations, there are also continuous consultations being conducted with AIIB, IFAD, and CAISAR PMU including the PMU management, SECAP team, and engineering team to ensure that the disclosed information being aligned with the most updated information of the project.

During project preparation, various stakeholders have been consulted in July and August 2024. Table below summarizes the number of people consulted by consultation techniques:

Table 41: Number of participants being consulted for Ou Ta Paong Sub-scheme

Levels	Household survey (Beneficiaries and Potentially Affected)	Focus Group Discussions	Key Informant Interviews	Total
Village level	140	61	9	210
Commune level			9	9
District level			5	5
Provincial level			21	21
			Total	**245**

6.2 Consultation Process

The purposes of the consultation were to:

- Inform local people and interested stakeholders of the purpose of the rehabilitation and construction of the irrigation system,

- Share the project information and the design options from the draft engineering design,
- Highlight subproject's key activities that are potentially associated with them, and
- Collect their opinion, concern and feedback on the project focusing on background information, project potential impacts (positive and negative), suggestions for impact mitigations, and consultation mechanism.

The consultation agenda with stakeholders included (i) the introduction of the study team, (ii) sharing project information using illustration materials, (iii) discussion and consultation on potential benefits and impacts of the project, (iv) suggestions on the mitigation measures, (v) grievance process and concerns, and (vi) final wrap up for the consultation. The study team were trained to introduce themselves to the purpose of the consultation, followed by the introduction about the project's component and activities expected to be implemented within the area. Materials including leaflet on project information and map of the command area were shared and explained to stakeholders prior to the consultation. Lastly, the consultation began with an overall discussion and specific questions as per the relevant aspect to the stakeholder. Opinions, concerns and suggestions were gathered and confirmed prior to the end of the consultation.

6.3 Stakeholder Engagement during Sub–Scheme Preparation

6.3.1 Environment, Biodiversity and Climate Change Impact

6.3.1.1 Pollution prevention and resource efficiency

Under the physical and environment aspects, the consultations discussed to gather opinion of stakeholders regarding the air quality, noise and vibration, surface and ground water quality, soil pollution, solid waste, domestic waste, wastewater. The consultations showed that stakeholders showed some opinions, concerns, and suggestions regarding the risks and impacts that CAISAR project may cause as below:

Overall Opinion

- There seems to be no concern regarding the quality of air or other disturbing factors as the community people and relevant stakeholders indicated the impacts are far below the other risks and impacts which they used to face. For example, the one caused by local factories and enterprises which shown to be at a higher level.
- The surface water quality seems to be impacted by various sources of pollution, including agricultural runoff from fertilizers and pesticides, factory waste, livestock waste, and human activities such as domestic waste and solid waste. While the project's activities are planned to conduct construction in the dry season and include their waste management plan, there's likely less impact on the water quality.

Concerns

- During the construction stage, such as the rehabilitation of irrigation canals and farm roads, can have disturbing environmental effects.
- Large machines used in the irrigation system construction generate noise and vibration pollution, which can disturb nearby residents and wildlife.

- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site will negatively impact local air quality and surface water.

Suggestions from the consulted people

- Avoid canal rehabilitation and upgrading of the canal being conducted at night.
- Install garbage bins and waste storage areas in the construction sites and conduct orientation workers to put the waste in the garbage bins.
- Government institutions and stakeholders should regularly conduct site inspections to reduce project activities that harm the environment and local community.
- Relevant ministries should conduct a visit to evaluate and address the issue of liquid waste from the construction activities in the commune.

6.3.1.2 Biodiversity

Regarding biodiversity, consultations have been conducted with local people, local authorities, and relevant institutions, focusing on habitat loss and fragmentation, alteration of water regimes, and loss of biodiversity in the command areas. The summary of the results is provided here:

Overall Opinion

- The CAISAR project's construction activities will have a minimal impact on biodiversity within the sub-schemes. By improving irrigation infrastructure, farmers can cultivate their land more frequently, and during the project operation, this may lead to increased biodiversity and ecological benefits.
- Improved irrigation systems will enable farmers to supplement their income by engaging in aquaculture, such as fish farming.
- Fish and other aquaculture will increase due to expanding habitat and space for moving, and farmers will be able to fish for household consumption and income.
- Less impact to biodiversity, however it has more benefit to biodiversity itself and farmers in the community.
- The project will significantly enhance the landscape by generating a livelier farming activities and water availability.

Concerns

- CAISAR project may cause negative impact on the environment, including changes in water quality, dust generation, air pollution, soil erosion, improper waste disposal, and hazardous waste from machinery.
- Additionally, the project's construction could disrupt the natural flow of water from upstream to Tonle Sap Lake, potentially harming the lake's biodiversity.
- The fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the reirrigation infrastructure and canal upgrading.

Suggestions from the consulted people

- The contractors and relevant parties should conduct on water quality and air quality monitoring during construction.
- To ensure the well-being of workers, contractors must regularly monitor and inspect of living conditions of the workers, manage waste effectively, and provide adequate housing and sanitation facilities to them.
- The contractor is responsible for providing comprehensive training to workers on proper waste oil management procedures.
- Activities such as fishing and hunting should be strictly prohibited to minimize environmental impact.
- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.
- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.

6.3.1.3 GHG Emission

There seems to be limited awareness and knowledge regarding the construction and farming activities which will contribute to the GHG emission. Only a few stakeholders reported the opinions were recorded which are mainly the line departments.

Overall Opinion

- The contribution of the project in terms of GHG emission may add into the global GHD emission due to activities like transportation, agricultural practices, the decomposition of agricultural waste, and the burning of agricultural waste.
- The use of trucks and heavy machinery during the construction process will inevitably release greenhouse gases into the atmosphere.

Concerns

- Climate change is negatively impacting rice production, causing problems such as increased disease, insect infestations, and extended dry seasons,
- Waste and pollution may contribute to the emission of GHG, and
- The impact maybe small such as waste burning at the construction sites and the increased use of machinery

Suggestions from the consulted people

- The contractors should ensure that garbage bins are conveniently placed throughout the workers' camp and collaborates with a waste collection company to guarantee regular and efficient removal of waste.
- To minimize emissions, contractors are advised to refrain from using outdated machinery.
- Installing solar water pumps in agriculture processing facilities can reduce fuel consumption, which causes greenhouse gas emissions.

6.3.2 Social Aspects

6.3.2.1 Labor and Working Conditions

Overall Opinion

Common impacts of labour and working condition, provided by relevant stakeholder during the consultation including:

- The project's benefits outweigh the negative impacts, as it is anticipated to improve the availability of workspaces for both men and women and enabling farmers to boost agricultural production.
- People without land may find labour opportunities, potentially reducing migration.
- Even though women may be occupied with factory work, they can still engage in agricultural activities.

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.

Suggestions from the consulted people

In response to the common issues outlined above, participants have also offered suggestions to address these concerns as the following:

- The construction companies should hire local workers to offer them jobs and strictly abide to laws and reducing the concerns about gender-based violence or sexual violent.
- Construction companies and relevant departments should provide training on gender issues, violence, labour laws, and social protections to their staff and workers.
- The project should allocate budget for relevant line departments to conduct relevant trainings to the companies and workers, and to monitor the construction sites

6.3.2.2 Community Health and Safety

Overall Opinion

- The construction and rehabilitation of the irrigation system is unlikely to generate any significant impact on community health, as no harmful chemicals are used, aside from some noise and vibrations.

Concerns

- Participants remain concerned that the presence of workers could result in sexual abuse of women and children living near the project site,
- Drug trafficking and consuming among workers may cause unsafe environment for both workers and surrounded residents,
- The construction activities may generate dust and slippery road conditions which may lead to traffic incidents,

- Waste generated from worker camps and construction activities during the project could degrade water quality, negatively impacting human health, livestock, and crops.

Suggestions from the consulted people

- The construction companies should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community,
- The project should promote gender awareness, enforce stricter punishments for offenders, and prevent drug trafficking in the workplace,
- The construction companies must collaborate with local authorities in all activities to make a proper management, control and monitoring during construction, and
- The project should conduct gender education at the district to prevent and address gender-based violence,
- The project should equip the solar lights along the roads to promote the safety of travellers during nighttime,

6.3.2.3 Land acquisition, economic and physical displacement

Overall Opinion

Perspective on land acquisition, economic and physical displacement impact from all the sub-scheme organizations is stated below:

- The rehabilitation or restoration of the irrigation system does not appear to directly impact rice farming, but it is crucial for enhancing rice and agricultural production and improving transportation infrastructure for agricultural products,
- Currently, farmers face water shortages for rice cultivation during the dry season and excess water during the wet season, due to insufficient sub-canals, reservoirs, and water sources,
- The irrigation system contributes to improving livelihoods for both general and vulnerable groups by boosting rice production, increasing local businesses and vendors, supporting water-related enterprises (such as water filtration), facilitating labor sales, and promoting local tourism. However, the irrigation system alone will not reduce migration unless there is a market for agricultural products,
- The project is believed to have minimal impact on farmers' land and private companies as it is planned to mainly rehabilitate the existing system,
- People tend to have positive views and welcome such a kind of project and normally they are willing to voluntary contribute the land,
- The provincial, district, and relevant institutions are capable solving the issues well and people are willing to cooperate,
- The roles and structure of the relevant authorities in dealing with the land acquisition and resettlement are well-prepared and ready to address the concern,
- Law on expropriation will be complied and compensation will be made as per the legislation of the country, so it is not generally a big problem for such a project,

Concerns

- Conflicts between the project and affected families may arise, often driven by external influences rather than the families themselves.
- Land-owning farmers might lose their land for agriculture, which could compel them to migrate, increasing their risk of exploitation and potentially leading to their children dropping out of school.

Suggestions from the consulted people

- The project should conduct a preliminary study on land issues before construction is going to be implemented, addressing specific aspects of land impact and conducting evaluations for each affected property,
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project,
- Farmers who own land may lose it for farming, which could force them to migrate, heightening their vulnerability to exploitation and potentially causing their children to drop out of school.

6.3.2.4 Cross–cutting risks and impacts

Regarding to cross-cutting risks and impact focus on social inequalities, and elite capture which influenced by the project, all the participants illustrate their perspectives, concerns and provide some idea and feedback as per their location as the following:

Overall Opinion

- The management of the system is quite challenging which is based on the actual situation of the system,
- The back-and-forth arguments may cause the delay of the construction of the irrigation system,
- The rising price of rice has led farmers to produce more rice than the available water supply can support, despite warnings from PDWRAM,

Concerns

- Unequal water distribution among farmers leads to favoritism and conflicts, often because farmers do not follow water distribution guidelines or announcements from authorities.
- Institutions or companies responsible for establishing FWUCs are typically based at the national level, resulting in limited quality of implementation, which weakens the FWUCs, while PDWRAM is sidelined, leading to wasted resources.
- The FWUCs struggle to generate income, making water management challenging, as there is no budget for repairs, leading to improper system operations.
- In addition to water issues, farmers face challenges such as pests, diseases, labor shortages, lack of capital, limited production techniques, flooding, unstable prices for vegetables and livestock, and high agricultural input costs.

- The provincial department lacks the budget to support the resolution of water user conflicts.
- Some farmers are absent from the rice fields during water distribution periods.
- Tensions between upstream and downstream villages arise when excess water released upstream during the wet season causes downstream flooding, while in the dry season, insufficient upstream water flow impacts downstream areas.
- High agricultural input costs continue to reduce farmers' profitability.
- Farmers do not follow official guidance on the size of rice fields to be cultivated, leading to inadequate water for irrigation.
- Manure availability for fertilizer is declining due to reduced livestock raising, and falling cattle prices are prompting farmers to further decrease livestock production.

Suggestions from the consulted people

- Women should be engaged and be promoted as the members of Water User Community to promote water distribution equality regarding water allocation from the system,
- PDWRAM should be the leader in formulating the FWUCs with the support from national level,
- Closed monitoring and support to FWUCs are critical and should be conducted regularly by all levels,
- Water use and maintenance support should be provided including technical and management training, along with problem-solving techniques, to effectively control and manage water distribution,
- The project should thoroughly examine the water availability, technical and situational aspects of the sub-scheme before construction to prevent water shortages or flooding,
- Ensure transparent water supply to prevent disputes by holding meetings to plan water use and distribution, involving the district governor, commune council, and relevant stakeholders,
- All parties should also participate in the maintenance of the irrigation system and provide training or education on water conservation to farmer.
- The Environment Department should allow dam or canal restoration activities of private companies, as these activities benefit both the community and agricultural production.
- Prior to starting irrigation rehabilitation, organize a public forum to gather feedback from local residents, disseminate project information to people and stakeholders, and announce the construction period in advance.
- The water consumption fee should be gathered from farmer which could be used later to support caretaker and maintenance the irrigation system.
- Increase the number of commune agricultural technical officers to provide training and monitor farmers' cultivation techniques.

- Build more water storages, and reservoir such as ponds or wells and conduct training on water-saving techniques to adapt to actual water availability.
- Installing and upgrading the damaged sluice gates to improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Facilitate the development of additional agricultural markets.
- Provide crop seeds to farmer and implement crop rotation techniques to improve yields.
- Providing modern equipment and new techniques to department officers can enhance agricultural production efficiency and yield.

6.4 Stakeholder Engagement during Sub–Scheme Implementation

During the implementation of the sub–scheme, particularly prior to construction, when locations of contractor's office, workers' camp, disposal sites for construction debris and construction waste, and labor management plan, etc. are identified – based on Contractor's ESMP, environmental and social risks and impacts associated with Contractor's specific construction methods and measures will be updated in C-ESMP and disclosed for continued consultation with local people and local authorities to avoid/minimize E&S risks and impacts.

6.5 Information disclosure

This ESCMP will be disclosed to the public in both English and Khmer language. The English version will be disclosed in full version whereas the Khmer version will be disclosed as Executive Summary. The documents will be disclosed on the website of MOWRAM (as Project Implementation Unit), and on the website of AIIB, IFAD and GCF before project appraisal and project approval – as per disclosure guidelines required by each donors.

7. GRIEVANCE REDRESS PROCEDURES

7.1 Objectives of the Project GRMs

The objective of the GRM is to provide affected persons with redress procedures that can be conveniently used to raise a project related concern or grievance. The GRM guides how a complaint can be lodged, including forms and channels through which a complaint can be submitted. To facilitate the grievance resolution process, grievances received will be acknowledged in writing and solved within a specified timeframe. During the resolution process, where necessary, dialogue will be held with aggrieved people for mutual understanding and effective resolution. Once a complaint is resolved, the aggrieved person will be notified of the resolution results.

The GRM has sequential steps that aggrieved person can use. If the aggrieved person is not satisfactory with the grievance resolution result, or if their complaint is not resolved within the timeframe specified for a particular step, aggrieved person can move on to the next step which is higher in resolution hierarchy. The project has an appeal process where complainants can

resort if they are not satisfied with a resolution decision at a particular step, or their complaints are not resolved within a specified timeframe.

7.2 Summary of National Legislation Related to Grievance and Complaint

The RGC has various laws and sub-decrees that have been in place to guide the implementation of the complaint resolution process. These documents specify the right of the complainants as well as the responsibilities of concerned governmental agencies as to complaint resolution. Relevant legal documents include:

- Law on Expropriation (dated 26 February 2010)
- Labor Law (dated 13 March 1997, amended on 20 July 2007 and 26 June 2018)
- Law on Prevention of Domestic Violence and Protection of Victims (dated 24 October 2005)
- Sub-decree No. 22 ANK/BK (2018) on Standard Operating Procedures for Land Acquisition and Involuntary Resettlement for Externally Financed Projects in Cambodia. Guidelines for Grievance Redress Mechanism (Appendix 8)
- Law on Administrative Management of Capital, Provinces, Municipalities, Districts and Khans (dated 22 May 2008) – Section 6 on Solution of Local Conflicts
- Sub-decree No. 22 (25 March 2002) on Decentralization of Roles, Functions, and Power to Commune Councils (Article 61: duty to promote the role of conciliating disputes between citizens)
- Sub decree No 47 ANK.BK (31 May 2002) on Organization and Functioning of the Cadastral Commission (Chapter 4 – District/Khan Level Conciliation).

7.3 Principles of the Project GRMs

Under CAISAR, the following principles will be applied:

- Channels. Different channels are established to enable affected person to submit their grievances, including submission to village committee, as well as district and provincial levels.
- Forms. Grievances can be submitted in writing and verbally, and either directly by the affected households, or by a person delegated by the complainant.
- Complainant can delegate a representative who acts on their behalf. A person lodging a grievance can ask assistance from their family or from individual to act as their representative.
- Disclosure. GRM procedures are disclosed in public domain (e.g., websites of PMU, public notice board at village hall, and in front of substation).

- Documentation. A grievance logbook will be maintained at substation (subproject level) and at PMU level (through PMU GRM focal point).
- Transparency. Grievance procedures include steps, time frame for grievance resolution for each step, notification to affected person, how decision is made.
- Acknowledgement. The unit in charge of complaint resolution will notify complainant upon complaint receipt and will initiate the complaint resolution process.
- Appeal. If the agency in charge does not resolve a grievance in a manner that is satisfactory to the affected person, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court.
- Monitoring. All grievances received are recorded by PMU and relevant substations, and are processed/resolved in a given timeframe, and are monitored by PMU GRM focal point.
- Time-limit. Time-limit is specified for each step in the grievance resolution process.
- Complainants bear no costs. Complaint resolution is free of charge to aggrieved person. However, if the complaints bring their case to court, they will bear the costs associated with their lawsuit.
- Any grievance concerning urgent health and safety issues shall be resolved immediately.

7.4 Project's Redress Procedures

The project has in place complaint handling procedures for three types of potential grievances, including grievances related to 1) land acquisition, 2) labour and working conditions, and 3) sexual exploitation and abuse and sexual harassment (SEA/SH/GBV/GBV), and 3) general complaints. These procedures are established based on the above GRM principles and are in accordance with pertinent national legislation. The GRM for complaints related to land acquisition is provided in the project's Resettlement and Policy Framework (RPF) and that for IPs is provided in the project's IPPF. Summary for the above four procedures is provided below:

7.4.1 Redress Procedure for Complaints related to Land Acquisition

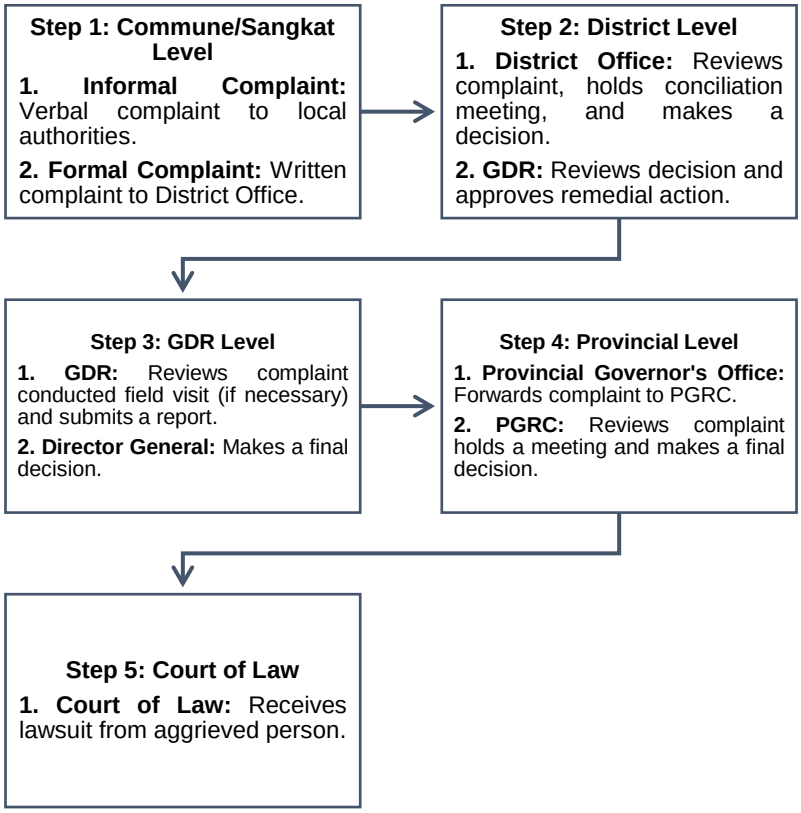
Under this project, to facilitate the grievance redress (Figure 17), the informal and formal steps are combined for convenient use of affected people, as follows:

- Step 1 − Commune/Sangkat level. APs will seek assistance from commune/Sangkat chief or community elderlies who will discuss with the leader of the PRSC-WG to find a solution. Verbal grievance can be provided to the commune/Sangkat chief or community elderlies. So, no written complaint is required. It is noted that even if the complaint is made verbally, the complaint will be registered in project's logbook, including resolution process and result for such verbal grievance for monitoring purpose. Upon receipt of the verbal complaint, the PRSC-WG will consult with the IRC-WG to ensure the complaint is addressed timely. If the grievance is not resolved to the

satisfaction of the AP, or if the AP prefers, s/he may lodge their complaint through the formal route which includes the steps below.

- Step 2 − District level. AH can lodge a written complaint to the Head of the District Office (where the subproject is located). The AH can bring a community elderly or their representative to discuss their grievance at the District Office. A conciliation meeting shall be held, and a decision be made within 15 working days from the date of complaint is received by the District Office. If the complaint is resolved to the satisfaction of the AH, the IRC-WG will inform GDR's Department of Internal Monitoring and Data Management (DIMDM) who will review and seek the approval of the Director General of GDR for appropriate remedial action. GDR will inform the AF of the decision/ remedial action within 15 working days from the receipt of the grievance by the District Office. If the complaint is rejected at this step, District Office will inform the AH of the rejection in writing. If the complainant is not satisfied with the decision/resolution result, s/he can proceed to step 3 (below).
- Step 3 − GDR level. The complainant who is not satisfied with proposed resolution from Step 2 shall lodge a written complaint to the GDR for resolution. The GDR, through its DIMDM, will carry out a holistic review of the complaint and submit a report on its findings with the relevant recommendations, if any, to the Director General of GDR for review and decision. GDR may conduct a field visit to meet the complaint and the IRC-WG to gather relevant information. The final report must be completed within 30 working days from the date of receipt of the complaint by GDR for submission to the Director General of GDR who will make a final decision within 5 working days of receipt of the final report. In the event that the subject matter requires a policy level intervention, it will be referred to the IRC for a decision which may require that an additional 10 working days be extended from the original deadline for final decision.
- Step 4 − Provincial level. AH will submit a written complaint to the PGRC through the Provincial Governor's Office. The complainant or a representative will be given an opportunity to present its case during a meeting and the PGRC may consider any compelling and special circumstances of the AH to inform their decision. The GDR will send a representative, as a non-voting member, to provide an explanation to the rejection of the complaint at Step 3 with the GDR. The decision of the PGRC must be made on a consensus basis and will be final and binding except when the matter relates to government's policy. Decisions related to government's policy matters on land acquisition and resettlement are decided by the IRC. The PGRC will have 40 working days from the date of receipt of the complaint to reach a final decision. The decision of the PGRC will be sent to the IRC (through the GDR) for endorsement before any remedial action is taken. There are no fees or charges levied on the AH for their lodgment of complaint and for complaint resolution for the above 4 steps.
- Step 5 − Court of Law. If the aggrieved person prefers filing a lawsuit at the Provincial/Municipal Courts, as applicable, to seek a resolution, AP can do so but will bear cost related to the lawsuit as per the Expropriation Law. When the case is brought to a Court of Law, there is no involvement of the GDR, PRSC or IRC-WG unless there is a judicial order from the competent courts.

Figure 33: Redress Procedure for Complaints related to Land Acquisition



7.4.2 Redress Procedure for Complaints Related to Labor and Working Conditions

Project workers can lodge their grievance/complaint as follows:

- Step 1 – Employer Level (Contractor and Subcontractor). Aggrieved person (AP) can submit their grievance to their Employer who serves as the first focal point for receiving and resolving grievance. Grievance can be lodged verbally or in writing, in person or by phone, text message, mail or email (anonymous complaint is accepted). The Employer involved will resolve the case no later than 15 working days. Once resolved and the AP is satisfactory, the Employer will report the case, including resolution process and results, to the SEO of the MOWRAM for information and record. If the AP is not satisfied with the resolution of their Employer, the Employer will refer the AP to the SEO of MOWRAM, if needed and inform the AP of this referral. It is noted that if a complaint concerns the safety and health of one or several individuals, such complaint shall be resolved as soon as possible – depending on the nature and urgency of the grievance.

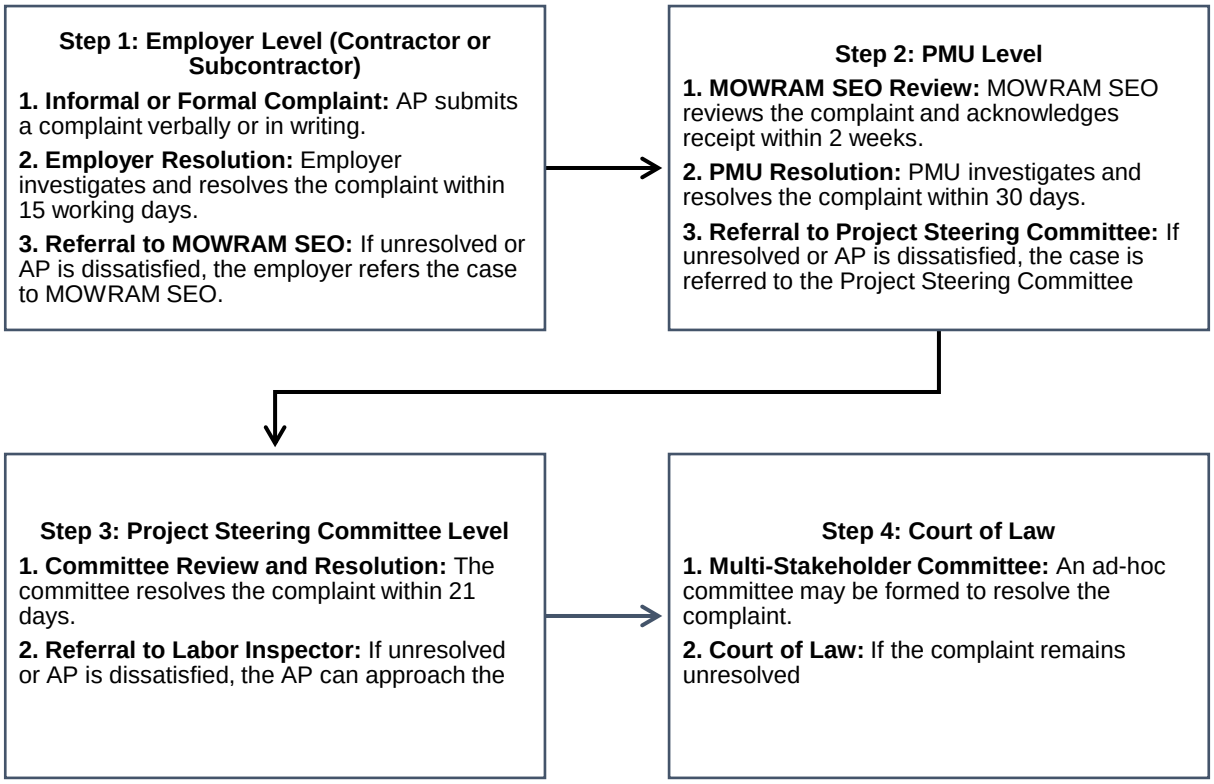
- Step 2 – PMU level. MOWRAM SEO will resolve the complaint referred to by the Employer (Step 1) and acknowledge receipt of the AP's complaints within two weeks from the date of complaint receipt. If the SEO of MOWRAM cannot resolve the complaint, the SEO Team will consult with the Project Manager/Director for resolution. The SEO of the MOWRAM will inform the AP (in writing) of the PMU's resolution result within 30 days from the date of complaint receipt. If the AP is not satisfied with the

resolution result proposed by PMU, PMU will refer the case to the Project Steering Committee of the project and shall inform the AP (in writing) of this referral.

- Step 3 – Project Steering Committee level. At this level, the case will be resolved no later than 21 days. The AP will be informed of the resolution decision in writing. In case the grievance has not been solved within the specified timeframe, or the AP does not agree with the proposed resolution, the AP can approach the Labor Inspector of his/her province or municipality.

- Step 4 – Court of Law. If the AP is not satisfied with the resolution proposed above, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court. If the grievance could not be resolved satisfactorily by the multistakeholder committee, the affected person may resort to the court of law. The cost associated with the lawsuit shall be borne by the AP. The decision of the Court will be final.

Figure 34: Redress Procedure for Complaints Related to Labor and Working Conditions



7.4.3 Redress Procedure for Complaints Related to SEA/SH/GBV

Under the project, the GRM for SEA/SH/GBV mainly serves to: (i) refer complainants to a local GBV service provider; and (ii) record resolution of the complaint. In line with the above, the following principles apply so as to recognize SEA/SH/GBV victim as principal decision makers in their own care, and treat them with agency, dignity and respect for their needs and wishes: § Multiple channels are in place for easy access and lodge complaints.

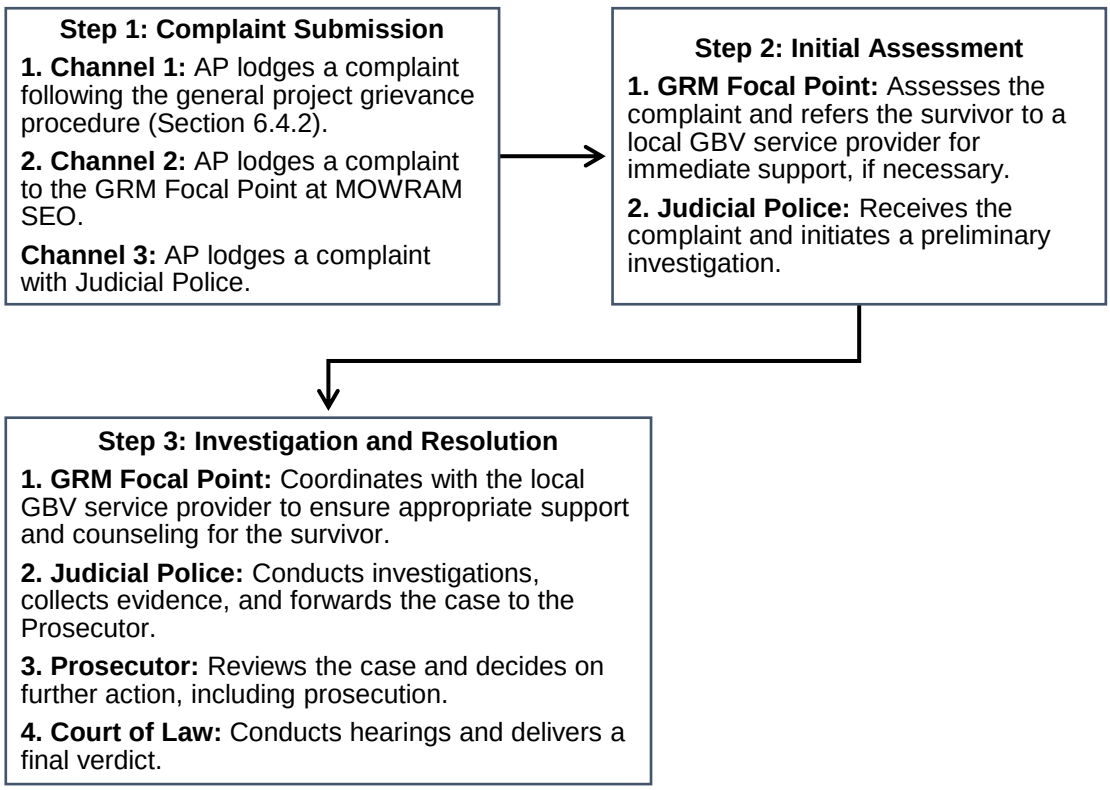
- SEA/SH/GBV survivors will be referred to a local GBV service provider for immediate support if they make a complaint directly to PMU.

- Confidentiality of survivors is protected. GM operator (at PMU and local GBV service providers) will keep confidential for SEA/SH/GBV allegation report.
- No identifiable information on the survivor shall be collected and stored in Project Grievance Logbook.
- Costs of operating the SEA/SH/GBV GRM will be covered by the project.

It is noted that under this project, GBV service provider will be engaged for subprojects that are rated “High” or “Substantial” for SEA/SH/GBV risks − as part of site-specific ESMP. based on SEA/SH/GBV risk assessment The following channels can be used to submit a grievance related to SEA/SH/GBV:

- Channel 1 – AP who believe the SEA/SH/GBV incidence is related to project workers can follow steps outlined in Section 6.4.2 (above) to lodge a SEA/SH/GBV complaint.
- Channel 2 – Alternatively, AP can lodge their complaint, verbally or in writing, to the GRM’s Focal Point within the SEO of MOWRAM for advice and resolution (contact of GRM Focal Point is provided in Section 5.1 (Resources).
- Channel 3 – If AP wants to bring the case to the Court of Law, AP can follow steps below for prosecution. Prosecution related to SEA/SH/GBV is administered under the Criminal Code and the Code of Criminal Procedure and is as follows:

Figure 35: Redress Procedure for Complaints Related to SEA/SH/GBV



- Step 1 – Judicial Police. SEA/SH/GBV victim or a representative can submit their grievance to a local Judicial Police (JP) Officer. JPs include a) Commune/ Sangkat Chief, b) Commune/ Sangkat/ District/ Provincial/ National Police, and c) District/ Provincial/ National Military Police. The JP is responsible for receiving, recording complaints, and may conduct preliminary investigations to identify and arrest the perpetrator. The JP will also collect evidence to support the prosecutors. If the SEA/SH/GBV happens at home and/or falls under the domain of domestic violence (as per Law on the Prevention of Domestic Violence and Protection of Victims), the SEA/SH/GBV survivor may seek support from a local qualified Judiciary Police Officer (appointed by the Ministry of Women's Affairs) who can act as a complaining party on behalf of the SEA/SH/GBV survivor15.
- Step 2 – Prosecutor. Upon receiving the completed written record from the JP, the prosecutor can decide on if the prosecutor will hold a file without processing it further or conduct proceedings against the perpetrator. The prosecutor may bring the case to the Court of Law and present the evidence in Court hearings.
- Step 3 – Investigation by Judge. During this step, the investigating Judge will conduct interrogation of the charged person and perform other required investigation procedure.
- Step 4 – Hearing. After issuing an order of indictment, the investigating Judge will submit the case to the trial court president who shall arrange a date for the trial. The decision of the Court on SEA/SH/GBV resolution is final.

7.4.4 Redress Procedure for General Complaints

In case individuals, households, or communities are affected by any other aspects, for instance, environmental impacts such as increased dust, noise, or lack of safety measures that increase risks of traffic accident to road users or to local EM, various channels will be established for convenient use by affected parties, including IPs. These include:

- PMU GRM focal point's telephone (See Section 5.1 – Resources). o Local EM leaders (in case affected individual/households are EM)
- Contractor's hotline: to report cases that they think contractors can solve timely (contact detail of Contractors will be posted at construction sites, and distributed to IPs (through Subproject Information Booklet) during consultation, and post at public billboard of Commune/Sangkat offices, pagodas, etc.
- Commune/Sangkat offices

7.5 Registration of Project Grievance

The SEO, Project 6. Managers within MOWRAM is responsible to establishing and maintaining the project grievance logbook (PGL). The PGL will be established by the SEO to record all concerns/ grievance that are submitted by project stakeholders during project implementation. In case there is serious complaint, the World Bank should be notified of these complaints within 24 hours of complaint receipt (See Annex 3 for Guidance for establishing and maintaining Project Grievance Logbook).

The GRM is an integral project management element that intends to seek feedback from beneficiaries and resolve of complaints on project activities and performance. The GRMs for the project are based on IAAB, IFAD, UN, and GCF requirements and, most importantly, national requirements for solving potential problems between project owners and residents/persons affected by the subproject(s).

8. IMPLEMENTATION ARRANGEMENTS

8.1 Environmental and Social Duties of the PMU/Detail Design Consultants

8.1.1 MOWRAM'S PMU

The MOWRAM's PMU will work closely with PDWRAM in planning and implementing subprojects located within their province. The PDWRAMs will also supervise project officers at the district-level Department of Water Resource and Meteorology, and are responsible for:

- Coordinating effectively with all project stakeholders, including MOWRAM's SEO, consultants, contractors, local authorities, provincial departments, and project communities.
- Supporting provincial and district-level project officers in monitoring and evaluating progress and performance of consultants and contractors.
- Supporting MOWRAM'S SEO to conduct training on labor, gender, SEA, SH, VAC, and HIV/AIDS.
- Supporting MOWRAM'S SEO to disseminate project information and conduct consultation activities, as well as ensuring effective grievance redress resolution within their province.
- Supporting MOWRAM'S SEO to conduct screening and scoping of the subprojects, and identifying environment, social, land acquisition impacts and screening for presence of IPs in the subproject area.
- Liaising with village authorities in subproject area to encourage vulnerable groups to apply for jobs that may be offered by project's contractors.
- Collaborating with relevant departments involved in land acquisition and/or other environment or social mitigation measures.

8.1.2 NCDD'S PMU

NCDD's PMU will work closely with Provincial Cabinet in planning and implementing subproject located within their province. NCDD PMU will be responsible for day-to-day project implementation, monitoring and evaluation of Project Component 1, 2.1 and 2.2 in collaboration with MAFF. PMU will work under the oversight and guidance of NCDDS and will be responsible for all aspects of environmental and social performance, including E&S monitoring and evaluation, reporting of E&S performance, and relevant incidence during project implementation.

8.1.3 Provincial Department of Water Resources and Meteorology

PDWRAM's main responsibility includes:

During subproject preparation:

- Support design parties in their surveys and consultation to prepare Feasibility Study and Detailed Design for sub-scheme.

During construction:

- Oversee construction activities under Component 2, particularly construction of the new irrigation canal in the command area

During operation:

- Collaborate with other relevant technical departments, especially PDAFF at provincial level, farmer water user groups (FWUG) to ensure its regulators (located within the water distribution network) are operated effectively, and in a manner that minimizes water use conflicts among target water user community in the command area.
- Conduct regular maintenance of the reservoir and irrigation canals during subproject operation and maintenance stage.

8.1.4 Provincial Department of Agriculture, Forestry and Fisheries

PDAFF is responsible for implementing activities under Component 1, 2.1 & 2.2. Under this subproject, PDAFF is responsible for developing and implementing agricultural techniques that make full use of improved water access (under Component 1) to enable farmers in the command area to produce more food in a sustainable manner which improves farmers' income and livelihoods. PDAFF will focus on the following:

- Promoting crop diversification for farmers in the command area (e.g. crop rotation for rice and horticulture production improves soil conditions whereas enhancing vegetation production for household's better nutrition and income.
- Introducing to farmers new agricultural engineering techniques to promote a) mechanization to increase productivity in crop production (e.g. mechanization in soil preparation using laser land leveling, use of combine harvester to save labor and reduce production costs, b) save water by applying alternate wet and dry (AWD) and drip irrigation for horticultural activities, c) reduce GHG.
- Scaling up Crop Production and engaging Private Sector in value chain development for specific farm product (e.g. rice, bean, and other cash crops such as vegetables…) and relevant agricultural services through agricultural cooperatives, producer groups, etc.

8.2 Contractor's Environmental and Social Management Plan (C-ESMP)

The civil works contractor is responsible for implementing the Environmental and Social (E&S) mitigation measures outlined in this ESMP for Component 2, which involves constructing the irrigation canal and related structures like gates and regulators. Based on the ESMP and the project's Labour Management Plan (LMP), the contractor will:

- Prepare and submit a Contractor's Environmental and Social Management Plan (C-ESMP) for each contract, detailing how E&S risks related to construction activities, workers, camps, machinery, and vehicles will be mitigated. The C-ESMP must also include a labor management plan (C-LMP) and be site-specific, addressing risks based on the contractor's capacity and site conditions.
- If subcontractors are engaged, they must prepare their own E&S plan aligned with the ESMP and LMP, outlining how they will manage identified risks and impacts. Reporting arrangements between the subcontractor and the main contractor must be detailed, with the main contractor consolidating subcontractor reports into monthly E&S performance reports to the PMU, with quarterly reporting potentially required.
- If changes occur to the proposed works and activities during the contract period, the contractor must update the C-ESMP to reflect these changes, including relevant subcontractor plans. The C-ESMP should include:
    - A policy statement outlining the contractor's commitment to the site-specific ESMP.
    - Document details (issue date, revision status, distribution list, and signatures).
    - Applicable laws, regulations, and required permits.
    - Plans to manage E&S risks, including mitigation measures, a Workers' Code of Conduct, and a Contractor's LMP.
    - A list of required environmental and social training for all personnel, including occupational health and safety, SEA/SH/VAC risks, and emergency response.
    - Financial resources and responsibilities for implementing the C-ESMP, including subcontractor responsibilities and training for local workers.
    - Monthly environmental reports, covering accident/incident reporting within 48 hours to MoWRAM, compliance with the C-ESMP, challenges, non-compliance issues, subcontractor activities, and meeting minutes with MoWRAM.

The contractor must ensure timely funding, human resources, and implementation of pre-construction and construction mitigation measures, along with any additional E&S mitigation required.

8.3 Contractor's Safety, Social and Environmental Officer (SSEO)

The contractor must appoint a competent on-site Safety, Social, and Environment Officer (SSEO), trained in environmental management, to oversee contractors and subcontractor personnel. The SSEO's responsibilities include:

- Supervising subcontractor compliance with the Contractor's LMP and C-ESMP.
- Submit the LMP and C-ESMP to the PMU/DDIS for approval before mobilizing staff.
- Conducting site inspections and audits to ensure compliance with environmental and social mitigation measures.

- Monitoring and reporting on E&S compliance and preparing audit reports.
- Investigating complaints, recommending corrective actions, and addressing non-compliance.
- Informing the contractor, PMU, and DDIS of any E&S issues, and maintaining detailed records.
- Collaborating on labor issues and preparing the Contractor's LMP and C-ESMP, including OHS regulations.
- Maintaining employment records, verifying minimum working age, and ensuring signed Workers' Codes of Conduct.
- Providing regular training on occupational safety, SEA/SH/VAC, and community relations.
- Ensuring primary suppliers address SEA/SH/VAC, child labor, forced labor, and OHS risks.
- Developing and implementing a grievance mechanism for contracted workers, resolving grievances promptly, and reporting to the PMU.
- Ensuring all workers sign the Code of Conduct and implement measures to prevent SEA/SH.
- Developing and enforcing COVID-19 prevention and mitigation plans.

Incident reporting

The contractors are required to inform DDIS and PMU any incidents listed below within agreed timeframe (e.g. 48 hours):

- Any violations to national laws, regulations, or international agreements.
- Any serious accidents or fatalities,
- Significant impacts that cause losses to personal property such as traffic accidents, damages to local houses/roads and other incidents.
- Serious surface/ground water pollution.
- Failures of embankments at disposal sites that cause serious pollutions to the surroundings,
- Fire related to worker's behaviours,
- Any claims related to SEA/SH/VAC, or any other incidents related to children, and
- Receive a complaint about pollution or damages.

8.4 Contractor's obligation as to contractual requirements

The contractor and its subcontractors, if any, shall comply with the ESMP. In particular, the Contractor must prepare a Contractor's ESMP (C-ESMP) to elaborate this ESMP based on a)

site condition, b) capacity of the Contractors and their subcontractors (if any), c) national regulations that are active by the time of subproject implementation.

To ensure that necessary action has been undertaken and that steps to avoid adverse impacts and/or reoccurrence have been implemented, the Project Manager, the Safeguard Focal Persons, and/or contractor must report to PMU within 48 hours of any serious incidents of non-compliance that may have serious consequence. In the event of working practices being deemed dangerous either by the subproject, the local authorities, or the other concerned agencies, immediate remedial action must be taken by the contractors. The contractor must keep records of any incidents and any corrective action taken. The records of non-compliance that could be practically addressed (not cause serious impacts) will be reported to the DDIS with a copy to PMU monthly.

The contractor will be responsible for dealing with any reports/grievance forwarded by the local communities, authorities, police or other agencies as soon as practicable, preferably within one hour but always within 48 hours. The Project Manager/Safeguard Focal Persons will monitor and ensure that the contractor has taken appropriate action. Where appropriate, approval of remedial actions may require an agreement from the local authorities and/or other government agencies. Procedures should be put in place to ensure, as far as is reasonably practical, that necessary actions can be undertaken to avoid recurrence and/or serious damage.

9. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM

9.1 Environmental Monitoring Program

To ensure the effectiveness of environmental management, the environmental monitoring program is prepared to monitor the environmental quality. The contractor and/or sub-contractor is responsible for monitoring using appropriate method, equipment and system. Details on monitoring parameters are shown in the table below:

Table 42: Environmental monitoring plan during pre-construction, construction, and operation phase

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Pre-construction phase					
UNEXPLODED ORDNANCES (UXO)	• UXO screening by certified experts required before any construction. • Found UXOs to be removed by certified experts. • UXO clearance certificate required before subproject activities. • UXO risk training and awareness for the local community.	Along the canales (construction site)	• Confirm all relevant areas are clear from UXO by consulting national military. • Obtain a certificate of UXO clearance	Before construction	PMU Contractor
During construction phase					
	ENVIRONMENTAL				
Noise and Vibration	• Avoid working during night-time from 21:00 hours to 06:00 hours • Provide ear sets for workers to prevent noise if the noise level exceeds the standard • Check and maintain construction machinery regularly to avoid noisy and high vibration • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures	Construction site Nearby sensitive structures	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
	Measuring noise and vibration level	Construction site, there are 2 locations for noise and vibration level sampling. ANV1 X: 356908 Y: 1395649	Measuring equipment and/or appropriate monitoring methods	Every 06 months	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
		ANV2 X: 355879 Y: 1404046			
Air quality	• Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition • Solid waste or construction waste activities • Construction machinery operation and maintenance • Distance of sitting concrete mixing plants, crushing • plants, quarries and other facilities to settle and other sensitive receptors • Transportation of construction materials	Construction site	Site inspection Visual observation Monitoring equipment and/or appropriate monitoring methods	Daily	SEO E&S specialist consultants PMU
	Testing air quality (NO2, SO2, CO, TSP, PM10, PM2.5)	There are 2 locations for air quality sampling. ANV1 X: 356908 Y: 1395649 ANV2 X: 355879 Y: 1404046	Air quality monitoring equipment	Every 06 months	
Impact to Water	• Wastewater management • Design and capacity of septic tank • Digging of side drain at campsite • Construction of retaining structures	Construction site	Site inspection Visual observation	Daily	SEO E&S specialist consultant s PMU
	• Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform).	There are 3 locations for surface water quality sampling. SW1 X:356706 Y:139619	Water quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
		8 SW2 X:355668 Y:140401 8 SW3 X:352153 Y:141441 0			
	• Testing of soil quality is going to be analyzed in the agriculture context: - Soil classification or particle size, - Soil moisture, - Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na), - Organic Metter - Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio), - Total phosphorus (P), - Cation exchange capacity (CEC), - pH, - Electrode Conductivity.	There are 2 locations for soil quality sampling. SS1 X:355662 Y:139906 3 SS2 X: 354509 Y:140685 2	Soil quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU
Solid and hazardous waste	• Solid and liquid waste management plan in the project construction sites. • Install septic tanks at the construction camp to prevent the discharge of polluted sewage into the outside. • Implement waste segregation of reusable construction materials, biodegradable, and non- biodegradable wastes. • Orient workers on the solid waste segregation system and prohibit them from indiscriminate throwing wastes outside of waste bins in the construction sites. • Provide sufficient waste bin and proper storage before transportation	Construction site	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	to dispose at an authorized landfill. • Fuel storage tank will be provided with retention areas to contain accidental spills.				
Wastewater	• Establishment of proper wastewater management systems, including adequate sanitation facilities for workers.	Construction site/Camp	• Monitoring wastewater discharge for parameters such as temperature, pH, TSS, DO, COD, BOD_5. • Regular checks for leaks or spills from sanitation facilities.	Daily	PMU, Contractor
Physical Hazards	• Incidence of worker injuries due to physical hazards (e.g., falls, cuts, being struck by objects) • Unsafe working conditions (e.g., inadequate lighting, lack of proper safety equipment, slippery surfaces) • Compliance with safety regulations and use of personal protective equipment (PPE)	• Construction sites • Worker camps • Access roads	• Site inspections • Incident reports • Safety audits.	• Daily during construction Weekly safety meetings	Contractors PMU
Chemical hazards	• Exposure of workers and communities to hazardous chemicals (e.g., pesticides, fuels, solvents) • Improper storage, handling, and disposal of chemicals • Air and water quality monitoring to detect chemical contamination	• Construction sites • Worker camps • Areas surrounding construction sites	• Site inspections • Training for workers	Regular inspections of chemical storage and handling areas	Contractors PMU
Heat Stress	• Implementation of safety measures and provision of break times for workers during extreme weather events.	Construction site/Worker	• Monitoring weather	Daily	Contractors PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	• Provision of adequate drinking water and shelter.	camps	conditions, including temperature and humidity. • Observation of worker breaks and access to shade and drinking water. • Records of any heat-related incidents.		
	BIODIVERSITY				
Habitat Loss and Fragmentation	• Area of habitat lost or fragmented. • Changes in vegetation cover. Number of isolated habitat patches • Presence of wildlife corridors.	Construction site	Site inspection Visual observation GIS analysis (if available) Drone surveys (if available)	Daily/Weekly	SEO E&S specialist consultants PMU
Loss of biodiversity and ecosystem services	• Changes in species abundance and diversity • Decline in water quality • Changes in soil fertility • Reduced pollination services • Alterations in hydrological processes	Construction site	Site inspection Visual observation Biodiversity surveys	Daily/Weekly	SEO E&S specialist consultants PMU
Hunting and trading, and consumption of wildlife	• Avoid cutting of trees or destruction of vegetation • No hunting, fishing, or collection of animal and plant materials • Revegetation success will be monitored, particularly surrounding riparian vegetation along area where levee is installed for flood protection and for increased water retention.	Construction site	Site inspection Visual observation Community interviews	Daily/Weekly	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Loss of fauna and flora	• Number of individuals of each species observed • Presence of endangered or threatened species • Changes in plant community composition	Construction site	Site inspection Visual observation Biodiversity surveys	Daily/Weekly	SEO E&S specialist consultants PMU
Destruction of farming ecosystem	• Area of farmland affected • Changes in crop yields • Impacts on livestock • Pollution of water sources used for irrigation	Construction site	Site inspection Visual observation Interviews with farmers	Daily/Weekly	SEO E&S specialist consultants PMU
Landscape and biodiversity	• Adopting good housekeeping and good construction practices. • Ensuring proper lining of canals and adequate assembling of pipes • Adopting slope stabilization techniques. • Implementing Biodiversity Action Plan (BAP)	Construction sites	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Protected Areas	• Exclude subproject located in the community forestry, and Zone 3 of the protected area.	Construction sites	Site inspection	Daily	SEO
GHG emission	• Monitor the amount of fuel used by construction vehicles, heavy machinery, and generators. • Track the fuel efficiency of these machines to identify opportunities for improvement. • Assess the effectiveness of measures to control dust emissions from construction sites. • Monitor the types and quantities of waste generated and their disposal methods. • Track the amount of waste recycled or reused to reduce emissions associated with landfill disposal. • Monitor the number and types of vehicles entering and leaving the construction site. • Track the efficiency of transportation methods used to deliver materials and equipment.	Construction site Nearby sensitive structures	Site inspection Visual observation Consultation	Daily	SEO E&S specialist consultants PMU
	During operation phase				

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Water Quality	Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform) and pesticide residues in water.	There are 3 locations for surface water quality sampling. SW1 X:356706 Y:1396198 SW2 X:355668 Y:1404018 SW3 X:352153 Y:1414410	Site inspection Visual observation	Annually	SEO E&S specialist consultants PMU
Soil Pollution	• Testing of soil quality is going to be analyzed in the agriculture context: - Soil classification or particle size, - Soil moisture, - Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na), - Organic Metter - Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio), - Total phosphorus (P), - Cation exchange capacity (CEC), - pH, - Electrode Conductivity.	There are 2 locations for soil quality sampling. SS1 X:355662 Y:1399063 SS2 X: 354509 Y:1406852	Soil quality monitoring equipment	Annually	SEO E&S specialist consultants PMU
Biodiversity and Ecosystem Services	• Implementing Biodiversity Action Plan (BAP)	The entire sub-scheme	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Habitat Loss and Fragmentation	• Area of habitat converted for agricultural use • Changes in the size and connectivity of habitat patches • Number of isolated habitat fragments	The entire sub-scheme	Site inspection Visual observation	Annually	SEO E&S specialist consultants PMU
Invasive Species	• Presence and abundance of invasive species • Area affected by invasive species • Effectiveness of control measures	The entire sub-scheme	Site inspection Visual observation Vegetation surveys	Annually	SEO E&S specialist consultants PMU
GHG emission	• Monitor the Knowledge, Attitude and Practices of farmers in farming activities that cause GHG emission	The entire sub-scheme	Site inspection Visual observation Consultation	Daily	SEO E&S specialist consultants PMU
	ANNUAL CROP MANAGEMENT PLAN				
Water resource efficiency	• Monitor water extraction rates from surface and groundwater sources. • Assess irrigation efficiency by measuring the amount of water applied versus the amount of water actually used by crops. • Monitor the implementation and effectiveness of water-saving irrigation methods (drip irrigation, sprinkler irrigation, AWD for rice). • Track water consumption per unit of crop yield (e.g., cubic meters of water per ton of rice produced).	Irrigation intake points Representative fields within the sub-scheme	Water flow measurements Soil moisture monitoring Crop water use assessments	Daily	PMU FWUC
Soil erosion and soil erosion risk	• Monitor soil erosion rates in different parts of the sub-scheme, particularly in sloping areas. • Assess the effectiveness of erosion control measures (contour planting, terracing, grass barriers). • Monitor soil organic matter content as an indicator of soil health and erosion resistance.	Representative fields Areas with different slopes and soil types	• Visual assessments of erosion features (gullies, rills) • Soil loss measurements using erosion	After significant rainfall events Annually	PMU Agricultural extension officers

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
			plots or sediment traps • Soil organic matter analysis		
Nutrient application and management	• Monitor the types and amounts of fertilizers applied to different crops. • Conduct regular soil testing to assess nutrient levels and guide fertilizer application rates. • Monitor nutrient runoff from fields, especially near watercourses.	Representative fields Water sampling points near fields	• Fertilizer application records • Soil nutrient analysis • Water quality testing for nutrients (nitrogen, phosphorus)	Before and after fertilizer application Regularly during the growing season	PMU Farmers
Use and effectiveness of pesticides	• Monitor the types and amounts of pesticides used for different crops and pests. • Assess the effectiveness of pest control measures by monitoring pest populations and crop damage. • Track the incidence of pesticide-related health issues among farmers and workers.	Representative fields Pesticide storage facilities	• Pesticide application records • Pest scouting and monitoring data • Health records	Regularly during the growing season	PMU Agricultural extension officers
Pesticide residues on site soil	• Conduct soil sampling and analysis to measure pesticide residue levels in representative fields.	Representative fields Areas near pesticide storage facilities	• Soil residue analysis	Periodically (e.g., annually or before planting sensitive crops)	PMU Third-party laboratories
Pesticide residues on produce	• Collect and analyze samples of produce to determine pesticide residue levels. • Ensure that produce meets national and international standards for maximum residue limits (MRLs).	Representative fields at harvest time	• Laboratory analysis of produce samples	Before harvest	PMU Third-party laboratories

9.2 Social Monitoring Program

To ensure the effectiveness of social management, the social monitoring program is prepared to monitor social issues. The contractor and/or sub-contractor are responsible for monitoring using appropriate methods, equipment and system. Details on monitoring parameters are shown on the table below:

Table 43: Social monitoring plan during pre-construction, construction, and operational phase

Monitoring Parameters	Monitoring Indicators	Locations	Measurements	Frequency	Responsibility
Preconstruction phase					
Land acquisition/ Economic displacement	• Track the process of acquiring land for the project, ensuring fair compensation is provided to affected landowners. • Implement programs to help displaced individuals and communities restore their livelihoods. Establish effective grievance mechanisms to address complaints and concerns related to economic displacement.	Construction sites	• Monitor the distribution of compensation payments and address any disputes or concerns. • Monitor the effectiveness of these programs.	• Daily • Reported to PMU within 48 hours	• PMU
During construction phase					
PROTECTING THE WORKFORC					
Child Labor/ Forced Labor	• Involvement of child labor/ forced labor in main contractor and subcontractors' workforce • Involvement of child labor/ forced labor among primarily supply workers	• Construction sites • Worksite of primary supplier	• Site inspection • Observation	• Daily • Screening prior to engaging services of primary supplier	
COMMUNITY HEALTH AND SAFETY					
Community Health and diseases	• Incidence of waterborne diseases • Prevalence of vector-borne diseases (e.g., malaria, dengue fever) • Respiratory illnesses related to dust and air pollution • Availability and accessibility of healthcare services	• Construction sites • Worker camps • Community and neighboring areas	• Health data collection • Site inspections • Health surveys and interviews • Consultation with	• Monthly • During outbreaks • Periodic community health awareness	• PMU • Contractors • Local health authorities

	• Community awareness of health risks and preventative measures		workers and community members	campaigns	
SEA/SH	• Before mobilizing workers to construction site, conduct orientation/training on SEA/SH (using sample Code of Conduct as a minimum) for all Contractors' managers and workers mobilized to construction site • As part of the above training/orientation, ensure all workers understand SEA/SH risks, disciplines and penalty, and understand project's grievance procedures related to SEA/SH • As part of the workers and manager's work contract, require all workers engaged for project (both workers mobilized to site or work in contractors' office) to peruse and sign Workers' CoC • Ensure Contractors appoint a focal point in charge of ESHS and grievance reception, processing and resolution • Apply all measures related to management of work camps	• Construction sites • Relevant local communities	• Number and percentage of workers trained on SEA/SH prior to mobilization to subproject site • Number and percentage of workers signing Code of Conduct as part of Work Contract • Percentage of workers perpetrating SEA/SH and percentage of cases reported to PMU and resolved • Name and contact of ESHS and grievance focal report reported in Contractor's ESMP.	• Monthly and during subproject cycle • Reported to PMU within 48 hours if occurred	• Contractors • PMU
Traffic safety and Security	• Security cautions • General disease prevalence • Worker health • Communicable diseases	• Construction sites • Access roads to construction sites • Newly constructed/rehabilitated roads	• Site inspections • Incident reports • Data collection • Consultation with workers and community members • Review of contractor safety plans	• Daily during construction • Weekly during construction • Monthly during operation	• Contractors • PMU • Local authorities
Community Health and diseases	• Consultations with target communities to assess the current social situation and social impacts of sub-projects. • Recommendations and solutions from communities obtained regarding negative social impacts.	• Target communities • Workers	• Assessment of social situation and social impacts. • Collection of community	• During consultations	• Contractors • PMU

			recommendations and solutions.		
Personal Protective Equipment	• Health and safety regulations enforced at construction sites. • Appropriate training and personal protective equipment (PPE) provided to workers.	• Construction sites and worker camps	• Monitoring that contractors provide appropriate PPE and enforce its use. • Observation of training sessions. • Review records of PPE distribution and training.	• Monthly monitoring during construction	• Contractors • PMU
Working conditions and Management of Worker	• Worker wages and benefits compared to legal requirements and industry standards • Instances of discrimination or unfair treatment based on gender, ethnicity, or other factors • Access to grievance mechanisms for workers to report unfair labor practices	• Construction sites • Worker camps	• Payroll records review: Verify worker wages and benefits. • Worker interviews: Confidential interviews to gather feedback on labor conditions and treatment. • Observation of worker interactions: Monitor for signs of discrimination or unfair treatment. • Review of contractor labor policies and practices: Ensure compliance with labor laws and ethical standards.	• Regular payroll audits • Periodic worker satisfaction surveys • Prompt investigation of any reported grievances	• Contractors • PMU
Cultural heritage	• Unexpected impacts on heritage resources	• Construction sites	• Site inspection • Observation • Report by local people/local authority	• Daily • Reported to PMU within 48 hours	• PMU • Contractors

CROSS-CUTTING					
Loss access to land and other assets	• Number of households affected by land acquisition or temporary restrictions on land use • Types of assets affected (e.g., land, houses, crops, trees) • Adequacy of compensation and resettlement measures for affected households	• Project areas where land acquisition is required • Areas affected by temporary restrictions on land use	• Land surveys and asset inventories • Consultations with affected households • Review of compensation and resettlement plans • Monitoring of resettlement implementation	• Before land acquisition • During land • After resettlement	• Contractors • PMU
Loss access to natural resources:	• Impacts on community access to water resources (e.g., for drinking, irrigation, fishing) • Impacts on access to forests and other natural resources • Measures to mitigate impacts and provide alternative access to resources	• Areas downstream of irrigation schemes • Areas surrounding project activities that may affect natural resources	• Water quality and quantity monitoring: Assess impacts on water resources downstream of project activities. • Consultations with communities: Gather feedback on impacts on natural resource access and use. • Development and implementation of mitigation plans: Address impacts and provide alternative access to resources.	• Regular water quality and quantity monitoring • During project implementation: Monitor the effectiveness of mitigation measures.	• PMU • Relevant government agencies • Contractors
Social inequality	• Any actions on the part of Contractors' workers or community member that cause social conflicts (e.g. SEA/SH, the way construction activities are carried out [pollution, restricted access, loss of local income/livelihoods, accidents…)	• Construction sites • Relevant local communities	• Number of social conflicts arising and nature and scope of conflict	• Daily • Monthly	• Contractors • PMU

	• Conflicts between upstream farmers who prioritize water storage for their crops and downstream farmers who require a consistent water supply for their agricultural needs.	• Local communities are living downstream and upstream.	• Number of social conflicts resolved by contractors within 7 days • Number of social conflicts resolved by local authorities • Number of serious cases that have happened and reported to PMU within 48 hours		
Elite capture	• Equitable distribution of project benefits among community members • Transparency and accountability in decision-making processes • Mechanisms for community participation and feedback	• Project implementation areas • Community meetings and consultations	• Monitoring of benefit distribution: Track who is receiving project benefits and ensure fairness. • Observation of decision-making processes: Assess inclusivity and transparency. • Community feedback mechanisms: Establish channels for communities to voice concerns and provide input.	• Throughout project implementation • Regular community meetings and consultations	• PMU • Contractors • Community representatives
Gender inequality	• Percentage of female beneficiaries • Percentage of beneficiaries who are youth • Average percentage women consulted • Number of action plans integrating specific women's • Average percentage FWUC with women in leadership positions • Women/youth trained in O&M • Number of training on gender and social inclusion	• Project sites • Community level	• Data collected through surveys and consultations • Review of project documents, training plans, and meeting minutes	• Monthly monitoring • Quarterly • Semi-annually • Annually	• PMU • Contractors •

	delivered to MOWRAM staff				
During operation phase					
COMMUNITY HEALTH AND SAFETY	• Number of accidents and fatalities related to construction activities • Number of disease outbreaks and environmental pollution incidents • Number of reported cases of worker health issues	• Construction sites • Camp site and Worker camps • Nearby community	• Site inspection reports • Accident/Incident reports • Medical records/reports • Consultation minutes/reports	• Daily for site inspections • Monthly for reports and consultations • Within 48 hours for reporting accidents, disease outbreaks.	• PMU • PDWRAM
CROSS-CUTTING					
Gender inequality	• Percentage of female workers in different roles (skilled, unskilled) • Number of reported cases of gender-based violence or discrimination • Participation of women in FWUCs and decision-making processes related to water management.	• Construction sites • FWUC meetings • Community consultations	• Observation of worker roles and interactions. • Records of complaints and their resolution. • Attendance records and meeting minutes.	• Monthly for data collection and reporting	• PMU • PDWRAM
Social inequality	• Employment rates of vulnerable groups (poor, ethnic minorities, people with disabilities) in project activities. • Access to project benefits (training, information, resources) among different social groups.	• Construction sites • Training sessions • Community consultations	• Employment records and beneficiary lists. • Attendance records and feedback surveys. • Consultations with community members and representatives of vulnerable groups.	• Monthly for data collection and reporting	• PMU • PDWRAM
Elite capture	• Participation and representation of different social groups in decision-making bodies (FWUCs, committees). • Transparency and accountability in the allocation of project resources and benefits. • Monitoring of complaints related to favoritism or exclusion	• FWUC meetings • Community consultations • Project implementation	• Observation of meeting dynamics and representation • Analysis of resource allocation records.	• Regularly during FWUC meetings and project implementation • Continuously through the GRM.	• PMU • PDWRAM

	in decision-making.	records	• Records of complaints and their resolution.		

10. ESTIMATED COSTS

10.1 Estimated Costs for ESCMP Implementation

The costs of implementing the ESCMP listed below are related to PMU costs in addition to the dedicated safeguards PMU personnel budget line item. The main costs of implementing this ESCMP are the additional cost which have not been budgeted within the project, exclusive of the actual budget for the land resettlement and land acquisition which will be estimated by the end of the year as per the newly approval on the final conceptual design. For example, the project component 1 focus on establishment, capacity building and strengthening the FWUCs, therefore the concern regarding water management and water distribution inequality have already covered. Moreover, the sustainable agricultural practices and agricultural value chain is one the project actions. In this regard, the concern regarding GHG emission from the farming activities have been already addressed. The proposed budget therefore is the additional cost which are added to the existing one.

Table 44: Estimated cost for ESCMP implementation

No.	Items	Qty	Unit	Cost (USD)	Total (USD)
1	UXO clearance	1	Lum-sump	150,000	150,000
2	Preparation of the National EIA for the sub-scheme	1	Lum-sump	100,000	100,000
3	Land Acquisition and Land Impact Assessment and the preparation of the Land Acquisition and Land Resettlement Plan	1	Lum-sump	121,119	120,000
4	Implementing Biodiversity Management Plan	5	Year	200,000	1,000,000
5	ESMP awareness raising and sensitization with key stakeholders and communities (5 times)	5	Times	3,000	15,000
6	Community outreach at the project area	1	Sub-scheme	15,000	15,000
7	Consultation facilitation	1	Sub-scheme	10,000	10,000
8	E&S monitoring activities	1	Lum-sump	99,000	99,000
	Total				**1,510,119**

10.2 Estimated Costs for ESMCP Monitoring Program

The monitoring cost will be budgeted only for the activities which are supposed to be additional expenditure which are not included in the social and safeguard consultant. The cost for monitoring is mainly focused on the monitoring cost for soil, water, and air quality.

Table 45: Estimated cost for ESCMP monitoring program

No.	Items	Unit	Qty	Cost	Total
1	Soil quality monitoring (every six months* 3 locations * 3 years)	Times	18	1,500	27,000
2	Air quality, noise and vibration quality monitoring (every six months* 3 locations * 3 years)	Times	18	2,000	36,000

3	Water Quality monitoring (every six months* 3 locations * 3 years)	Times	18	2,000	36,000
	Total				**99,000**

Annex

Annex 1: Screening checklist for E&S impacts for Ou Ta Paong Sub-scheme

Circle screening conclusion:

- If the answers to the checklist questions are “No”, there is no need for further action.
- If the answers to the questions are “Yes”, then consult the relevant procedures /guidelines for assistance in addressing issues of concerns.

A	Environmental and Social Impacts	No	Yes	Notes
Location				
1	Are there environmentally sensitive areas (forests, pastures, rivers, and wetlands) or threatened species that could be adversely affected by the sub-project?		√	
2	Does the sub-project area (or components of the project) occur within or adjacent to any protected areas designated by government (national park, national reserve, world heritage site, etc.)?		√	
3	If the sub-projects are outside of, but close to, any protected area, is it likely to adversely affect the ecology within the protected areas (e.g., interference with the migration routes of mammals, fish, or birds)?		√	
4	Will the sub-projects reduce people’s access to pasture, water, public services, or other resources that they depend on?	√		
5	Might the sub-projects alter any historical, archaeological, or cultural heritage site or require excavation near such a site?	√		
Physical and biological environment				
6	Will projects require large volumes of construction materials (e.g. gravel, stones, water, timber, firewood)?	√		
7	Might the projects lead to soil degradation or erosion in the area?		√	
8	Might the projects affect soil salinity?		√	

9	Will the projects create solid or liquid waste that could adversely affect local soil, vegetation, rivers, streams, or groundwater?	√		
10	Might river or stream ecology be adversely and remarkably affected due to the installation of structures such as weirs, etc.?	√		
11	Will the projects have adverse impacts on natural habitats that will not have acceptable mitigation measures?	√		
12	Do the projects have human health and safety risks, during construction or later?		√	OHS safety and Dam safety
13	Might the projects lead to migration into the area?		√	
Alternatives				
14	Is it possible to achieve the objectives above in a different way, with fewer environmental and social impacts?	√		
B	**Land Acquisition and Social Issues**			
1	Have all groups within the community been consulted about the proposed project?		√	
2.	Which groups have not been consulted?	√		
3	Will the projects require acquisition of land (public or private) and/or other assets for its development?		√	Need to re-assess when the final design being made available
4	Will anyone be prevented from using economic resources (e.g. pasture, community places, forests etc.) to which they have had regular access?		√	Need to re-assess when the final design being made available
5	Will the projects result in the involuntary resettlement of individuals or families?		√	Need to re-assess when the final design being made available
6	Will the projects result in temporary or permanent loss of crops, fruit trees and household infrastructure such as granaries, toilets, kitchens etc.?		√	Need to re-assess when the final design being made available
7	Will the projects affect the livelihoods of particular groups within the communities, especially vulnerable groups such as the landless?	√		
8	Will the projects affect the well-being and livelihoods of women, particularly female-headed households?		√	Need to re-assess when the final design being made available
9.	Will the projects benefit all groups within the		√	

	community equally?			
10.	Are there ongoing land or water disputes within the community/with neighboring communities?		√	
C	**Pesticides and Waste Materials**			
1	Will the project result in the introduction of pesticides or an increase in pesticide use if the use of such products exists?		√	
2	Will the project result in the production of solid or liquid waste (e.g. water, domestic or construction waste), or will it result in an increase in waste production during construction or operation?		√	Need to reassess when the final design and needs in construction being made available
D	**Is there a probability of the presence of unexploded ordinance (UXO) at or near the proposed sub-project area?**		√	

Annex 2: Layout of Ou Ta Pong sub-scheme

Figure 1. Administrative map of Ou Ta Paong sub-command area 199
Figure 2. Three blocks (sub-scheme) of Ou Ta Pong sub-project 199
Figure 3. Concept design of Block A of Ou Ta Pa Ong Scheme 200
Figure 4. Concept design of Block B of Ou Ta Pa Ong Scheme 200
Figure 5. Concept design of Block C of Ou Ta Pa Ong Scheme 201
Figure 6. The illustration of the engineering design in Ou Ta Paong sub-scheme 201
Figure 7. Map of Construction Sites and Residential Area in Ou Ta Paong 202
Figure 8. Map of Locations for Air, Noise, and Vibration for Baseline Understanding 203
Figure 9. Map of groundwater sampling locations 203

Figure 1: Administrative map of Ou Ta Paong sub-command area

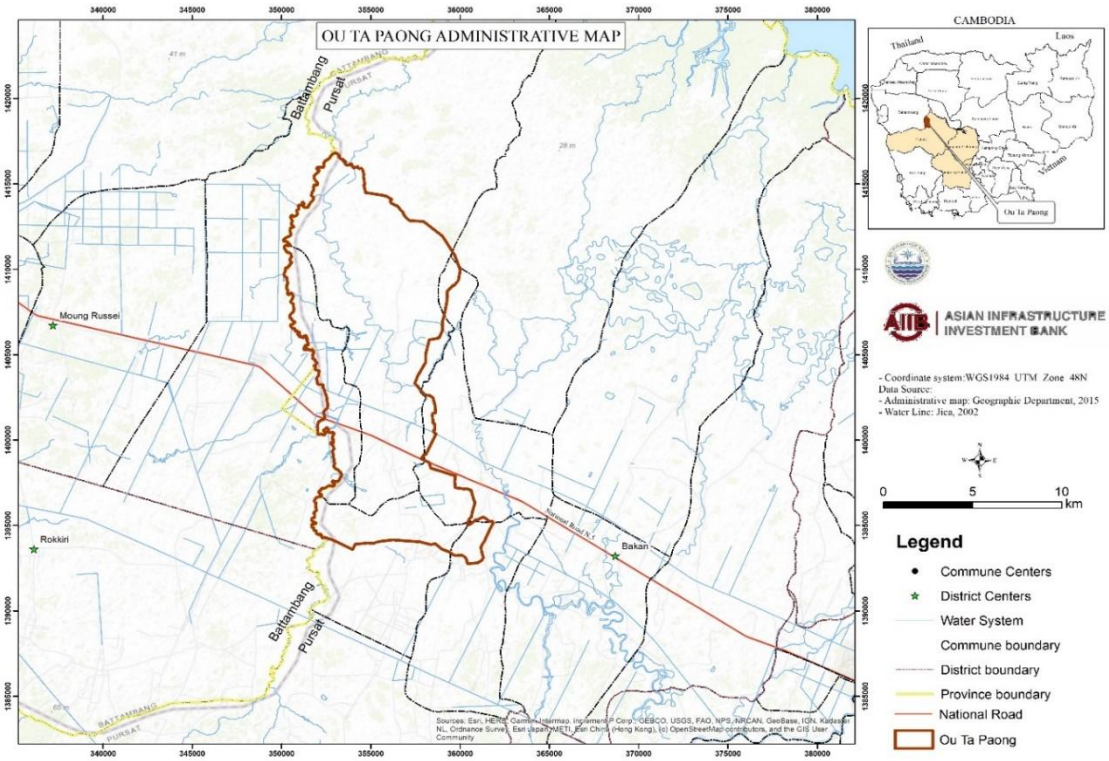


Figure 2: Three blocks (sub-scheme) of Ou Ta Pong sub-project

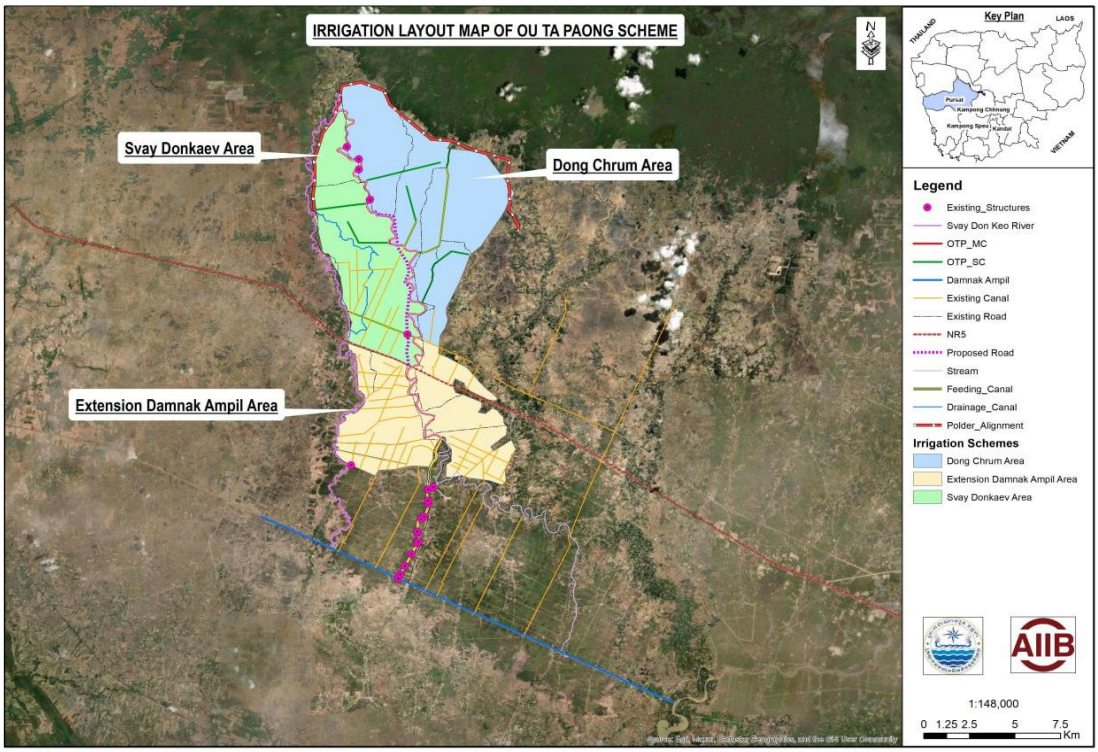


Figure 3: Concept design of Block A of Ou Ta Pa Ong Scheme

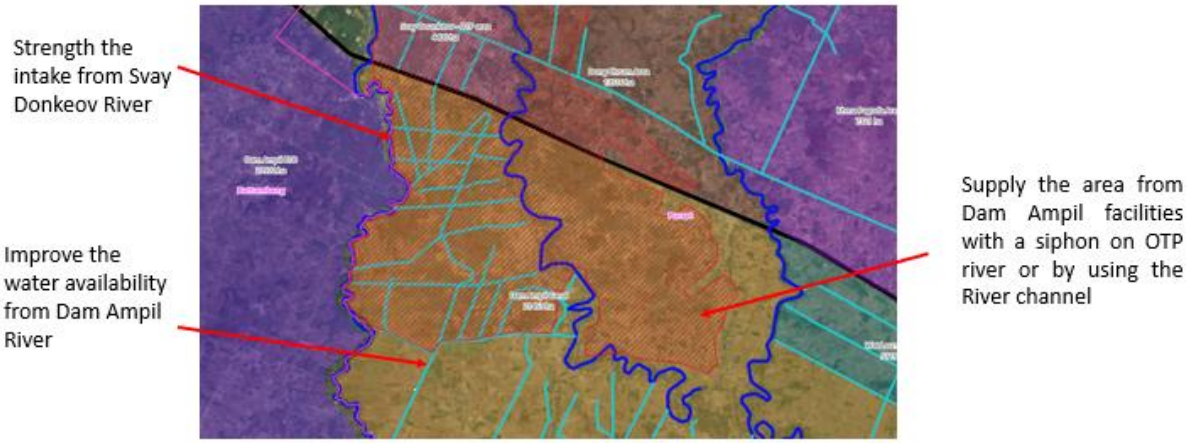


Figure 4: Concept design of Block B of Ou Ta Pa Ong Scheme

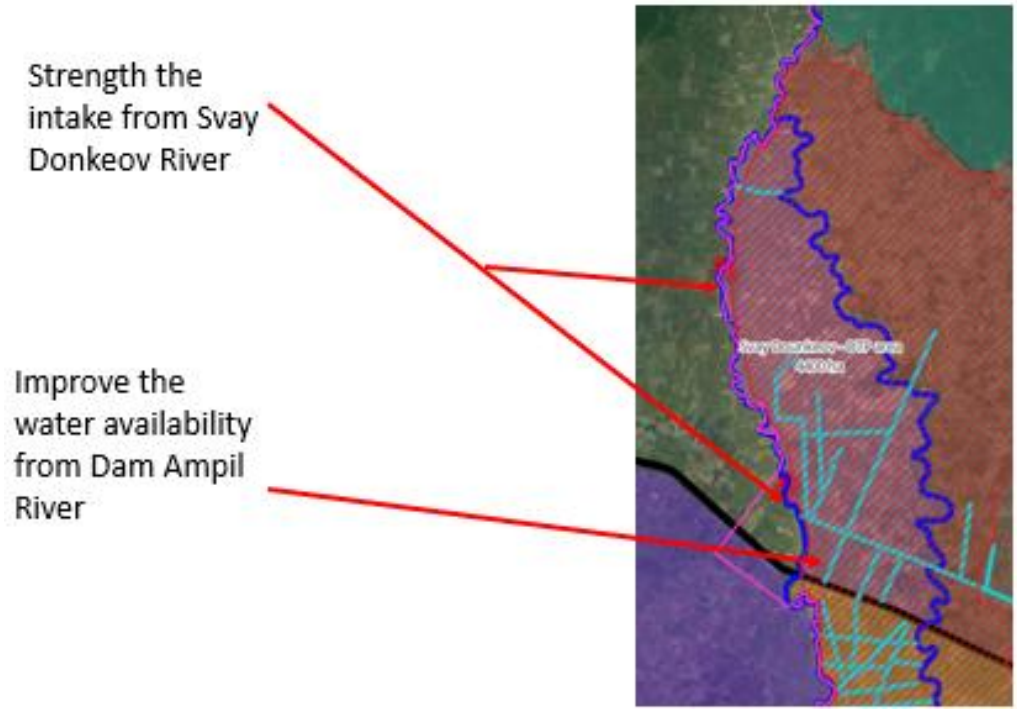


Figure 5: Concept design of Block C of Ou Ta Pa Ong Scheme

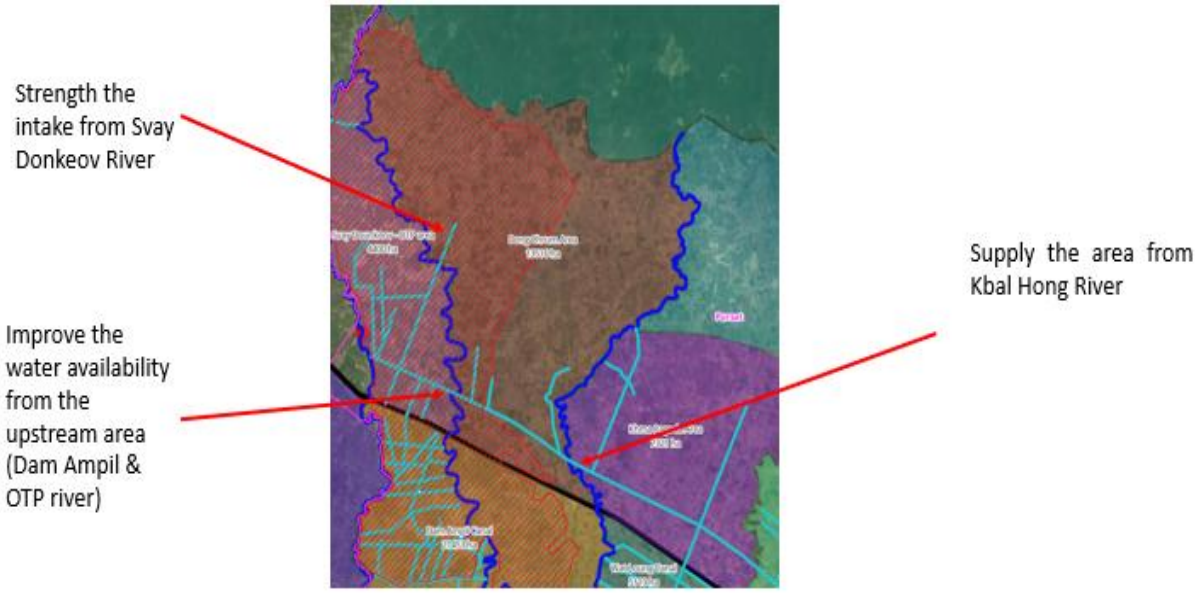


Figure 6: The illustration of the engineering design in Ou Ta Paong sub-scheme

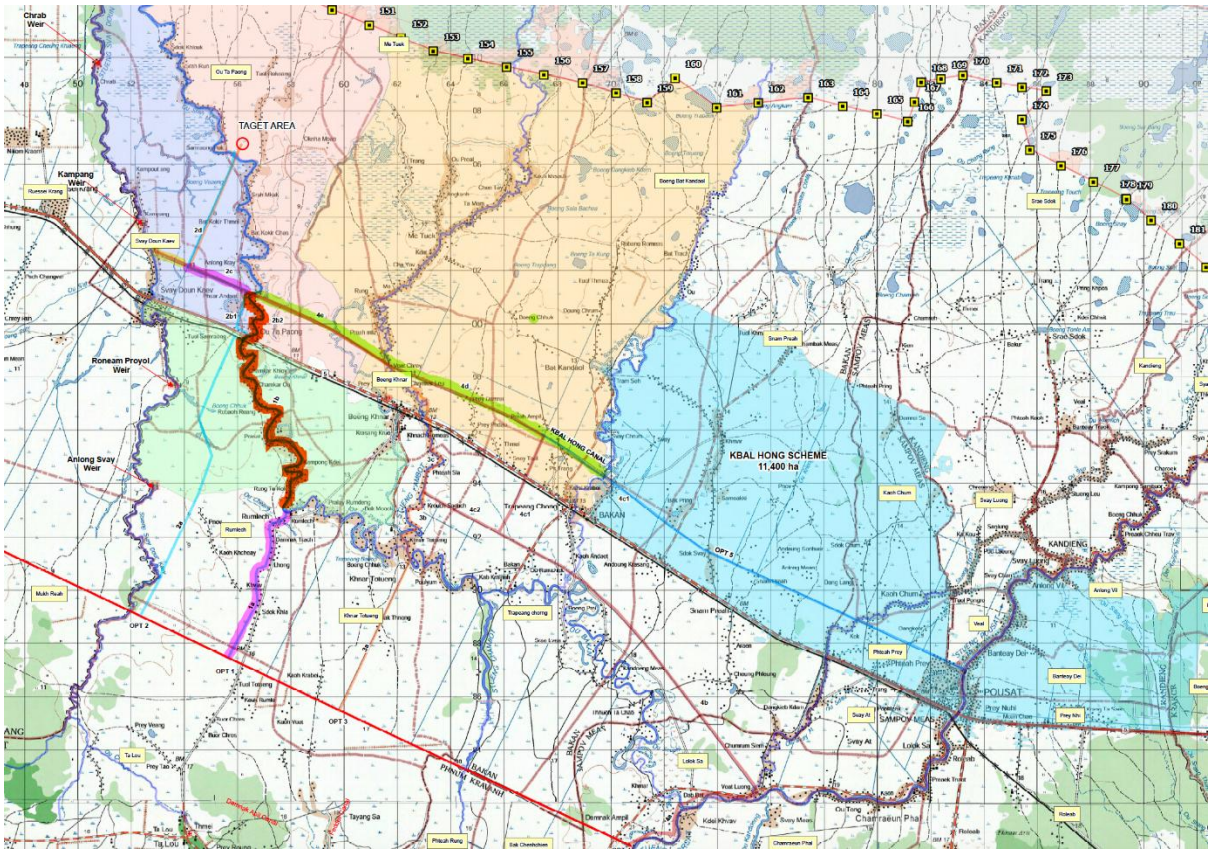


Figure 7: Map of Construction Sites and Residential Area in Ou Ta Paong

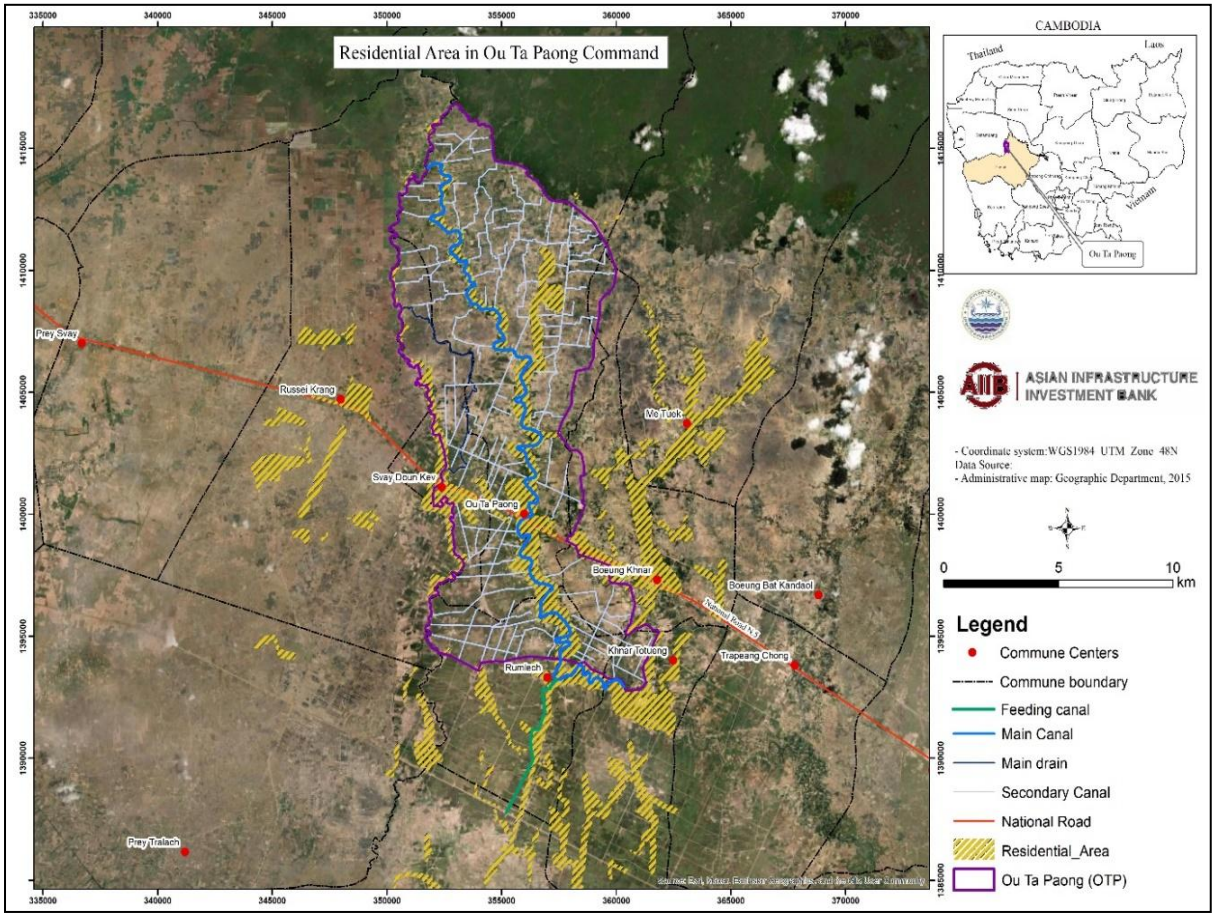
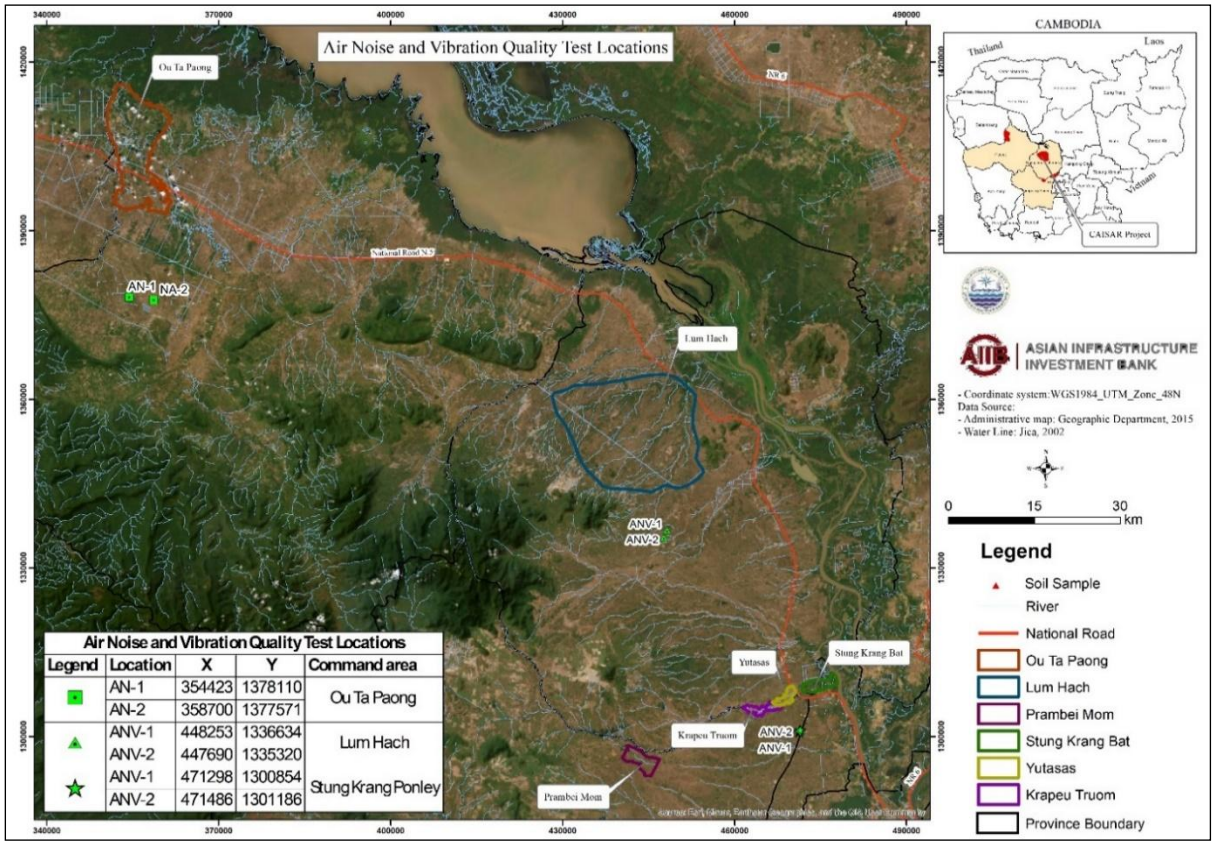


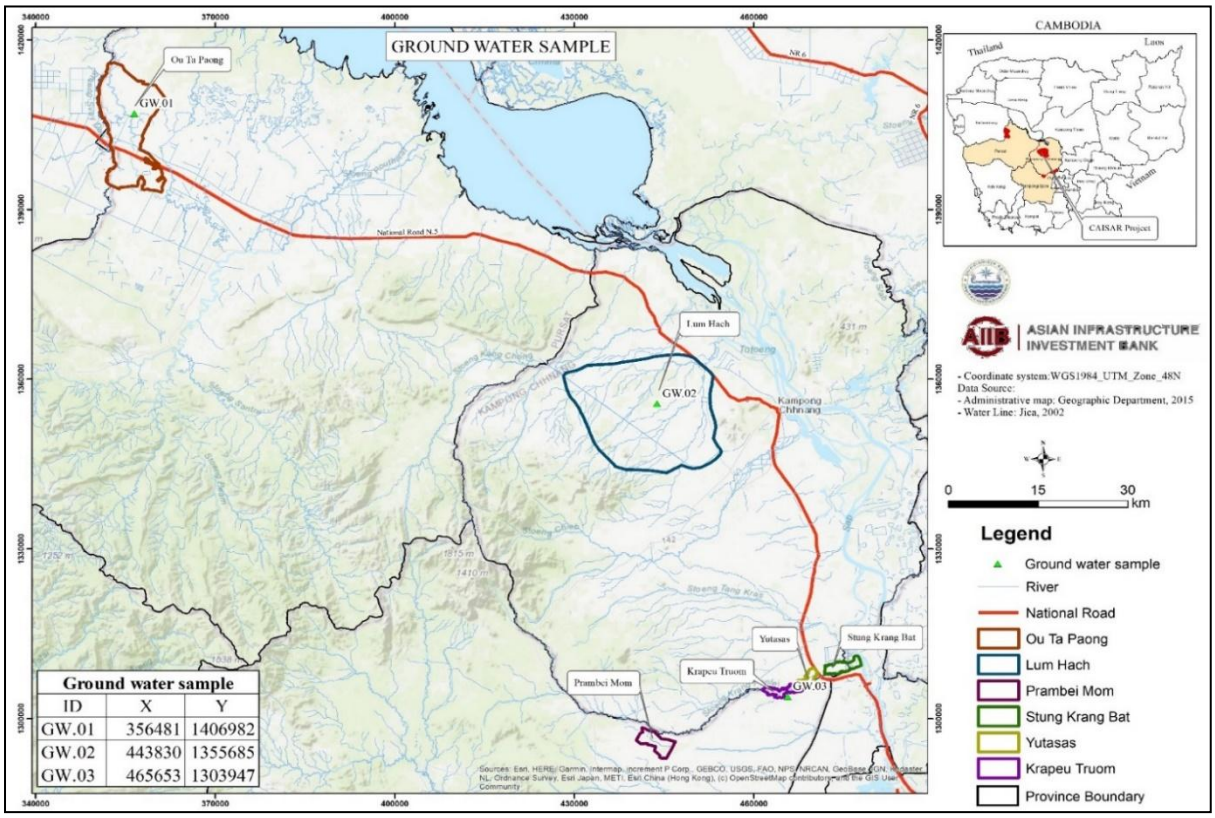
Figure 8: Map of Locations for Air, Noise, and Vibration for Baseline Understanding



Air Noise and Vibration Quality Test Locations

Legend	Location	X	Y	Command area
■	AN-1	354423	1378110	Ou Ta Paong
	AN-2	358700	1377571	
▲	ANV-1	448253	1336634	Lum Hach
	ANV-2	447690	1335320	
★	ANV-1	471298	1300854	Stung Krang Ponley
	ANV-2	471486	1301186	

Figure 9: Map of groundwater sampling locations



Ground water sample

ID	X	Y
GW.01	356481	1406982
GW.02	443830	1355685
GW.03	465653	1303947

Annex 3: Grievance Monitoring

1.1 Reportable Incidents

The following incident types are to be reported using the environmental and social incident response process.

- **Fatality**: Death of a person(s) that occurs within one year of an accident/incident including from occupational disease/illness (e.g., from exposure to chemicals/toxins).
- **Lost Time Injury**: Injury or occupational disease/illness (e.g., from exposure to chemicals/toxins) that results in a worker requiring 3 or more days off work, or an injury or release of substance (e.g., chemicals/toxins) that results in a member of the community needing medical treatment.
- **Acts of Violence/Protest**: Any intentional use of physical force, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, deprivation to workers or project beneficiaries, or negatively affects the safe operation of a project worksite.
- **Disease Outbreaks**: The occurrence of a disease in excess of normal expectancy of number of cases. Disease may be communicable or may be the result of unknown etiology.
- **Child Labor:** An incident of child labor occurs: (i) when a child under the age of 14 (or a higher age for employment specified by national law) is employed or engaged in connection with a project, and/or (ii) when a child over the minimum age specified in (iii) and under the age of 18 is employed or engaged in connection with a project in a manner that is likely to be hazardous or interfere with the child's education or be harmful to the child's health or physical, mental, spiritual, moral or social development.
- **Forced Labor:** An incident of forced labor occurs when any work or service not voluntarily **performed** is exacted from an individual under threat of force or penalty in connection with a project, including any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor- contracting arrangements. This also includes incidents when trafficked persons are employed in connection with a project.
- **Environmental pollution incident:** Exceedances of emission standards to land, water, or air (e.g., from chemicals/toxins) that have persisted for more than 24hrs or have resulted in harm to the environment.
- **Discrimination based on SOGI:** Discrimination means creating a distinction, exclusion, or restriction which has the purpose or effect of impairing or excluding a person based on their real or perceived sexual orientation, gender identity, gender expression, or sex characteristics from being on an equal basis with others.
- **Sexual Exploitation:** Any actual or attempted abuse of position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially, or politically from the sexual exploitation of another. In Bank

financed operations/projects, sexual exploitation occurs when access to or benefit from a Bank financed Goods, Works, Non-consulting Services or Consulting Services is used to extract sexual gain.

- **Sexual Abuse:** Actual or threatened physical intrusion of a sexual nature, whether by force or under **unequal** or coercive conditions. In Bank financed operations/projects, sexual abuse occurs when a project related worker (contractor staff, subcontractor staff, supervising engineer) uses force or unequal power vis a vis a community member or colleague to perpetrate or threat to perpetrate an unwanted sexual act.
- **Sexual Harassment:** Any unwelcome sexual advance, request for sexual favor, verbal or physical conduct or gesture of a sexual nature, or any other behavior of a sexual nature that might reasonably be expected or be perceived to cause offence or humiliation to another, when such conduct interferes with work, is made a condition of employment, or creates an intimidating, hostile or offensive work environment. In Bank financed operations/projects, sexual harassment occurs within the context of a subcontractor or contractor and relates to employees of the company experiencing unwelcome sexual advances or requests for sexual favor or acts of a sexual nature that are offensive and humiliating among the same company's employees.
- **Other**: Any other incident or accident that may have a significant adverse effect on the environment, the affected communities, the public, or the workers, irrespective of whether harm had occurred on that occasion. Any repeated non-compliance or recurrent minor incidents which suggest systematic failures that PMU deems needing the attention of the WB.

1.2 For environmental and social incidents

1.2.1 Form to be completed by PMU within 48 hours

Q1: Incident Details	
1. Date of Incident:	
2. Time:	
3. Date Reported to PMU:	
4. Date Reported to WB:	
5. Reported to PMU by:	
6. Reported to WB by:	
7. Notification Type (Email/'phone call/media notice/other):	
8. Full Name of Main Contractor:	
9. Full Name of Subcontractor:	
Q2: **Type of incident (please check all that apply)**	
1. ☐ Fatality 2. ☐ Lost Time Injury 3. ☐ Displacement Without Due Process 4. ☐ Child Labor	

5. ☐ Acts of Violence/Protest
6. ☐ Disease Outbreaks
7. ☐ Forced Labor
8. ☐ Unexpected impacts on heritage resources
9. ☐ Unexpected impacts on biodiversity resources
10. ☐ Environmental pollution incident
11. ☐ Dam failure
12. ☐ Other

Q3: Description/Narrative of Incident

For example:

1. What is the incident?
2. What were the conditions or circumstances under which the incident occurred (if known)?
3. Are the basic facts of the incident clear and uncontested, or are there conflicting versions? What are those versions?
4. Is the incident still ongoing or is it contained?
5. Have any relevant authorities been informed?

Q4: Actions taken to contain the incident

Short Description of Action	Responsible Party	Expected Date	Status

For incidents involving a contractor:

1. Have the works been suspended under the Contract GCC8.9?
   a) ☐ Yes
   b) ☐ No
2. Name of Contractor: **……**

Q5: What support has been provided to affected people?

1.2.2 Form to be completed by PMU (following investigation)

Q6. Fatality/Lost time Injury information

Cause of fatality/injury for worker or member of the public (please check all that apply):	*Vehicle Traffic:*
1. ☐ Caught in or between objects 2. ☐ Struck by falling objects 3. ☐ Stepping on, striking against, or struck by objects 4. ☐ Drowning 5. ☐ Chemical, biochemical, material exposure 6. ☐ Falls, trips, slips 7. ☐ Fire & explosion 8. ☐ Electrocution 9. ☐ Homicide	13. ☐ Project Vehicle Work Travel 14. ☐ Non-project Vehicle Work Travel 15. ☐ Project Vehicle Commuting 16. ☐ Non-project Vehicle Commuting 17. ☐ Vehicle Traffic Accident (Members of Public Only)

10. ☐ Medical Issue 11. ☐ Suicide 12. ☐ Others	

Name	Age/DOB	Date of Death/injury	Gender	Nationality	Cause of Fatality/Injury	Worker (Employer)/Public

Q7: Financial Support/Compensation Types (To be fully described in Corrective Action Plan template)

1. ☐ Contractor Direct
2. ☐ Contractor Insurance
3. ☐ Workman's Compensation/National Insurance
4. ☐ Court Determined Judicial Process
5. ☐ Others
6. ☐ No Compensation Required

Name	Compensation Type	Amount (US$)	Responsible Party

Q8: Supplementary Narrative:

1.3 For SEA/SH Incident

1.3.1 Incident Form for SEA/SH (to be completed by PMU within 48 hours)

Q9. Incident Details		
Date of incident intake by project/GM:	Date Reported to PMU:	Date Reported to AIIB:
Reported to project/GM by: 1. Survivor 2. Third party 3. Others:	Reported to PMU by: 1. GM operator 2. Directly, by Survivor 3. Directly, by third party 4. Others:	Reported to AIIB by: 1. PMU 2. Directly, by Survivor 3. Directly, by third party 4. Other:
Q10. Is a record of this incident in GM?		

a) ☐ Yes b) ☐ No
Q11: Incident type (please check all that apply) See Appendix 1 for definitions
c) Sexual exploitation d) Sexual abuse e) Sexual harassment
Q12: Provide the following details from the GM record.
1. Age of survivor (if recorded in GM):
2. Have the national legislation or mandatory reporting requirements been followed? f) ☐ Yes g) ☐ No
3. Sex of survivor (if recorded in GM): a) ☐ Male b) ☐ Female c) ☐ Others
4. Was the survivor referred to service provision? a) ☐ Yes b) ☐ No
5. Is the survivor employed by the project (as indicated by the survivor or complainant and reported in the GM)? a) ☐ Yes b) ☐ No
6. Is the alleged perpetrator employed by the project (as indicated by the survivor or complainant and reported in the GM)? a) ☐ Yes b) ☐ No
Q13: Basis for further action
1. Has the complainant provided informed consent to lodge a formal complaint? a) ☐Yes b) ☐ No
2. Does the employer have a suitable administrative process and capacity in place to investigate misconduct relating to SEA/SH in a survivor-centered way? a) ☐ Yes b) ☐ No
3. Has the survivor provided informed consent to be part of an investigation into misconduct? a) ☐ Yes b) ☐ No
4. Has the complaint been filed anonymously or through a third party? a) ☐ Yes b) ☐ No
5. If the answer to any of these questions is no, has the GM assessed the risks and benefits of carrying out an investigation into the alleged misconduct, taking into account the survivor's safety and wellbeing? a) ☐ Yes b) ☐ No

6. Will an investigation into misconduct be undertaken in addition to an investigation into adequacy of project systems, processes or procedures? a) ☐ Yes b) ☐ No

1.4 Incident Form for SEA/SH (to be completed by PMU following SEA/SH investigation)

Q14: Findings of the investigation
1. Have sanctions against a perpetrator been recommended as part of an investigation into misconduct? a) ☐ Yes b) ☐ No
2. Has an investigation into adequacy of project systems, processes or procedures been undertaken? a) ☐ Yes b) ☐ No

Q15: Corrective actions to be implemented (To be fully described in Corrective Action Plan)		
Short Description of Action (SEA/SH examples)	**Responsible Party**	**Timeline for completion/Status**
1. Referral of Survivor to holistic care services		
2. Undertake disciplinary investigation in accordance with GM timelines and confirmed process		
3. Disciplinary actions, including sanctions, to be applied following misconduct investigation by employer		
4. Increased training on Codes of Conduct (CoC)		
5. Audit of implementation of SEA/SH safety mitigation		
6. Strengthened awareness training on project-related risks, CoC and how to report incidents for project-affected community		
7. Training for project supervisors on the need to follow guidelines of behavior in CoC and their		

	supervisory responsibilities		
8.	Plan to improve coverage/quality of service provision		
9.	Any other system strengthening measures or corrections for system failures that are necessary		

3.1 Project's Grievance Logbook

3.1.1 Sample for Local Levels

No	Name of complainant (or anonymous)	Addresses	Sex	Age	Contact information	Date Received	Details of nature of grievance (Environmental impacts, social impacts, labor, health, etc.)	Which of the three GRM that was used?	Actions taken to resolve grievance, by whom	How many steps that have been used in the relevant GRM	Date grievance was finally resolved/closed?	Notes

3.1.2 Sample for PMU Level to be elaborated on Excel spreadsheet with filter function

No	Questions	Response
1	**Date Received:**	
2	**Name of Complaint** (or anonymous):	
3	**Sex:**	
4	**Age:**	
5	**Contact information** (Phone number/email, other channel(s):	
6	**Location of Complainants** (Province, District, commune, village):	
7	**Form of grievance received** (Writing or Verbal (face to face, telephone, online), SMS, MOWRAM and DoWRAM comment box in designated Website/Face book/What's App, etc.	

8	**Channel of Receipt** (Direct to PMU GRM Focal Point, or Relayed from other channels (Provide details)	
9	**Key topics of Grievances** a) Labor and Working Condition Resettlement (incl Voluntary Land Donation) b) SEA/SH c) Environmental impacts d) Community Health and Safety Accidents	
10	**Nature of complaints?** a) Resolution required b) Clarification required c) Suggestion n only (for project improvement) d) General Concerns	
11	**Step 1 of GRM Procedure:**	
	a) Date receipted:	
	b) Date solved/transferred:	
	c) Duration spent (in days):	
12	**Step 2,3,4** (Replicated in Excel spreadsheet):	
13	**Closing of Case** (At which Steps, date of case closing):	
14	**Notes:**	

Annex 4: Worker's Code of Conducts

The Annex has two Code of Conduct (COC): one is for ESHS and SEA/SH/VAC, and the other is for working with local Ethnic Communities.

1.1 Code of Conduct related to ESHS and SEA/SH/VAC

Instructions:

This Code of Conduct shall be perused and signed by all individual workers who enter direct work contract with a) PMU, b) PMU's consulting firms and service providers, c) contractors who renovate existing HCFs.

I,_____, acknowledge that adhering to environmental, social, health and safety (ESHS) standards, following the project's occupational health and safety (OHS) requirements, and prevention of Sexual Exploitation & Abuse (SEA)/Sexual Harassment (SH), are important.

I understand that that failure to follow ESHS and OHS requirement, or to partake in activities constituting SEA/SH -- be it at the project site, the surrounding area of the project site, workers' camps, or the project communities, including community members and project workers, constitute acts of gross misconduct and are therefore grounds for sanctions, penalties, or potential termination of employment. Prosecution by the Police of those who commit SEA/SH may be proceeded as applicable under relevant Laws.

I agree that while working on the project, I will:

- Carry out my duties competently and diligently.
- Comply with this Worker's Code of Conduct and all applicable laws, regulations, and other requirements, including requirements to protect the health, safety and well-being of other project workers, and any other person and community members.
- Maintain a safe working environment including by:
    - Ensure that workplaces, machinery, equipment, and processes under each person's control are safe and without minimal risk to health and safety of those involved.
    - Use appropriate measures relating to chemical, physical and biological substances, and agents; and
    - Follow applicable emergency response procedures.
- Report works situations that I believe unsafe or unhealthy to either project workers and/or community and remove myself and inform those relevant to remove themselves from a work situation which I reasonably believe imminent and dangerous to safety, life, and health of those involved.

- Consent, if required, to a background check in any place I have worked for more than six months.
- Attend and actively partake in training courses related to ESHS, OHS, SEA/SH and VAC, as requested by my employer.
- Always wear my personal protective equipment (PPE), as required while at work or engaged in project related activities.
- Take all practical steps to implement the environmental and social management plan (ESMP), which may include OHS Management Plan.
- Abide by a zero-tolerance policy as to SEA/SH/VAC and alcohol consumption during work activities, and refrain from use of narcotics or other substances which can impair worker's expected working ability and judgement.
- Respect women, children (persons under 18 years of age), and the elderlies regardless of their ethnic background, language, religion, personal opinions, disability, and/or other socioeconomic status.
- Shall not use language or behavior that are inappropriate to community members and project workers, particularly women, children, and the elderlies,
- Shall not commit any sexual abuse and or exploit, and/or sexual harassment of any kinds to community members in the project area and any project workers.
- Shall not engage in sexual harassment of project personnel and staff — for instance, making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature (looking somebody up and down; kissing, howling or smacking sounds; hanging around somebody; whistling and catcalls; in some instances, giving personal gifts.
- Shall not engage in offering any work-related favors such as making promises of favorable treatment (i.e., promotion), or make threats of unfavorable treatment (i.e., loss of job), or make payments in kind or in cash depending on sexual acts — or other forms of humiliating, degrading or exploitative behavior.
- Shall not engage in using prostitution service -- in any form and at any time during project implementation.
- Shall not participate in sexual contact or activity with children under 18 years of age — including grooming or contact through digital media. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not considered a defense or excuse.
- Consider reporting through the project's GRM, or to my manager, any suspected or actual SEA/SH deed by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.
- Complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation & Abuse, Sexual Harassment, and Violence Against Children (VAC).
- Report violations of this Code of Conduct; and

With respect to children under the age of 18:

- Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
- Wherever possible, ensure that another adult is present when working in proximity to children.
- Shall not invite unaccompanied children unrelated to my family into my home unless they are at immediate risk of injury or in physical danger.
- Not use any computers, mobile phones, video, and digital cameras or any other medium to exploit or harass children or to access child pornography (see also “Use of children's images for work related purposes” below).
- Avoid, in all circumstances, any verbale and/or physical punishment or discipline of children.
- No hiring of children (under 18) in any project activity.
- Comply with all relevant local regulations, including labor law in relation to child labor and forced labor.
- Take appropriate caution when photographing or filming children (see also section below). Photos or films of children should not be taken under the project, except for instances showing the benefits or impacts of road works, such as impacts to schools or school safety trainings.

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

- Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this, I must explain how the photograph or film will be used.
- Ensure photographs, films, videos present children in a dignified and respectful manner and not in a manner that is vulnerable or submissive. Children should be adequately dressed up and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Raising Concerns

If any person observes behavior that I believe may represent a violation of this Code of Conduct, or that otherwise concerns me, I will raise the issue promptly. This can be done in either of the following ways:

1. Contact [enter name of the Employer’s Social Focal Point] to handle these incidences.
2. Call Employer’s telephone number (See contact detail at Section 5 of project’s

Stakeholder Engagement Plan).

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. PMU will take all reports of possible misconduct seriously and will investigate and take appropriate action. In case of SEA/SH, PMU will provide referral to local service provider who will provide support to SEA/SH victims (See also Section 6.4 of project's Stakeholder Engagement Plan).

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

Sanctions

I understand that if I breach this Workers' Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning.
- Formal warning.
- Additional Training.
- Termination of employment.
- Report to the Police if warranted.

I understand that it is my responsibility to:

Ensure that the Environmental, Social, Health and Safety requirements are met. Adhere to the Occupational Health and Safety Management Plan

Avoid actions or behaviors that could be construed as SEA/SH/VAC. Any such action will be a breach of this Workers' Code of Conduct.

I hereby acknowledge that I have perused the foregoing part of this Workers' Code of Conduct, agree to comply fully with the requirements contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, SEA/SH/VAC issues. I understand that any actions that are inconsistent with this Workers' Code of Conduct, or failure to act as mandated by this Workers' Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

1.2 Code of Conduct for Working with Local Ethnic Communities

This Code of Conduct is grounded on the objectives of the WB's ESS7, which are:

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To avoid adverse impacts of projects on Indigenous Peoples, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a manner that is accessible, culturally appropriate and inclusive.
- To improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the Indigenous
- To recognize, respect and preserve the culture, knowledge, and practices of Indigenous Peoples, and to provide them with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.

Annex 5: Simplified Pest Management Plan

1.1 Rationale

In Cambodia, around 90% of cultivated land is used for rice production. Rice alone accounts for about 70% of the country's total calorie supply. Rice production contributes an estimated 44% of rural household income, making the rice sector an area for strategic development in the country. Despite rice is the major crop in Cambodia, rice production is characterized by widespread misuse of pesticides. This is due to inconsistent enforcement of current regulation and a lack of information on pesticide safety and alternative pest management techniques among rice farmers. Most pesticides are imported and labelled in a foreign language incomprehensible to farmers. It is common that rice farmers mix two to five pesticides by intuition, leading to pesticide poisoning among farmers and adverse impact on environment[17]. Rice farmers tend to apply more pesticide when they see pests on their field[18]. Vegetable farmers also typically mix various types of pesticides per spray which is not good practice[19].

The CAISAR project will 1) improve overall water security for all stakeholders in the targeted basins in the four provinces, 2) exploit the potential of unused water resources and increase agricultural productivity in the targeted basin, and 3) enhance the overall capacity of the water resources management of the central government, concerned local governments, and concerned communities. Through all of the three project components, the project will improve 1) Water Service Delivery, 2) Agricultural Productivity, and 2) Water Resources Management. The project does not involve procurement of pesticides.

Under CAISAR, the project will support target farming population in irrigated areas to improve their use of good agricultural practices, including integrated crop water management, climate-smart agriculture (diversification into high-value crop plantation, public-private-partnership and commercialization), as well as agribusiness and trade development. CAISAR does not involve procurement of chemical fertilizers, pesticides, and/or other toxic agrochemicals nor promote use of chemical agricultural inputs during project implementation. However, rehabilitation /upgrading of existing reservoirs/irrigation system, etc. to be financed under the Project are expected to increase the agricultural command areas, including the number of crops per year. This increased crop may give rise to increased use of fertilizers, pesticides, and/or other toxic agrochemicals in the subproject areas which are unintended impact of the project.

1.2 Key Pesticide Management Outcomes in Cambodia

Pesticide Use and IPM implementation in Project Provinces: The General Directorate of Agriculture (GDA)'s survey in 2014 and nation-wide inspections in 2013 of pesticide and herbicide suppliers in provincial capitals and other main distribution hubs, indicate that the most commonly sold products include: abamectin, chlorpyrifos, cypermethrin, glyphosate,

[17] https://ipmil.cired.vt.edu/our-work/projects/rice-ipm-for-cambodia/

[18] Matsukawa, M., Ito, K., Kawakita, K. et al. Current status of pesticide use among rice farmers in Cambodia. Appl Entomic Zool51, 571–579 (2016). https://doi.org/10.1007/s13355-016-0432-5.

[19] Sim Skooching, Keo Socheat and Sarom Moldiest. 2021. Pesticide Use Practices in Cambodia's Vegetable Farming. CDRI Working Paper Series No. 128. Phnom Penh: CDRI.

imidacloprid. In the Northern provinces, where a large part of the herbicide use is on corn and rubber plantations, the main products sold are the herbicides Glyphosate, Paraquat and Atrazine. Nowadays, on Rice and Maize cultivation farmers don't use pesticide accept some vegetables. These inspections have also shown that the most problematic highly hazardous products, such as monocrotophos, methyl parathion, methamidophos, mevinphos, endosulfan, etc., are no longer found on the market with the exception of the occasional old bottle. The only banned products that still are found regularly are paraquat and methomyl. This is because these products were banned only recently (2010) and are still permitted in the neighboring countries from where they are informally brought in by users or retailers. The banning of highly hazardous pesticides in China does not seem to have led to dumping of old stocks in Cambodia. There are no known large stocks of obsolete pesticides.

Insecticides are used mainly on vegetables (such as Long Yard Bean, Chilly, Cabbage, Chinese Cabbage) marketable high-value crops and plantation crops, notably rubber. Field surveys by the national IPM program and GDA indicate there still is wide-spread abuse of pesticides among farmers. Lack of knowledge among farmers is a major constraint. Abuse includes mixing without justification (just to be sure), use of wrong pesticides, use of wrong dosages, etc. Adequate protective gear is hardly being used. Shops often have gloves and masks for sale, but these tend to be inadequate for protection against hazardous chemicals. Buyers of pesticides rarely also buy protective gear, and shops do not provide it for free. Half used pesticide bottles or packages are often stored within the house or near homesteads, often in easy reach of children. Empty pesticide containers are often discarded at the border of fields or in drainage ditches.

1.3 Government Regulation Related to Pest Management

Pest management practices in Cambodia have been promoted through the expansion of the National Integrated Pest Management (IPM) Program by both the government and NGOs. These agencies have been working together to establish a Pesticide Reduction Network to develop awareness of the risks associated with pesticide use amongst farmers.

As a key function, Ministry of Agricultural and Forestry (MAFF) has been examining and implementing various international legal guidelines and instruments relating to regulating the trade, distribution and use of pesticides in Cambodia. These include adherence to the FAO Code of Conduct on the Distribution and Use of Pesticides, the Stockholm Convention on Persistent Organic Pollutants, and the WTO sanitary and phytosanitary measures.

Following the promulgation of the Law on Management of Pesticides and Fertilizers as Royal Kram Number 0112/005 on 14th January 2012, MAFF had developed five Prakas in relation to Procedures for Registration and Business Operations, as follows:

- Prakas No. 415/MAFF dated 17 August 2012, on Procedures and Standard Requirements for Fertilizer Registrations.
- Prakas No. 456/MAFF dated 19 October 2012, on Procedures and Standard Requirements for Pesticide Registrations.
- Prakas N. 484/MAFF dated 26 November 2012, on List of Pesticides in the Kingdom of Cambodia.

- Prakas No. 119/MAFF dated 11 April 2013, on Procedures for Management of Fertilizers for Business Operations.
- Prakas No. 120/MAFF dated 11 April 2013, on Procedures for Management of Pesticides for Business Operations.

  Within MAFF, the Department of Agriculture Legislation and GDA are mandated to oversee all pesticide regulations and use.

1.4 International Code of Conduct on the Distribution and Use of Pesticides

The following rules are observed for IPM:

- The standards of conduct set forth in this Code: 1.7.6. are designed to promote Integrated Pest Management (IPM) (including integrated vector management for public health pests).
- Concerted efforts should be made by governments to develop and promote the use of IPM. Furthermore, lending institutions, donor agencies and governments should support the development of national IPM policies and improved IPM concepts and practices. These should be based on scientific and other strategies that promote increased participation of farmers (including women's groups), extension agents and on-farm researchers.
- All stakeholders, including farmers and farmer associations, IPM researchers, extension agents, crop consultants, food industry, manufacturers of biological and chemical pesticides and application equipment, environmentalists and representatives of consumer groups should play a proactive role in the development and promotion of IPM.
- Governments, with the support of relevant international and regional organizations, should encourage and promote research on, and the development of, alternatives posing fewer risks: biological control agents and techniques, non- chemical pesticides and pesticides that are, as far as possible or desirable, target-specific, that degrade into innocuous constituent parts or metabolites after use and are of low risk to humans and the environment.
- Governments should provide extension and advisory services and farmers' organizations with adequate information about practical IPM strategies and methods, as well as the range of pesticide products available for use.
- Governments should ensure that any pesticide subsidies or donations do not lead to excessive or unjustified use which may divert interest from more sustainable alternative measures.

1.5 Current Governmental Implementation Arrangements Related to Pest Management

Integrated Pest Management (IPM) refers to all pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

Under MAFF, Department of Plant Protection, Sanitary and Phytosanitary and their branches in provinces as well as Agricultural Offices at district level are governmental agencies that coordinate and work on Integrated Pest Management Programs. These activities are built on the National IPM program that was initiated with assistance from the FAO, DANIDA and other donors since early 1990s which is largely being maintained using national budget.

IPM activities implemented by these local authorities and technical backstopping by experts from GDA include conducting field surveys, making forecast, monitoring and checking progress of on-field pest development. Using the forecast based on the timing, scale and level of damage that the key pests may cause, provincial plant protection authorities recommend policies, plans, and measures for pest management purposes.

Farmers learn how to implement various integrated measures such as pest identification, pest control, pest analysis, pest surveillance, and apply measure to control pest, such as applying chemical and botanical control agent, promoting application of biological measures for pest management, reducing chemicals and practice sustainable IPM. Farmers are also trained on proper use of chemical pesticide and fertilizers to ensure efficiency in pest management, ensuring safety for human, natural enemy, and the environment. Communication campaigns on plant protections and quarantine legislations and advance IPM technics to the farmers are also carried out depending on budget availability, etc.

GDA's Plant Protection Center, including the national IPM program, has developed training programs intended to raise awareness, develop capacity and help rural communities formulate and implement their own action plans for pesticide risk reduction. As of 2018, some 300,000 Cambodian farmers have participated in IPM courses. Season-long Integrated Pest Management training through Farmers Field Schools (FFS) often includes these short-duration IPM courses. These FFSs allow farmers to learn about and adopt Integrated Pest Management to reduce overuse of pesticides in crop production. Pesticide Risk Reduction and IPM adoption at farm level remains a priority for the Government.

Operational costs of plant protection agencies are allocated from state funds. Their staff also work on projects and programs that are financed by other international funding and conduct additional annual trainings (using international budget) for farmers.

1.6 Objective of Simplified Pest Management Plan

This Simplified Pest Management Plan (S-PMP) aim to see out plan and measures to ensure the project does not unintentionally give rise to increased overuse of chemical agricultural inputs (such as chemical pesticide, fertilizers, and plant growth regulators, etc.). This S-PMP will be integrated into on-going pest management program and effort that provincial DAFF in

project provinces have been doing and make sure pest management efforts target areas where water access is improved through project investment activities.

To mitigate this potential impacts as a 'good practice', the subproject owner will prepare and implement a S-PMP aiming to increase famers knowledge on Government regulations, policies, and/or technical guidelines related to safe use (application, storage, and disposal) of pesticides and toxic agrochemicals likely to be used by farmers as well as promote the application of an Integrated Pest Management (IPM) practice that are appropriate for the agriculture productions in the subproject area through training and other capacity building activities.

Key Elements - The elements of the S-PMP include the followings:

- Preventing pest problems.
- Monitoring for the presence of pests and pest damage.
- Establishing the density of pest population, which may be set at zero, that can be tolerated or corrected with a damage level sufficient to warrant treatment of the problem based on health, public safety, economic or aesthetic threshold.
- Treating pest problems to reduce population below those levels established by damage thresholds using strategies that may include biological, cultural, mechanical and pesticidal control methods and that shall consider human health, ecological impact, feasibility and cost effectiveness; and
- Evaluating the effects and efficacy of pest treatments.

Decision Making

Detecting a single pest under the Project will not always mean control is needed. A decision to use pesticides will be taken only as the very last resort and will also be based on conclusions reached from an agroecosystem analysis and trials. The decision will also depend on the number of pests and diseases found in the respective crop and the level of damage they are doing. If it is necessary to spray crops with pesticides, use of selective rather than broad-spectrum pesticides shall be strictly observed.

Pest Monitoring and Surveillance

A process for the reporting and identification of unusual plants, animals and pests will be established to track and document all pest cases, be it minor or major in a pest inventory register. Pest surveys will be conducted on a regular basis to detect new infestations and will include the types, abundance, location of pest plants, date when first spotted or seen, and date when reported. This information will be gathered from surveillance or monitoring systems to be put in place, periodic surveys to be conducted and feedback from farmers/ farm assistants. The data will be managed in a standardized way so that trends can be established. A rapid response process for the management of new infestations will be established to treat and manage new pest infestations as soon as they are identified.

Table 1: Potential impacts and proposed mitigation for pest

Potential Impacts	Proposed Mitigation

Contamination of ground water resources	Conducting trials on relatively flat land with less than 2% slope reducing the possibility of run off and at more than 500m away from water sources
Effect of pesticides on non-target species	Use pesticides that are systemic and narrow range and specific to sucking insects.
Effect of pesticides on grazing areas, settlements	Spraying in the morning hours when the weather is cool and less windy to reduce spray drifts. Locating trials or plots at distance of between 500-1000m away grazing areas or human settlements
Possibility of increasing resistance of pests to the pesticide	Training of field staff responsible on recommended usage of the pesticide
Harmful effects on staff applying pesticides	Provision and usage of safety clothing and working gear to staff
Harm to people within the homestead where the chemical is stored	Designation of a separate and secured storage room for pesticide Warnings and notices to increase awareness

1.7 Mitigation Measures

It is expected that there will be no procurement of pesticides under the project and that pesticide use, overall, will decline as a result with the introduction of good agricultural practices. To ensure the tendency of increased overuse of pesticide does not happen with subproject where project intervention take place, the project will prohibit procurement of large pesticides using the “negative list” and provide training to key staff and farmers on integrated pest management, safe use of pesticides, and organic farming practices. This will be integrated as part of the safeguard training. This S-PMP will be applied to the project activities that involve:

a) Any rehabilitation/upgrading of weirs/reservoirs/dams/existing irrigation schemes that are likely to prompt farmers to increase their use of pesticides:

b) Change/introduction of best agricultural practices such as integrated crop water management, Climate-smart agriculture, and

c) Promotion of agribusiness and trade related to farm products produced from target command area, and neighboring areas.

The plan is comprised of three parts:

(i) Application of government regulation on pesticide control.

(ii) Training of the integrated pesticides concept and/or other approaches for the safe use of pesticides; and

(iii) Monitoring.

Annex 6: Biodiversity Assessment Findings for Ou Ta Paong

Proposed project activities and potential risks and impacts

Avian species such as the Greater Adjutant, Milky Stork, and Bengal Florican have been documented in the lower section. These birds rely on seasonal wetlands, lakes, waterholes, grasslands, and rice fields for foraging. Additionally, the critically endangered Siamese Tiger Perch and Black Mash Turtle inhabit Boeung Kamsaeng Lake and Svay Daunkav River, respectively, in the upper portion of the command area.

The flooded forest habitat and natural lakes adjacent to the lower section support a diverse array of wildlife, including four critically endangered reptile species: the Black Mash Turtle, Southeast Asian Box Turtle, Giant Asian Pond Turtle, and Elongated Tortoise. These species play crucial roles in the ecosystem, contributing to nutrient cycling, seed dispersal, and maintaining ecological balance. Furthermore, the region is home to two critically endangered mammal species: the Indochinese Silvered Langur and Long-tailed Macaque. These primates are essential for forest regeneration and seed dispersal, helping to maintain the health and resilience of the forest ecosystem. This area, particularly its lower section, serves as a critical habitat for a diverse array of endangered and critically endangered species.

Given the significant ecological value of the Ou Tapaong Command Area, any irrigation system renovations must be carried out with utmost care to minimize negative impacts on biodiversity. This may involve implementing measures such as habitat restoration, creating wildlife corridors, and ensuring that water management practices are sustainable and supportive of biodiversity. By carefully considering the ecological implications of the project, it is possible to balance the needs of agriculture with the conservation of endangered species and their habitats. Under OTP, various activities will be carried out that cause the following E&S risks and impacts:

Table 1: Projection activities that may cause potential impacts on the environment and social aspects at Ou Tapaong sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes, and water management practices	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.

2	Increased agricultural activities, sedimentation, and pollution	**Water quality degradation** could impact aquatic ecosystems and species that rely on clean water.
3	**Hydrological changes due to m**odifications to water flows and regimes	**Altered habitat** conditions that disrupt ecological processes.
4	**Increased human activities**	**Labor influx (during project construction) and Increased** human activities (during project operations pose additional threats to biodiversity. Increased human activity within the command area which could potentially disrupt wildlife behavior (nesting/foraging), increase poaching or predation risks if not properly managed.
5	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. For example, changes in seasonal wetlands or lakes' floodplains can disrupt breeding patterns for avian. Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats.
6	Use of chemicals and nutrient loading	**If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.**
7	Species displacement and disruption of foraging and breeding habits	Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats. Additionally, alterations to the irrigation system could disrupt the foraging and breeding habits of endangered birds and other wildlife.
8	**Land Use Changes**	The changes in land use that may occur as a result of the project, such as agricultural expansion or deforestation.
9	**Biodiversity**	The potential impacts of the project on water flow, water quality, and sedimentation patterns.
10	Introduction of invasive species through irrigation canals	Irrigation canals may facilitate the introduction of invasive plant or animal species into native aquatic ecosystems like Water Hyacinth, Mimosa Pigra, Tilapia etc. These invasives can outcompete native species for resources such as food and habitat space

Areas of Influence

The Ou Tapaong Irrigation Sub-scheme's estimated area of influence encompasses a) the entire command area (some 14,000 hectares, including the upper, middle, and lower parts), and b) any other areas outside the command area where project activities leave an environmental footprint during project implementation and sub-scheme operations. While the first is clear in terms of the boundary, the latter needs additional information based on the final project engineering design and environment monitoring data to establish the additional area of influence that is outside of the command area (due to the project's environmental footprint).

In line with the methods set forth under Section 3.2 (above), a detailed assessment was conducted for the OTP command area (as Modified Habitat) while a preliminary assessment was carried out for the area located immediately outside and to downstream of the OTP command area. It is noted within the OTP command area, that there is a lake called Boeng Kanseang or Kanseang Lake which is home to fish and birds. Analysis to determine critical habitat (Steps 1 and 2 of the CHA method)

Analysis to prepare for determining CH status

Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for OTP. The coordinates of OTP (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 11 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 4 reptile species, 2 mammals, 2 fishes, and 3 birds (See list of 11 EN and CR species in Table 3 below).

Description of screening for narrowing down

For Ou Ta Paong, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2025. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the OTP area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 17 EN and CR species were identified in the OTP area of influence (See Table below). In the 3rd round of screening (in August 2024), however, 11 (out of a total of 17 species) were confirmed as "potentially present" in the OTP's area of influence.

So, the assessment for Ou Ta Paong focuses on the confirmed list of **11 species** that are categorized by IUCN as EN and CR species, including 4 reptile species (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise), 2 mammals (Indochinese Silvered Langur and Long-tailed Macaque), and 2 fishes (Striped catfish and

Siamese Tiger Perch), and 3 birds (Greater Adjutant, Milky Stork, and Bengal Florican) (See Table below for the list of confirmed species and see Figure 2 for potential locations reported by key informers of these species in the project's area of influence).

Table 2: Confirmed List of endangered and critically endangered species for the Ou Tapaong sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=17)	Confirmed Species in Round 3 (Total = 11)
	I. Reptile spices					
1	អណ្តើកក្អែក	Black Marsh Turtle	*Siebenrockiella crassicollis*	EN	Yes	Yes
2	អណ្តើកសោម	Giant Asian Pond Turtle	*Heosemys grandis*	CR	Yes	Yes
3	អណ្តើកបិទមុខ	Southeast Asian Box Turtle	*Cuora amboinensis*	EN	Yes	Yes
4	អណ្តើកព្រោង	Elongated Tortoise	*Indotestudo elongata*	CR	No	Yes
	II. Mammal species					
5	តេរោមច្រមុះ	Hairy-nosed Otter	*Lutra sumatrana*	EN	Yes	No
6	ស្វាព្រាម	Indochinese Silvered Langur	*Trachypithecus germaini*	EN	Yes	Yes
7	ស្វាក្តាម	Long-tailed Macaque	*Macaca fascicularis*	EN	Yes	Yes
	III. Fish species					
8	ក្រីជ្រោង	Striped catfish	*Pangasianodon hypophthalmus*	EN	Yes	Yes
9	ក្រីកន្ត្រៀបខ្លា	Siamese Tiger Perch	*Datnioides pulcher*	CR	Yes	Yes
	IV. Bird species					
10	ក្រដក់ធំ	Greater Adjutant	*Leptoptilos dubius*	EN	Yes	Yes
11	រនៀលស	Milky Stork	*Mycteria cinerea*	EN	Yes	Yes
12	ចាបព្រៃវែង	Yellow-breasted Bunting	*Emberiza aureola*	CR	Yes	No
13	ឌ្រីប ឬ ទ្រមាក់អណ្តើក	Bengal Florican	*Houbaropsis bengalensi*	CR	Yes	Yes
14	ពពូលទឹក	Masked Finfoot	*Heliopais personatus*	CR	Yes	No
15	ទាព្រៃស្លាបស	White-winged Duck	*Asarcornis scutulata*	EN	Yes	No
	V. Amphibians, and aquatic plants					

16	កញ្ជ្រោងជេ កក្តាក្រវាញ	Cardamon Shrub Frog	*Philautus cardamonus*	EN	Yes	No
17	ស្មៅស្ដឹង / ទន្លេ	River-weed	*Terniopsis chanthaburiensis*	EN	Yes	No

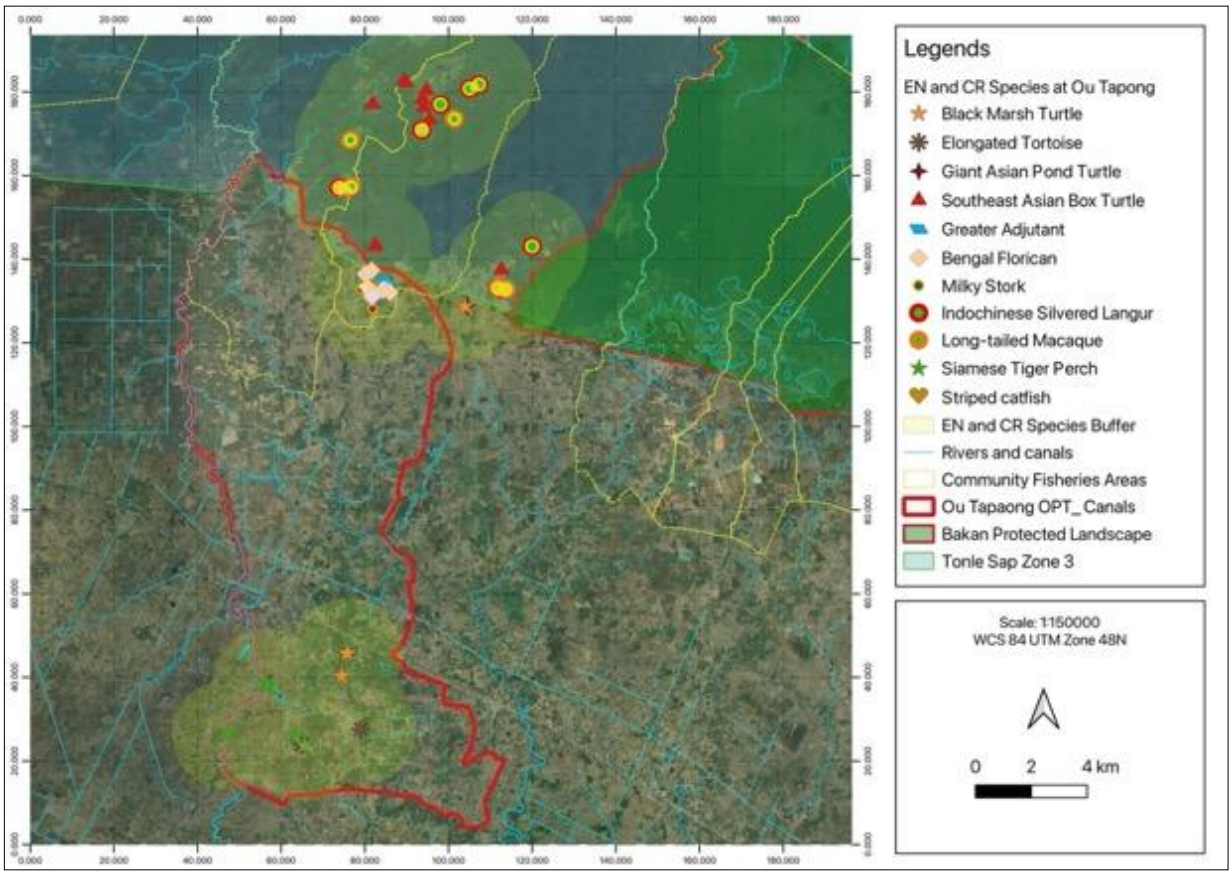


Figure 1: Map showing the observed distribution of identified EN and CR species (with the potential movement of 1-2 km within and around suitable habitats (2020 to 2024)

Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 11 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants[20].

[20] Community councils and committees, including community fisheries (CFi) and farmer water user community (FWUC), were convened on July 25 and August 4, 2024. These meetings aimed to identify potential field assessment areas and select individuals with deep local ecological knowledge and experience for interviews. A total of 13 key informants were interviewed in Ou Topaong. Five of these individuals were from the upper command area, while seven were from the lower command area. Additionally, one representative from Punleu Komar Organization, which supports the Samraong Muk Yeik Community Forest Initiative, was included. Notably, the Samraong Muk Yeik and Sdok Khlouk Community Fisheries locations overlaps with portions of the Lower Ou Tapaong Command Area.

The OTP command area has been in existence since the 1970s. The OTP is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the OTP river, have been changed and various sections by local people to support living and farming activities. The OTP command area, therefore, the ecosystem within the OTP command area has been subject to human-induced changes over the past several decades. As such, the OTP command area is a modified habitat.

Reptiles (4 species)

The Black Mash Turtle was observed in both upper and lower sections of the command area, as well as along the main Ou Tapaong river (which is being used as a key canal feeding irrigation water for the command area). Conversely, the Elongated Tortoise was only found in the upper reaches while the Giant Asian Pond Turtle and Southeast Asian Box Turtle were found only in the lower section within Tonle Sap Zone 3 (figure 2 above). Details are below:

- **The Black Mashed Turtle *(Cuora galbinifrons)*** was confirmed to be present in the area of influence based on the accounts of four local informants. Residents from the upper reaches of Ou Tapaong reported historical sightings of this species within the past 10-20 years although recent spotting has been scarce. Key informants who live in the lower part of the command area and had livelihoods closely intertwined with the Tonle Sap Management Zone indicated that there have been ongoing efforts to bring the **Black Mashed Turtle back** to the region albeit its rarity. One informant successfully captured a Black Mashed Turtle just before the interview. This species is highly valued in the local market, particularly among middlemen, and is often used for traditional medicinal purposes. The Black Mashed Turtle is listed as Critically Endangered by the IUCN Red List, and its presence in the area of influence indicates that the habitat is essential for its survival and reproduction. Therefore, the habitat meets the criterion of being significant for a Critically Endangered species of criteria 1a of IFC PS6.
- **Elongated Tortoise:** This species wasn't initially screened for the interview, but it was identified and spotted by two key informants at the upper section of the Ou Tapaong based on the turtle images that were shown to facilitate the identification of species. No such sightings have been documented in the lower portions of the command area. One informant, a local resident near Ou Tapaong, provided a firsthand account of capturing this species. After a thorough examination of the accompanying photographs and a comparison with verified identifying features, this species is confirmed present as reported by the local informant. The Elongated Tortoise is listed as Critically Endangered by the IUCN Red List. The presence of this species within the project area indicates that the habitat is essential for its survival and reproduction, meeting the requirements of Criterion 1a.
- **Giant Asian Pond Turtle:** Three local informants who were interviewed in the lower Ou Tapaong River region confirmed the presence of the Giant Asian Pond Turtle. One informant reported spotting this species in Boeung Kum Traeng, a wetland within Tonle Sap Zone 3 while the other two informants indicated their encounters with this species in the mountainous regions of Kravanh District. Asian Pond Turtle is listed as Critically Endangered by the IUCN Red List. The reported sightings in Boeung Kum Traeng and the mountainous regions of Kravanh District indicate that these areas may be important habitats for the survival and reproduction of this species, meeting the requirements of Criterion 1a.
- **Southeast Asian Box Turtle:** During our survey in the lower section of the Ou Tapaong, we obtained valuable information about the Southeast Asian Box Turtle. All seven informants in this area confirmed the presence of this species in nearby

wetlands and flooded forest areas within Tonle Sap Zone 3, which is close to the command area boundary. While three informants reported recent encounters with this species, the remaining four mentioned that they had encountered it 10 to 20 years ago. They explained that the turtle was once abundant but has become very rare in recent years.
Similarly, all turtle species, including the Southeast Asian Box Turtle, are threatened by ongoing illegal hunting for trading purposes. Some people were hesitant to share recent information about these species.

Mr. Pheoun Moeun, Deputy Chief of Samraong Muk Yeik Community Fishery (SMY-CFi) is exceptionally knowledgeable about wildlife species in his Cfi area. He has been actively participating in forest patrols and community activities. He mentioned that some people who go fishing in the forest occasionally bring back one or two turtles with them but he preferred not to disclose this information.

One key informant admitted that they captured a turtle from a nearby forest and sold it for income. Income was shared among the four individuals. While informants were willing to share their past incidents, they were reluctant to provide details about the recent events because these activities are illegal.

the Southeast Asian Box Turtle, a Critically Endangered species, is present in the lower section of the Ou Tapaong and nearby wetlands. These unique ecosystems are highly threatened. Therefore, Criteria 1a and 4 of IFC PS6. Additionally, Criteria 1b may also apply due to the high threat level and declining population. are potentially met.

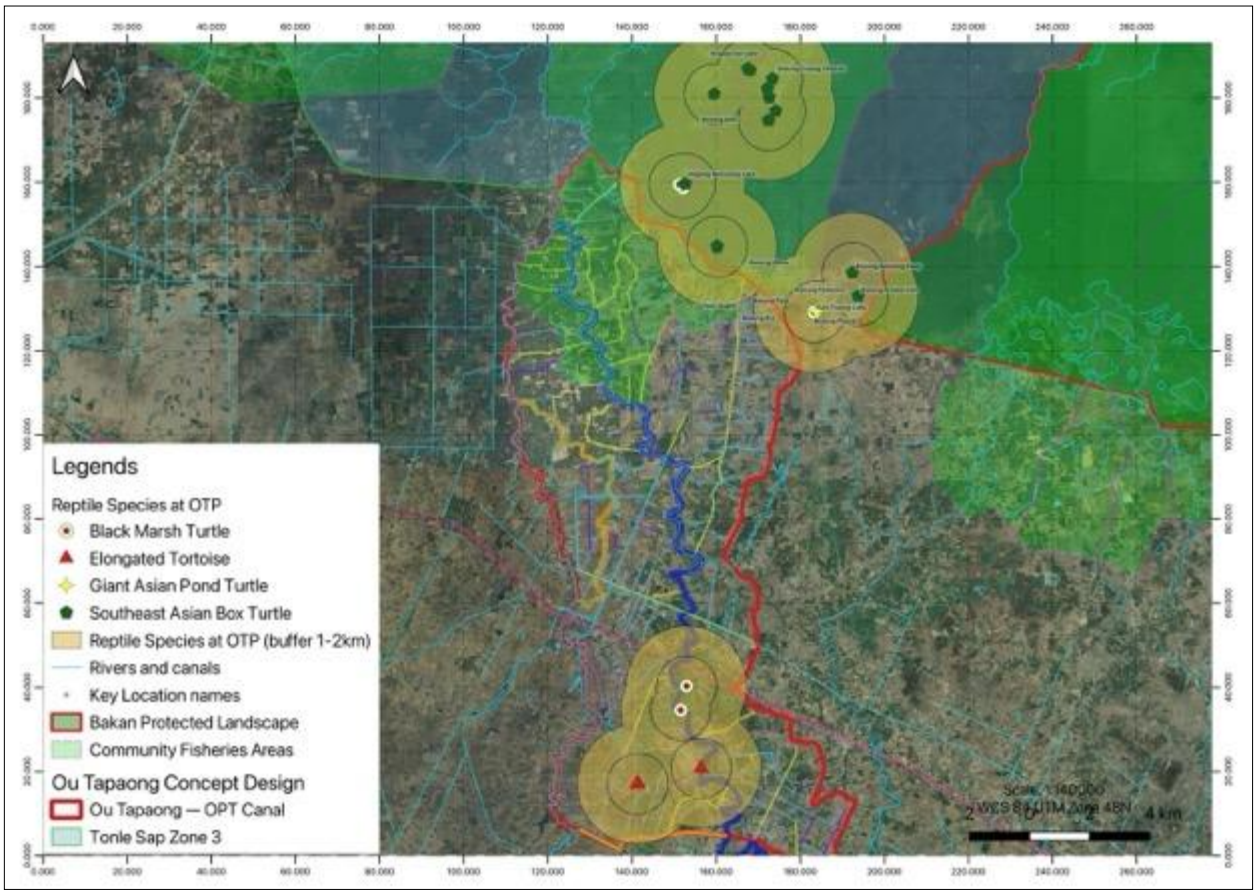


Figure 2: Distribution of identified turtle and tortoise species in and outside the OTP Command Area

Birds (3 species)

Despite extensive interviews with key informants residing in the upper reaches of Ou Tapaong, numerous endangered or critically endangered bird species were reported within their community. Conversely, only three of six bird species were confirmed by both key informants and CFi committees in the lower section. The following paragraphs summarize the primary findings and justifications for each species' presence, along with the associated level of confidence. These conclusions are based on in-depth interviews, technical expertise, and consultations with relevant units, which provided valuable assistance in verifying species of high conservation significance. Several species were initially identified by local residents.

- **Bengal Florican:** Five informants confirmed the presence of the Bengal Florican in the area of influence. Two individuals reported sightings within the past 10-20 years while three others have observed the species within the last five years and in the past. Notably, one informant witnessed a pair (male and female) as recently as March 2024 (see Figure 3). The lower reaches of Ou Tapaong exhibit a diverse mosaic of habitats, including open wetlands, grasslands, flooded forests, and minimally intensified paddy fields, creating a relatively undisturbed environment that is potentially conducive to Bengal Florican populations. Notably, the Ou Tapaong Command Area is situated only 1 kilometre from the Bakan Protected Landscape (BPL), a region characterized by similar ecological conditions (figure 3).

  Established in July 2023 through a joint effort by the Ministry of Environment and the Wildlife Conservation Society (WCS), the BPL aims to safeguard the southernmost Bengal Florican subpopulation within the Tonle Sap Great Floodplain. Moreover, the BPL serves as a critical wintering habitat for the Yellow-breasted Bunting, Manchurian Reed-warbler, and Cambodia's unique population of the Chinese Grassbird, along with other globally threatened avian and wildlife species (WCS 2023).

  The project area likely meets Criterion 1a (habitat of significant importance to Critically Endangered species) due to the presence of the Bengal Florican. Additionally, it may meet Criterion 4 (highly threatened and/or unique ecosystems) given the diverse habitat mosaic. However, a detailed ecological assessment is crucial to confirm these findings and identify any other relevant criteria.

- **Greater Adjutant:** During field assessments within the study area, multiple informants reported sightings of Greater Adjutants. While most individuals were unable to definitively distinguish between the Greater Adjutant and the similar-looking bird, which is Lesser Adjutant), one informant positively identified a Greater Adjutant within the Ou Tapaong Command area. This sighting occurred in recent years (figure 3). Unfortunately, due to the time of the observation, the Greater Adjutant had likely already migrated to its breeding grounds at Prek Toal Ramsar Site, a protected wetland area situated in Koh Chiveang community, Ek Phnom District, Battambang province (MoE 2012).

  Prek Toal Ramsar Site is the sole known breeding habitat for the greater adjutant in Southeast Asia and is recognized as the second-largest breeding colony for this species globally, following Assam, India. In December 2015, the Royal Government of Cambodia and the Ramsar Convention Secretariat designated the Prek Toal Core Area as a Wetland of International Importance due to its exceptional biological,

social, and economic value. This designation solidified Prek Toal's status as Cambodia's fourth Ramsar Site (WCS 2016). Following the breeding season, greater adjutants migrate across the Tonle Sap Floodplain to their foraging habitats, with the lower section of Ou Tapaong serving as a critical foraging ground.

Despite the challenges faced during the field observation due to the time of year, the confirmed sighting of a Greater Adjutant in the study area is a significant finding. It suggests that the species may still be present in the region and that a suitable habitat may exist for its continued survival.

The findings indicate that the project area meets IFC PS6 Criteria 1a and 3. This is due to the presence of the Critically Endangered Greater Adjutant, a migratory species that utilizes the area as a critical foraging habitat, particularly during the non-breeding season.

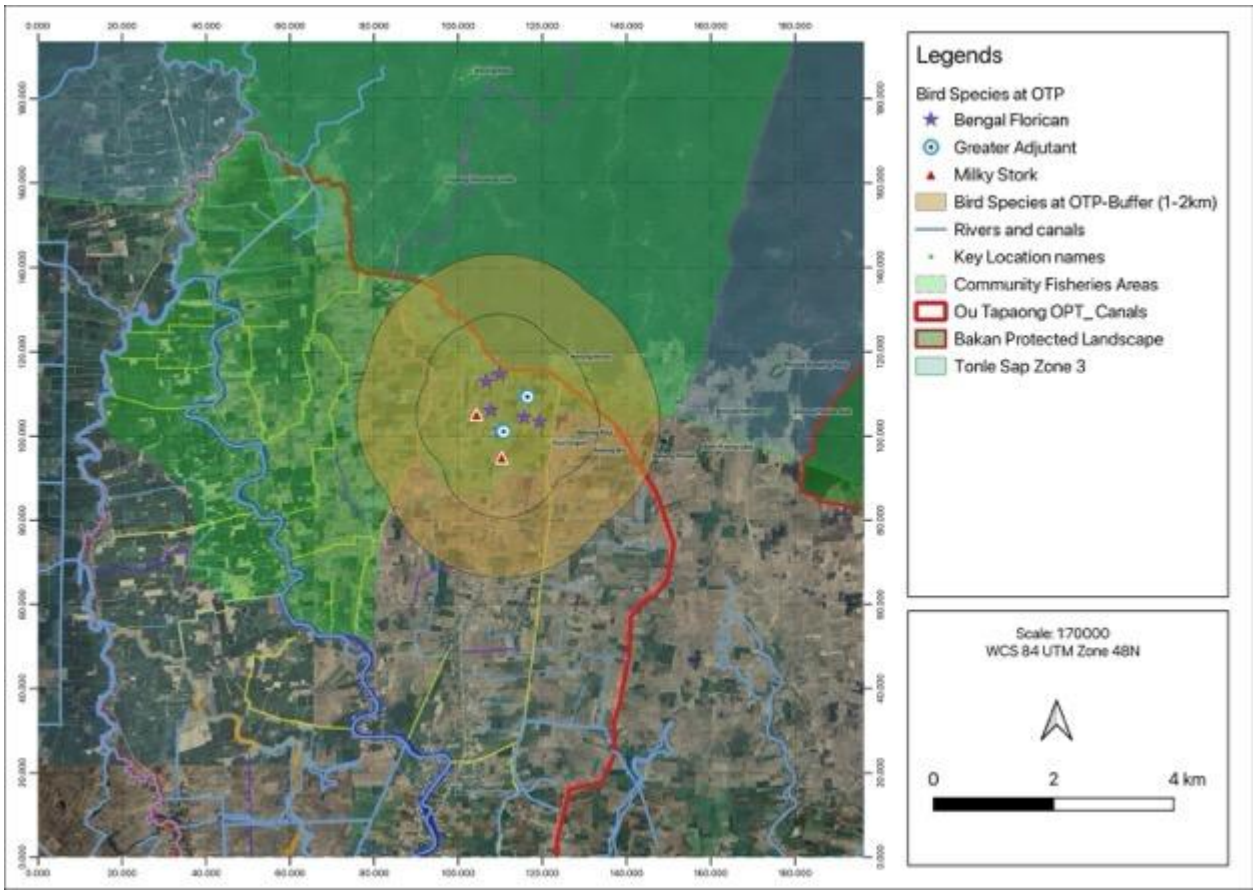


Figure 3: A spatial distribution map was generated for three bird species—the Bengal Florican, Greater Adjutant, and Milky Stork—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.

- **Milky Stork:** Despite repeated attempts to elicit accurate information, many key informants were unable to distinguish between the Painted Stork and the Milky Stork, two similar-looking bird species. This confusion is a common challenge in bird identification, especially for non-experts. While the Milky Stork is considered extremely rare in Cambodia, with sightings typically limited to 1-3 individuals, some informants claimed to have encountered larger groups. This discrepancy can be attributed to misidentification and the difficulty of accurately counting birds in the field.

Based on my experience in bird identification and conservation, I was able to evaluate the credibility of the information provided. Two informants offered the most reliable accounts, describing sightings of 2-3 Milky Storks feeding alongside numerous Painted Storks in seasonal wetland areas near flooded forests (figure #3). These observations align with the limited available data on Milky Stork distribution and behavior in Cambodia. When the flooding season arrives, they migrate to degraded forest areas in the uplands. Milky Stork and Great Adjutant are migratory birds that move both locally and across international borders. The Prek Toal Ramsar Site serves as the only known breeding ground for Milky Stork and Greater Adjutant in Southeast Asia; after breeding, they migrate to other wetland areas throughout the country.

The Milky Stork's situation appears to align with several IFC PS6 criteria:

Species Level:

Endangered Species (Criterion 1a): The Milky Stork's rarity and the challenges in accurately assessing its population make it a strong candidate for this criterion. Its limited distribution and potential threats further emphasize its vulnerability.

Migratory Species (Criterion 3): The migratory nature of the Milky Stork, particularly its reliance on the Prek Toal Ramsar Site as a breeding ground and its movements to other wetland areas, highlights its dependence on various habitats throughout its range.

Ecosystem Level:

Highly Threatened and/or Unique Ecosystems (Criterion 4): The wetland habitats used by the Milky Stork, especially the flooded forests and seasonal wetlands, are often threatened by human activities like deforestation, agriculture, and pollution. These ecosystems are essential for the survival of the species and other biodiversity.



Figure 4: Photograph of a Milky Stork foraging alongside a flock of Painted Storks (credit: Sang Mony, Sam Veasna Conservation Tour), and a map illustrating the distribution of Milky Stork sightings in Cambodia from 2020 to 2024, extracted from eBird data.

- **Yellow-breasted Bunting**: The Yellow-breasted Bunting is a small, migratory songbird found in Southeast Asia, including Cambodia. It is characterized by its bright yellow breast and throat, contrasting with its olive-green upperparts. The Yellow-breasted Bunting is a winter visitor and spring passage migrant in Cambodia, often found in rice fields, scrub, grasslands, and marshes in the lowlands. In Cambodia November to May, the species has been recorded in the Tonle Sap Floodplain and the Lower Mekong Delta. Yellow-breasted Buntings are typically observed in rice fields, scrublands, grasslands, and marshes in the lowlands of Cambodia (Ly et al. 2022).

  The local population often mistakenly identifies this species as a sparrow or a weaver due to their similar size, appearance, and shared habitats. After conducting inquiries, none of the locals could confirm whether they had observed this species in the area. This highlights a common gap in local ecological knowledge regarding small bird species like this one. Identifying such species typically requires individuals with advanced birdwatching experience, who can locate them in the appropriate habitat at the right time.

  Based on an overall assessment of the habitat conditions in the lower part of Ou Tapaong, we can confirm that this area has the potential to serve as a wintering habitat for this species. Additionally, the boundary of the Ou Tapaong Command Area is just 1 km away from the Bakan Protected Landscape.

  The Yellow-breasted Bunting's Critically Endangered status and the Ou Tapaong area's potential as a wintering habitat potentially meet IFC PS6 Criteria 1a. Additionally, the species' restricted range and migratory behavior align with Criteria 2 and 3. The Yellow-breasted Bunting, a CR species, is known to inhabit such areas during its winter migration.

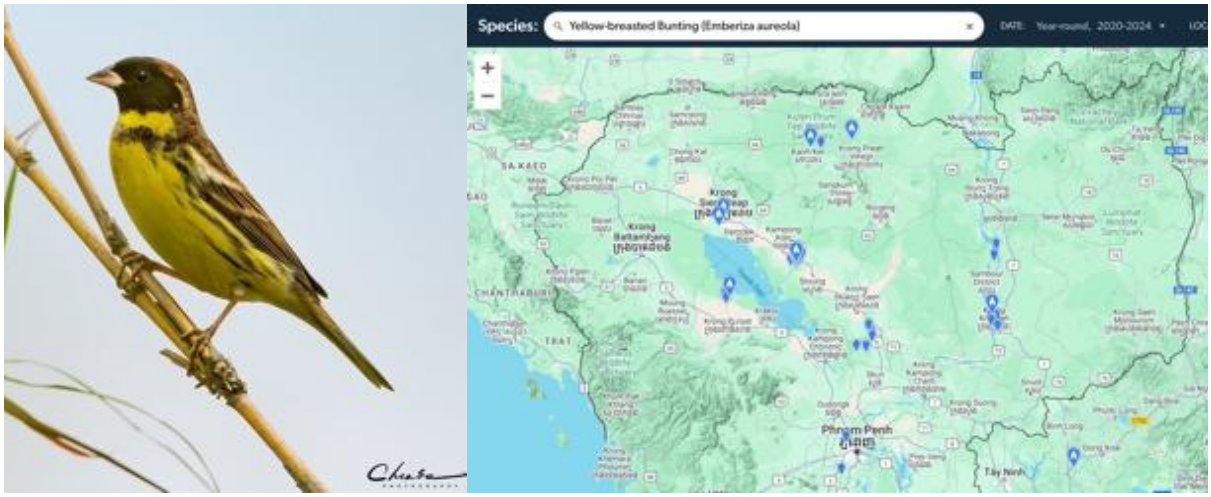


Figure 5: Photo of Yellow-breasted Bunting (Emberiza aureola) and its distribution map from eBird data (2020-2024) recorded by birdwatcher and wildlife overserves.

- **Wild-winged Duck:** Regarding the Wild-winged Duck, there was some confusion among informants who mistakenly identified it as the Knob-billed Duck (Sarkidiornis melanotos). However, after discussing key identification features and ecological characteristics, such as breeding and nesting habitats, we determined that none of them had actually encountered the Wild-winged Duck before. Due to it's tiny population, Wild-winged Duck is very sensitive, and live in the forest close to the lake, wetland, river and waterhold with less disturbance. Due to its limited population, the Wild-winged Duck is particularly sensitive to disturbances and prefers to reside in relatively undisturbed forests adjacent to lakes, wetlands, rivers, and watering holes.

This preference for quieter, less populated areas helps to ensure the survival of this vulnerable species.

Mammals/ primates (2 species)

No suitable habitats or sightings of three mammal species were identified in the upper section of Ou Tapaong. Two primate species (Indochinese Silvered Langur and Long-tail Macaque) were confirmed at the lower section in the Flooded Forest habitat of the Tonle Sap Zone 3 and CFi Areas. Additionally, multiple reports indicated the presence of Hiary-nosed Otters in the region, particularly in the deep waters of the flooded forest near the Tonle Sap Great Lake's mouth. The following paragraphs summarize the key findings and justifications for the presence of these two primate species, along with their associated confidence levels. These conclusions are based on comprehensive interviews, technical expertise, and consultations with relevant units, which contributed to the verification of species with high conservation importance.

- **Indochinese Silvered Langur:** Six local informants (86%) reported frequent encounters with Indochinese Silvered Langurs within the flooded forests of Tonle Sap Zone 3 which is outside of the OTP command area. These sightings, primarily near natural lakes, have been confirmed by multiple individuals engaged in livelihood activities within these areas. While the population of Indochinese Silvered Langur was once plentiful, informants noted a significant decline in recent decades, with only smaller troops now being observed. The species is known to inhabit areas near rivers and large bodies of water.

  Mr. Chem Sophal from Punleu Komar Organization highlighted that his organization provides support for the Samraong Muk Yeik Community Fishery (SMY-CFi) and Sdok Khlouk Community Fishery (SK-CFi) in managing and protecting fisheries resources and flooded forests within their Community Fishery Area (figure 6). Portions of these CFi Areas overlap with the Lower section of Ou Tapaong Command Area. This effort is part of the EU “Our Tonle Sap” Project, led by the Wildlife Conservation Society and funded by the European Union. Mr Sophal emphasized the presence of numerous endangered and critically endangered species, including the Indochinese Silvered Langur, within this CFi Area. To confirm the presence of any Community Fisheries (CFIs) within the specified area, we interviewed the Chief of Pursat Fishery Administration Cantonment. Our inquiry revealed that two CFi areas overlap with the designated region, as illustrated in the accompanying map (see map below).

  Based on the provided information, the following IFC PS6 criteria are potentially met regarding the Indochinese Silvered Langur and the flooded forests of Tonle Sap Zone 3:

  Species Level:
  Criterion 1: Critically Endangered and Endangered Species: The Indochinese Silvered Langur is an endangered species, making its habitat a potential candidate for this criterion.
  Criterion 2: Highly Threatened Species: Given the observed decline in the population and potential threats to its habitat, the species could be considered highly threatened.

  Ecosystem Level:

Criterion 5: Highly Threatened and Unique Ecosystems: The flooded forests of Tonle Sap Zone 3 represent a unique and threatened ecosystem, particularly due to factors such as habitat loss and degradation.

- **Long-tailed Macaque:** Indochinese Silvered Langurs and Long-tailed Macaques were commonly reported by key informants residing within the Tonle Sap Zone 3. These informants, who frequently engaged in fishing activities in the surrounding forests, encountered Long-tailed Macaques regularly. They added that these primates, known for their social nature, live in troops and communicate vocally to alert their group members of potential threats or discoveries. Some troops inhabit flooded forests situated close near the command area.

  However, informants expressed deep concern over the significant decline in the population of Long-tailed Macaques over the past several years. This alarming trend has prompted urgent action from conservation organizations. In response to the deteriorating situation, the primate specialist group upgraded the conservation status of this species from Vulnerable to Endangered in March 2022. This elevated status underscores the urgent need for increased protection measures to mitigate the species' decline, which is primarily driven by the high demand for these primates in the illegal pet trade (*Primate Conservation Alliance. 2022)*

  The provided information strongly suggests that the Tonle Sap Zone 3 adjacent to the OTP meets multiple IFC PS6 criteria related to the Critically Endangered Long-tailed Macaque:
  - Criteria 1a: The recent uplisting of the Long-tailed Macaque to Endangered status by the IUCN Red List underscores the habitat's critical importance for the species' survival and reproduction. The frequent sightings of these primates by local informants, especially in the flooded forests, highlight the area's significance as a key habitat.
  - Criteria 4: The flooded forests of the Tonle Sap Zone 3 represent a highly threatened and unique ecosystem. They face significant threats from habitat loss, pollution, and climate change. These forests provide a crucial habitat for the Long-tailed Macaque and other potentially threatened species.

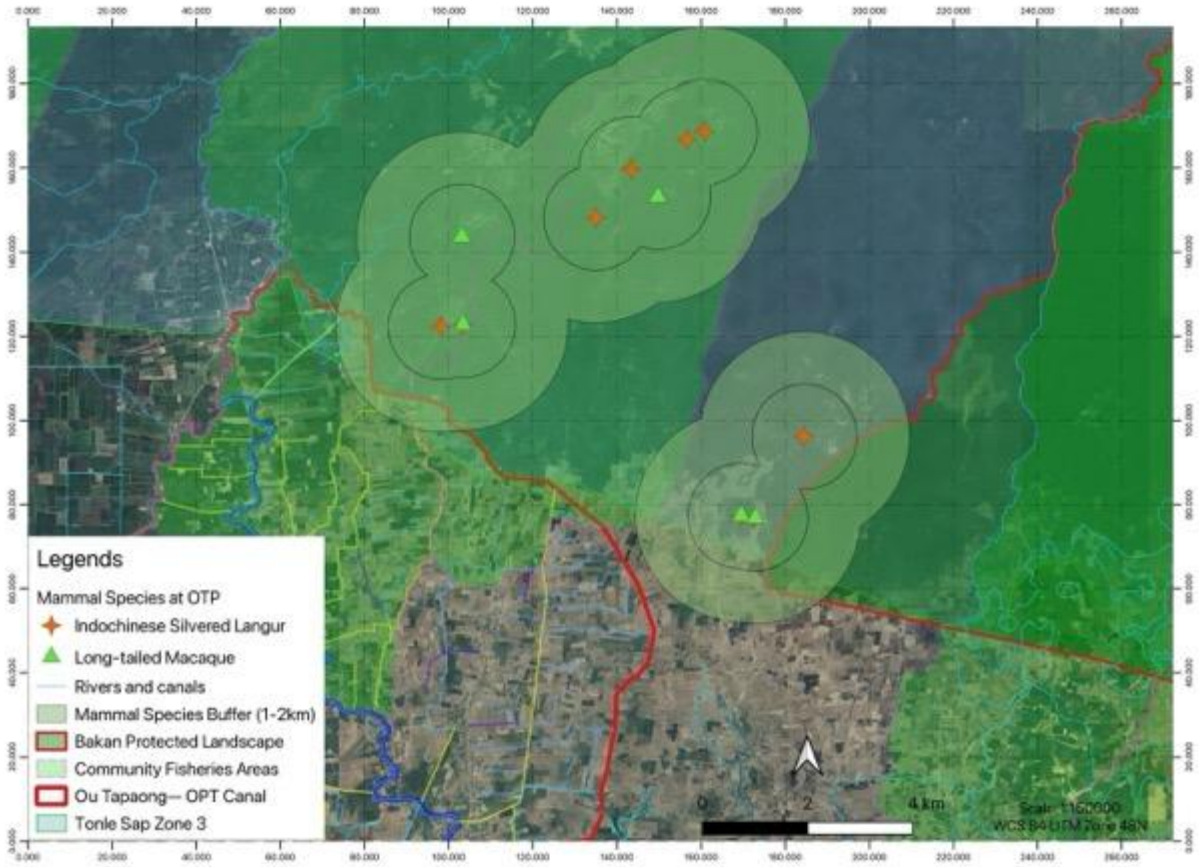


Figure 6: A spatial distribution map was generated for two primate species—the Indochinese Silvered Langur and Long-tailed Macaque—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.

Fishes (2 species)

Overall, these statements provide valuable insights into sightings and knowledge about Siamese Tiger Perch and Striped Catfish within different sections of the Ou Tapaong Command area. The following paragraphs summarize the key findings and justifications for the presence of these two fish species confirmed by key informants, along with their associated confidence levels and their ecological knowledge of fish diversity and migration.

- **Siamese Tiger Perch:** According to four key informants in the upper section of the Ou Tapaong Command area, Siamese Tiger Perch has been consistently observed in Boeng Kansaeng Lake, located in the southwest part of the Ou Tapaong Command Area. Three of them reported encountering a few individuals of this fish species in 2023 and 2024 (figure #7), while another informant saw them about 20 years ago during the fully flooded period. This particular informant stopped fishing for many years after becoming older.

  The Siamese Tiger Perch is believed to migrate from Tonle Sap Great Lake to the upstream through Svay Daun Kav River (along the western boundary of command area) and then move into Boeng Kansaeng through its tributary canal during flooding periods. Common fishing gear used includes line nets, cast nets, and small fish traps. The informants mentioned that catching this species is extremely rare, with only one to two individuals caught per season using line nets. They possess extensive knowledge about fish and make a living through fishing.

On the other hand, two key informants from the lower Ou Tapaong section stated that although they are familiar with Siamese Tiger Perch, they have never seen them in their area. One informant mentioned having seen this species in 1979 but not recently. Similarly, Mr. Chem Sophal from Punleu Komar Organization confirmed his awareness of this species but stated that it is not present in the lower Ou Tapaong Area.

The Criterion 1a of IFC Performance Standard 6 (PS6) is potentially met. The Siamese Tiger Perch, a Critically Endangered species, has been observed in Boeng Kansaeng Lake, a habitat within the Ou Tapaong Command Area. However, the frequency of sightings is low and historical, suggesting that further investigation is necessary to definitively establish the habitat's significance for the species' survival and reproduction.

- **Striped catfish**: One informant recalled seeing the Striped Catfish approximately 7 years ago in a small wetland area during the peak of flooding. This species is exceptionally rare, and it is known to migrate to this specific area when the entire region becomes submerged in floodwater.

  Based on what we know, the habitat for the Critically Endangered Striped Catfish likely meets two of the IFC PS6 criteria:
  - Criterion 1a: This habitat is super important for the survival of this super rare fish. It's like their special breeding ground during floods.
  - Criterion 3: The fish migrates to this specific area when it floods, making it a key spot for this travelling species.

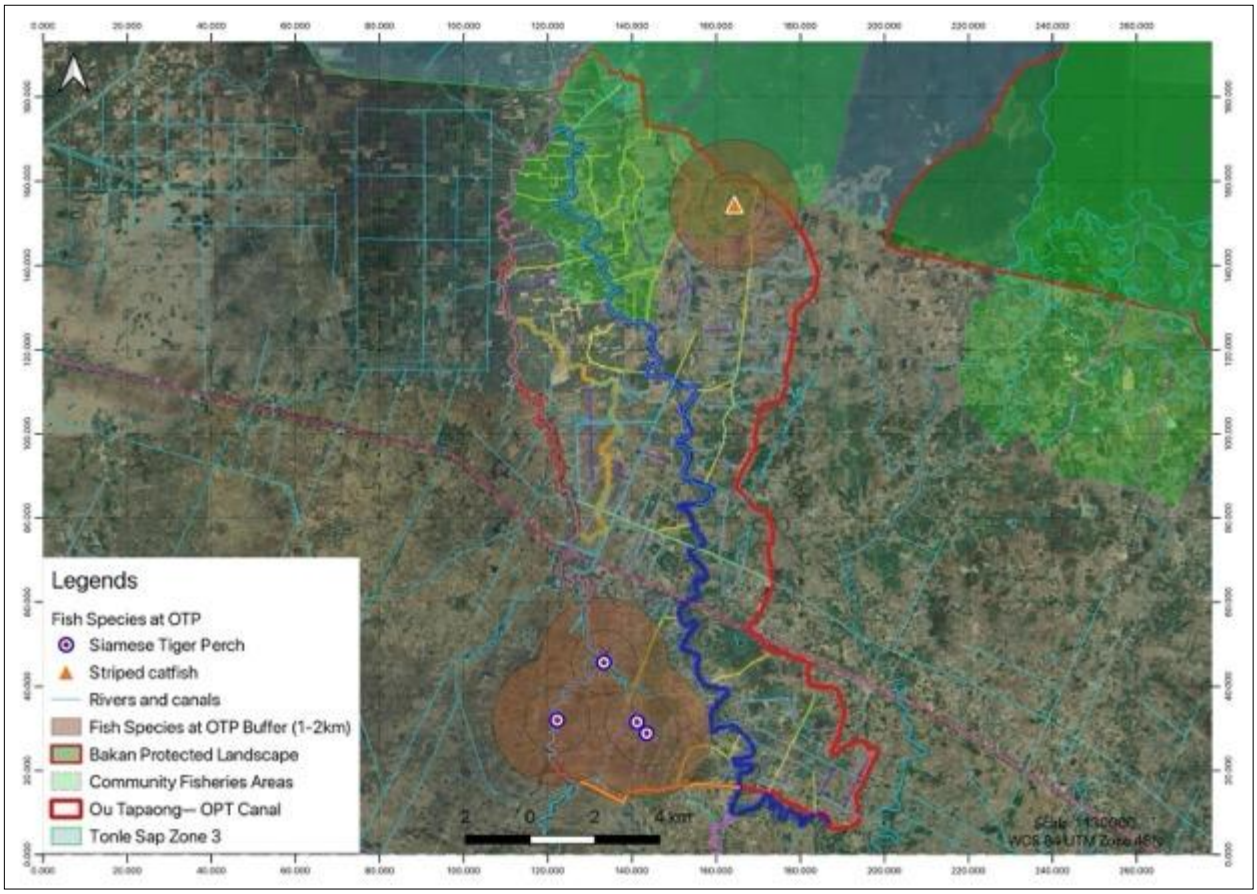


Figure 7: A spatial distribution map was generated for two fish species—the Siamese Tiger Perch, and Striped Catfish (old record-7 years ago)—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.

Occurrence of Protected Areas near the Sub-scheme Area

A review of protected areas in the vicinity of the sub-scheme has been conducted as a preparatory step before proceeding with Step 3 of the CHA. There are four areas located near and downstream of the OTP sub-scheme (See Table below). The preliminary assessment focuses on the two that are closest to the OTB: Flood Forest Conservation, b) Bakan Grassland Protected Area[21].

No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
1	Flooded Forest Conservation	Royal Government of Cambodia: Sub-decree No. 197 dated 29 August 2011	The Tonle Sap's flooded forests are a vital part of its unique ecosystem. During the wet season, the Mekong River's waters back up into the Tonle Sap, flooding vast areas and creating a rich habitat for diverse wildlife. This dynamic ecosystem supports a multitude of fish species, waterbirds, and other wildlife. However, it faces threats like deforestation, overfishing, and pollution, necessitating conservation efforts to protect this vital resource.	0 (share the border)
2	Bakan Grassland protected area	Royal Government of Cambodia: Sub-decree No. 144, dated 04 July 2023	Bakan Grassland, a 38,430-hectare protected area in Cambodia, is a vital part of the Tonle Sap ecosystem. It's home to endangered bird species like the Bengal Florican and Chinese Grassbird. The Wildlife Conservation Society (WCS) and local communities are working together to protect this unique habitat.	2
3	Dei Roneat Important Bird Area (IBA)	BirdLife Internation	The IBA supports breeding colonies of important birds like the Darter, Lesser Adjutant, and Greater Adjutant. Its diverse habitat supports various bird species, but faces threats from human activities. Conservation efforts include monitoring, community engagement, habitat restoration, and policy advocacy to protect this crucial site.	12

[21] Bakan grassland is a protected area for birds designated by sub-decree No. 144 in 2023.

No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
4	Tonle Sap Biosphere Reserve (TSBR)	Royal Government of Cambodia: Royal Decree in 2001[22]	The Tonlé Sap Biosphere Reserve is a distinctive ecological region encompassing the Tonlé Sap, or Great Lake of Cambodia. The reserve was successfully designated a UNESCO Biosphere Reserve in 1997 and subsequently enshrined in the Cambodian Royal Decree in 2001.	16
5	Prek Toal Important Bird and Biodiversity Area (IBA), then designated at the core area of TSBR in 2001, and then promoted Prek Toal Ramsar Site in 2015	BirdLife Internation Royal Government of Cambodia: Royal Decree in 2001[23] Sub-decree in 2015	The area is well known as the largest waterbird breeding colonies in Southeast Asia, support a congregation of may globally threatened birds, fish and other wildlife specicis. It's the second world largest breeding habiatat for Greater Adjutant, and the only breeding habitat for Spot-billed Pelican, and Milky Stork in Southeast Asia. Prek Toal is only inland breeding population for Milky Stork in the world.	24

[22] https://www.unesco.org/en/articles/national-conference-tonle-sap-biosphere-reserve-brings-together-stakeholders-discuss-sustainable

[23] https://www.unesco.org/en/articles/national-conference-tonle-sap-biosphere-reserve-brings-together-stakeholders-discuss-sustainable

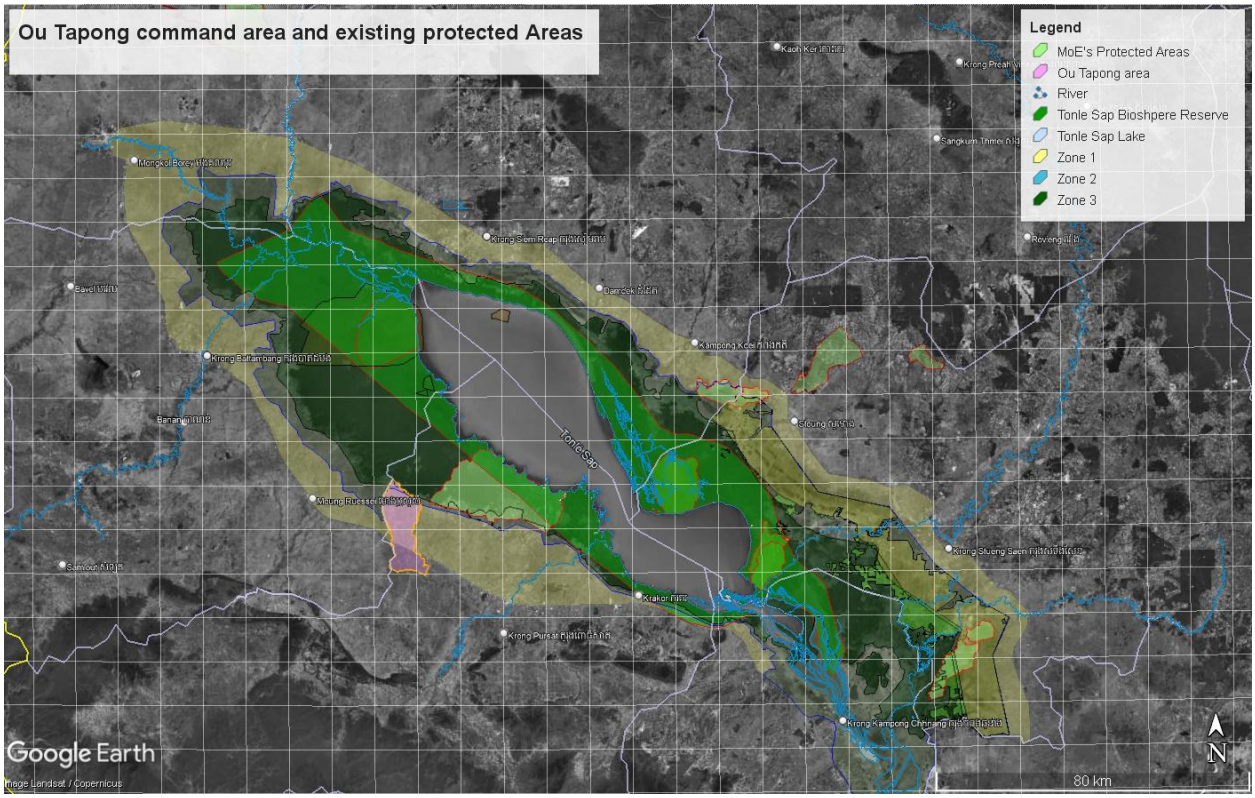


Figure 8: Map of Ou Tapong Command Area and other existing protected areas under administered of the Ministry of Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministries of Water Resources and Meteorology

Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species (identified in the list of 11 EN and CR species) qualify for Critical Habitat features.

All information presented in this study report has been meticulously verified against reliable sources, including key government research institutes, national and international organizations, and expert consultations. To ensure accuracy, fish, bird, mammal, and reptile species identification at Ou Ta Paong, Lum-Hach, Brambei Mom, Kraeu Trom, and Yottasass was confirmed through consultations as below:

Table 3: list of internation and nation key expert were consulted to check and verify each all target EN and CR species

Name	Position and institution	Key Area of expertise/ consultation	Contact
Dr. Ea Chitra	Head of the Aquaculture Faculty at the Kampong Speu Institute of Technologies	Key fish species were released by his faculty at Anlong Chrey and Brambei Mum Reserviors.	+855 14 388 694
Mr. Robert Tizard	Senior Project Lead for Tonle Sap Landscape, WCS Camodia	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme	rtizard@wcs.or

Mr. Tach Sovannara	Head of the Fisheries Lab at the Inland Freshwater Research and Development Institute of the Fisheries Administration	Identification and clarification of EN and CR species of fish and reptiles across all sub-schemes	
Mr. Khim Sokha	Chief of office of the Fisheries Conservation Department	Identification and clarification of EN and CR species of fish and reptiles across all sub-schemes	+855 12 784 687
Mr. Chuem Sophal	Program Manager, Punleu Komar Organization	Confirm present of birds and key wildlife species at Ou Ta Paong Sub-scheme	
Mr. Morn Ravy	Bakan Protected Landscape Project Coordination, WCS Cambodia	Confirm present of birds and key wildlife species at Ou Ta Paong Sub-scheme	morn@wcs.org
Mr. Somony Thay	Direct of Aquaculture Department, FiA	Fish identification, key fish species releasing data, and distribution range across all schemes	+855 12 829 971
Mr. Neang Ty	Conservation Program Manager, Wild Earth Allies	Internation and national expert on reptile	+855 12 864 409
Mr. Hong Chamnan	Director of the Freshwater Wetland Conservation Department, MoE	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme, national protected area data	+855 12 922 429
Mr. Sun Visal	Deputy Director of the Freshwater Wetland Conservation Department, MoE	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme, national protected area data	+855 12 708 836

All information concerning avian and other key wildlife species, including their behavioral patterns, was corroborated through sighting data verified by relevant experts from the Wildlife Conservation Society (WCS), a long-standing partner of the Ministry of Environment (MoE), Fisheries Administration, and Forestry Administration in conservation efforts spanning over 25 years. Additionally, consultations were held with Mr. Hong Chamnan, Director of the Freshwater Wetland Conservation Department, and Mr. Sun Visal, his Deputy Director and the head of the Tonle Sap Biosphere Reserve. Both individuals possess extensive experience, ranging from 20 to 30 years, in avian ecology and protected area management within the Tonle Sap Lake region.

Finally, information related to reptiles and amphibians was validated through consultations with Mr. Neang Ty and his team from Wild Earth Allies, renowned experts who have made significant contributions to the discovery of new reptile and amphibian species in Cambodia, including the Cardamon Shrub Frog (Philautus cardamonus).

Overview of the current land use and land cover at OPT

The map below features the current land and use and land cover at Ou Tapaong Command Area based on the satellite image captured by Sentinel 2 with 10m resolution in late 2023. The color bands failed to distinguish between rice fields, grassland and shrubland areas. However, based on field assessment, the command area is dominated by existing rice fields and some modified habitats. There are some small and fragmented natural habitats like shrubland, and grassland along the natural streams, seasonal ponds and wetland habitat creating a mosaic habitat for many wildlife species to strive as the area is situated within the Tonle Sap Floodplain close to many protected areas and IBBAs. Residential areas are situated along the main roads, rivers, and streams.

The northern portion of the OTP Command Area is a dynamic landscape characterized by a varied mosaic of habitats. Here, agricultural lands coexist with modified habitats, wetlands, shrublands, and remnants of grassland, seamlessly transitioning into the vast expanse of the Tonle Sap Zone 3 flooded forest.

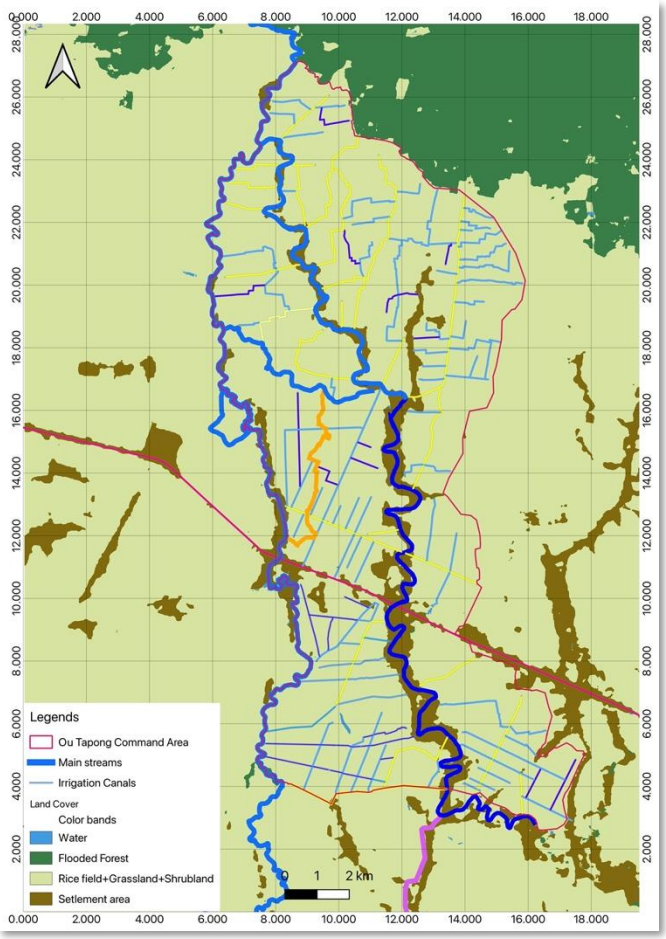


Figure 9: Land use and land cover map based on

This diverse ecological mosaic plays a crucial role in supporting a rich array of biodiversity. The area serves as a vital foraging ground for numerous migratory bird species, providing them with abundant food resources. Additionally, it functions as a critical refuge and breeding ground for fish during the wet season, when the flooded forests and wetlands offer ideal conditions for spawning and juvenile development.

The intricate interplay of these habitats sustains a diverse community of wildlife, including birds, mammals, fish, and reptiles. These species rely on the unique characteristics of the flooded forest and wetland ecosystems for essential life cycle activities such as breeding, nesting, and foraging. The area's significance as a biodiversity hotspot is underscored by its role in supporting a wide range of Habitat of significant importance to CE and EN species

As presented in Section 4.1.3.3 (Ecological State), species that qualify as critical habitat features include:

- **Reptile** (4 species): Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise,
- **Mammals** (2 species): Indochinese Silvered Langur and Long-tailed Macaque),
- **Fishes** (2 species): Striped catfish and Siamese Tiger Perch, and
- **Birds** (3 species): Greater Adjutant, Milky Stork, and Bengal Florican.

First of all, the Ou Tapaong command area was assessed as a modified habitat because the command area which is around 14,000 hectares is a mixture of paddy fields, rivers, shrubland, seasonal ponds, farmers, and houses. Rivers such as Ou Ta Paong River and Svay Donkeo River have been substantially modified at various

locations of the river for water collection, storage, as well as for other living and farming purposes.

In this assessment, we divided Ou Tapaong Command Area into three parts: 1) the upper part to the south, 2) the middle part along National Road 5, and 3) the lower part to the north which is situated within the floodplain of Tonle Sap Zones 2 and adjacent to Tonle Sap Zone 3 for key informant interview and habitat assessment purposes as this command area is large and maintain different demographic and natural habitat conditions. On August 7, 2024, the Cambodian government discussed the decision to register two zones (Zone 2 and Zone 3) of the Tonle Sap Lake Basin as state land to protect the natural resources of the lake. This decision will prohibit any further requests for land concessions in these zones. The Ministry of Land Management, Urban Planning and Construction hopes that this will help to preserve the biodiversity of the lake[24]. The assessment focused on the upper and lower parts because these areas are known to have a diverse biodiversity landscape. While the survey revealed variations in knowledge about wildlife among local communities, it also highlighted the need for increased awareness and understanding across all areas.

[24] Land Management, Urban Planning and Construction, Cambodia (2024). Zones 2 and 3 of the Tonle Sap Lake will be registered as state land to preserve this precious natural resource for inheritance for all generations.

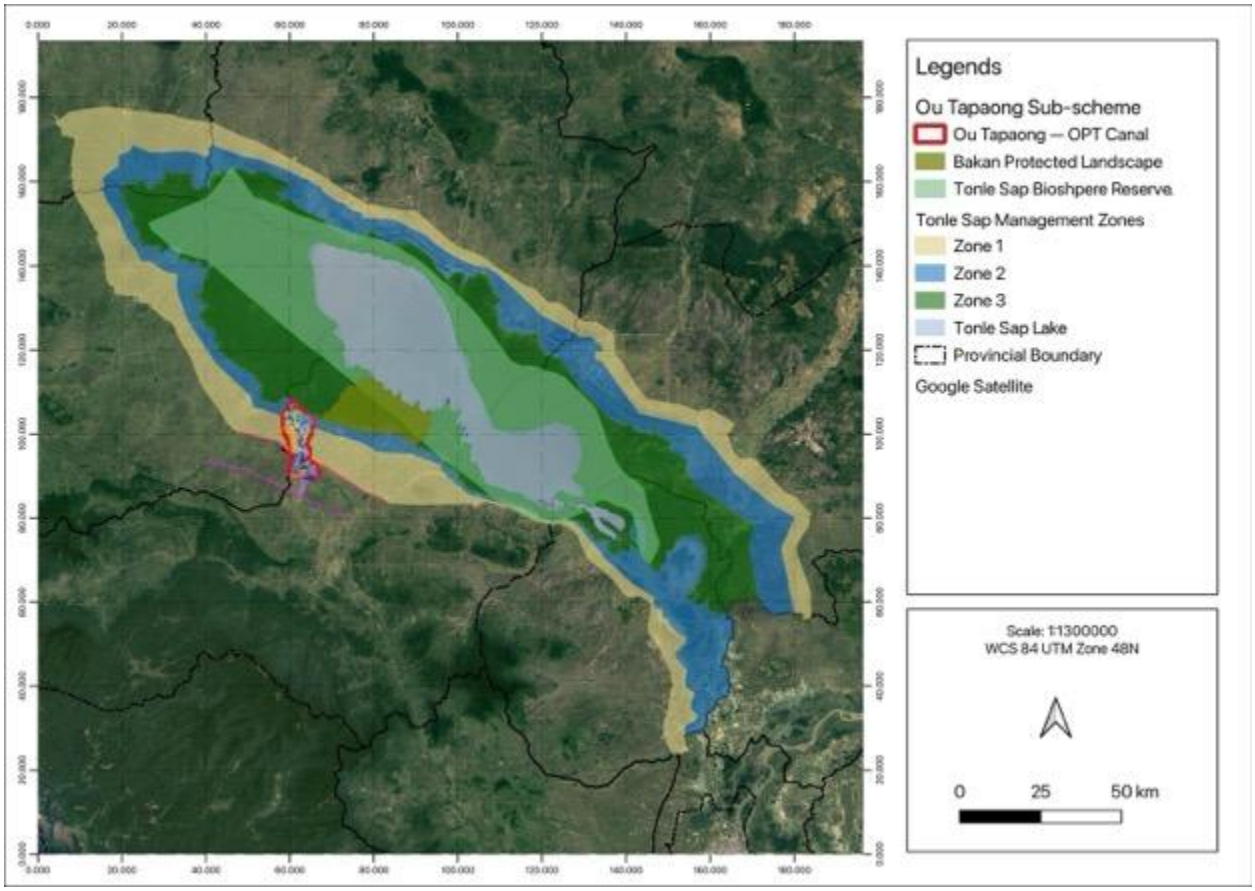


Figure 10: Map of Ou Tapaong command area and other existing protected area within the Tonle Sap Basin

The southern part of the command area is predominantly agricultural, with limited remaining natural habitats. Boeng Kansaeng, the largest seasonal wetland, faces challenges in water retention during the dry season. While the command area mostly gets water for irrigation from the Svay Daunkaev and Pursat rivers, the water volume is insufficient to maintain natural flows (e.g. Ou Tapaung River). Additionally, human interventions such as earth dams and conversion of waterways into fish ponds have fragmented the natural habitats and as such hindered the movement of aquatic species (Figures 8 and 9).

The northeastern part of the command area, though dominated by agriculture, includes a significant area of flooded forests. This diverse habitat supports a range of endangered and critically endangered species. However, the entire water system faces challenges that limit its suitability for species requiring extensive, interconnected habitats. The lowest part of this area is connected to a very healthy flooded forest habitat, consisting of many small and large waterholes, and wetland areas, creating a mosaic habitat that provides suitable ecological niches for many endangered and critical species in the area. This huge flooded forest habitat is part of the Tonle Sap Multiple Use Area, Tonle Sap Biosphere Reserve under the Ministry of Environment, and Tonle Sap Management Zone under the administration mandate of the Tonle Sap Authority, and Flooded Forest Protected Area under the Fisheries Administration. Additionally, a portion of Ou Tapaong's lower command area overlaps with two Community Fisheries (CFIs) areas.

The critical habitat for these bird species within the Ou Tapaong Irrigation sub-scheme includes flooded forests, wetlands, lakes, rivers, grassland, abandoned and fellow rice fields, and waterways. The flooded forests in Tonle Sap Zone 3 serve as crucial habitats for several endangered and critically endangered primate species like the Indochinese Silvered Langur and Long-tailed Macaque and are charaterised with lakes and wetlands inside that are crucial foraging habitats for birds. Based ont this key finding we can identify and cacharaterise critical habitats of various EN and CR species presence within and close thie command area as below:

- Flooded forests, particularly those in Tonle Sap Zone 3, are particularly significant for biodiversity. These forests provide crucial habitat for endangered primates such as the Indochinese Silvered Langur and Long-tailed Macaque. Additionally, the lakes and wetlands within these forested areas offer essential foraging grounds for various bird species including Greater Adjutant and Milky Stork.
- Wetlands, such as Boeung Kansaeng, play a vital role in supporting aquatic and terrestrial biodiversity. These areas provide essential food, shelter, and breeding grounds for a variety of species including birds, reptiles, and fish.
- Rivers and waterways, like the Svay Daun Kav River, serve as important corridors for fish migration and connectivity between different habitats. This can indirectly benefit birds by providing a healthy aquatic ecosystem.
- Grasslands and open areas, while less diverse than forested habitats, can still support certain Bengal Florican, Yellow-breasted Bunting and other bird species. Abandoned and fallow rice fields may also offer temporary refuge for many bird birds including the Florican. The Bengal Florican utilizes this habitat for nesting and feeding during the dry season. The Yellow-breasted Bunting winters in this region before returning to its breeding ground in Siberia, Russia, from May to November

Based on the biodiversity assessment conducted at Ou Tapaong Irrigation Sub-scheme, several critical habitats have been identified, and described below. These habitats support a range of endangered and critically endangered species, highlighting their ecological significance. **The critical habitat assessment activities that should be taken for the Ou Tapaong Command area, considering IFC PS 6 guidance on biodiversity conservation and sustainable management of living natural resources, are as follows:**

1. Baseline Studies: Conduct comprehensive baseline studies to identify and understand the biodiversity values in the area. This should include a literature review, stakeholder engagement and consultation, field surveys, and other relevant assessments. The focus should be on identifying key species (such as Greater Adjutant, Milky Stork, Bengal Florican), fish (Siamese Tiger Perch and Striped Catfish), reptiles (Black Marsh Turtle, Southeast Asian Box Turtle, Giant Asian Pond Turtle, Elongated Tortoise), mammals (Indochinese Silvered Langur and Long-tailed Macaque), and their habitats.
2. Habitat Mapping: Map out the different habitats present within the Ou Tapaong Command area. This should include flooded forests, lakes (such as Boeung Kamsaeng Lake), rivers (Svay Daunkav River), waterholes, grasslands, and fellowed rice fields used by bird species for foraging.
3. Threat Assessment: Assess potential threats to critical habitats identified in step 2. Consider factors such as habitat loss due to infrastructure development or land-use changes related to irrigation system renovation.
4. Stakeholder Engagement: Engage with relevant stakeholders including local communities living in or around critical habitats to gather their knowledge about biodiversity values in the area.

5. Mitigation Measures: Develop mitigation measures specific to each identified critical habitat that aligns with IFC PS 6 guidance on avoidance of impacts whenever possible; implementation of measures to minimize habitat fragmentation; restoration activities during operations or after project completion; implementation of set-asides for protection; consideration of biodiversity offsets where appropriate based on no net loss principle.
6. Environmental and Social Impact Assessment (ESIA): Conduct an ESIA that considers all potential impacts on critical habitats identified through steps 1-5 above.
7. Monitoring Plan: Develop a comprehensive monitoring plan that includes regular monitoring of key species populations within critical habitats identified in step 2 above.



Figure 11: Boeung Kansaeng located in Ou Tampaong's upper reaches, offers sighted records of Siamese Tiger Parch. The area's upper part in this photo is a settlement along the Svay Daunkav River.



Figure 12: Overview of Boeung Kansaeng, located upstream of Ou Tapaong Command Area. A canal connects to Stueng Svay Daunkav River (left) and Ou Tapaong (right), a potential fish migration route during floods.



Figure 13: Aerial photograph depicting the Ou Tapaong Stream/canal fragmented by earth dams, roads, and ponds, illustrating its diversion for non-intended purposes.



Figure 14: Aerial photograph of intake flooded forest habitat within Tonle Sap Zone 3 and the continuous land encroachment, converting forest land for rice cultivation.

Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Ou Ta Paong).

Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for OTP, therefore is expected to qualify as critical habitats under this criterion.

Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

Boeung Kansaeng Lake still maintains hydrological connectivity for fish migration from Stueng Svay Daunkav River through its canals, where the Siamese Tiger Perch was confirmed. Some small wetland areas at the lower part of the OTP command area support ecological functions and connectivity for confirmed birds, reptiles and fish species for their local movement, nesting, and foraging ground. So, that is necessary to support biodiversity values that require applying biodiversity mitigation measures and protection efforts (described under the above criteria) have been identified. Pumping, drainage, and discharge of chemical inputs into that wetland can have a significant impact on the biodiversity and survival rate of EN and CR species present in that area.

Potential Impacts & Feasibility of Net Gain Requirements (Step 4)

Step 4 (as described in the above CHA method) requires a high-level assessment of the potential for critical habitat features to be affected by the investment activities of the sub-scheme (both construction and operation). This step is necessary to determine if Net Gain measures need to be demonstrated and whether the necessary measures are feasible.

In the section below, species that are assessed as “Present” or “Possible” in sub-scheme AoI (as shown in the above table) are included in the impact assessment. These include the following 8 species: 1) Four reptiles (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, Elongated Tortoise), 2) Three birds (Greater Adjutant, Milky Stork, and Bengal Florican), and 3) One fish (Siamese Tiger Perch).

Potential impacts

Reptiles *(Substantial risk)*

All four species of reptiles are found in the upper and lower part of the OTP command area, particularly in areas near natural water courses (rivers and streams). During construction,

these reptiles are potentially affected directly due to a) disturbances from noise and vibration due to increased vehicle activity and human presence, b) being hit by vehicles, equipment from increased traffic movement and river dredging/training at Ou Ta Paong river, excavating of the extended canal of Kbal Hong and other relevant canals, c) caught by workers, local people, and hunters. During project operation, these reptiles may be directly affected, including a) being caught by local people and hunters, and b) pesticide residues from intensified crop production.

Birds *(Moderate risk)*

Greater Adjutant, Milky Stork, and Bengal Florican are found seasonally in the command area, mainly in the lower/downstream part which is subject to annual flooding. These birds are migratory and as such are rare. Local people don't catch these birds for food. However, since these birds feed on aquatic species available from the command area, they may be affected by the feeds that are contaminated with pesticide residues.

Net gain assessment

Additionally, during construction activities, these birds may be indirectly affected through disturbance and habitat loss caused by increased human activity and changes in water levels. It is important to note that the Ou Tapaong Command Area serves as a critical habitat for these endangered bird species, making it crucial to minimize any potential negative impacts.

Based on the potential impacts identified above, it is evident that measures need to be implemented to achieve a net gain in biodiversity within the Ou Tapaong Command Area. These measures should focus on minimizing direct disturbances and habitat loss during construction activities, as well as implementing sustainable agricultural practices to prevent pesticide contamination of food sources for these bird species.

In conclusion, based on the assessment results, it is recommended that comprehensive actions be taken to protect critical habitats for species such as reptiles (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle Elongated Tortoise), birds (Greater Adjutant, Milky Stork, Bengal Florican), ensuring their survival alongside irrigation system renovation projects.

Table 4: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Ou Ta Paong sub-scheme of the Project Area

English Name	Scientific Name	IUCN Status	Global population	Cambodia population	Migratory/ Congregatory	Habitat and Distribution	Likelihood of Occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Reptile									
Black Marsh Turtle	*Siebenrockiella crassicollis*	EN	Unknown (suspected to have decreased by about 80% in SEA)	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds; 5-20 masl.	Moderate - Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Giant Asian Pond Turtle	*Heosemys grandis*	CR	Unknown (suspected to have decreased by about 80%)	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds	Moderate - Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Southeast Asian Box Turtle	*Cuora amboinensis*	EN	Unknown-kept declining	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds; 5-20 masl.	Moderate - Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Elongated Tortoise	*Indotestudo elongata*	CR	Unknown-kept declining	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds; 5-20 masl.	Moderate - Confirmed in AoI in 2024	Reported at the upper part of Ou Ta Paong with possibly moving between upstream and downstream during wet season via Ou Ta Paong and Svay Daunkev rivers. While much suitable habitat, itis therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Fishes									
Striped catfish	*Pangasianodon hypophthalmus*	EN	Unknown	Unknown	Yes	This freshwater fish is native to the Mekong River Basin in Southeast Asia, including countries like Thailand, Laos, Cambodia, and Vietnam	Low	List as EN in the IUCN red list, this species migrates upstream and Tonle Sap Floodplain area during flooding season. Due to the climate change, and dam construction, there's not enough flood plus with the last several years. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**
Siamese Tiger Perch	*Datnioides pulcher*	CR	Unknown	Unknown	Yes	This freshwater fish species is native to the Mekong and	Moderate - Confirmed	List as EN in the IUCN red list, this species migrates upstream and	**IN**

						Chao Phraya River basins in Southeast Asia, including Thailand, Cambodia, Laos, and Vietnam.	in AoI in 2024	Tonle Sap Floodplain area during flooding season. This species navigates through rivers and canals to upstream to reach some lake and wetland areas. It's confirmed to present in the project AoI. Likely to qualify as CH under Criterion 1& 3 threshold.	
Mammal									
Hairy-nosed Otter	*Lutra sumatrana*	EN	Unknown-kept declining	Unknown-kept declining	No	Endangered and elusive, inhabit the Tonle Sap Floodplain's diverse wetlands, including flooded forests and marshes. Their survival is threatened by habitat loss, hunting, and bycatch.	Very Low	Despite there's some habitat but the species was confirmed present around 15 to 12 km way downstream. Therefore, It's likely absent in the project AoI.	**Out**
Indochinese Silvered Langur	*Trachypithecus germaini*	EN	Unknown-kept declining	> 3,000 individuals[25]	*No*	Inhabit the diverse forests of the Tonle Sap Floodplain, including flooded areas. Habitat loss and hunting threaten their populations.	Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 6 threshold.	**IN**
Long-tailed Macaque	*Macaca fascicularis*	EN	Unknown-kept declining	Unknown-kept declining	No	Inhabit the diverse forests of the Tonle Sap Floodplain, including flooded areas. Habitat loss and hunting threaten their populations.	Moderate - Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 6 threshold.	**IN**
Birds									
Greater Adjutant	*Leptoptilos dubius*	EN	1,000–1,200 individuals[26]	100–150 individuals	N/A	Has a very restricted range in Cambodia. Its primary stronghold is the Tonle Sap Biosphere Reserve, where it favors flooded forests and wetlands.	Moderate - Confirmed in AoI in 2024	IUCN listed as EN and although restricted range across the Tonle Sap Floodplain. It is likely to occur in Project AoI at some suitable habitats. Likely to qualify as CH under Criterion 1& 6 threshold.	**IN**
Milky Stork	*Mycteria cinerea*	EN	> 1,500 mature individuals	≥ 100 and 150 individuals	Yes	Primarily inhabit and breed around the Tonle Sap Lake, particularly its flooded forests and surrounding wetlands, shrubland, grassland making it their most crucial habitat in the country; 5-10 masl.	Low - Confirmed in AoI in 2024	The project area's lakes, rivers, and wetlands within the lower command area provide suitable habitat, although the Milky Stork population is small and local awareness of the species is limited. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**

[25] https://www.phnompenhpost.com/national/silvered-langur-endangered-plentiful-kingdom

[26] BirdLife International. (2023). *Leptoptilos dubius*. The IUCN Red List of Threatened Species 2023: e.T22697721A220483715.

Yellow-breasted Bunting	*Emberiza aureola*	CR	< 10,000 individuals *(80-90% decline since 1980s)*[27]	Unknown	Yes	This CR species is a rare winter visitor and passage migrant in Cambodia. It prefers open habitats such as wetlands, grasslands, and agricultural areas like rice paddies, which provide food and shelter. It has been observed in key areas including the Tonle Sap Floodplain, Mekong River Basin, Northern Plains, and coastal regions. However, its presence is declining due to habitat loss, hunting, and degradation.	Moderate - but didn't confirm in AoI in 2024 due to seasonal preference	While much suitable habitat is present downstream of the project and along the Ou Ta Paong and the species is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**
Bengal Florican	*Houbaropsis bengalensi*	CR	250-1,000 individuals	150–700 individual	N/A	Primarily found in the floodplain grasslands of the Tonle Sap Floodplain, particularly in the Siem Reap, Kampong Thom, and Pursat provinces. This area provides the critical grassland habitat that the species depends on for breeding and foraging	Moderate - Confirmed in AoI in 2024	IUCN listed as CR and although restricted range with the Tonle Sap Grassland. WCS and MoE established a new protected area to conserve this species of where it's boundary is just 1km from the command area. It is likely to occur in Project AoI at some suitable habitats. Likely to qualify as CH under Criterion 1& 6 threshold.	**IN**
Masked Finfoot	*Heliopais personatus*	CR	600 - 1,700 individuals	< 100 individuals	No	Inhabits forested wetlands, slow-moving rivers, and flooded forests, especially around Tonle Sap Lake, Stung Treng Ramsar Site, and the Mekong River with dense vegetation for nesting and foraging.	Not confirmed	IUCN listed as CR and although it is a restricted-range species it is found mainly in the dense vegetation and flooded forest close the open lake and therefore it has been screened out	**Out**
White-winged Duck	*Asarcornis scutulata*	EN	250-100 individuals	< 50 individuals	No	Survives in fragmented populations within protected lowland evergreen and semi-evergreen forests, favoring forested wetlands and slow-moving rivers. With fewer than 50 mature individuals remaining, habitat loss, hunting, and human disturbance pose severe	Not confirmed	IUCN listed as EN and although it is a restricted range withing dry forest and semi-evergreen habitats. There's no suitable habitat within AoI and therefore it has been screened out	**Out**

[27] **IUCN Red List**: BirdLife International. (2020). *Emberiza aureola*. The IUCN Red List of Threatened Species 2020: e.T22720966A180040113

						threats, making habitat protection crucial for the species' survival.			
Fauna									
Cardamon Shrub Frog	*Philautus cardamonus*	EN	Unknown (very small and declining)	Unknown (very small and declining)	No (endemic)	This small and critically endangered frog species is endemic to the Cardamom Mountains in southwestern Cambodia. Due to its restricted range and the ongoing threats of habitat loss and degradation, its population size is believed to be very small and declining	Not confirmed	IUCN listed as EN and as the Endemic to the Cardamom Mountains between 1,000 and 1,700 meters above sea level. There's no suitable habitat within AoI and therefore it has been screened out	**Out**
River-weed	*Terniopsis chanthaburiensis*	EN	Unknown	Unknown	No	Rare and poorly studied aquatic plant species endemic to Thailand, specifically found in the Chanthaburi Province.	Not confirmed	IUCN listed as EN and as the Endemic to the Thailand and therefore it has been screened out	**Out**

Table 5: Results of the prioritisation exercise to support BAP planning: priority biodiversity for BAP actions for Ou Tapong

Action Category (AC)	Group	Priority Biodiversity	Mitigation and monitoring approach
AC 1 High Priority for habitat mitigation and/or species-specific measures	Mammal	Indochinese Silvered Langur and Long-tailed Macaque	The highest priority for achieving net gain (offset targets) lies in the implementation of both species-specific and habitat-focused mitigation and offset actions.
	Reptiles	Black Marsh Turtle, Elongated Tortoise	
	Birds	Bengal Florican	
	Natural Habitats	Riverine habitat along the main canal where turtles present	
	Protected Areas and Internationally Recognized Areas	Tonle Sap Zone 3, Bakan Protected Landscape	
AC 2	Birds	Greater Adjutant, Milky Stork, Yellow-breasted Bunting	While the likelihood of significant impacts is considered low, the potential consequences are

Contingency planning	Reptiles	Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle	substantial. Proactive mitigation measures should be implemented across the board as a matter of best practice. If impacts are observed, the situation should be escalated to the highest level of concern (Category 1) and species-specific mitigation strategies should be developed and implemented
	Natural Habitat	Somraong Muk-yiek Community Fisheries and Sdok Khloak Community Fisheries	
	Freshwater fish	Siamese Tiger-perch	
	Mammal	Indochinese Silvered Langur and Long-tailed Macaque	
AC 3 General habitat mitigation measures	Freshwater fishes	Siamese Tiger Perch	To minimize anticipated impacts, implement best practices for habitat mitigation. Monitor habitat (or species-specific factors if necessary) to assess the actual impact scale. If monitoring indicates a high likelihood of significant impacts, reclassify the project to Category 1.
	Reptiles		
	Mammals	Hairy-nosed Otter,	
AC 4 Remain aware	Aquatic plant	River-weed *Terniopsis chanthaburiensis*	Potential impacts are anticipated to be minimal. Proactive mitigation measures should be implemented across the project area. Habitat monitoring can serve as an effective indicator to assess the project's actual impact scale.
	Birds	Masked Finfoot, White-winged Duck	

Biodiversity Action Plan (OTP), (if relevant, to achieve net gain)

A comprehensive Biodiversity Action Plan (BAP) should be developed to achieve net gain in biodiversity with a clear outline below:

Biodiversity Action Plan for Ou Tapaong Irrigation Sub-scheme

Executive Summary

This conservation action plan outlines strategies to mitigate potential negative impacts on biodiversity within the Ou Tapaong irrigation scheme. The plan is based on a critical habitat assessment that identified significant biodiversity values in the area, particularly for endangered and critically endangered species. The proposed actions align with the International Finance Corporation's Performance Standard 6 (PS6) on biodiversity conservation and sustainable management of living natural resources.

Key Objectives

Protect critical habitats: Identify and conserve areas crucial for biodiversity, such as flooded forests, wetlands, and rivers.

- Minimize negative impacts: Implement measures to reduce the adverse effects of irrigation scheme development on wildlife and their habitats.
- Enhance biodiversity: Promote habitat restoration and conservation activities to support species recovery.
- Engage with stakeholders: Foster collaboration with local communities and relevant government agencies to ensure effective conservation efforts.

Habitat Mapping

- Map out the different habitats present within the Ou Tapaong Command area. This should include flooded forests, lakes, rivers, waterholes, grasslands, fellows rice fields used by bird species for foraging.

Threat Assessment

- Assess potential threats to critical habitats identified in step 2. Consider factors such as habitat loss due to infrastructure development or land-use changes related to irrigation system renovation.

Mitigation Measures

- Develop mitigation measures specific to each identified critical habitat that align with IFC PS 6 guidance on avoidance of impacts whenever possible; implementation of measures to minimize habitat fragmentation; restoration activities during operations or after project completion; implementation of set-asides for protection; consideration of biodiversity offsets where appropriate based on no net loss principle.
- Carefully design project activities to avoid direct impacts on critical habitats.
- Identify alternative project locations or routes that avoid sensitive areas.
- Modify project designs to minimize the footprint and disturbance of critical habitats.
- Implement temporary measures to protect critical habitats during construction.

Minimization:

- Implement responsible construction practices to minimize adverse effects on critical habitats, such as avoiding unnecessary clearing of vegetation and minimizing soil disturbance.
- Establish effective waste management systems to prevent pollution.
- Implement erosion control measures to prevent sedimentation in aquatic habitats.
- Develop pollution prevention strategies to reduce water and air pollution.

- Habitat Protection and Restoration:
- Establish measures to protect and restore flooded forests, wetlands, and other natural habitats within and around the command area.
- Promote sustainable land use practices like agroforestry, conservation agriculture, and sustainable forest management.

Species Conservation:

- Develop species-specific conservation plans for endangered and threatened species identified in the area.
- Monitor populations of these species regularly and assess their habitat needs
- Consider implementing captive breeding programs or reintroduction efforts if necessary
- Implement habitat management measures that improve the quality and suitability of their habitats

Carbon Sequestration:

- Carbon Sequestration is the process of capturing and storing atmospheric carbon dioxide (CO2). It's a crucial strategy in mitigating climate change by reducing the amount of greenhouse gas in the atmosphere.
- Forest and wetland restoration: Re-establishing or enhancing forest and wetland areas can significantly increase carbon sequestration. These ecosystems act as carbon sinks, absorbing carbon dioxide from the atmosphere.
- Soil carbon enhancement: Implementing agricultural practices that improve soil organic matter content can increase carbon storage in the soil.
- Blue carbon: Protecting and restoring wetland and flooded forest ecosystem, can contribute to carbon sequestration.

Community Engagement:

- ***Involve local communities in biodiversity conservation efforts through participatory planning, monitoring, and implementation***
- ***Educate communities about the importance of biodiversity i nthe sub-scheme area***
- ***Foster community awareness about endangered species present within their vicinity***
- ***Promote sustainable livelihoods that support conservation, such as community-based ecotourism, sustainable*** rice cultivation (eg. Sustainable Rice Flatform, and Organic Rice***, and fisheries management***

Research and Monitoring:

- ***Conduct further research assessing biodiversity and ecological processes within Ou Tapaong Irrigation Sub-Scheme***
- ***Establish long-term monitoring programs to track changes in biodiversity and habitat conditions which will provide valuable data for evaluating the effectiveness of ongoing conservation efforts***

Sustainable Water Management:

- Ensure irrigation systems and water use practices do not harm critcal haibitats. Optimise irrigation efficiency, reducing water pollution and protecting water sources.

Biodiversity Offsets:

- If significant residual impacts are expected despite avoidance and minimisation measures, biodiversity.

Budget for the Implementation of the Biodiversity Action Plan for Ou Ta Paong

No.	Items	Unit	Qty	Cost	Total
3	Implementing Biodiversity Management Plan	Year			1,000,000
3.1	**Restoration:** Implement the restoration of damaged or degraded critical habitats including reforestation, wetland restoration, habitat connectivity initiatives, and soil remediation measures over 5 years	Times	10	5,000	50,000
3.2	**Habitat Protection**				
3.2.1	Conduct continuous patrolling activities (1 time per months)	Times	60	500	30,000
3.2.2	Demarcation for the boundary of the critical habitats and nearby protected areas and community fisheries boundaries (mapping, pole posting, conflict resolution, etc.)	Poles	200	250	50,000
3.2.3	Support community patrols (2 community fisheries)	Year	5	15,000	75,000
3.2.4	Support ranger join patrol within zone 3	Year	5	18,000	90,000
3.3	**Species Conservation**				
3.3.1	Set up and train community-based biodiversity monitoring teams (1 training/year x 5 years)	Training	5	1,000	5,000
3.3.2	Conduct monthly biodiversity monitoring and protection	Year	5	14,000	70,000
3.3.3	Monitor populations of these species regularly and assess their habitat needs for 5 years	Lum-sump	5	10,000	50,000
3.3.4	Implement captive breeding programs or reintroduction efforts if necessary	Year	5	15,000	75,000
3.3.5	Implement habitat management measures that improve the quality and suitability of their habitats	Lum-sump	5	18,000	90,000
3.4	Implementing Community Based Carbon Sequestration program for community people for 5 years	Lum-sump	5	10,000	50,000
3.5	**Community Engagement**				
3.5.1	Conduct community awareness raising about the importance of biodiversity in the sub-scheme area for 5 years and 10 locations in OTP	Times	50	1,500	75,000
3.5.2	Involve local communities in biodiversity conservation efforts through participatory planning, monitoring, and implementation	Lum-sump	5	10,000	50,000
3.5.3	Promote sustainable livelihoods that support conservation, such as community-based ecotourism, handicraft, and fisheries management for 5 years 1. Train and provide capacity building to farmer on agroforestry, and SMART agriculture pratices 2. Provide training on community-based ecotourism and natural resource protection	Lum-sump	5	18,000	90,000

No.	Items	Unit	Qty	Cost	Total
	3. Promote wildlife friendly products and community market				
3.6	Establish long-term monitoring programs to track changes in biodiversity and habitat conditions 1. Forest fire monitoring and firefighting 2. Remote sensing analysis-based satellite image data 3. Conduct annual land used and land cover study	Lum-sump	5	15,000	75,000
3.7	Promote biodiversity offsets for conservation activities to community people (5 years) 1. Tree nursery preparation 2. Tree planting, maintaining and monitoring	Lum-sump	5	15,000	75,000
	Total cost for over 5-year period				**1,000,000**

Annex 7: Chance Find Procedure

1. Purpose, Objectives and Scope

Construction of small infrastructure and facilities as well as livelihood supports related activities under the CAISAR project has the potential to alter tangible or intangible cultural heritages, unknown or unrecorded cultural and archaeological sites. The project will develop Chance Finds Procedure to define the steps on how Chance Finds will be managed once they have been discovered. MOWRAM PMU will ensure contractors and livelihood experts to be familiar with the possibility that they may discover unknown finds and know how to manage them.

The objectives of the Chance Finds Procedure are to:

- Define the steps which must be followed to manage the discovery of previously unknown sites, including the preservation and appropriate treatment of these finds, while minimizing any disruption to the construction schedule
- Enable compliance with all relevant national laws and regulations and other requirements.

MOWRAM PMU will make sure that the Chance Finds Procedure will be applied by all CAISAR contractors/ subcontractors at subproject sites.

2. Procedure and Implementation

Consultation. MOWRAM PMU will consult with all relevant parties, including relevant ministries at national level, provincial line technical departments, and district authority, in order to agree to the Chance Finds Procedure.

Laboratory and Other Support. MOWRAM PMU, with technical support from the Ministry of Culture and Fine Art and its provincial departments, will make arrangements for suitable laboratory test and other necessary facilities at provincial level or national level for identifying the find objects.

Training and Awareness. Where necessary, MOWRAM PMU, with support from cultural expert, will develop and implement a Cultural Heritage Training and Awareness. The training and awareness will include basic training in the identification of sites and objects relevant to the subproject sites, including the cultural significance of IC communities. The training and awareness shall be delivered to all relevant project implementation agencies at sub-national level, contractor, and subcontractor prior to their participation in subproject activities.

3. Implementation & Monitoring

Monitoring shall require the appropriately trained personnel to determine the significance of a chance find in accordance with the definitions provided in the CAISAR project's Cultural Heritage Management Framework and follow the Chance Find Flowchart provided in

Attachment 1.

Attachment 1 - Chance Find Flowchart

- Bound copy of Chance Finds Report Forms presented to MOWRAM PMU and provincial representative
- Verification of each Chance Find Report Forms to Chance Finds items completed
- Chance finds appropriately packed and labelled
- Inventory of Chance Finds Items placed inside packed boxes
- Outstanding issues relating to any or all of the above have been resolved
- MOWRAM PMU or provincial representative accepts transfer of Chance Finds items from contractor to relevant provincial department of Culture and Fine Art.

Contractor Representative	MOWRAM PMU Representative	Provincial Representative
Name	Name	Name
Signature	Signature	Signature
Date	Date	Date

4. Stop Work

a) Once cultural heritage objects sites are identified, contractor or sub-contractor shall immediately stop work within an approximate distance of the site.

b) Contractor/sub-contractor shall call MOWRAM PMU and provincial level to the location to make a rapid determination of the significance of the find.

c) Contractor/sub-contractor shall, in the event that a site of potentially high significance is discovered, demarcate, and secure the area.

d) MOWRAM PMU, provincial Department of Culture and Fine Arts and contractor shall evaluate sites or objects in accordance with the procedure required by the Ministry of Culture and Fine Arts.

e) If threated species such as animal and trees are found, these species must be kept intact, protected, and immediately reported to relevant site managers for appropriate handling. Wild animals spotted on the construction sites must not be caught for sale and/or consumption in any way.

5. Management of Chance Finds

In case the chance find site is a highly significant cultural sites, contractor and MOWRAM PMU shall work together to determine any requirements for community engagement accordance to ESS10. The team will seek out and consult with the affected stakeholders and establish the appropriate action.

Management Options. The following management options will be considered:

- **Avoidance** to minimizes the impact to the site through partial or complete project redesign or relocation, should be the preferred option for cultural resource management perspective.
- **In-situ Management** This option includes the application of site protection measures. Appropriate protection measures will be identified and agreed between MOWRAM PMU, contractor, provincial department of culture and fine arts, and the local authority on a site-specific basis.
- **Destruction** If a site is assessed as having limited cultural significance, it may be destroyed once a complete photographic record has been made and the Chance Finds Report Form has been completed.

6. Reporting

All cultural heritage sites will be reported to MOWRAM PMU and provincial level and national level as part of contractor's monthly report, and will include a summary of:

- An update of the Key Performance Indicators
- Incidents of disturbance to known cultural heritage sites
- All cultural heritage sites identified, distinguishing between known and chance finds
- All Chance Finds, etc.

Annex 8: Summary of Stakeholder Consultation

This section summarizes four consultation rounds carried out during the project preparation phase. These consultations involved discussions with relevant institutions, non-governmental organizations, local authorities, and local communities throughout the preparation process. The data collection and consultations were conducted over four periods:

1. First consultation

- The first consultation was conducted between 26 and 28 July 2024 to capture information regarding biodiversity and environmental condition in the project area.

2. Second consultation

- The second consultation was conducted to consult with forestry and fishery communities, local authorities and key informants to understand the situation and concerns related to the presence of the project. The consultation was conducted between 03 and 09 August 2024.

3. Result of consultation

- The information gathered from the key informant interviews highlighted several confirmed species present within Ou Ta Paong Irrigation Sub-scheme's command area. These included a variety of reptiles such as Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle along with Elongated Tortoise amongst others. Additionally Indochinese Silvered Langur and Long-tailed Macaque were among those mammal speices confirmed to be present by informants while striped catfish and Siamese Tiger Perch stood as confirmed fish species recorded in this area. Furthermore, among bird speices Greater Adjutant, Milky Stork, Bengal Florican were also amongst others that have been successfully verified to be living in this region.
- Proposed project activities: Given the critical habitats identified and the biodiversity assessment results, proposed project activities must prioritize conservation measures.

4. Third consultation

- The third consultation was conducted at household, village, and commune level stakeholders focusing on status, concerns and feedback regarding the project implementation. This consultation was conducted between 10 and 18 August 2024.
- The Ou Ta Paong sub-schemes have a predominantly young population, which suggests strong potential for future development, though higher education levels are low. Agriculture is the main occupation, with 10% engaged in full-time private sector work. For secondary jobs, rice and crop production are most common. About 9% of the population falls under poor categories 1 and 2, indicating economic challenges, while 1.1% are people with disabilities. Migration is notable, with 16% moving within the country and 13% abroad, totaling 29% of the population.
- Moreover, both men and women share together for household chore, agricultural

involvement and decision making.

Table 1. List of participants of KII and FGD in Ou Ta Paong Command area

No	Name	Sex	Position	Commune	District
Key Informant Interview					
1	Chhut Vandy	M	Deputy Village Chief	Svay Doun Keo	Bakan
2	Vann Sorng	M	Deputy Village Chief	Svay Doun Keo	Bakan
3	Hach Pat	M	Village Chief	Rumlech	Bakan
4	Kae Vanna	M	Village Chief	Boeng Khnar	Bakan
5	Yaet Horn	M	Village Chief	Ou Ta Paong	Bakan
6	Voa Saren	M	Village Chief	Ou Ta Paong	Bakan
7	Tol Nhib	M	Village Chief	Ou Ta Paong	Bakan
8	Doung Savy	M	Village Chief	Ou Ta Paong	Bakan
9	Chhut Vandy	M	Deputy Village Chief	Svay Doun Keo	Bakan
10	Deuk Kimhean	M	Commune Council	Svay Doun Keo	Bakan
11	Un Samart	M	Commune Council	Svay Doun Keo	Bakan
12	Moung Moeun	M	Commune Council	Svay Doun Keo	Bakan
13	Sok Chanthy	M	Commune Council	Svay Doun Keo	Bakan
14	Long Tang	M	Commune Council	Svay Doun Keo	Bakan
15	Chhum Phally	F	Commune Council	Rumlech	Bakan
16	Tang Rebanglay	F	Commune Council	Boeng Khnar	Bakan
17	Meng Chhorn	F	Commune Council	Ou Ta Paong	Bakan
18	Hul Sereyvathana	F	Commune Council	Ou Ta Paong	Bakan
Focus Group Discussion					
1	Sean Soeurn	F	Vegetable Farmer	Rumlech	Bakan
2	Bo Sokban	F	Vegetable Farmer	Rumlech	Bakan
3	Kann Noeurn	M	Vegetable Farmer	Rumlech	Bakan
4	Chhin Rou	F	Vegetable Farmer	Rumlech	Bakan
5	Moung Touch	M	Vegetable Farmer	Boeng Khnar	Bakan
6	Chou Rath	F	Vegetable Farmer	Boeng Khnar	Bakan
7	Nhim Roeurn	F	Vegetable Farmer	Ou Ta Paong	Bakan
8	Vann Sary	F	Vegetable Farmer	Ou Ta Paong	Bakan
9	Phin Siem	F	Vegetable Farmer	Ou Ta Paong	Bakan
10	Huy Soy	F	Vegetable Farmer	Ou Ta Paong	Bakan
11	Nhen Sol	M	Vegetable Farmer	Ou Ta Paong	Bakan
12	Chum Khorn	F	Vegetable Farmer	Ou Ta Paong	Bakan
13	Chhean Sang	F	Vegetable Farmer	Ou Ta Paong	Bakan
14	Soun Sitha	F	Vegetable Farmer	Ou Ta Paong	Bakan
15	Soeurng Soeurn	M	Rice Farmer	Rumlech	Bakan
16	Boem Hil	M	Rice Farmer	Rumlech	Bakan
17	Soeurng Seng	M	Rice Farmer	Rumlech	Bakan
18	Kon Chantha	M	Rice Farmer	Rumlech	Bakan
19	Kann Noeurn	M	Rice Farmer	Rumlech	Bakan
20	Sien Hean	M	Rice Farmer	Rumlech	Bakan
21	Em Kong	M	Rice Farmer	Svay Doun Keo	Bakan
22	Chhut Bunchhai	M	Rice Farmer	Svay Doun Keo	Bakan
23	Kov Keo	M	Rice Farmer	Svay Doun Keo	Bakan
24	Uk Chenda	F	Rice Farmer	Svay Doun Keo	Bakan
25	Kim Sophal	M	Rice Farmer	Ou Ta Paong	Bakan

26	Tuy Savoeurn	F	Rice Farmer	Ou Ta Paong	Bakan
27	Kim Sak Sakhorn	M	Rice Farmer	Ou Ta Paong	Bakan
28	Khim Soeurn	M	Rice Farmer	Ou Ta Paong	Bakan
29	Net Borey	M	Rice Farmer	Ou Ta Paong	Bakan
30	Meng Chhaoet	M	Rice Farmer	Ou Ta Paong	Bakan
31	Em Pa	M	Rice Farmer	Boeng Khnar	Bakan
32	Nhim Sophal	M	Rice Farmer	Boeng Khnar	Bakan
33	Kae Sophal	M	Rice Farmer	Boeng Khnar	Bakan
34	Mai Phorn	M	Rice Farmer	Svay Doun Keo	Bakan
35	Sorng Kimsoeurn	M	Rice Farmer	Svay Doun Keo	Bakan
36	Long Phalla	M	Rice Farmer	Svay Doun Keo	Bakan
37	Ly Neang	F	Rice Farmer	Ou Ta Paong	Bakan
38	Von Morng	M	Rice Farmer	Ou Ta Paong	Bakan
39	Sieng Sokchea	M	Rice Farmer	Ou Ta Paong	Bakan
40	Men Leang	M	Rice Farmer	Ou Ta Paong	Bakan
41	An Roun	F	Rice Farmer	Ou Ta Paong	Bakan
42	Nhim Roeurn	F	Chicken Farmer	Ou Ta Paong	Bakan
43	Vann Sary	F	Chicken Farmer	Ou Ta Paong	Bakan
44	Phin Siem	F	Chicken Farmer	Ou Ta Paong	Bakan
45	Huy Soy	F	Chicken Farmer	Ou Ta Paong	Bakan
46	Nhen Sol	M	Chicken Farmer	Ou Ta Paong	Bakan
47	Chum Khorn	F	Chicken Farmer	Ou Ta Paong	Bakan
48	Chhean Sang	F	Chicken Farmer	Ou Ta Paong	Bakan
49	Soun Sitha	F	Chicken Farmer	Ou Ta Paong	Bakan
50	Hun Chan	F	Chicken Farmer	Ou Ta Paong	Bakan
51	Voeurn Phal	F	Chicken Farmer	Ou Ta Paong	Bakan
52	Thy Channa	F	Chicken Farmer	Ou Ta Paong	Bakan
53	Khin Niem	F	Chicken Farmer	Ou Ta Paong	Bakan
54	Thoeng Chantha	M	Chicken Farmer	Ou Ta Paong	Bakan
55	Pat Pov	M	Duck Farmer	Svay Doun Keo	Bakan
56	Chin Voeurn	F	Duck Farmer	Svay Doun Keo	Bakan
57	Loat Phung	F	Duck Farmer	Svay Doun Keo	Bakan
58	Nhim Nhenh	M	Duck Farmer	Ou Ta Paong	Bakan
59	Chorn Nan	F	Duck Farmer	Ou Ta Paong	Bakan
60	Nhenh Channy	F	Duck Farmer	Ou Ta Paong	Bakan
61	Sao Bunthoeurn	M	Duck Farmer	Ou Ta Paong	Bakan

Figure 1: Household survey in Ou Ta Paong commune



5. Fourth Consultation

The last consultation was conducted between 21 and 23 August 2024 with the district and provincial stakeholders, mainly focusing on the opinion, and feedback regarding the implementation of the project.

6. Consultation Results

6.1 Environment and Biodiversity Component

6.1.1 Pollution prevention and resource efficiency

Concerns

- The rehabilitation of irrigation canals and farm roads can disturb environmental effects.
- Large machines can generate noise and vibration pollution, which can disturb nearby residents and wildlife.
- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site can negatively impact local air quality and surface water.

Suggestions

- Avoid construction at night.
- Install garbage bins and waste storage areas in the construction sites and conduct orientation workers to put the waste in the garbage bins.

- Government institutions and stakeholders should regularly conduct site to inspect project activities that harm the environment and local community.

6.1.2 Biodiversity

Concerns

- The CAISAR project may cause negative impact on the environment, including changes in water quality, dust generation, air pollution, soil erosion, improper waste disposal, and hazardous waste from machinery.
- The project could disrupt the natural flow of water from upstream to Tonle Sap Lake, potentially harming the lake's biodiversity.
- Fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the reirrigation infrastructure and canal upgrading.

Suggestions

- The contractors and relevant parties should conduct water quality and air quality monitoring during construction.
- Contractors must regularly monitor and inspect the living conditions of the workers, manage waste effectively, and provide adequate housing and sanitation facilities to them.
- Providing comprehensive training to workers on proper waste and oil management procedures.
- Activities such as fishing and hunting should be strictly prohibited to minimize environmental impact.
- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.
- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.

6.1.3 GHG Emission

Concerns

- Climate change is negatively impacting rice production, causing problems such as insect infestations, and extended dry seasons,
- Waste and pollution may contribute to the emission of GHG

Suggestions

- The contractors should ensure that garbage bins are conveniently placed throughout the workers' camp and collaborates with a waste collection company to guarantee regular and efficient removal of waste.
- To minimize emissions, contractors are advised to refrain from using outdated machinery.

6.2 Social Component

6.2.1 Labor and Working Conditions

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.

Suggestions

- The construction companies should hire local workers to offer them jobs and strictly abide to laws and reducing the concerns about gender-based violence or sexual violent.
- Construction companies and relevant departments should provide training on gender issues, violence, labour laws, and social protection to their staff and workers.
- The project should allocate the budget for relevant line departments to conduct relevant trainings to the companies and workers, and to monitor the construction sites

6.2.2 Community Health and Safety

Concerns

- Participants remain concerned that the presence of workers could result in sexual abuse of women and children living near the project site,
- Drug trafficking and consumption among workers may cause unsafe environment for both workers and surrounded residents,
- The construction activities may generate dust and slippery road conditions which may lead to traffic incidents,
- Waste generated from worker camps and construction activities during the project could degrade water quality, negatively impacting human health, livestock, and crops.

Suggestions

- The construction companies should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community,
- The project should promote gender awareness, enforce stricter punishments for offenders, and prevent drug trafficking in the workplace,
- The construction companies must collaborate with local authorities in all activities to make a proper management, control and monitoring during construction, and
- The project should conduct gender education at the district to prevent and address gender-based violence,

6.2.3 Land acquisition, economic and physical displacement

Concerns

- Conflicts between the project and affected families may arise, often driven by external influences rather than the families themselves.

- Land-owning farmers might lose their land for agriculture, which could compel them to migrate.

Suggestions

- The project should conduct a preliminary study on land issues before construction is going to be implemented, addressing specific aspects of land impact and conducting evaluations for each affected property,
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project,
- Farmers who own land may lose it for farming, which could force them to migrate, heightening their vulnerability to exploitation.

6.2.4 Cross–cutting risks and impacts

Concerns

- Unequal water distribution among farmers leads to conflicts.
- Institutions or companies responsible for establishing FWUCs are typically based at the national level, resulting in limited quality implementation weakening the FWUCs as PDWRAM is sidelined.
- The FWUCs struggle to generate income, making water management challenging, as there is no budget for repairs, leading to improper system operations.
- Farmers face various challenges such as pests, diseases, labor shortages, lack of capital, limited production techniques, flooding, unstable prices for vegetables and livestock, and high agricultural input costs.
- The provincial department lacks the budget to support the resolution of water user conflicts.
- Some farmers are absent from the rice fields during water distribution periods.
- Tensions between upstream and downstream villages arise when excess water released upstream during the wet season causes downstream flooding, while in the dry season, insufficient upstream water flow impacts downstream areas.
- High agricultural input costs continue to reduce farmers' profitability.
- Farmers do not follow official guidance on the size of rice fields to be cultivated, leading to inadequate water for irrigation.

Suggestions

- PDWRAM should be the leader in formulating the FWUCs with the support from national level,
- Water use and maintenance support should be provided including technical and management training, along with problem-solving techniques, to effectively control and manage water distribution,
- The project should thoroughly examine the water availability, technical and situational aspects of the sub-scheme before construction to prevent water shortages or flooding,

- Ensure transparent water supply to prevent disputes by holding meetings to plan water use and distribution, involving the district governor, commune council, and relevant stakeholders,
- All parties should also participate in the maintenance of the irrigation system and provide training or education on water conservation to farmer.
- Prior to starting irrigation rehabilitation, disseminate project information to people and stakeholders, and announce the construction period in advance.
- The water consumption fee should be gathered from farmers which could be used later to support caretaker and maintenance the irrigation system.
- Increase the number of commune agricultural technical officers to provide training and monitor farmers' cultivation techniques.
- Build more water storage, and reservoir such as ponds or wells and conduct training on water-saving techniques to adapt to actual water availability.
- Installing and upgrading the damaged sluice gates to improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Facilitate the development of additional agricultural markets.
- Providing modern equipment and new techniques to department officers can enhance agricultural production efficiency and yield.

Table 2. List of participants during the fourth consultation meeting

No	Name	Sex	Position	Organization
1	Lay Viseth	M	Deputy Provincial Governor	Pursat Provincial Hall
2	Hun Sovan	M	Deputy Director	DAFF
3	Meas Set	M	Head of Office	DAFF
4	Kit Phal	M	Deputy Director	DoWRM
5	Lao Sokha	M	Deputy Director	DoWRM
6	Ra Sovanret	M	Deputy Head of Office	DoWRM
7	Mao Mina	M	Deputy Head of Office	DoWRM
8	Kol Buntheuorn	M	Director	DoLVT
9	Morn Kimsoeurn	M	Deputy Director	DoWA
10	Teou Sonary	F	Head of Health Office	DoWA
11	Kruoch Bunly	M	Officer	DoWA
12	Dang Rady	M	Head of Office	DoE
13	Lay Vannak	M	Deputy Head of Office	DoE
14	Suong Se	M	Deputy Director	DoLMUPC
15	Ut Raksa	M	Deputy Director	DoCFA
16	Chea Sophea	M	Head of Office	DoCFA
17	Teng Phearum	M	Deputy Head of Office	DoCFA
18	Phang Polin	M	CEO	Sustainable Cambodia Organization
19	Ok Seab	M	Manager	Sustainable Cambodia Organization
20	Ruon Phorn	F	Project Staff	Lutheran Hope Cambodia Organization
21	Khorn Sokluk	M	Director	HEKS - EPER Cambodia Organization
22	Khiev Raning	M	Deputy District Governor	Bakan District Hall
23	Chea Heng	M	Deputy District Governor	Bakan District Hall

24	Sam Sophun	M	Chairman of District Council	Bakan District Hall
25	Vann Sokhon	F	Head of Agriculture Office	Bakan District Hall
26	Him Makara	F	Head of Social Office	Bakan District Hall

Figure 2: Consultation with Provincial Department of Women Affaire, Pursat Province



Figure 3: Consultation with Provincial Department of Water Resources and Meteorology, Pursat Province



Figure 4: Consultation with District officer at Bakan District, Pursat Province



Annex 9: Laboratory Testing Result

Groundwater Quality Testing Result **273**
Surface Water Quality Testing Result **274**
Results of Soil Laboratory Testing **277**

Groundwater Quality Testing Result

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន លេប

WATER INNOVATION LAB

ផ្លូវជាតិលេខ៧ ភូមិអំពិលក្រោម ឃុំអំពិល ស្រុកកំពង់សៀម ខេត្តកំពង់ចាម

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Date: 19 August 2024
Reference No: 240005

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	GW1	Water Source:	Well Pump
Client:	PPIC	Province:	Pursat
Date received:	11-Aug-24	District:	Bakan
Collection date:	10-Aug-24	Commune:	Ou Ta Paong
Preservation:	HNO3/Ice box	Village:	Oknha Moan

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.003	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.0004	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.01		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	345.8	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	13		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	6.4	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.3	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	14,065	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	691.4	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.4	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	1.92	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

WATER INNOVATION LAB KINGDOM OF CAMBODIA

Samrach Phan

Surface Water Quality Testing Result

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន លេប

WATER INNOVATION LAB

ផ្លូវជាតិលេខ៧ ភូមិអំពិលក្រោម ឃុំអំពិល ស្រុកកំពង់សៀម ខេត្តកំពង់ចាម

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Date: 19 August 2024
Reference No: 240008

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW1	Water Source:	River
Client:	PPIC	Province:	Pursat
Date received:	11-Aug-24	District:	Bakan
Collection date:	10-Aug-24	Commune:	Rumlech
Preservation:	HNO3/Ice box	Village:	Prasat

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.32		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	30.76	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	11		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	4.8	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.8	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	50,200	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	61.4	0.0	
11	Temperature	Electrode	°C	10-Aug-24	31.3	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.34	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

WATER INNOVATION LAB

KINGDOM OF CAMBODIA

Samrach Phan

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន លេប

WATER INNOVATION LAB

ផ្លូវជាតិលេខ៧ ភូមិអំពិលក្រោម ឃុំអំពិល ស្រុកកំពង់សៀម ខេត្តកំពង់ចាម

National Road 7, Ampil Krom Village, Ampil Commune, Kampong Siem District, Kampong Cham 030501, Cambodia

E-mail: lab@wil-kh.com; Tel: +855-16-668 900

Date: 19 August 2024
Reference No: 240009

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW2	Water Source:	Canal
Client:	PPIC	Province:	Pursat
Date received:	11-Aug-24	District:	Bakan
Collection date:	10-Aug-24	Commune:	Ou Ta Paong
Preservation:	HNO3/Ice box	Village:	Bat KoKir Thmei

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.2		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	38.07	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	29		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	3.8	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.6	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	38,750	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	76.12	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.8	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.6	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

WATER INNOVATION LAB KINGDOM OF CAMBODIA

Samrach Phan

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន លេប

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National Road 7, Ampil Krom Village, Ampil Commune, Kampong Siem District, Kampong Cham 030501, Cambodia

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Date: 19 August 2024
Reference No: 240010

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW3	Water Source:	River
Client:	PPIC	Province:	Pursat
Date received:	11-Aug-24	District:	Bakan
Collection date:	10-Aug-24	Commune:	Ou Ta Paong
Preservation:	HNO3/Ice box	Village:	Ta Nai

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.44		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	40.71	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	39		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	3.5	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.4	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	31,650	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	81.43	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.9	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.7	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

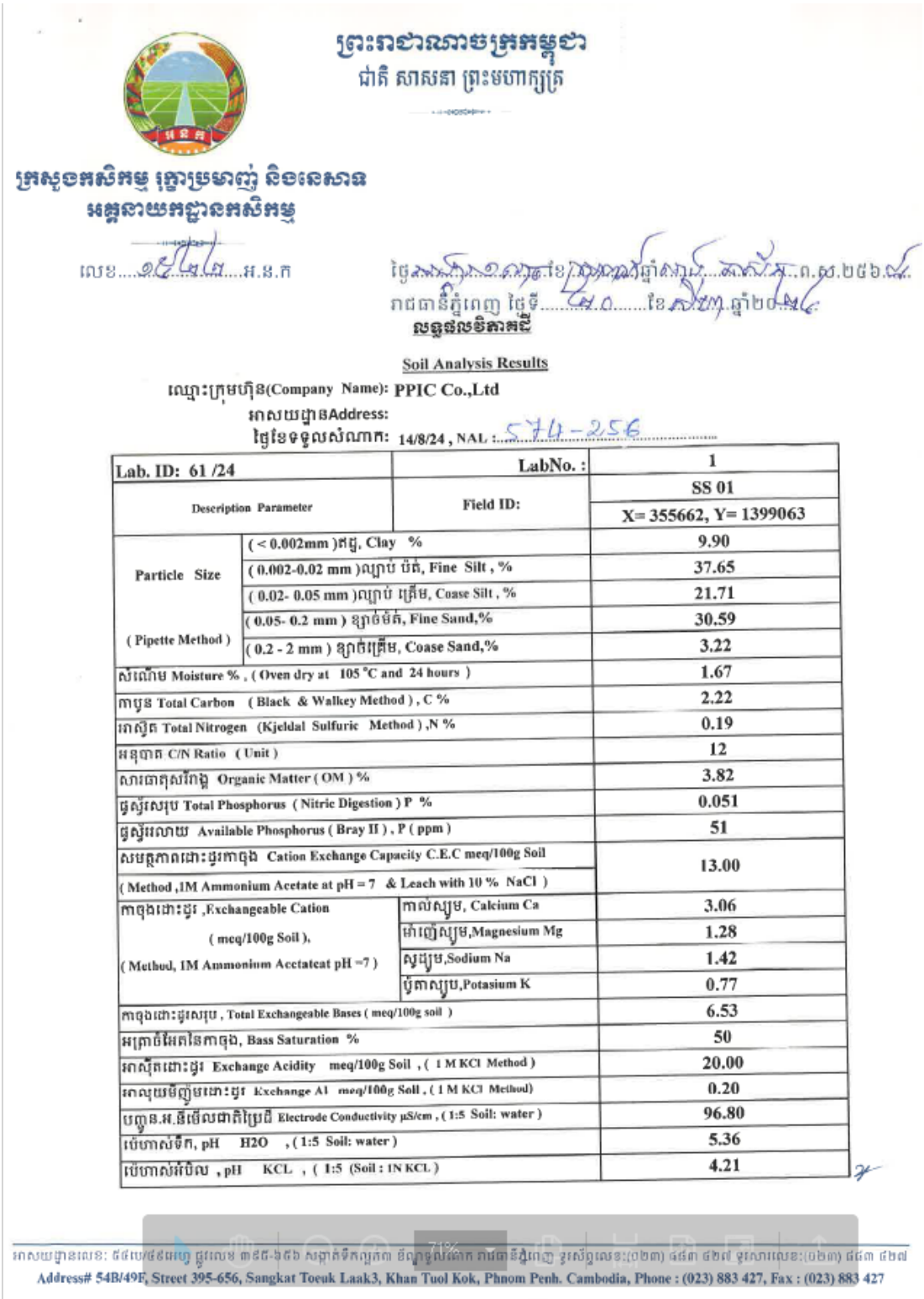
Kampong Cham, 19 August 2024

Verified by

Lab Director

Samrach Phan

Results of Soil Laboratory Testing



ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ
អគ្គនាយកដ្ឋានកសិកម្ម

លេខ.....អ.ន.ក

ថ្ងៃ.....ខែ.....ឆ្នាំ.....ព.ស.២៥៦.....
រាជធានីភ្នំពេញ ថ្ងៃទី.....ខែ.....ឆ្នាំ២០.....

លទ្ធផលវិភាគដី

Soil Analysis Results

ឈ្មោះក្រុមហ៊ុន(Company Name): **PPIC Co.,Ltd**

អាសយដ្ឋានAddress:

ថ្ងៃខែទទួលសំណាក: 14/8/24 , NAL :574-256

Lab. ID: 61 /24		LabNo. :	1
Description Parameter		Field ID:	SS 01
			X= 355662, Y= 1399063
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		9.90
	(0.002-0.02 mm)ល្បាប់ ម៉ដ់, Fine Silt , %		37.65
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		21.71
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ់, Fine Sand,%		30.59
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		3.22
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			1.67
កាបូន Total Carbon (Black & Walkey Method) , C %			2.22
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.19
អនុបាត C/N Ratio (Unit)			12
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.82
ផូស្វ័សេរុប Total Phosphorus (Nitric Digestion) P %			0.051
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			51
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil (Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			13.00
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)	កាល់ស្យូម, Calcium Ca		3.06
	ម៉ាញ៉េស្យូម,Magnesium Mg		1.28
	សូដ្យូម,Sodium Na		1.42
	ប៉ូតាស្យូម,Potasium K		0.77
កាចុងដោះដូរសេរុប , Total Exchangeable Bases (meq/100g soil)			6.53
អត្រាចំអែតនៃកាចុង, Bass Saturation %			50
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			20.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.20
បញ្ជូន.អ.ឌីមើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			96.80
ប៉ែហាសទឹក, pH H2O , (1:5 Soil: water)			5.36
ប៉ែហាសអំបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.21

អាសយដ្ឋានលេខ: ៥៤ប/៤៩ផ្លូវ ផ្លូវលេខ ៣៩៥-៦៥៦ សង្កាត់ទឹកល្អក់៣ ខ័ណ្ឌទួលគោក រាជធានីភ្នំពេញ ទូរស័ព្ទលេខ:(០២៣) ៨៨៣ ៤២៧ ទូរសារលេខ:(០២៣) ៨៨៣ ៤២៧
Address# 54B/49F, Street 395-656, Sangkat Toeuk Laak3, Khan Tuol Kok, Phnom Penh. Cambodia, Phone : (023) 883 427, Fax : (023) 883 427

Lab. ID: 61 /24		LabNo. :	2
Description Parameter		Field ID:	SS 02
			X= 354509, Y= 1406852
Particle Size (Pipette Method)	(< 0.002mm)ដីដូ, Clay %		14.01
	(0.002-0.02 mm)ល្បាប់ ម៉ត់, Fine Silt , %		35.55
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		22.69
	(0.05- 0.2 mm) ខ្សាច់ម៉ត់, Fine Sand,%		32.75
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		2.32
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			1.73
កាបូន Total Carbon (Black & Walkey Method) , C %			1.84
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.16
ផូស្វ័សសរុប Total Phosphorus (Nitric Digestion) P %			0.043
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			41
សមត្ថភាពដោះដូរកាថុង Cation Exchange Capacity C.E.C meq/100g Soil			12.40
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាថុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)		កាល់ស្យូម, Calcium Ca	3.77
		ម៉ាញ៉េស្យូម,Magnesium Mg	1.38
		សូដ្យូម,Sodium Na	0.75
		ប៉ូតាស្យូម,Potasium K	0.27
កាថុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			6.17
អត្រាចំអែតនៃកាថុង, Bass Saturation %			50
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			15.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បញ្ជូន.អ.នីមើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			36.10
ប៉េហាស់ទឹក, pH H2O , (1:5 Soil: water)			5.29
ប៉េហាស់អំបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.12

2

Lab. ID: 61 /24		LabNo. :	3
Description Parameter		Field ID:	SS 03
			X=441471, Y=1355655
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		1.23
	(0.002-0.02 mm)ល្បាប់ ម៉ត់, Fine Silt , %		3.40
	(0.02- 0.05 mm)ល្បាប់ គ្រឹម, Coase Silt , %		5.23
	(0.05- 0.2 mm) ខ្សាច់ម៉ត់, Fine Sand,%		33.52
	(0.2 - 2 mm) ខ្សាច់គ្រឹម, Coase Sand,%		55.72
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			0.20
កាបូន Total Carbon (Black & Walkey Method) , C %			1.80
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.10
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.046
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			46
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil			10.00
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)	កាល់ស្យូម, Calcium Ca		3.56
	ម៉ាញ៉េស្យូម,Magnesium Mg		1.58
	សូដ្យូម,Sodium Na		0.30
	ប៉ូតាស្យូម,Potasium K		0.13
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			5.57
អត្រាចំអែតនៃកាចុង, Bass Saturation %			56
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			5.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.04
បញ្ជូន.អ.ន៏មើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			99.30
ប៉េហាសនីក, pH H2O , (1:5 Soil: water)			7.67
ប៉េហាសអំបិល , pH KCL , (1:5 (Soil : 1N KCL)			6.51

3

Lab. ID: 61 /24		LabNo. :	4
Description Parameter		Field ID:	SS 04
			X=465450, Y=1304887
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		14.95
	(0.002-0.02 mm)ល្បាប់ ម៉ដ្ត, Fine Silt , %		30.00
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		19.81
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ្ត, Fine Sand,%		31.12
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		5.92
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			2.64
កាបូន Total Carbon (Black & Walkey Method) , C %			1.63
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.14
អនុបាត C/N Ratio (Unit)			12
សារធាតុសរីរាង្គ Organic Matter (OM) %			2.80
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.044
ផូស្វ័រអាឡាយ Available Phosphorus (Bray II) , P (ppm)			29
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil			16.50
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)		កាល់ស្យូម, Calcium Ca	8.30
		ម៉ាញ៉េស្យូម,Magnesium Mg	2.37
		សូដ្យូម,Sodium Na	2.57
		ប៉ូតាស្យូម,Potasium K	0.36
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			13.60
អត្រាចំរែតនៃកាចុង, Bass Saturation %			70
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			10.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បណ្តាន.អ.ទឹមើលជាតិប្រៃជី Electrode Conductivity µS/cm , (1:5 Soil: water)			108.40
ប៉ែហាស់ទឹក, pH H2O , (1:5 Soil: water)			7.41
ប៉ែហាស់អំបិល , pH KCL , (1:5 (Soil : 1N KCL)			6.23

4

Lab. ID: 61 /24		LabNo. :	5
Description Parameter		Field ID:	SS 05
			X=469604 , Y=1306117
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		7.30
	(0.002-0.02 mm)ល្បាប់ ម៉ដ, Fine Silt , %		21.10
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		11.70
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ, Fine Sand,%		30.29
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		28.78
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			2.62
កាបូន Total Carbon (Black & Walkey Method) , C %			1.87
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.22
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.094
ផូស្វ័រអាចយក Available Phosphorus (Bray II) , P (ppm)			37
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil (Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			16.30
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)		កាល់ស្យូម, Calcium Ca	5.43
		ម៉ាញ៉េស្យូម,Magnesium Mg	1.48
		សូដ្យូម,Sodium Na	1.50
		ប៉ូតាស្យូម,Potasium K	0.35
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			8.76
អត្រាចំរែតនៃកាចុង, Bass Saturation %			54
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			10.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បញ្ជូន.អ.ន៏មើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			63.00
ប៉ូហាស់ទឹក, pH H2O , (1:5 Soil: water)			5.66
ប៉ូហាស់អំបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.47

ចំណាំ:លទ្ធផលនៃការវិភាគមានតម្លៃតែលើសំណាកដែលបានបញ្ជូនមកវិភាគតែប៉ុណ្ណោះ(Note:Analysis result refers to the sumitted sample only).

ប្រធានមន្ទីរសោធន៍ជាតិកសិកម្ម

បានឃើញ និងឯកភាព
ប្រតិភូរាជរដ្ឋាភិបាលកម្ពុជាទទួលបន្ទុកជាអគ្គនាយក
នៃអគ្គនាយកដ្ឋានកសិកម្ម

អគ្គនាយករង

ហ៊ុ ពុទ្ធា

Annex 10: List of Archeological and Cultural Sites

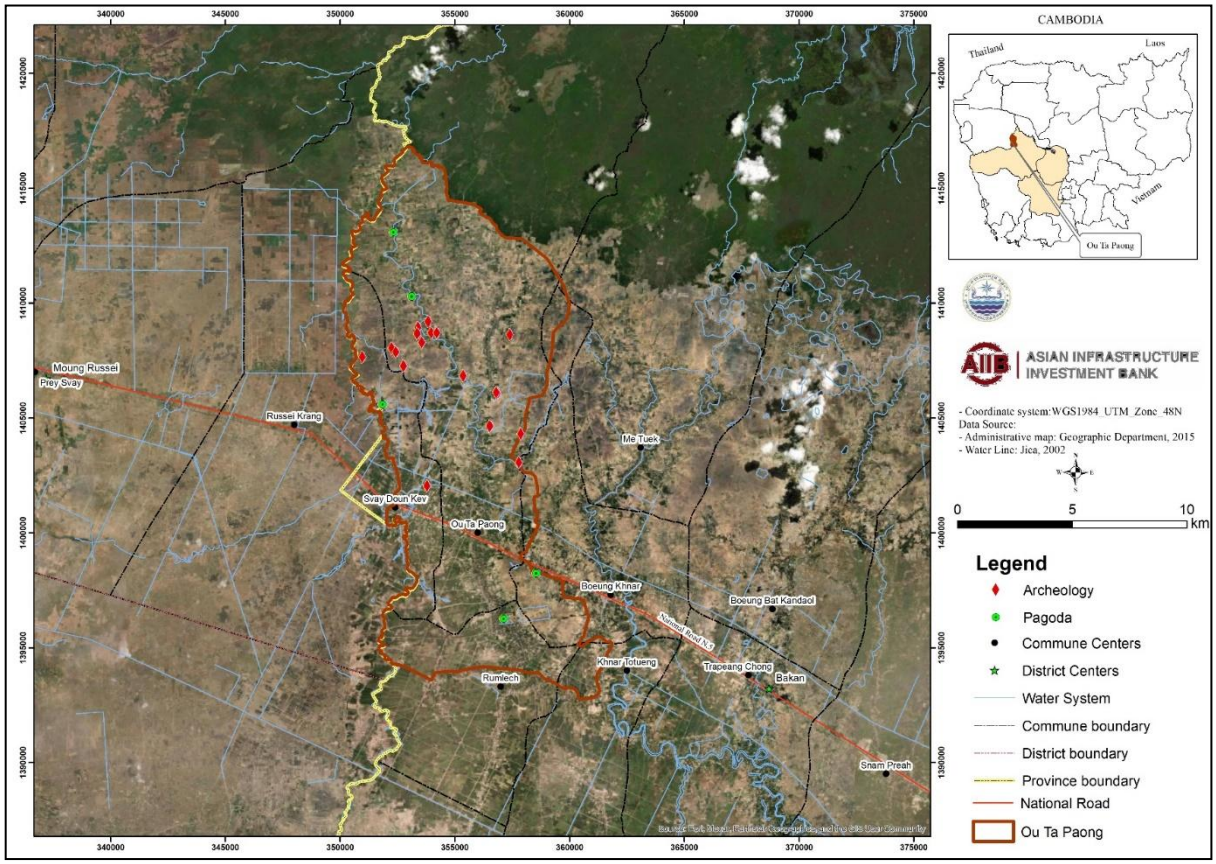
The following are the list of the archeological and cultural sites within the command areas as per the statistics given by Provincial Department of Culture and Fine Arts in 2024.

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
1	Ou Ta Paong	ទួលតាមុំ	Tuol Ta Mom	Archaeology	Bat Kokir Chas	Ou Ta Paong	Bakan	Pursat	357802	1403082
2	Ou Ta Paong	ទួលពង្រួញ	Tuol Proung	Archaeology	Bat Kokir Chas	Ou Ta Paong	Bakan	Pursat	357886	1404335
3	Ou Ta Paong	ទួលអ្នកតាឧកញ៉ាម៉ាន់	Tuol Neak Ta Oknha Moan	Archaeology	Oknha Moan	Ou Ta Paong	Bakan	Pursat	356855	1406103
4	Ou Ta Paong	ទួលតាស៊ុក	Tuol Ta Suk	Archaeology	Oknha Moan	Ou Ta Paong	Bakan	Pursat	356817	1406136
5	Ou Ta Paong	ទួលវត្តចាស់	Tuol Wat Chas	Archaeology	Ou Bat	Ou Ta Paong	Bakan	Pursat	355370	1406864
6	Ou Ta Paong	ទួលស្រះម្កាក់	Tuol Srah Mkak	Archaeology	Srah Mkak	Ou Ta Paong	Bakan	Pursat	356525	1404675
7	Ou Ta Paong	ទួលស្រះរុន	Tuol Srah Run	Archaeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353855	1409227
8	Ou Ta Paong	ទួលរាជ	Tuol Reach	Archaeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353565	1408310
9	Ou Ta Paong	ទួលអំពិល២	Tuol Ampil 2	Archaeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353408	1408957
10	Ou Ta Paong	ទួលអំពិល១	Tuol Ampil 1	Archaeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353364	1408699
11	Ou Ta Paong	ទួលតាទុយ	Tuol Ta Tuy	Archaeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353980	1408730
12	Ou Ta Paong	ទួលអំពិល	Tuol Ampil	Archaeology	Srah Run	Ou Ta Paong	Bakan	Pursat	354218	1408735
13	Ou Ta Paong	ទួលរកាំង	Tuol Rokeang	Archaeology	Tuol Rokeang	Ou Ta Paong	Bakan	Pursat	357407	1408650
14	Ou Ta Paong	ទួលវិហា (ថ្មក្រែ)	Tuol Vihea (Thmo Krae)	Archaeology	Chrob	Svay Don Kev	Bakan	Pursat	350967	1407679
15	Ou Ta Paong	ទួលគុក	Tuol Kuk	Archaeology	Chrob	Svay Don Kev	Bakan	Pursat	352252	1408072

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
16	Ou Ta Paong	ទួលកំពោតអាង	Tuol Kampot Ang	Archaeology	Kampout ang	Svay Don Kev	Bakan	Pursat	352770	1407290
17	Ou Ta Paong	ទួលតាកោ	Tuol Takor	Archaeology	Kampout ang	Svay Don Kev	Bakan	Pursat	352433	1407902
18	Ou Ta Paong	ទួលប្រត្រាញ់	Tuol Pratranh	Archaeology	Svay Don Kev	Svay Don Kev	Bakan	Pursat	353801	1402072
19	Ou Ta Paong	វត្តចន្ទគន្ធារាម	Chan Khutaram	Pagoda	Ta Nai	Ou Ta Paong	Bakan	Pursat	352341	1413104
20	Ou Ta Paong	វត្តស្តុកឃ្លោក	Stok Khlok	Pagoda	Sdok Khlouk	Ou Ta Paong	Bakan	Pursat	353133	1410316
21	Ou Ta Paong	វត្តកំពាំង	Kampang	Pagoda	Kampout	Svay Don Kev	Bakan	Pursat	351865	1405613
22	Ou Ta Paong	វត្តប្រាសាទដូនអន	Prasat Wat Don Orn	Pagoda	Prasat	Rumlech	Bakan	Pursat	357137	1396275
23	Ou Ta Paong	វត្តបឹងខ្នារ	Boeng Khna	Pagoda	Prey Svay	Boeung Khnar	Bakan	Pursat	358563	1398259

(Source: Pursat Provincial Department of Culture, and Fine Arts, 2024).

Figure 1: Maps of archeological and cultural sites in and near Ou Ta Paong Sub-scheme



IFAD
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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 14. f. ESCMP

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Programme Management Department

CLIMATE ADAPTIVE IRRIGATION AND SUSTAINABLE AGRICULTURE FOR RESILIENCE (CAISAR) AIIB PPSF GRANT S0452A, CODE 00-452-PPSF-DTA

ENVIRONMENTAL, SOCIAL, AND CLIMATE MANAGEMENT PLAN FOR YUTASAS SUB-SCHEME

FINAL

Submitted To:

Project Management Unit
Ministry of Water Resources and Meteorology,
AIIB and IFAD

Submitted By:

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24TH FEBRUAY 2025

EXECUTIVE SUMMARY

The document is an Environmental, Social, and Climate Management Plan (ESCMP) for the Yutasas sub-scheme, a part of the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project in Cambodia. The project aims to improve farm-level climate adaptation, water use efficiency, and agricultural productivity while promoting sustainable practices. The Yutasas sub-scheme focuses on rehabilitating existing irrigation infrastructure and enhancing agricultural practices in the Stung Krang Ponley basin.

The ESCMP plays a crucial role in ensuring the project's sustainability by addressing potential environmental and social impacts. It outlines measures to mitigate risks associated with water resource management, infrastructure development, and agricultural intensification. One of the key aspects of the ESCMP is its focus on water resource management, as the Yutasas River is vital for both agriculture and local livelihoods. The plan promotes efficient irrigation practices to optimize water use and minimize the risk of water shortages, especially in drought-prone regions.

The ESCMP recognizes the potential social impacts of infrastructure development. It emphasizes community engagement throughout the project's lifecycle to address concerns and ensure that local livelihoods, particularly those dependent on farming and fishing, are not negatively affected. This includes consultations, fair compensation for any land acquisition, and measures to minimize disruption to existing social structures. The plan also highlights the importance of complying with national and international environmental and social standards, which is essential for securing funding and aligning with global best practices in sustainable development.

The ESCMP's objectives include:

- Identifying and assessing environmental and social risks and impacts.
- Applying a mitigation hierarchy to avoid, minimize, or mitigate risks and impacts**.**
- Engaging affected communities and vulnerable groups in the assessment and mitigation process.

The ESCMP for the Yutasas sub-scheme covers project activities under Component 1 (Improving farm-level climate adaptation, resilience, and water use efficiency) and Component 2 (Improving irrigation access and water management). The project's geographical area is in the Stung Krang Ponley basin, with the Yutasas scheme situated on the left bank of the Krang Ponley River. The area has faced natural challenges like droughts and floods over the past decade. The proposed investments include:

- Rehabilitation and improvement of existing irrigation canals.
- Construction of new tertiary canals.
- Installation of solar power systems.
- Training and capacity building for Farmer Water User Communities (FWUCs).

- Agricultural extension services for improved farming practices and value chain development.

The tentative implementation schedule includes detailed design starting in January 2025, followed by procurement and construction. The construction is expected to start in the last quarter of 2026 and be completed by mid-2030. The ESCMP identifies potential environmental and social risks and impacts during different project stages and proposes mitigation measures.

Before and during construction, potential risks include:

- Unexploded ordnance (UXO): The presence of UXO requires a clearance plan and expert assessment before any construction activity.
- Air and noise pollution: Dust suppression measures, reduced operating hours for machinery, and regular maintenance are proposed to mitigate air pollution and noise.
- Water pollution: Construction diversion control, restrictions on filling canals, and proper waste disposal are crucial to prevent water pollution.
- Solid and hazardous waste: Waste management plans, including designated dump sites, are needed to handle various types of waste generated during construction.
- Wastewater: Proper handling and disposal of hazardous wastewater, such as oil or fuel, are essential.
- Biodiversity impacts: Measures to minimize habitat loss and fragmentation, prevent the spread of invasive species, and raise awareness about wildlife protection are necessary.
- Social impacts: These include labor influx, community health and safety, potential for SEA/SH (Sexual Exploitation, Abuse, and Harassment), and traffic accidents. Mitigation measures involve labor management plans, awareness campaigns, safety training, and grievance redress mechanisms.

During operation, potential risks include:

- Water pollution: The ESCMP emphasizes the need for sustainable agricultural practices, including Integrated Pest Management (IPM), to minimize the risk of water pollution from agricultural runoff.
- Biodiversity impacts: Continued monitoring and management are necessary to address the potential for long-term habitat loss and fragmentation.
- Climate change: Promoting energy-efficient irrigation, reducing reliance on fossil fuels, and adopting climate-smart agricultural practices are key to mitigating GHG emissions.

The ESCMP also outlines a comprehensive stakeholder engagement plan, including consultations with various stakeholders during project preparation and implementation. This plan ensures that local communities and other stakeholders are informed about the project and have opportunities to voice their concerns and suggestions.

The ESCMP also includes a grievance redress mechanism to address complaints and grievances from affected people. The mechanism provides a structured process for resolving issues related to land acquisition, labor, SEA/SH, and other project-related concerns. The plan also details implementation arrangements, outlining the roles and responsibilities of various stakeholders, including government agencies, contractors, and consultants, in implementing and monitoring the ESCMP.

The estimated cost for implementing the ESCMP is USD 237,000, including expenses for UXO clearance, preparation of national EIA report, biodiversity management, community outreach, and monitoring activities. The monitoring program, which includes regular monitoring of soil, air, and water quality, is estimated to cost USD 18,500. The Executive Summary of the ESCMP will be publicly disclosed in both English and Khmer, ensuring transparency and accountability throughout the project's lifecycle.

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii
TABLE OF CONTENTS v
LIST OF TABLES viii
LIST OF FIGURES ix
LIST OF ABBREVIATIONS ix
1. INTRODUCTION 1
1.1 Rationale of Yutasas Sub-scheme 1
1.2 Objectives of the ESCMP 1
2. PROJECT DESCIPTION 2
2.1 Geographical Area of the Sub–scheme 2
2.2 Characteristics of the Sub–scheme 6
2.2.1 Water Availability 6
2.2.2 Irrigation Management 7
2.2.3 Natural challenges 8
2.3 Proposed Investment under Yutasas Sub–scheme 8
2.3.1 Tentative Schedule for Sub–scheme Implementation 8
2.3.2 Key activities by Project Component 9
2.3.3 Proposed Infrastructure ..... Error! Bookmark not defined.
2.4 Analysis of Alternatives ..... Error! Bookmark not defined.
2.4.1 "Without" Project Alternative ..... Error! Bookmark not defined.
2.4.2 "With" Project Alternatives ..... Error! Bookmark not defined.
2.5 Project Area of Influence ..... Error! Bookmark not defined.
2.5.1 Definitions ..... Error! Bookmark not defined.
2.5.2 Areas of Influence of Yutasas Sub–scheme ..... Error! Bookmark not defined.
3. LEGAL AND INSTITUTIONAL FRAMEWORK 27
3.1 Royal Government of Cambodia's Legal Framework 27
3.1.1 National legal framework 27
3.1.1.1 The Constitution of the Kingdom of Cambodia (1993) 27
3.1.1.2 Legal Framework related to the Management and Conservation of Natural Resources and Biodiversity 27
3.1.1.3 Legal Framework related to Labour, Public Well-Being, and Safety 31
3.1.1.4 Legal Framework related to Governance and Social Inclusion 32

3.1.2 International Conventions and Treaties 32
3.2 AIIB'S Environmental and Social Framework (ESF)....35
3.3 IFADs' SECAP 36
3.4 GEF'S Environmental and Social Policies 37
3.5 Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF 39
4. BASELINE CONDITIONS....46
4.1 Physical Conditions 51
4.2 Environmental Conditions 60
4.2.1 Air Quality and Noise....62
4.2.2 Soil Quality....64
4.2.3 Surface Water Quality....65
4.2.4 Groundwater Quality 66
4.2.4.1 Sampling Locations 66
4.2.4.2 Results of the Groundwater Quality Testing 66
4.3 Biological Resources 67
4.3.1 Existing Species 67
4.3.2 EN and CR Species Confirmation....68
4.4 Socio-Economic and Cultural Conditions....68
4.4.1 Demographic and Facilities....68
4.4.2 Socio–economic Conditions of the Beneficiaries 72
4.4.3 Gender....75
4.4.3.1 Labor Division....75
4.4.3.2 Income 77
4.4.3.3 Decision Making....78
4.4.4 Agricultural Production.... Error! Bookmark not defined.
4.4.4.1 Rice Production .... Error! Bookmark not defined.
4.4.4.2 Vegetable Production .... Error! Bookmark not defined.
4.4.4.3 Animal Production .... Error! Bookmark not defined.
5. ENVIRONMENTAL & SOCIAL RISKS, IMPACTS, AND MITIGATION 78
6. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE....123
6.1 Purpose and Process of Stakeholder Engagement 123
6.2 Consultation Process....123
6.3 Stakeholder Engagement during Sub–Scheme Preparation 124

6.3.1 Environment, Biodiversity and Climate Change Impact 124
6.3.1.1 Pollution prevention and resource efficiency 124
6.3.1.2 Biodiversity 124
6.3.1.3 GHG Emission 125
6.3.2 Social Aspects 125
6.3.2.1 Labor and Working Conditions 125
6.3.2.2 Community Health and Safety 125
6.3.2.3 Land acquisition, economic and physical displacement 126
6.3.2.4 Cross–cutting risks and impacts 126
6.4 Stakeholder Engagement during Sub–Scheme Implementation 127
6.5 Information disclosure 128
7. GRIEVANCE REDRESS PROCEDURES 128
7.1 Objectives of the Project GRMs 128
7.2 Summary of National Legislation Related to Grievance and Complaint 128
7.3 Principles of the Project GRMs 129
7.4 Project's Redress Procedures 130
7.4.1 Redress Procedure for Complaints related to Land Acquisition 130
7.4.2 Redress Procedure for Complaints Related to Labor and Working Conditions 132
7.4.3 Redress Procedure for Complaints Related to SEA/SH/GBV 133
7.4.4 Redress Procedure for General Complaints 135
7.5 Registration of Project Grievance 135
8. IMPLEMENTATION ARRANGEMENTS 135
8.1 Environmental and Social Duties of the PMU/Detail Design Consultants 135
8.1.1 MOWRAM'S PMU 135
8.1.2 NCDD'S PMU 136
8.1.3 Provincial Department of Water Resources and Meteorology 136
8.1.4 Provincial Department of Agriculture, Forestry and Fisheries 136
8.2 Contractor's Environmental and Social Management Plan (C-ESMP) 137
8.3 Contractor's Safety, Social and Environmental Officer (SSEO) 138
8.4 Contractor's obligation as to contractual requirements 139
9. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM 139
9.1 Environmental Monitoring Program 139
9.2 Social Monitoring Program 148

10. ESTIMATED COSTS 155
10.1 Estimated Costs for ESCMP Implementation 155
10.2 Estimated Costs for ESMCP Monitoring Program 155
Annex 156
Annex 1. Screening checklist for E&S impacts for Yutasas Sub-scheme 156
Annex 2: Layout of Yutasas sub-scheme 159
Annex 3. Grievance Monitoring 163
Annex 4 – Worker's Code of Conducts 171
Annex 5 – Simplified Pest Management Plan 176
Annex 6. Biodiversity Assessment Findings for Yutasas Sub-scheme 183
Annex 7. Chance Find Procedure 196
Annex 8 – Summary of Stakeholder Consultation 199
Annex 9: Laboratory Testing Result 209
Annex 10. List of Archeological and Cultural Sites 217

LIST OF TABLES

Table 1: Administrative and population coverage of Yutasas sub-scheme 5
Table 2: Water sources for the Krang Ponley Sub-scheme 7
Table 3: Water sources for the Yutasas sub-schemes**No** 7
Table 4: Frequency and seriousness of natural disasters in Yutasas sub-scheme 8
Table 5: Tentative implementation schedule of Yutasas irrigation scheme. 9
Table 6: Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF 42
Table 8: Soil analysis results in an agricultural context 64
Table 9: Result of surface water quality 65
Table 10: Groundwater sampling locations 66
Table 11: Result of groundwater quality 67
Table 12: Screening list of Endangered and Critically Endangered Species in Yutasas 67
Table 13: Demographic information of the HH living within and the vicinity of the command areas 71
Table 14: Access to energy and water and sanitation facilities 71
Table 15: Occupation of the HHs living within and the vicinity of the command areas 72
Table 16: Migration and vulnerability of the people within the sub-schemes 72
Table 17: Houses and Assets of the HHs within the Sub-Schemes 73
Table 18: Issues in the project communities 73
Table 19: Rice production during wet and dry season ..... **Error! Bookmark not defined.**
Table 20: Vegetable production during wet and dry season ..... **Error! Bookmark not defined.**

Table 21: Environmental Risks, Impacts, and proposed Mitigation Measures... **Error! Bookmark not defined.**
Table 22: Social Risks, Impacts, and proposed Mitigation Measures..... **Error! Bookmark not defined.**
Table 23: Environmental monitoring plan during construction phase 140
Table 24: Social monitoring plan during construction and operational phase.....148
Table 25: Estimated cost for ESCMP implementation.....155
Table 26: Estimated cost for ESCMP monitoring program 155

LIST OF FIGURES

Figure 1: Administrative map of Yutasas sub-command area 6
Figure 2: Length from Sub-Scheme to Another of Krang Ponley 7
Figure 3: Concept design of Yutasas irrigation scheme..... **Error! Bookmark not defined.**
Figure 4: Locations of irrigation structures in Kropeau Truom, Yutasas, and Stoeng Krang Bat ..... **Error! Bookmark not defined.**
Figure 5: Length from Sub-Scheme to Another of Krang Ponley 53
Figure 11: Location of soil sample selection ..... **Error! Bookmark not defined.**
Figure 12: Map of surface water sampling locations..... **Error! Bookmark not defined.**
Figure 13: Map of groundwater sampling locations ..... **Error! Bookmark not defined.**
Figure 14: Groundwater sampling activity ..... **Error! Bookmark not defined.**
Figure 15: Division of Roles in Household Chores (n=65) 76
Figure 16: Share of Roles in Crop Cultivation (n=65) 77
Figure 17: Share of roles in Animal Husbandry (n=65) 77
Figure 18: Type of animal in command area..... **Error! Bookmark not defined.**
Figure 19. Redress Procedure for Complaints related to Land Acquisition 131
Figure 20. Redress Procedure for Complaints Related to Labor and Working Conditions 132
Figure 21. Redress Procedure for Complaints Related to SEA/SH/GBV 134

LIST OF ABBREVIATIONS

AH	Affected Household
AIIB	Asian Infrastructure Investment Bank
AP	Aggrieved Person
AWD	Alternate wet and dry
C	Carbon
C/N	Carbon-to-nitrogen
Cal	Calcium

CEC	Cation exchange capacity
C-ESMP	Contractor's Environmental and Social Management Plan
CFU	Colony-Forming Unit
C-LMP	Contractor's Labour Management Plan
CO	Carbon monoxide
CO_2	Carbon Dioxide
CoC	Code of Conduct
CR	Critically Resilient
DDIS	Detailed Design Implementation and Supervision
DIMDM	Department of Internal Monitoring and Data Management
DO	Dissolved Oxygen
E&S	Environmental and Social
EHSO	Environmental Health and Safety Officer
EIA	Environmental Impact Assessments
EN	Endangered
ESCIA	Environmental, Social, Climate Impact Assessment report
ESCM	Environmental, Social, Climate Management
ESCMP	Environmental and Social Management Plan
ESF	Environmental and Social Framework
ESHS	Environmental, Social, Health and Safety
ESMCD	Environmental and Social Management and Compliance Division
ESMP	Environment and Social Management Plan
ESS	Environmental & Social Standards
FPIC	Free, Prior and Informed Consent
FWUC	Farmer Water User Communities
FWUG	Farmer Water User Groups
GBV	Gender Based Violence
GCF	Green Climate Fund
GDR	General Department of Resettlement
GEF	Global Environment Facility

GHG	Green House Gas
GRM	Grievance Redress Mechanism
GW	Groundwater
HH	Household
IBAT	Integrated Biodiversity Assessment Tool
IEC	Information, Education and Communication
IFAD	International Fund for Agricultural Development
ILO	International Labour Organization
IPs	Indigenous People
IPM	Integrated Pest Management
IPPF	Indigenous People Planning Framework
IUCN	International Union for Conservation of Nature
JP	Judicial Police
K	Potassium
KCl	Potassium chloride
LMP	Labour Management Plan
MAFF	Ministry of Agriculture, Forestry and Fisheries
MCM	Million Cubic Meters
meq/100g	Milliequivalents per 100 grams
Mg	Magnesium
mg/m3	Milligram per cubic meter
MoE	Ministry of Environment
MOWRAM	Ministry of Water Resources and Meteorology
N	Nitrogen
Na	Sodium
NCDD	National Committee for Sub-National Democratic Development
NO_2	Nitrogen dioxide
OM	Organic Matter
PDAFF	Provincial Department of Agriculture, Forestry and Fisheries
PDWRAM	Provincial Department of Water Resources and Meteorology

pH	Potential of hydrogen
PM10	Particulate Matter with A Diameter of 10 Microns or Less
PMU	Project Management Board
PPE	Personal Protective Equipment
ppm	Parts Per Million
PRSC	Provincial Resettlement Sub-Committee
PWD	People with disability
RGC	Royal Government of Cambodia
RPF	Resettlement and Policy Framework
RUPP	Royal University of Phnom Penh
SEA/SH	Sexual Exploitation and Abuse/Sexual Harassment/
SECAP	Social, Environmental, and Climate Assessment Procedures
SEO	Social and Environmental Officer
SO2	Sulphur Dioxide
SSEO	Safety, Social and Environmental Officer
SW	Surface Water
ToR	Terms of Reference
TSP	Total Suspended Particulate
TSS	Suspended Solids
TVET	Technical and Vocational Education and Training
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
VAC	Violence Against Children
µS/cm	Micro Siemens per centimetre

1. INTRODUCTION

1.1 Rationale of Yutasas Sub-scheme

Yutasas is one of the four sub-schemes located within the larger Stung Krang Ponley subproject, covering a relatively small area of 593 hectares. The Yutasas sub-scheme is designed as an irrigation system aimed at supporting agricultural activities by providing a reliable water source for crop production. It plays a crucial role in boosting agricultural productivity in the region by ensuring that farmers have consistent access to water, especially during dry seasons. This system is an essential component of local water management, contributing to improved crop yields and enhancing the livelihoods of the farming communities dependent on it.

The primary function of the Yutasas sub-scheme is to regulate and distribute surface water from nearby rivers or reservoirs to irrigate agricultural lands. The system is structured to maximize water efficiency by delivering water directly to the fields, minimizing wastage, and conserving valuable water resources. This approach is particularly important in regions prone to water shortages, ensuring that crops receive the necessary water to thrive, which ultimately contributes to food security and agricultural sustainability.

Social impacts are also a critical consideration in the preparation of the ESCMP. The Yutasas River is vital to the livelihoods of local communities, particularly those engaged in farming and fishing. Infrastructure development without proper social safeguards could disrupt these livelihoods, leading to economic challenges and potential social conflict. The ESCMP ensures that communities are actively engaged in the project's planning and implementation, addressing their concerns through consultations and fair compensation where necessary. This inclusive approach minimizes social disruption and fosters stronger community support for the project.

Additionally, the ESCMP is crucial for ensuring that the CAISAR Project meets both national and international environmental and social standards. Compliance with these standards is necessary for securing funding and aligning with global best practices in sustainable development. By preparing a comprehensive ESCMP, the project mitigates both environmental and social risks while promoting long-term sustainability, ensuring that both the natural environment and local communities benefit from the project’s outcomes.

1.2 Objectives of the ESCMP

The objectives of the ESCMP for Yutasas sub-scheme are:

- Identify and assess environmental and social (E&S) risks and impacts that are potentially associated with investment activities proposed under Component 1 and Component 2.
- Ensure the identification and assessment of E&S risks and impacts are in accordance with the requirements of the laws and regulation of the Royal Government of Cambodia, AIIB’s Environmental and Social Framework, IFAD’s Social, Environmental and Climate Assessment Procedures (SECAP), and GEF’s Safeguard Policies.

- Apply a mitigation hierarchy to: (a) anticipate and avoid risks and impacts; (b) where avoidance is not feasible, minimize or reduce risks and impacts to acceptable levels; (c) once risks and impacts have been minimized or reduced, mitigate them; and (d) where residual risks or impacts remain, compensate for or offset them, where technically and financially feasible.
- As part of the risk and impact identification and assessment, engage a) people potentially affected by project activities (including both project beneficiaries and those potentially affected adversely, and parties interested in project implementation and operations.
- Conduct consultation, particularly with affected people who are disadvantaged/ vulnerable.
- Propose measures to avoid/ minimize/ mitigate E&S risks and impacts and compensate for adverse impacts where residual risks or impacts remain, compensate for impacts that remain, or offset residual risks, where technically and financially feasible.

Coverage of the ESCMP Yutasas

This site–specific ESCMP cover project activities proposed under Component 1 and Component 2 (See brief description of investment activities in Section 2.3 below).

2. PROJECT DESCIPTION

2.1 Background

The project has three Components (summarized below). However, the ESCMP Yutasas will covers investment activities proposed under only Component 1 and Component 2.

Component 1. *Improving farm-level climate adaptation, resilience, and water use efficiency*

The objective of this component is to build climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. This component is designed to address the lack of knowledge and skills to deploy technologies and practices at farm level by farmers and the lack of appropriate extension services to propagate them. It will introduce farmers with various climate resilient technologies and practices for both rice and non-rice activities such as vegetable production, poultry and aquaculture.

Sub-component 1.1 Deployment of farm-level climate adaptation and water use efficiency measures

Output 1.1: Increased capacity of farmers to deploy climate resilient (CR) practices at farm level

This output will focus on developing farmers' capacity in deploying CR technologies and practices to transform the agricultural production system to adapt to the changing climate context. Farmer's will be trained to first develop Action Plans (AP) to re-orient farmer behavior

and assist them in transforming the agriculture production system in a manner that is better adapted to factoring in the agro-ecological context and expected climate change impacts.

- Activity 1.1.1 Preparation of community-based action plans (AP) to transform agriculture with CR practices.
- Activity 1.1.2 Preparation of training materials to support implementation of the AP.
- Activity 1.1.3 Conduct trainings to create a pool of expertise to demonstrate and propagate the CR technologies and practices.
- Activity 1.1.4 Train farmers on applying CR technologies using the FFS approach.
- Activity 1.1.5 Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery.
- Activity 1.1.6 community-based monitoring and evaluation (CBME) of implementation

Sub-Component 1.2 Climate adapted, value added, and market led agricultural investments

Output 1.2 CR value added, and market led agriculture investments secured.

This output involves improving and enhancing some value chains that are key for the project area and include rice, vegetable, chicken and aquaculture value chains, through the use of Public Private Producer Partnerships (4Ps) and increased access to finance, which will improve market access, climate adaptability, and ensure increased income for smallholders in the value chains.

- Activity 1.2.1 Value chain study and planning
- Activity 1.2.2 Establish District Multi-Stakeholder Platforms (MSPs)
- Activity 1.2.3 Public Private Producer Partnership Facility (4PF)

Sub-component 1.3 Improve enabling conditions, capacities and disaster risk management strategies

Output 1.3. Increased access to and use of climate information and advisory services for climate responsive agriculture planning

This sub-component will strengthen the production and dissemination of tailored agro-meteorological information to inform climate responsive management and planning of agriculture in the project target areas through ICT technologies. The aim is to ensure that agro-meteorological services are accessible and useful to farmers to manage climate risks, access to and use of water and efficient cropping systems.

- Activity 1.3.1 Establish ICT based multi-disciplinary platform at provincial level.
- Activity 1.3.2 Building the capacities of the platform to deliver services.
- Activity 1.3.3. Establish the agromet information systems and the outreach mechanisms.
- Activity 1.3.4 Awareness raising and capacity building of farmers and stakeholders in applying the *services.*

Sub-component 1.4 Rural roads

Output 1.4: Increased resilience of farm road infrastructure to climate change

- Activity 1.4.1 Initial planning and identification
- Activity 1.4.2 Technical survey and design considerations, preparation of cost estimation
- Activity 1.4.3 Improve 50 Kilometers of farm roads.
- Activity 1.4.4 Handing over of the completed works.

Component 2: Irrigation Infrastructure for increased resilience

Component 2 will focus on rehabilitating/creating and modernizing hydraulic infrastructure, including canals, ponds, flood-proof infrastructure (river, drain) and to provide high-efficiency climate-resilient irrigation systems for adapting to both increasing flood and drought conditions. It will include support and capacity building to O&M operators at both, Provincial (PdoWRAM) and scheme (FWUC) level, to ensure the sustainability of the scheme. The output will secure and increase farmer's agricultural production by improving the irrigation supply and protect crops from water-related disasters.

Component 2 is linked with Component 1 such that it facilitates the implementation of CR on farm crop and water management practices through improved field level water supply delivery and drainage. It will focus on rehabilitating and modernizing of irrigation and flood protection/drainage infrastructure in the six sub-projects, including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions.

Sub-Component 2.1: Modernization of irrigation scheme and ponds

- Activity 2.1.1 Technical analysis, field surveys and preparation of plans for system upgrading.
- Activity 2.1.2 Implementation of infrastructure upgrading.
- Activity 2.1.3 Preparation of canal O&M plans including application of ICT and SCADA for operation

Sub-Component 2.2: Flood-proofing and Drainage improvements

- Activity 2.2.1 Establish flood monitoring, information, and early warning systems.
- Activity 2.2.2 Strengthening and construction of flood control and drainage infrastructures.

Sub-Component 2.3: Establishments and training of Farmers Water User Communities (FWUC)

- Activity 2.3.1 Formation of institutional strengthening of the FWUC
- Activity 2.3.2 Build technical capacities of FWCU for canal structure O&M
- Activity 2.3.3 prepare long term financing plan for O&M of the systems including the WUAS.

Sub-Component 2.4: Water information and Management (SCADA)

Component 3. Institutional Strengthening

Sub-Component 3.1 MOWRAM capacity Support.

Output 3.1 Strengthened MOWRAM Capacity

Sub-Component 3.2 Strengthening of NDA and NCDD.

Output 3.2 Improved capacities for climate action monitoring

- Activity 3.2.1 Preparation of Loss and Damage Strategy
- Activity 3.2.2 Strengthen national M&E process for climate action
- Activity 3.2.3 Enhancing Capacity of NDA and other stakeholders.

2.2 Project Area and Beneficiaries

The Yutasas sub-scheme is located in Svay commune within the Sameakki Mean Chey district of Kampong Chhnang province, solely stretching within the boundary of Svay commune shared by a total of 5 villages which are home to a total household of 1,339, making a total population of 5,330 people (out of which 2,773 are females). This sub-scheme is one of four that make up the Krang Ponley sub-project, alongside Brambei Mom, Krapeu Troum, and Stung Krang Bat. The Krang Ponley sub-project spans Kampong Speu, Kampong Chhnang, and Kandal provinces.

Table 1: Administrative and population coverage of Yutasas sub-scheme

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
1	Sameakki Meanchey (Kampong Chhnang)	Svay	5	1,339	5,330	2,773
	Total	**1**	**5**	**1,339**	**5,330**	**2,773**

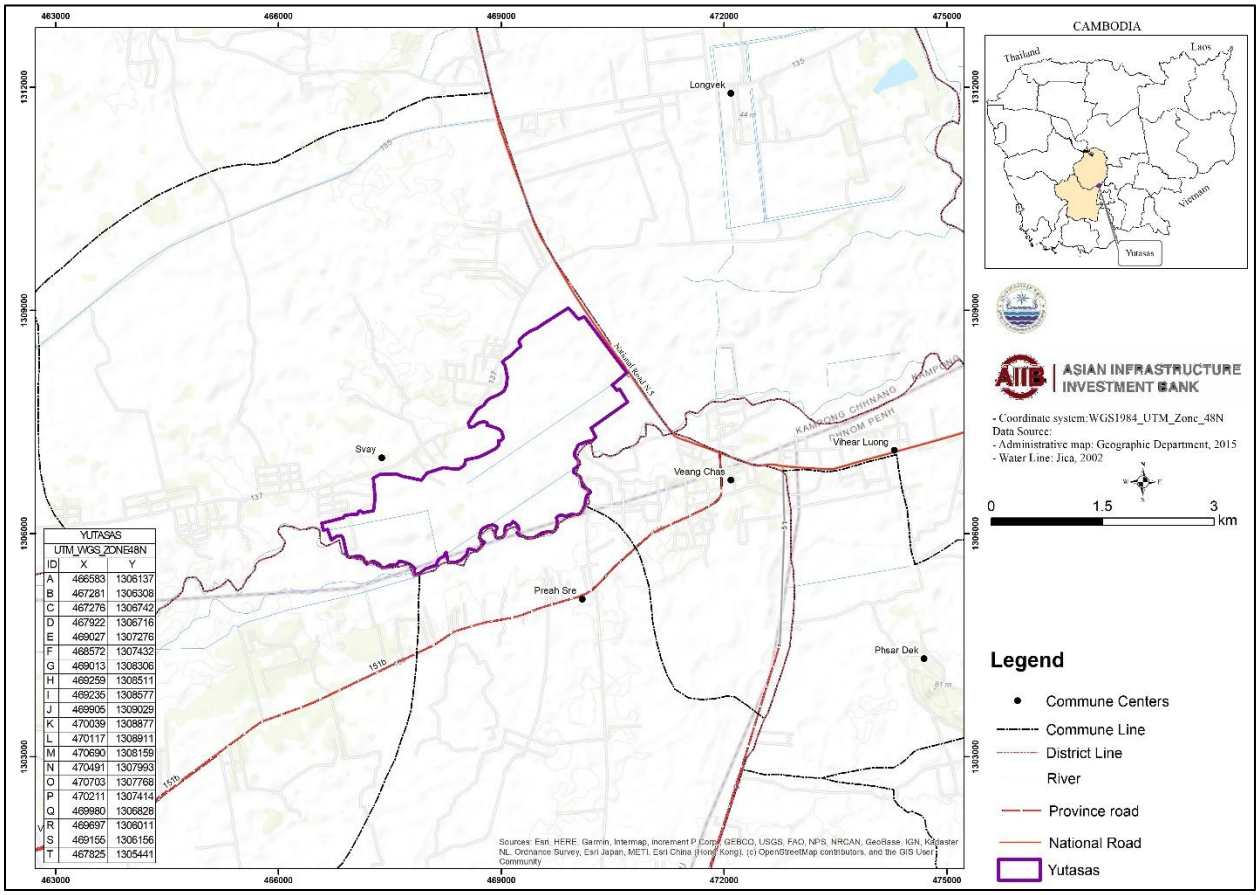
(Source: Ministry of Planning, Commune Database, 2023)

Table 2: List of Yutasas sub-schemes under CAISAR

No.	Scheme Name	Component 2						Beneficiaries	
		Irrigation		Rainfed area		Total			
		Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	Area (ha)	Ratio (%)	HH*	Ratio
4	Yutasas	593	3%	600	8%	1,193	4	700	3%

*HH = Household

Figure 1: Administrative map of Yutasas sub-command area



2.3 Description of the Sub-Schemes

2.3.1 Water Availability

Considering that a river-basin-wide water resources management plan will be needed to regulate water resources utilization for optimal supply to all schemes/water uses along the river, the Yutasas scheme was added on the CAISAR project in October 2023. The Yutasas sub-scheme is geographically situated along the Krang Ponley River. It draws its main water supply from the Anlong Chrey Dam, while the Kdol Dam and River act as secondary water sources. The proposed irrigation target for the Yutasas sub-scheme is 593 hectares. The communes surrounding Yutasas include Veang Chas, Preah Sre, Veal Pung, and Longvek.

Like the other sub-schemes in the Krang Ponley sub-project, the Yutasas sub-scheme is situated within the Krang Ponley River Basin. The basin's floodplain lies approximately 10 meters above sea level and is characterized by low permeability due to the presence of fine soil particles. This characteristic makes the area highly susceptible to flooding. The Krang Ponley River serves as the primary water source for the irrigation schemes within this basin.

Yet, it is noted its intake downstream of Kropeau Troum and upstream of Steung Krang Bat.

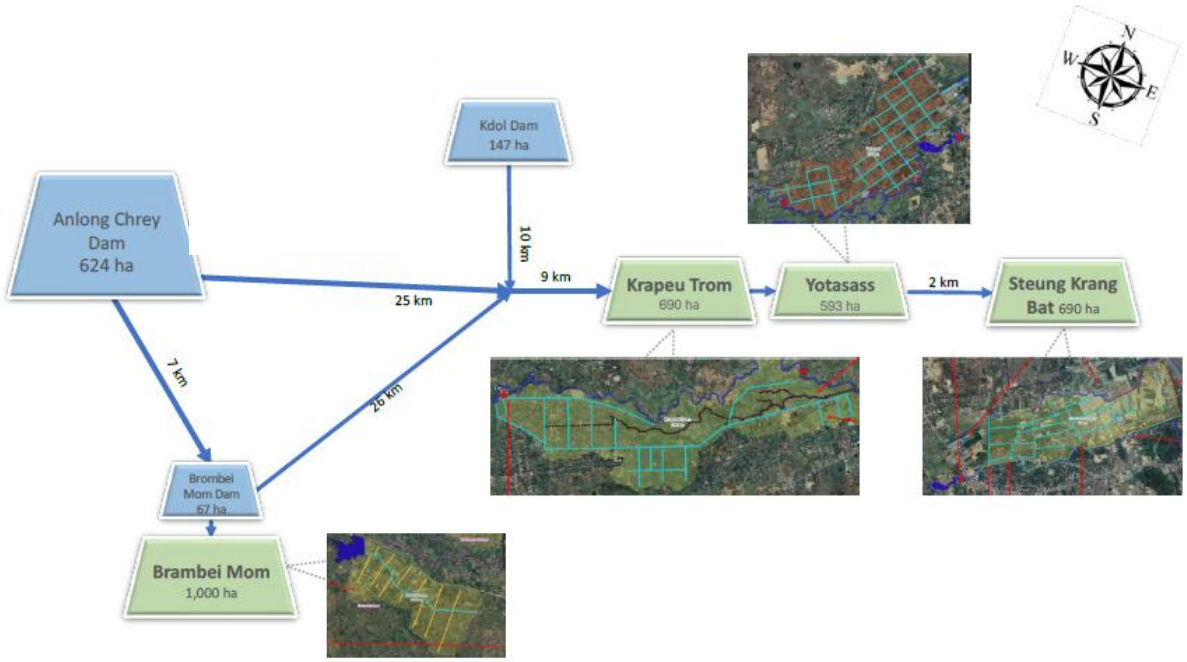
Table 3: Water sources for the Krang Ponley Sub-scheme

Resource	Description
Anlong Chrey Reservoir	Primary water source for the Krang Ponley scheme
Kdol Dam	Secondary water source, providing additional water supply
Ponley River	Connects the four separate scheme areas, facilitating water transfer

Table 4: Water sources for the Yutasas sub-schemes

No	Irrigation scheme	Proposed target command area (ha)	Main Water source	Secondary water source
1	Yutasas	593	Anlong Chrey Dam (30 MCM)	Kdol dam (4.7 MCM), Kdol river

Figure 2: Length from Sub-Scheme to Another of Krang Ponley



2.3.2 Irrigation Management

The water distribution system for Yutasas is managed by the Farmer Water User Community (FWUC), which coordinates with the Provincial Department of Water Resources and Meteorology (PDWRAM) in Kampong Chhnang province. The FWUC handles requests from local farmers and oversees the allocation of water to the various villages within the command area. However, the field interview revealed that the FWUC is not working as the water is only available during the wet

season. The situation is worse as the Watergate at Kdol dam is currently malfunctioning and the committee cannot respond to the water needs or requests of farmers.

2.3.3 Natural challenges

Over the past 10 years, the Yutasas irrigation sub-scheme has encountered several natural challenges. Drought was the most frequently reported, affecting 65% of respondents, with an average of three occurrences over the decade. However, only one of these occurrences was considered serious. Floods were the second most reported issue, noted by 54% of respondents, with an average of three events, of which two were deemed serious. Storms were the third most common natural challenge, reported by 35% of respondents and occurring four times, with two of these events considered serious. Insect outbreaks were experienced by 43% of respondents, with an average of three occurrences over the last decade, but only one event was considered serious.

Table 5: Frequency and seriousness of natural disasters in Yutasas sub-scheme

Types	Figures	Percent	Times	Number of Seriousness
Drought	42	65%	3	1
Flood	35	54%	3	2
Storms	23	35%	4	2
Insect outbreak	28	43%	3	1
None	10	15%		

2.4 Proposed Investment under Yutasas Sub–scheme

2.4.1 Activities and Timeline

Should the feasibility study for the Krang Ponley subproject proceed to detailed design, then allowing for the design process, procurement process and approvals, it has been assumed the following planning as displayed in the following Table.

The following assumptions have been made:

- The detailed design will start in January 2025.
- The procurement process will not take more than three quarters.
- The work construction will start after the rainy season in Cambodia with a mobilization period (last quarter of the year);
- The work construction duration will not last more two dry seasons.

Hence the construction would be able to commence at the last quarter 2026 with total completion by mid-2030 for Yutasas irrigation scheme.

Table 6: Tentative implementation schedule of Yutasas irrigation scheme.

COMPONENTS, SUB-COMPONENTS, OUTPUTS AND ACTIVITIES	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
2.1.5 - Yotasast	●	●	●	●	●	●	●	●	●	●	●	●	●	●										
Activity 2.1.5.1 - Detailed design	●	●	●	●																				
Activity 2.1.5.2 - Procurement					●	●	●																	
Activity 2.1.5.3 - Work construction and supervision								●	●	●	●	●	●	●										

2.4.2 Design Concept and Options

The current planning coverage area of Krang Ponley sub-project is around 3,000 hectares, drawing water from the Krang Ponley River, with existing storage at Anlong Chrey and Brambei Mom. Nature-based solutions include controlling the flood regime at Krang Bat for flood recession and fisheries, alongside the rehabilitation of 31 major ponds. Solar pump installations total 184 units distributed across Brambei Mom (110), Chrey Loeu (47), and Krang Ponley Teuk (27). Canal infrastructure includes 31.3 km of main/feeder canals, 29.2 km of secondary canals, and 63.5 km of tertiary canals. Drainage infrastructure comprises 42.8 km of main and secondary drains, while flood embankments and channels are planned for flood management, with raised canal banks in Krang Ponley Teuk. Storage facilities include the upgrade and safety improvement of the Anlong Chrey Reservoir, 31 rehabilitated ponds at Brambei Mom, and support for local storages and fish refuges. The land area for canals is 383 hectares, comprising 144 existing and 239 proposed hectares (Table 2.19).

Table 7: Key Features of the Krang Ponley Sub-Project

Sub-Project	**Krang Ponley**
Area Cultivated (ha)	3,000
Water Source	Krang Ponley River with existing storage at Anlong Chrey and Brambei Mom
Nature Based Solution[1]	Control of flood regime at Krang Bat for flood recession and fisheries. Rehabilitate 31 major ponds.
Solar Pump Installations	110 (BBM) + 27(KPT)
Main Canals C/L(km)/N	6_31.3km
Secondary Canal C/L (km)/N (Exist)	35_29.2km
Tertiary Canal C/L (km)/N Existing	77_ 63.5km
Main/Secondary Drains (C/L km/N)	17_42.8km
Flood Embankments /structures (Km/N)	Storage/Operation in AC reservoir for flood, Raised canal bank on KPT, flood channels in KPT and embankment on TS
Storages	Existing Anlong Chrey Reservoir to be upgraded and safety improvements. 31 major ponds on Barambei Mom. Support local storages and fish refuge.
Land Area of Canals (Existing proposed Ha)	144/239

BBM = Brambei Mom, CL= Chrey Loeu, KPT = Krang Ponley Teuk.

[1] Nature-Based Solution, in this case is the improvement of water storage capacity including canal enhancement and pond restoration, is applied to contribute to the recovery of the natural condition of the water system within the command area.

The Yutasas irrigation system as per the design layout in Figure 3 consists of:

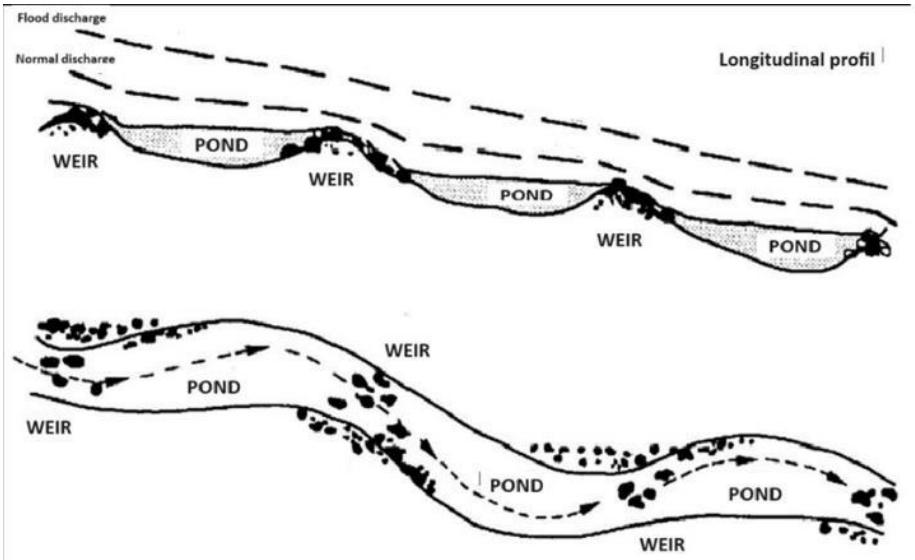
- The rehabilitation of the intake structure on Anlong Chrey stream.
- The rehabilitation of the irrigation distributary canals to irrigate 593 ha. It is envisaged to have canal lining for the main infrastructures (main and secondary canal)
- The development of sub-distributary canals (tertiary). Investigation will be performed to envisage the possibility of collective solar pumping system at the tertiary level.
- The rehabilitation of the Anlong Chrey and existing main drainage system to prevent flooding and water disaster.

These combined efforts seek to elevate irrigation capabilities, refine water distribution, and alleviate potential water-related risks within the project area.

Figure 3: Conceptual design layout of Yutasas irrigation scheme



Figure 4: Principles of river rehabilitation for Yutasas scheme



2.4.3 Project Activities

The infrastructure investment of the project, as outlined in the previous section, involves several key activities during the pre-construction phase. These activities set the foundation for the successful implementation of the project's construction work and ensure that resources and personnel are well-prepared for the task.

The project is divided into two (2) key components. Component 1 focuses on improving farm-level climate adaptation, resilience, and water use efficiency. This involves planning and training activities to develop community-based action plans and build capacity among farmers. Additionally, mechanization efforts and farm road improvements will enhance agricultural productivity and accessibility. Component 2 aims to strengthen irrigation infrastructure for increased resilience. This includes a range of activities such as river dredging, canal rehabilitation, construction of small-scale structures, river training, polder system development, solar pumping system installation, feeder canal construction, and pond construction or rehabilitation. These interventions will improve water management, increase water storage capacity, and ensure efficient water distribution to agricultural fields.

2.4.3.1 Pre-construction Phase

At the pre-construction phase, there are several activities that need to be done where disturbance to local people as well as natural resources may occur. These activities are:

1. Land and Right of Way Negotiation: This initial step focuses on securing the necessary land and access rights for the construction. Negotiations with local authorities, landowners, and other stakeholders ensure that all legal and logistical requirements are met, minimizing potential delays or disputes that could arise during the project.
2. Contracting and Training of Staff: The project then engages in the recruitment and contracting of skilled personnel, including construction teams, engineers, and project management staff. This step is critical to ensure that the workforce has the necessary expertise and experience. Alongside recruitment, training programs are provided to align staff with the project's goals, safety standards, and technical requirements.
3. Mine and UXO Clearance: In areas with potential unexploded ordnance (UXO), safety is the highest priority. Before any construction begins, the project undertakes mine and UXO clearance to ensure that the site is free of hazardous materials, creating a safe environment for workers and preventing accidents.

These pre-construction activities are integral to establishing a strong foundation for the project, ensuring that the necessary infrastructure, workforce, and materials are in place to proceed smoothly with the subsequent phases of construction.

2.4.3.2 Construction Phase

The construction phase of the project involves a comprehensive set of activities aimed at establishing the required infrastructure while ensuring safety, environmental management, and efficient use of resources. Key construction activities include:

1. Mobilization of Construction Materials, Consumables, Machinery, Equipment, and Staff: Once the team is in place, the project moves into the mobilization phase, where all essential materials, machinery, and equipment are transported to the construction site. This also includes the deployment of consumables and other resources required for ongoing construction. Ensuring the timely arrival and organization of these assets is crucial for avoiding disruptions in the construction timeline. Similarly, staff are mobilized to ensure a coordinated start to the construction activities.
2. Installation and Operation of Temporary Infrastructure: Temporary facilities, such as worker camps, asphalt plants, concrete mixing stations, and ground material processing plants, are set up to support the construction process. These facilities are critical for providing on-site accommodation for workers and ensuring the continuous supply of construction materials.
3. Site Clearing and Cleaning: This phase involves clearing the construction site of any obstructions such as vegetation, debris, and existing infrastructure. It ensures that the land is prepared and ready for subsequent construction activities.
4. Demolition and Removal of Existing Infrastructure: In areas where existing structures need to be replaced or upgraded, demolition and removal are necessary. This ensures that the site is clear for the installation of new infrastructure and allows for efficient use of the available land.
5. Land Movements (Excavations, Dredging, and Fills): Major land movements, including excavations and dredging, are conducted to reshape the land and prepare it for new infrastructure. These activities also involve filling areas to achieve the required ground levels for construction stability and support.
6. Construction of Hydraulic Works (Including Occupation of Waterways): Hydraulic works, such as dams, levees, or irrigation systems, are constructed to manage water resources effectively. This stage often requires temporary occupation of waterways, making careful planning and environmental considerations critical.
7. River Training: As part of managing water flow and preventing erosion, river training is conducted to stabilize riverbanks and direct water movement, which is essential for protecting both the construction site and surrounding ecosystems.
8. Dismantling of Temporary Facilities and Camps: Once the primary construction activities are completed, temporary infrastructure such as camps and material plants are dismantled. This marks the transition toward the final stages of the construction process.
9. Final Cleanup of Intervened Areas: A thorough cleanup of the construction site is conducted to remove debris, materials, and any temporary installations.
10. Site Restoration: To ensure the aesthetic and environmental sustainability of the project, landscaping efforts are undertaken, including replanting vegetation, managing drainage, and shaping the landscape to blend with the natural surroundings.

This series of construction activities ensures that the project is completed according to design specifications, with an emphasis on safety, environmental responsibility, and efficient resource management.

2.4.3.3 Operation and Maintenance

The post-construction phase of the project involves the transition from infrastructure development to its operational use, with a focus on agricultural intensification, resource management, and long-term maintenance. The key activities during this phase include:

1. Intensifying Agricultural Production: Following the completion of the infrastructure, there is a focus on enhancing agricultural productivity. The improved infrastructure allows for more efficient farming practices, increased crop yields, and the introduction of advanced agricultural techniques. This intensification contributes to greater food security and economic development in the region.
2. Increased Use of Energy and Fuel for Agriculture Production: With the intensification of agricultural activities, there is a corresponding rise in the use of energy and fuel to power farming machinery, irrigation systems, and other agricultural equipment. This increased demand for energy supports the scaling up of production but also requires careful management to ensure sustainability and minimize environmental impacts.
3. Operation and Maintenance: To ensure the long-term functionality and durability of the newly constructed infrastructure, regular operation and maintenance activities are critical. This includes monitoring the condition of the infrastructure, performing repairs, and ensuring that the systems in place continue to function as designed. Routine maintenance helps prevent deterioration and ensures that agricultural productivity remains high.
4. Water Management: Effective water management becomes a priority in this phase, especially with the new hydraulic infrastructure in place. This includes controlling irrigation systems, managing water levels in reservoirs, and ensuring that water resources are used efficiently to support agricultural activities. Sustainable water management is crucial for balancing agricultural demands with environmental conservation.

These post-construction activities ensure the long-term success of the project, contributing to sustainable agricultural growth, resource efficiency, and the ongoing maintenance of infrastructure to support continued productivity in the agricultural sector. Summary of the project activities is provided in Table 6.

Table 8: Summary of the Project Activities in relation to the infrastructure investment

No.	Stage	Activities
1	Pre-Construction	Land and right of way negotiation
		Contracting and training of staff
		Mobilization of construction materials, consumables, machinery, equipment and staff
2	Construction	Mine and UXO clearance

		Installation and operation of temporary infrastructure (camps, asphalt, concrete and ground material plants)
		Site clearing and cleaning
		Demolition and removal of existing infrastructure in areas to be intervened
		Land movements (excavations, dredging and fills)
		Construction of hydraulic works (includes occupation of waterways)
		River training
		Dismantling of temporary facilities and camps
		Final cleanup of intervened areas
		Landscaping management
	After Construction	Intensifying agricultural production
		Increased use of energy and fuel for agriculture production
		Operation and maintenance
		Water management

UXO = Unexploded Ordnance.

2.4.4 Construction Equipment

To support the construction activities, the project will require a variety of construction equipment and machinery. Below is the potentially used equipment for different stages of the project:

- Earthworks and Land Preparation
  - Excavators – For digging canals, ponds, and trenches.
  - Backhoe Loaders – For smaller excavation and loading tasks.
  - Bulldozers – For clearing and leveling land.
  - Motor Graders – For grading and leveling road and embankment surfaces.
  - Scrapers – For removing and transporting soil over short distances.
  - Soil Compactors/Rollers – For compacting soil before construction.
- Water Infrastructure Construction
  - Dredgers – For clearing and deepening irrigation canals and reservoirs.
  - Trenchers – For laying underground pipelines.
  - Pipe Layers – For positioning and installing large-diameter water pipes.
  - Concrete Pumps – For pumping concrete into irrigation structures.
  - Concrete Mixers (Stationary & Mobile) – For mixing and delivering concrete.
  - Cranes – For lifting heavy pipes, gates, and pre-cast structures.
  - Pile Driving Machines – For driving piles into the ground for dam or levee construction.
- Road and Pathway Construction
  - Asphalt Pavers – For paving roads within the project.
  - Dump Trucks – For transporting materials such as gravel, sand, and asphalt.
  - Bitumen Sprayers – For road surfacing.

- Road Rollers – For compacting asphalt or gravel surfaces.

- Drainage and Irrigation System Development
  - Water Pumps (Diesel & Electric) – For water transfer and dewatering.
  - Drilling Rigs – For well construction and deep-water extraction.
  - Channel Forming Machines – For shaping and lining irrigation channels.
  - Concrete Pipe Making Machines – For on-site production of irrigation pipes.
- Structural and Facility Construction
  - Tower Cranes – For lifting heavy materials in building sites.
  - Scaffolding Systems – For workers' access and safety.
  - Rebar Cutters and Benders – For reinforcing concrete structures.
  - Shotcrete Machines – For spraying concrete onto embankments.
- Environmental and Erosion Control
  - Hydroseeding Equipment – For erosion control and vegetation replanting.
  - Rock Crushers – For breaking stones for embankment protection.
  - Geotextile Laying Machines – For soil stabilization in embankments and canal lining.
- Power and Electrical Systems
  - Generators – For power supply in remote project sites.
  - Transformers & Substations – For irrigation pumping stations.
  - Solar Panel Installation Equipment – If renewable energy is incorporated.
- Monitoring and Surveying Equipment
  - Total Stations & GPS Survey Equipment – For site mapping and project layout.
  - Drones – For aerial surveys and project monitoring.
  - Water Flow Meters – For irrigation system performance assessment.

2.5 Associated Facilities

Under CAISAR, the screening for potential Associated Facilties (AF) was conducted by SECAP team. The definition for “Associated facilities” (AF) in the AIIB’s Environmental and Social Framework (May 2021 version) are activities that are not included in the description of the Project set out in the Legal Agreements governing the Project, but they are qualified to the following criteria:

(a) **directly** and **materially** related to the Project.

(b) **carried** out, or **planned to be carried out**, **contemporaneously** with the Project; and

(c) necessary for the Project to be **viable** and would **not be carried out if the Project did not exist**”.

Below is the summary of a) methods that was used by the team to screen for AF, and b) the results of the AF screening.

Methods

Interpretation of AF definition in the context of CAISAR project

Under CAISAR project, the key terms used in the above definition are interpreted as follows:

- **Project**: refers to CAISAR project
- **Direct**, in the context of environmental and social risk and impact assessment, refers to the **impact, which is caused by the project**, and **occurs contemporaneously in the location of the project**. This is to differentiate with an indirect impact which is an impact which is caused by the project and is later in time or farther removed in distance than a direct impact, but is still reasonably foreseeable, and will not include induced impacts. "Direct", in the context of AIIB's ESF refers to the "direct" relationship between a potential associated facilities (e.g. dam, reservoir, barrage) and its impact on the achievement of the intended project development.
- **Material**: significant, important, substantive. In the context of CAISAR, "material" refers to the strength of the above "direct" relationship between the impact of a potential AF on the intended outcome for each subproject which is indicative of **reliable and increased water access** for the target project groups – as per project plan, to achieve expected development outcome.
- **Contemporaneous**: at the same time, which is the relative overlap of time with regards to planning and actual implementation of potential AF and CAISAR project activities (defined by project planning period and project implementation life).
- **Viable**: for CAISAR sub–schemes to **achieve** mostly the **intended impacts** (expected outcome, i.e. increased irrigated area and/or number of crops per year/reliable irrigation access).
- **Not be carried out if the Project did not exist.** Indicates the functional interdependency between the AF and CAISAR project.

Findings

As per the consultation with the CAISAR PMU and SECAP team, the document regarding the AF had already been approved. Therefore, the result from the assessment were used in this report. Further assessment will be conducted on any emerging facilities after the consultation and agreement being provided by the PMU. Based on the screening by the SECAP team, five (5) existing works have been screened and assessed if they are associated facilities (See table below). The screening results indicates that the water resources facilities met the definition of AIIB's Environmental and Social Framework on Associated Facilities. Therefore, no further actions are required in connection with the works (please see in table 7).

Table 9: Screening of potential Associated Facilities under CAISAR*

Assessment criteria	Yutasas barrage
a) **directly** and **materially** related to the Project; and	Directly and materially (substantially) related to Yutasas sub–scheme

b) **carried out**, or **planned to be carried out**, **contemporaneously** with the Project; and	The Yutasas Dam construction was completed in 2015 **Not carried out contemporaneously** with Yutasas sub–scheme
c) **necessary** for the Project to be **viable** and **would not be carried out** if the Project did not exist.	**Necessary** for the Yutasas sub–scheme to be **viable** and **still carried out** even if Yutasas sub–scheme did not exist.
Initial screening	NOT AF

*. Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project

Source: Report on Screening of potential Associated Facilties under CAISAR (prepared by SECAP team)

2.6 Implementation Resources Requirement

2.6.1 Labour and Workforce

Table 8 outlines the estimated labor requirements for the construction of the irrigation system under the CAISAR project. Four main groups of the labor forces include: Direct Workers, Contracted Workers, Primary Supply Workers, and Other Stakeholders. The Direct Workers include individual consultants and members of the Project Implementation Unit (PIU), who are essential from the project preparation phase through to completion. The Contracted Workers, engaged by the PIU and construction contractors, consist of national specialists such as Detailed Design Consultants and Construction Supervision Consultants, as well as skilled and unskilled laborers. This group is engaged on intermittent basis. The Primary Supply Workers are mostly local workers involved in providing services to the project at local level during construction, while Other Stakeholders include civil servants from various government ministries and departments, such as MoWRAM, NCDDS, and MEF are technical support. Yutasas require 40 skilled and 60 unskilled workers for implementation.

The involvement of local workers and civil servants is a key feature of the labor requirements. Local workers are heavily engaged as unskilled laborers and primary supply workers, emphasizing the project's reliance on local resources and its potential to create employment opportunities in the region. Additionally, civil servants from ministries such as MoWRAM, NCDDS, and MEF play a significant role, particularly during the construction phase, ensuring compliance with safeguards and providing technical and administrative support. The CAISAR project, requiring careful coordination among consultants, contractors, government agencies, and local communities to ensure successful implementation.

Table 10: The estimated influx labor within the sub-schemes

Type of project workers	Characteristics of project workers	Duration of Labor Requirements	Yutasas
PIU's member MoWRAM & NCDDS	Individual consultants (e.g., E&S Specialists, Design Engineers, Construction Supervision Engineers, etc.	From project preparation till project completion	20

Type of project workers	Characteristics of project workers	Duration of Labor Requirements	Yutasas
Engaged by PIU			
Detailed Design Consultant	National specialists	From project preparation until project completion	3
Construction Supervision consultant	National specialists		1
Independent E&S Monitoring Consultant		One (1) month in very six (6) months	1
Technical Assistance			3
Skilled workers	National specialists	Durations vary, depending on construction stages & needs.	10
Unskilled workers	Local workers (around subproject location)		15
Primary Supply Workers			
Workers producing materials for core project activities	Mostly local workers	Construction stage	4
Other Stakeholders Working in Connection with Project			
Civil servants of MoWRAM, PDWRAM at provincial & district level	SEO safeguard team	The construction stage of the project.	2
Civil servants of NCDDS	Staff of NCDDS	From project preparation until project completion	2
Civil servants of MEF	Staff of GDR	From project preparation until project completion	1
Civil servants of relevant Ministries	Staff	The construction stage of the project.	1

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, E&S = Environmental and Social, NCDDS = National Committee for sub-National Democratic Development Secretariat, PDWRAM = Provincial Department of Water Resources and Meteorology, SEO = Social and Environmental Officer, MEF = Ministry of Economy and Finance, GDR = General Department of Resettlement.

2.6.2 Power Usage

During the construction, the project requires a reliable and sufficient power supply to support various construction activities including equipment operation, worker facilities, and site management. A significant portion of power consumption will be allocated to heavy machinery and equipment, including concrete mixers, cranes, drilling rigs, welding machines, water pumps, and earthmoving equipment such as excavators and bulldozers. These machines require high-power supply mainly from the self-propel engine using diesel or gasoline as the fuel whereas the power for lighting and security systems for general visibility on the construction site could be from the power grid as the location is accessible to power grid. Apart from machinery, electricity for

worker facilities and site infrastructure can be the power grid or diesel generators. Worker camps will require power for lighting, cooking, air circulation, and mobile charging.

The overall power demand will vary based on the project's phase, the number of workers, and the type of equipment used. However, the estimate of the demand is far from actual since many information is lacking. The engineering team recommended to wait until the DED stage. A hybrid power system using a combination of grid electricity, and diesel generators. Efficient energy management strategies will help optimize power use, reduce costs, and minimize environmental impact.

2.6.3 Supporting Facilities

Several supporting facilities that are required for the construction activities include site offices and administrative facilities, worker accommodation and welfare facilities such as worker camps containing toilets, showers, handwashing stations, and kitchens to ensure proper hygiene and nutrition. A stable power supply is needed for machinery operation, lighting, and worker facilities, sourced from grid electricity, diesel generators, or solar panels can be the options. Additionally, wastewater treatment facilities are need to manage sewage and reduce environmental pollution for the camp sites.

Proper storage and material handling facilities is needed to protect construction materials such as cement, steel, and gravel. Transportation infrastructure and access roads is used to facilitate the movement of materials and personnel, with designated loading and unloading zones to streamline logistics. To ensure safety, security measures such as perimeter fencing, guard posts, and fire safety stations is needed. Furthermore, environmental management facilities such as waste segregation units, drainage systems, and recycling bins are also needed to minimize environmental impact. The specific layout and location of the facilities can only be projected at after obtaining the final design layout plan of the engineering team during the construction stage after the contract award.

2.6.4 Water Consumption

Water is needed for construction activities and domestic uses of workers. Water is essential for various activities, including material preparation, earthworks, equipment operation, worker sanitation, and site maintenance. A significant portion of water use is allocated to concrete and material preparation, where it is needed for mixing concrete, mortar preparation, curing, and soaking bricks or blocks to prevent rapid water absorption. Additionally, earthworks and dust control require water for soil compaction, suppressing dust on unpaved roads, and softening the ground during grading and levelling. Water is also crucial for equipment and machinery operations, including cooling construction machinery, cleaning tools and formworks, and conducting hydraulic testing of pipelines to check for leaks and pressure integrity. In road construction and asphalt work, water is required for wetting base layers before compaction, mixing with bitumen, and cooling asphalt equipment. Estimate the quantity of water for such activities need the figure of the facilities. As per the consultation with the engineering team, it is not feasible to make an estimate on the water need for such a work since the scope of work including volume of excavated soil, volume of concrete to be used, and so on are not available.

The estimate of water needs for domestic use of the project associated workforce use the 70 liters per day as the basis for the calculation. As the duration of engagement of staff and officials, workers, civil servants over the project life time are varied from one to another. The PMU staff engagement at the field is estimated at 3 days per month over the period of 6 years. The DED Consultant is estimated at 100 days per year for one year, following by construction supervision consultant at 250 days per year for 2.5 year, independent E&S Monitoring Consultant at 25 days per year for 3 years, technical consultant at 50 days per year for 3 years, skilled and unskilled workers at 250 days per year for 2 years, primary supply workers at 50 days per year for 2 years, officials for MOWRAM and PDoWRAM at 50 days per year for 6 years, and other officials at 40 days per year for 6 years. The result of the estimate for water demand is provided below:

Table 11: The estimated quantity of water for domestic use of the project

No.	Type of Workers	Total Workers	Number of Days at Field	Total Water Demand (liters/day)	Total Water Demand (m3)
1	PIU member MoWRAM & NCDDS	20	4,320	1,400	6,048
2	Detailed Design Consultant	3	250	175	44
3	Construction Supervision consultant	1	781	88	68
4	Independent E&S Monitoring Consultant	1	94	88	8
5	Technical Assistance	3	375	175	66
6	Skilled workers	10	5,000	700	3,500
7	Unskilled workers	15	7,500	1,050	7,875
8	Primary Supply Workers	4	469	263	123
9	Civil servants of MoWRAM, PDWRAM	2	600	140	84
10	Civil servants of NCDDS	2	480	140	67
11	Civil servants of MEF	1	300	88	26
12	Civil servants of relevant Ministries	1	300	88	26
	Total				17,936

PIU = Project Implementation Units, MoWRAM = Ministry of Water Resources and Meteorology, NCDDS = National Committee for sub–National Democratic Development Secretariat, E&S = Environmental and Social, PDWRAM = Provincial Department of Water Resources and Meteorology, MEF = Ministry of Economy and Finance.

The estimated water demand is mainly for needed during the construction period, given less than 1% of the estimated water is required for pre-construction stage.

2.6.5 Expected GHG Emission and Discharge

During construction, the construction activities will generate Greenhouse Gas (GHG) emissions from various activities, primarily due to the use of fossil fuels, electricity consumption, and material production. One of the major contributors to emissions is fuel combustion in heavy machinery and construction equipment, such as excavators, bulldozers, cranes, and trucks. These machines rely

mainly on diesel fuel, which releases carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) into the atmosphere. Additionally, transportation of materials such as sand, gravel, cement, and steel to the construction site will also contribute to emissions through fuel consumption by trucks and other vehicles.

Another significant source of GHG emissions is the production and use of construction materials, particularly cement, steel, and asphalt. Cement manufacturing is known for high CO_2 emissions due to the chemical process of calcination, while steel production requires significant energy, leading to further emissions. The use of electricity for site operations, including lighting, worker accommodations, water pumping, and equipment, will also add to the overall carbon footprint, depending on the energy mix used. However, the exact amount of GHG emissions can only be determined after the detailed engineering design is completed, which will provide specific information on construction scope, number and size of equipment usage, and material requirements. Future calculations should take into account project-specific data to ensure a more accurate estimation of the environmental impact.

2.6.6 Land Acquisition for Material Storage

To support construction activities, contractors will need to rent land or engage local households to store materials and vehicles. This land will be used for essential contractor facilities, such as temporary storage areas, worker accommodations, and machinery stations. Securing this land is critical for ensuring efficient operational logistics and smooth construction management throughout the project. Overall, it is projected that a total of 5 households or land units will be needed for Yutasas.

2.7 Project Alternatives Analysis

2.7.1 Site Selection

Yutasas is a sub-scheme, located within the Krang Ponely catchment made of four (4) sub-areas: Brambei Mom, Krapeu Troum, Yutasas and Krang Bat covering a total area of 3,277 hectares.

2.7.2 Project Layout and Design

Rehabilitation and enhancement of the existing irrigation system is the main design option under the project opting out from the feasibility design stage as huge land area acquisition found to be critical and generate high social impacts on community people.

Table 12: Irrigation System Options in Yutasas

No.	Structures	Designed Length (km)	Existing Width (Average) m	Expansion (L) m	Expansion (R) m	Total Width (m)
Yutasas						
1	Embankment	1	18.4	1.6	0.8	20.80
2	Main canal	6.6	21.3	2.2	1.1	24.60
3	Main Drain	7.4	59	0	0	59.00
4	Secondary Drain	2.2	21.3	0	0	21.30

L = Left, R = Right

Secondary Canals. The construction of new secondary canal is expected to acquire huge land areas of farmers which may result in disruption of household economy. To avoid the negative impact, the construction of the canal was agreed to remove the newly plan secondary canal while off-take structure (culverts) will be used to allow farmers to abstract water from the system as per their block command areas. Farmers who own the land within the block need to discuss and agree whether they are going to build their own water canal or use plot by plot irrigation. The risk as per this option is when farmers could come up with the agreement on the construction of a small canal on their own, they have to continue irrigating their farm through deploying plot-to-plot irrigation or using long range pumping which involve with high cost and limited water use efficiency. Since the design is trying to avoid land acquisition, this will be the option for the system which is also applied to the quaternary and fourth-level canal as well.

River Training. River training methods are designed to regulate and stabilize river flows for various purposes, including irrigation, flood control, and erosion prevention. Below are three common types of river training, along with their respective advantages and disadvantages adopted from online source to provide general overview regarding the design and possible options which should be considered for the actual practices. However, it is up to the DED team to decide as per the consultation with Social Safeguard consultant (Table 13).

Table 13: River Training Design Options

River Training	Description
Embankments (Levees)	Embankments are artificially raised banks made of earth, concrete, or stone along the sides of a river to prevent water from overflowing into adjacent lands.
Advantages:	• **Flood Control:** Protects agricultural lands and infrastructure from river flooding. • **Irrigation Water Regulation:** Helps direct water flow into irrigation channels efficiently. • **Erosion Prevention:** Reduces bank erosion, safeguarding nearby farmlands and structures. • **Cost-Effective:** Generally, less expensive compared to more complex river training structures.
Disadvantages:	• **Sediment Deposition Issues:** Can lead to sediment buildup within the riverbed, raising water levels and increasing flood risks over time. • **Breaching Risk:** If poorly maintained, embankments can break during extreme floods, leading to catastrophic damage. • **Ecological Impact:** Alters natural river dynamics, affecting aquatic ecosystems and wetlands.

Spurs (Groynes)	Spurs (also called groynes) are structures extending perpendicularly from the riverbank into the river. They help deflect and slow down water flow to prevent erosion and sediment deposition in key areas.
Advantages:	• **Bank Protection:** Reduces erosion by redirecting strong currents away from vulnerable banks. • **Sediment Control:** Helps accumulate sediments in specific areas, aiding in land reclamation or creating stable riverbanks. • **Improves Water Availability:** Can be strategically placed to direct water flow into irrigation systems.
Disadvantages:	• **Local Scouring:** Can cause deep erosion near the structure, affecting nearby irrigation headworks or riverbanks. • **Periodic Maintenance Required:** Sediment accumulation may require periodic dredging to maintain functionality. • **High Initial Cost:** Construction and material costs can be relatively high compared to natural erosion control measures.
Weirs and Barrages	Weirs are low dams built across a river to regulate water flow, while barrages are adjustable structures with gates that control water levels for irrigation and flood management.
Advantages:	• **Water Level Control:** Maintains steady water levels in irrigation channels, ensuring consistent supply to farmlands. • **Hydropower Potential:** Some barrages can integrate small-scale hydroelectric generation. • **Prevents Saltwater Intrusion:** Useful in coastal areas where tidal effects can introduce salinity into freshwater irrigation systems.
Disadvantages:	• **Disrupts Natural River Flow:** Can impact fish migration and aquatic ecosystems if fish passages are not incorporated. • **Expensive to Build and Maintain:** High initial investment and ongoing maintenance are required for long-term functionality. • **Flooding Risk Upstream:** Can cause water accumulation upstream, leading to potential flooding in extreme weather conditions.

Design Slope. As per the confirmation of the Engineering Team, canal slopes will either be protected or left as earthen slopes based on their condition and the available budget, which will

be determined during the detailed design phase. For weak slopes, concrete lining and geosynthetic materials will be recommended for reinforcement. The feasibility of bio-engineering solutions will be assessed based on the specific site conditions of the project. The following is the comparison between the vegetated and concretized design slope:

Table 14: Slope Design Options Comparison

Concretized Canal Slopes	• Erosion Control: Concretized canal slopes provide strong erosion resistance, reducing sedimentation in water bodies downstream. This helps maintain water quality and prevents sediment-related ecological degradation. • Maintenance Needs: Concretized slopes generally require less maintenance compared to vegetated banks. They are easier to inspect and repair, reducing ongoing operational costs. • Habitat Impact: Concretized slopes typically offer limited habitat for aquatic organisms and vegetation compared to natural or vegetated banks. This can reduce biodiversity and ecological resilience in the waterway. • Heat Absorption: Concrete can absorb and retain heat, leading to higher water temperatures in the canal. This can affect aquatic life, especially sensitive species, and alter ecosystem dynamics. • Aesthetics: Concretized slopes may be perceived as less visually appealing compared to natural or vegetated banks. This could impact recreational use and community engagement with the water resource.
Vegetated Banks	• Erosion Control: Vegetated banks provide natural stabilization, reducing erosion by absorbing water, slowing runoff, and binding soil with root systems. They contribute to maintaining soil structure and preventing sedimentation downstream. • Biodiversity: Vegetated banks offer diverse habitats for aquatic and terrestrial species, promoting biodiversity and supporting ecological balance. They can serve as wildlife corridors and provide nesting sites for birds. • Water Quality: Vegetated banks act as buffers, filtering pollutants, and absorbing excess nutrients from runoff. This improves water quality and supports healthier aquatic ecosystems. • Temperature Regulation: Vegetation provides shade, helping to regulate water temperature and mitigate thermal pollution. This is particularly important for species sensitive to temperature fluctuations.

	• Community Benefits: Vegetated banks enhance the aesthetic value of the waterway, offering green spaces for recreation, relaxation, and cultural activities. They can also contribute to community engagement and ownership of the water resource.

Cross-Regulator/Off-Take Structure. The structure is required for all sub-schemes and specific size, number, and locations need to be assessed during DED stage. The calculation regarding the design specification need to consider the water requirement in each block of the sub-command areas.

2.7.3 Project Technology

The feasibility study has assessed the climate vulnerabilities of the Command Areas and their communities to design suitable, sustainable, and climate-resilient irrigation systems. The scheme will make use of nature-based, adaptive, and data-driven technologies to ensure its resilience to extreme floods and climate change. Smart SCADA technology will be installed to monitor the system for leaks and flood damages, while drainage systems will also be installed to reduce waterlogging, flood impacts, and crop failures.

Solar pumping will be employed in place of costly and high-carbon diesel alternatives to create a self-sustaining system. The lining of canals is an important feature of the system's climate resilience, and a range of investment options exist depending on the extent of lining in the new network. Concrete will be used for certain sections to reduce the carbon footprint.

There are different technological options being proposed for the project activities. The key technological options are provided here:

Table 15: Irrigation System Options

Options	Component	Options	Description
Pumping	1	Diesel water pump	Traditional water pumping systems powered by diesel engines. These are commonly used in areas where electricity is unavailable but it has higher operational cost and environmental impacts. However, it can be used anywhere in the sub-scheme.
		Solar pumps	Sustainable and cost-effective water pumping systems that harness solar energy, suitable for remote areas with abundant sunlight. They offer lower long-term costs but may require higher initial investment.
		Electric pumps	Powered by electricity from the grid or other sources, these pumps are efficient but depend on the availability of consistent electrical supply which maybe inapplicable at farm level in most of the sub-scheme
IPM	1	Pesticide application	A conventional approach involving chemical pesticides to manage pests, often leading to quick

			results but with potential risks to health, environment, and biodiversity. The times of application without IPM will be up to 6 times as per the reported from the field survey.
		With IPM*	The application of pesticides will be reduced to only around 3 times, minimizing the impacts on the quality and health of water, environment, wildlife, fauna and flora, human and animal
Agromet	1	Without Agromet	Farming practices carried out without the use of weather and climate data, potentially leading to inefficiencies and higher vulnerability to climate risks.
		Agromet	Incorporates meteorological data and forecasts into agricultural decision-making, enhancing productivity, resource optimization, and resilience to climate variability. However, the major challenge is mainly the operational cost of the system.
SCADA**	2	Convention	Manual or semi-automated control systems for monitoring and managing operations, which may be labour-intensive and less efficient in handling complex systems.
		SCADA	Advanced digital systems that provide real-time monitoring, data analysis, and remote-control capabilities for improved efficiency and operational oversight.

*. IPM = Integrated Pest Management

**. SCADA = Supervisory Control and Data Acquisition

For pumping, there is a need to be case specific to each of the option. Applying these technological options are important since the technologies will facilitate the agricultural production and complimenting each other is needed. The promotion of only one (1) option would decrease the effective farming activities. Regarding the IPM, it is quite important to promote the technologies as it will reduce the negative impacts which will be caused by the farming activities. The application of agromet will require technical skill and management capacity

2.7.4 Project Scenario Analysis

In the without-project scenario, the net command area of 593 ha will continue to be cultivated with a cropping intensity of 100% (593 ha). This includes 119 ha of late wet-season paddy and 474 ha of medium wet season paddy. This is the same to the land area of 1% (6 ha) continue to grow vegetable with the risk of crop failure due to limited water sources.

In the with-project scenario, while the net command area will remain unchanged, improvements in water availability, water management, transmission efficiency, and drainage will increase cropping intensity to 117% (covering 693 hectares). This will include 59 hectares of late wet-

season paddy, 237 hectares of medium wet-season paddy, 297 hectares of early wet-season paddy, and 100 hectares dedicated to high-value crops such as fruits and vegetables.

The proposed Yutasas scheme aims to install secondary and tertiary irrigation canals along with related infrastructure within the existing scheme, enhancing water availability during the dry season for 593 hectares of nearby agricultural fields. The project will also establish and train Farmer Water User Communities (FWUCs) to manage and maintain the irrigation infrastructure, ensuring its long-term sustainability. Additional agricultural extension services will be offered to local farmers, focusing on improved agricultural practices and value chain development, the use of improved seed varieties, cover crop application, and optimal fertilizer and pesticide use.

The project is expected to deliver the following agricultural benefits for the 1,339 targeted farming households: i) higher yields for wet-season rice, ii) expanded cultivated areas and increased yields for dry-season rice, and iii) the introduction of high-value crops like leafy and fruit vegetables for dry-season farming. These improvements are projected to enhance agricultural productivity, increase farmer incomes, and boost farmer resilience against drought, pests, diseases, and market risks through crop diversification.

In the without-project scenario, ongoing agricultural practices would persist, leading to suboptimal rice yields, limited crop diversification, low farmer incomes, and increased vulnerability to climate risks.

3. LEGAL AND INSTITUTIONAL FRAMEWORK

Following a framework for effective project development as well as environmental sustainability, the project owner shall comply with the national legal framework and protocols ratified by the Kingdom of Cambodia. For CAISAR Project, there are national laws, agreements, guidelines and relevant legal instruments as described below:

3.1 Royal Government of Cambodia's Legal Framework

3.1.1 National legal framework

3.1.1.1 The Constitution of the Kingdom of Cambodia (1993)

The Constitution is the highest legal authority in Cambodia and establishes the fundamental rights and duties of citizens and the state. It sets the groundwork for environmental protection, governance, social inclusion, and public well-being, ensuring that environmental and social rights are integrated into national laws.

3.1.1.2 Legal Framework related to the Management and Conservation of Natural Resources and Biodiversity

This framework aims to ensure sustainable use and conservation of Cambodia's natural resources, including water, land, biodiversity, and ecosystems. Laws under this framework help guide ESCIA processes to minimize environmental degradation.

- **Royal Decree on Protected Areas (2008)** sets the standard for managing Cambodia's protected areas. It categorizes these areas into **National Parks**, **Wildlife Sanctuaries**, **Protected Landscapes**, and **Multiple-Use Areas** to conserve biodiversity, ecosystems, and cultural heritage while supporting sustainable development.
- **Law on Environmental Protection and Natural Resource Management (1996)**: Establishes principles for sustainable development and environmental protection, requiring environmental assessments for projects impacting natural resources.
- **Environmental and Natural Resources Code 2023**: Provides a comprehensive approach to natural resource governance, setting standards for the sustainable management of resources.
- **Law on Land Management, Urban Planning and Construction (1994)**: Governs land use, urban development, and construction to ensure that environmental and social impacts are mitigated.
- **Law on Water Resource Management (2007)**: Regulates water usage, conservation, and management, ensuring that development projects do not negatively impact water resources.
- **Law on Fisheries (2006)**: Focuses on sustainable fisheries management and biodiversity conservation in aquatic ecosystems, crucial for ESCIA in projects affecting water bodies.
- **Protected Areas Law (2008)**: Establishes protected areas to conserve biodiversity and natural resources, ensuring that development projects respect these protected regions.
- **Land Law (2001)**: Regulates land ownership and management to promote sustainable land use practices.
- **Sub-Decree on Water Pollution Control (1999)**: Sets standards for water quality and pollution control in development projects.
- **Sub-Decree on Water Quality Standard for Public Waters for the Purpose of Biodiversity Conservation (1999):** These standards aim to maintain conditions suitable for aquatic ecosystems by limiting pollutants, ensuring water remains safe for the survival and reproduction of aquatic life, and preventing ecological degradation.
- **Sub-Decree on Environmental Impact Assessment (1999)**: Requires EIA for development projects, ensuring environmental impacts are assessed and mitigated.
- **Sub-Decree on Air Pollution Control and Sound Disturbance (2000)**: Provides standards to control air pollution and noise disturbances from development projects.
- **Sub-Decree on Solid Waste Management (1999)**: Governs solid waste management in projects, preventing environmental harm from improper waste disposal.
- **Prakas on Environmental Impact Assessment Reports (1999)**: Offers guidelines for preparing EIA reports to ensure thorough assessment of environmental impacts.

- **Prakas on Hazardous Substances (2015)**: Sets limits on the disposal of toxic substances, preventing environmental contamination from hazardous materials.
- **Biodiversity Convention (1994)**: Focuses on conserving ecosystems, species, and genetic diversity. Promotes sustainable use of resources, establishment of protected areas, and fair benefit-sharing from genetic resources.
- **Ramsar Convention (1999)**: Aims to conserve wetlands of international importance for biodiversity, water management, and climate resilience. Encourages sustainable use and designation of Ramsar sites.
- **UNFCCC (1994)**: Provides a framework to combat climate change impacts on ecosystems. Supports sustainable land use, forest conservation, and integration of climate adaptation into conservation strategies.
- **Kyoto Protocol (1997, entered into force 2005, Cambodia accessed 2002):** Strengthens the UNFCCC by setting legally binding targets for reducing greenhouse gas emissions, promoting sustainable development and renewable energy.
- **Vienna Convention for the Protection of the Ozone Layer (1988, Cambodia accessed 2001):** Aims to protect the ozone layer through global cooperation, encouraging research, monitoring, and measures to phase out harmful substances.
- **Montreal Protocol on Substances that Deplete the Ozone Layer (1987, entered into force 1989, Cambodia accessed 2001):** A legally binding treaty to phase out ozone-depleting substances. Contributes to environmental and climate protection.
- **Basel Convention (1992, Cambodia accessed 2001**): Controls the transboundary movement of hazardous wastes and their disposal, emphasizing waste reduction and environmentally sound management.
- **United Nations Convention to Combat Desertification (1996, Cambodia ratified 1997):** Addresses land degradation and desertification through sustainable land management, conservation of soil and water resources, and restoration of degraded land.
- **CITES (1975, Cambodia ratified 1997):** Regulates trade in endangered species to ensure their survival, focusing on sustainable management and combatting illegal wildlife trade.
- **UNESCO Network of Biosphere Reserves (Cambodia joined in 1997):** Promotes the sustainable management of biodiversity, ecosystems, and cultural heritage through conservation and sustainable development practices.
- **Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs):** Cambodia committed to global goals for environmental sustainability, including biodiversity conservation, climate action, and ecosystem protection.

- **ASEAN Agreement on Transboundary Haze Pollution (2006):** Focuses on preventing and mitigating air pollution caused by forest fires through regional cooperation and sustainable forest management.
- **ASEAN Agreement on Disaster Management and Emergency Response (2009):** Strengthens disaster preparedness, risk reduction, and environmental resilience in the ASEAN region.
- **Mekong Agreement (1995):** Promotes sustainable development, equitable water use, and conservation of the Mekong River Basin's ecosystems and resources.
- **Biodiversity Law (2009):** This foundational law provides a comprehensive legal structure for the sustainable management of biodiversity resources. It addresses habitat protection, species conservation, genetic resource management, and the sustainable use of biodiversity, outlining the government's responsibilities and promoting public participation.
- **Environmental Protection Law (1995):** This law sets general principles for environmental protection and outlines the government's role in environmental management, including pollution control, waste management, and natural resource conservation. It complements the Biodiversity Law by providing a broader environmental governance framework.
- **Forest Law (1994):** Regulating the management, use, protection, and restoration of Cambodia's forests, this law is crucial for balancing economic development with environmental conservation, particularly in biodiversity-rich ecosystems.
- **Wildlife Sanctuary and Protection Law (1993):** This law establishes wildlife sanctuaries and offers protection to wildlife species by prohibiting hunting, trapping, and other activities that threaten wildlife and their habitats.
- **Fisheries Law (1991):** This law governs the management of Cambodia's fisheries resources, setting rules for sustainable fishing practices, protecting aquatic habitats, and ensuring the long-term health of aquatic ecosystems.
- **Environmental Code (2023):** The newly introduced Environmental Code consolidates and updates Cambodia's environmental laws, introducing stricter regulations on pollution control, natural resource management, and biodiversity conservation. It emphasizes climate change adaptation and mitigation and enhances public participation and transparency in environmental decision-making.
- **Nagoya Protocol (2010):** As a party to the Nagoya Protocol under the Convention on Biological Diversity (CBD), Cambodia commits to the fair and equitable sharing of benefits arising from the utilization of genetic resources. This protocol supports

Cambodia's efforts to protect its biodiversity while ensuring that the benefits of its genetic resources are shared with local communities and stakeholders.

3.1.1.3 Legal Framework related to Labour, Public Well-Being, and Safety

This framework emphasizes the protection of workers' rights, public safety, and well-being in project development. It ensures that development projects comply with labor laws and safety standards.

- **Labor Law (1997)**: Protects workers' rights, ensuring safe and fair working conditions during project implementation.
- **Law on Roads (2014)**: Governs the construction and maintenance of roads, with provisions for minimizing environmental and social impacts.
- **Law on Road Traffic (2014)**: Addresses traffic management and safety measures to prevent accidents and disruptions during development.
- **Law on Suppression of Human Trafficking and Sexual Exploitation (2008)**: Protects vulnerable populations during project implementation from exploitation and trafficking.
- Government Occupational and Community Safety and Health (OHS) guidelines follow the OHS Program for Cambodia (2010-2013) developed by the International Labor Organization (ILO). The draft guidelines provide the framework for instituting OHS at the workplace and in the community.
- The Ministry of Labor and Vocational Training (MLVT) has the following guidelines which will be implemented during the construction phase of the Project:
    - MLVT Prakas on Sanitation at the Construction Site (March 2011). The Prakas sets to ensure that the sanitation and safety conditions are fulfilled for workers at construction sites by owners, directors, contractors or subcontractors of construction establishments or construction companies. Articles 3 and 4 ensure that workers are provided with shelter, sanitation facilities and safe potable water for drinking and washing.
    - MLVT Prakas on The Protection of Risk Resulting from Climate Change at Construction Sites (March 2011). Articles of this Prakas require safety measures and break times for workers at the construction site during extreme weather events.
    - MLVT Prakas on Providing of Information at the Construction Site (March 2011). This Prakas states requirements for owners or responsible persons of a construction site to provide information, i.e. name and address of the owner of enterprise, construction establishment, Construction Company, name and address of architect, nature of construction, date for the start of the construction, estimated time to finish the construction works, and estimated number of workers to be employed for construction activities.

- MLVT Prakas on Stock of Materials, Waste Disposal and Clearance at Construction Site (March 2011). This Prakas provides safety guidelines and requirements for the safe storage of construction of materials and waste.

3.1.1.4 Legal Framework related to Governance and Social Inclusion

This framework ensures that development projects promote inclusive governance, respect cultural heritage, and safeguard social rights. It includes provisions for tax obligations, land acquisition, resettlement, and social protection schemes.

- **Law on Taxation (1997)**: Governs the taxation of development projects, ensuring they contribute to national revenue and economic sustainability.
- **Sub-Decree on Construction Permit (1993)**: Requires permits for construction activities, ensuring they comply with environmental standards and social safeguards.
- **Law on Protection of the Rights of Persons with Disabilities (2009)**: Ensures that development projects consider the needs and rights of people with disabilities.
- **Law on Social Security Schemes (2002)**: Provides social protection for workers, ensuring their well-being during project execution.
- **Sub-Decree on Health Care Scheme (2016)**: Extends social security and health care protection to workers involved in development projects.
- **Law on the Protection of Cultural Heritage (1996)**: Safeguards cultural heritage sites, ensuring that development projects do not damage or destroy culturally significant areas.
- **Expropriation Law (2010)**: Regulates land acquisition for public purposes, ensuring fair compensation and minimizing the impact on affected populations.
- **Sub-Decree on Land Acquisition and Resettlement (2018)**: Provides procedures for land acquisition and involuntary resettlement, particularly for externally financed projects.
- **Sub-Decree on Social Land Concession (2003)**: Allows for the allocation of state land to landless citizens, particularly when development projects displace communities.
- **Sub-Decree on State Land Management (2005)**: Regulates the management of state land, ensuring its sustainable use in development.
- **Sub-Decree on River Basin Management (2015)**: Promotes sustainable management of river basins, ensuring that development projects do not harm water systems and dependent ecosystems.

3.2 EIA Classification

In order to provide guidelines on effective implementation of sub-decree No 72 ANRK.BK on environmental impact assessment Procedures for development projects, MoE promulgated sub-decree No. 21 on Environmental Impact Assessment Classification for Development Projects.

According to this sub-decree, environmental impact assessment for projects is classified into three categories.

- Appendix 1: Projects requiring full environmental impact assessment (full ESIA)
- Appendix 2: Projects that require initial environmental impact assessment (IEIA)
- Appendix 3: Projects requiring the Contract on Environmental Protection (EPC)

The sub-decree includes an annex listing projects under various sectors and their categorization on the basis of their nature, type and size. The sector and EIA classification for irrigation project is summarized in Table 11 below.

Table 16: ESIA Classification for Development Projects relevant

No	Project Type	ESIA (Equiv. to ADB's A)	ESIA (Equiv. to ADB's B)	Env. Protection Contract	Apply to CAISAR Project
1	Irrigation systems		≥5000ha	1000-5000ha	√
2	Water diversion systems		≥5000ha	1000-5000ha	√
3	All building construction	>45000m2	15000 – 45000m2	3000-15000m2	
4	Road construction (new)	>100km	≥ 30 – 100km	10-<30km	√
5	Railroad and road expansion	>100km	≥50 – 100km	10-<50km	√
6	Road in protected areas	>30km	≥ 10-30 Km	10km	
7	Road widens or rehabilitation in protected area	>50km	≥ 10-50 km	10km	

Source: Prakas No. 021 PRK.BST dated 03 February 2020.

3.3 Applicable Ambient Quality Standards

3.3.1 Water quality standards for public health protection

Water quality standards in public water areas for biodiversity conservation are shown in Table 17 below. These are applied as the national standards on surface water quality.

Table 17: Water quality standards in public water areas for bio-diversity conservation

No	Parameter	Unit	Surface water Standard	
			River	Lake etc
1	pH	mg/l	6.5-8.5	6.5-8.5
2	Total suspended solids (TSS	mg/l	25-100	1-15
3	Dissolved oxygen (DO)	mg/l	7.5-2.0	7.5-2.0
4	Biochemical oxygen demand (BOD5)	mg/l	1-10	<30

5	Chemical oxygen demand (COD)	mg/l	<50	1-8
6	Total Nitrate (TN)	mg/l	0.1-0.6	0.1-0.6
7	Total phosphorous (TP)	mg/l	0.005-0.05	0.005-0.05
8	Arsenic (As)	mg/l	<0.01	<0.01
9	Iron (Fe)	mg/l	<1	<1
10	Total Coliform	MPN/100ml	<5,000	<1,000

Note: Standard* = Surface water quality standards for lake, reservoirs and river of the MoE's Prakas on the adoption of terms of references for infrastructure and tourism sectors (2018).

The Royal Government of Cambodia has established a comprehensive policy on National Water Supply and Sanitation for both urban and rural water supplies. Based on this policy, and to ensure access to safe drinking water to all people, quality standards for both drinking water and groundwater are developed by an inter-ministerial process initiated by the Ministry of Industry, the Mines and Energy, and other concerned ministries with support from the World Health Organization.

Table 18: Groundwater and Drinking Water Quality Standards.

No.	**Parameters**	**Unit**	**Standard**		
			River	**Lake and reservoir**	**CDWQS***
1	Depth				
2	pH	-	6.5-8.5	6.5-8.5	6.5-8.8
3	Electrode Conductivity (EC)	mg/l	500-1500	500-1500	-
4	Arsenic (AS)	mg/l	<0.01	<0.01	0.05
5	Cadmium (Cd)	mg/l	<0.003	<0.003	<0.003
6	Lead (Pb)	mg/l	<0.01	<0.01	0.01
7	Total Nitrogen (TN)	mg/l	<3	<2	-
8	Total Phosphorus (TP)	mg/l	<0.25	<0.15	-
9	Total Dissolved Solid (TDS)	mg/l	<1000	<1000	<800
10	Total Suspended Solid (TSS)	mg/l	<100	<100	-
11	Dissolved Oxygen (DO)	mg/l	>3	>4	-
12	Total Coliform	MPN/100ml	<1000	<1000	0

*. Cambodia Drinking Water Quality Standard

Ambient Air Quality Standards are presented in Table 14. Maximum permitted noise levels in public and residential areas are shown in Table 14.

Table 19. Ambient Air Quality Standards

Parameters	**Cambodia**	**WHO Air Quality Guideline 2021**

	Period 1h Average mg/m^3	Period 8h Average mg/m^3	Period 24h Average mg/m^3	Period 1year Average mg/m^3	
Carbon monoxide (CO)	40	20	-	-	4mg/m^3 (24h Average)
Nitrogen dioxide (NO2)	0.3	-	0.1	-	10 ug/m^3(1 year average) 25 ug/ m^3 (24h average)
Sulfur dioxide (SO2)	0.5	-	0.3	0.1	40 ug/ m^3 (24 h average)
Ozone (O3)	0.2	-	-	-	100 ug/ m^3 (8h average)
Lead (Pb)	-	-	0.005	-	-
Particulates	-	-	0.33	0.1	5 ug/m^3 (PM2.5, 1year) 15 ug/m^3 (PM2.5, 24h average)

Note: 1. Sub-decree N0 42 ANRK.BK on Air Pollution Control and Noise Disturbance. Source: https://www.who.int/news-room/feature-stories/detail/what-are-the-who-air-quality-guidelines.

Table 20. Maximum permitted noise levels in public and residential areas (dB (A))

Location	Cambodia Standard			IFC-EHS Guideline	
	06:00 to 18:00	18:00 to 22:00	22 to 6:00	Day 7:00 to 22:00	22:00 to 7:00
Silence Area Hospital; Library, School, Nursery	45	40	35	55	45
Resident Area Hotel; Administration place, House	60	50	45	-	-
Commercial, Services Areas and mix	70	65	50	70	70
Small Industrial factories intermingling in residential areas	75	70	50		

Note: This is permitted noise level of any source of activity at the public and residential areas. Source: Sub-Decree on Air Pollution Control and Noise Disturbance, 2000.

3.4 AIIB'S Environmental and Social Framework (ESF)

The Asian Infrastructure Investment Bank's (AIIB) Environmental and Social Framework (ESF) (2022) outlines the principles and standards to ensure environmentally and socially sustainable

development practices for projects it finances. The framework consists of several Environmental and Social Standards (ESS) that provide comprehensive guidance on managing potential impacts and risks associated with AIIB-financed projects. AIIB's Environmental and Social Framework (ESF) (2022) are summarised here.

- **Environmental and Social Standard 1: Environmental and Social Assessment and Management**: These standard guides the assessment and management of environmental and social risks, requiring projects to evaluate alternatives, mitigate impacts, and disclose information. It emphasizes protecting the natural environment, particularly biodiversity and critical habitats, while addressing pollution, resource efficiency, and climate change. Social risks, including impacts on vulnerable groups, gender, and access to resources, must be considered. The standard also covers labor conditions, community health and safety, child labor, and security, ensuring proper grievance mechanisms, monitoring, and implementation plans.
- **Environmental and Social Standard 2: Land Acquisition and Involuntary Resettlement.** The standard provides guidance to avoid Involuntary Resettlement where possible. The requirements under the standard contain 18 points of action to which the executing agency needs to follow.
- **Environmental and Social Standard 3: Indigenous Peoples.** The standard aims to design and carry out projects in a way that fully respects Indigenous Peoples' identity, dignity, human rights, economies, and cultures. This ensures that Indigenous Peoples: (a) receive social and economic benefits that are culturally appropriate; (b) do not experience negative impacts from the projects; and (c) can actively participate in projects that affect them. The standard contains 15 points to follow.

3.5 IFADs' SECAP

The International Fund for Agricultural Development's (IFAD) Social, Environmental, and Climate Assessment Procedures (SECAP) provides a framework to ensure that IFAD-financed projects are sustainable, socially inclusive, and environmentally sound. SECAP is composed of several standards that address various environmental and social considerations. Listed in the ToR, here is the summary of the applied standards:

- **Standard 1: Biodiversity Conservation**: This standard ensures the protection of biodiversity by requiring projects to assess and mitigate biodiversity risks, avoid critical habitats, and provide compensation for unavoidable damages. It promotes sustainable use of genetic resources, discourages invasive species, and emphasizes expert advice and adherence to protected area laws.
- **Standard 2: Resource Efficiency and Pollution Prevention**: Focuses on efficient use of resources and pollution control. It requires projects to reduce energy, water, and material use, manage hazardous materials safely, and prevent pollution, with an

emphasis on sustainable natural resource management, including water, soil, fisheries, and forests.

- **Standard 3: Cultural Heritage**: This standard ensures the protection of tangible and intangible cultural heritage by screening and managing impacts, consulting local communities, and preserving access to cultural sites. Projects must avoid, minimize, or mitigate damage and follow legal requirements in protected areas.
- **Standard 4: Indigenous Peoples**: Supports and empowers indigenous communities by requiring free, prior, and informed consent (FPIC), promoting equitable resource access, and protecting cultural heritage. Projects must involve indigenous peoples in decision-making, ensure fair benefits, and avoid involuntary resettlement.
- **Standard 5: Labor and Working Conditions**: Sets requirements for safe, non-discriminatory workplaces, prohibiting forced and child labor. It requires the establishment of grievance mechanisms, safety protocols, and equal opportunities, with contractors and suppliers adhering to these standards.
- **Standard 6: Community Health and Safety**: Requires projects to assess and manage health risks, prevent exposure to hazards, and ensure infrastructure safety. It includes emergency preparedness, traffic and security management, and protection against gender-based violence.
- **Standard 7: Physical and Economic Resettlement**: Ensures resettlement is conducted legally and fairly, avoiding forced evictions. It requires special consideration for vulnerable groups, economic displacement, and establishing grievance mechanisms for affected communities.
- **Standard 9: Climate Change**: Ensures projects address climate risks and reduce GHG emissions. It mandates climate risk screening, adoption of climate-smart practices, and GHG accounting to guide project design towards reducing environmental impacts.

3.6 GEF'S Environmental and Social Policies

GEF adopts the interim environmental and social safeguards to identify, measure, and mitigate environmental and social risks based on IFC Performance Standards (PS). Under CAISAR, the following PSs are applied:

- Performance Standard 1 – Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2 – **Labor and Working Conditions**
- Performance Standard 3 – **Resource Efficiency and Pollution Prevention**
- Performance Standard 4 – Community Health, Safety, and Security
- Performance Standard 5 – Land Acquisition and Involuntary Resettlement

- Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7 – Indigenous Peoples
- Performance Standard 8 – Cultural Heritage.

3.6.1 International Conventions and Treaties

Cambodia has ratified all eight of the ILO's fundamental conventions, which cover core labour standards recognized as human rights. These conventions focus on issues such as freedom of association, elimination of forced labour, abolition of child labour, and elimination of discrimination in employment.

- **Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)**: Ratified by Cambodia in 1999, this convention protects workers' and employers' rights to freely form and join organizations without interference, ensuring autonomy and safeguarding against dissolution by authorities.
- **Right to Organise and Collective Bargaining Convention, 1949 (No. 98)**: Ratified in 1999, it protects workers' rights to organize, engage in collective bargaining, and prevents discrimination for union activities, promoting fair wage negotiations and just working conditions.
- **Forced Labour Convention, 1930 (No. 29)**: Ratified in 1969, this convention aims to eliminate all forms of forced labour, including coercive work for public works or political purposes, protecting workers' rights and dignity.
- **Abolition of Forced Labour Convention, 1957 (No. 105)**: Ratified in 1999, it strengthens the prohibition of forced labour for political coercion, discipline, or discrimination, ensuring freedom and justice in the workplace.
- **Minimum Age Convention, 1973 (No. 138)**: Ratified in 1999, it sets a minimum age for employment (usually 15) to prevent child labour, promoting access to education and protection from hazardous work.
- **Worst Forms of Child Labour Convention, 1999 (No. 182)**: Ratified in 2006, this convention seeks to eliminate extreme forms of child labour like slavery, trafficking, and hazardous work, prioritizing children's safety and rehabilitation.
- **Equal Remuneration Convention, 1951 (No. 100)**: Ratified in 1999, it promotes equal pay for men and women for work of equal value, combating gender-based wage discrimination and fostering economic justice.
- **Discrimination (Employment and Occupation) Convention, 1958 (No. 111)**: Ratified in 1999, this convention addresses workplace discrimination based on race, gender, religion, and other factors, promoting equal treatment and opportunities for all workers.

- **Employment Policy Convention, 1964 (No. 122)**: Ratified in 1971, it requires active employment policies to promote full, freely chosen employment, aiming to reduce unemployment and support economic and social development.
- **Weekly Rest (Industry) Convention, 1921 (No. 14)**: Ratified in 1969, this convention guarantees a weekly rest period of at least 24 consecutive hours for workers, helping protect their health and well-being.
- **Labour Inspection Convention, 1947 (No. 81)**: Ratified by Cambodia in 1974, this convention establishes labour inspections in industrial and commercial workplaces to ensure compliance with national labour laws, promoting safe, fair, and decent working conditions.
- **Labour Inspection (Agriculture) Convention, 1969 (No. 129)**: Ratified in 1999, it extends labour inspection to agriculture, ensuring workers in this sector, including migrant and seasonal labourers, are protected by labour laws and safe working conditions are maintained.
- **Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)**: Ratified by Cambodia in 2009, this convention promotes consultation between governments, employers, and workers on international labour standards. It ensures that all stakeholders are involved in the implementation of labour policies, enhancing social dialogue and cooperation for fair labour practices.

3.7 Good International Industry Practices (GIIP)

3.7.1 WBG General EHS Guidelines (2007)

The World Bank Group (WBG) General Environmental, Health, and Safety (EHS) Guidelines (2007) provide internationally recognized technical guidance on managing environmental, health, and safety risks. These guidelines are designed to support project developers and operators, particularly in emerging markets, by outlining best practices for environmental sustainability, worker health and safety, and community well-being.

Key sections include:

- **Environmental Guidelines:** Focus on pollution prevention and control, resource efficiency, and managing air, water, and soil impacts.
- **Occupational Health and Safety (OHS):** Address workplace hazards, accident prevention, and worker welfare.
- **Community Health and Safety:** Cover topics like traffic safety, emergency preparedness, and protecting communities from project-related risks.
- **Construction and Decommissioning:** Provide guidance on managing risks during the life cycle of a project.

The guidelines emphasize compliance with local regulations and international standards and are intended to be applied alongside sector-specific EHS guidelines.

3.7.2 WBG EHS Guidelines for Annual Crop Production (2016)

The World Bank Group (WBG) Environmental, Health, and Safety (EHS) Guidelines for Annual Crop Production (2016) provide technical guidance on sustainable practices for cultivating annual crops, such as grains, legumes, and vegetables. These guidelines aim to minimize environmental impacts, ensure worker safety, and promote efficient resource use.

Key focus areas include:

- **Environmental Management:** Guidance on soil conservation, water use efficiency, pest management, and biodiversity preservation.
- **Occupational Health and Safety (OHS):** Measures to prevent injuries, promote safe pesticide handling, and protect workers from physical and chemical hazards.
- **Community Health and Safety:** Recommendations to prevent risks like pesticide drift, water contamination, and traffic safety concerns related to agricultural operations.
- **Sustainable Practices:** Emphasis on integrated pest management (IPM), crop rotation, and efficient irrigation techniques to maintain productivity and environmental health.

These guidelines align with international standards and are designed to support sustainable agricultural development.

3.8 Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF

The study and analysis of the national legal framework against the requirements under the policies of AIIB, IFAD and GCF can be summarised as Table 5.

Overall, the Royal Government of Cambodia (RGC) has established various legal documents ranging from royal decrees, sub-decrees, and circulars framing the management, and implementation of all types of development projects and activities within the country at the pre-construction, construction and implementation periods. The laws cover the management and protection of the natural resources, and biodiversity including underground, inland and water bodies. These legal frameworks also contain the standards that are applicable to the country context including water quality, soil quality, air, noise quality and vibration. Regarding human well-being including health, safety, labour and sexual exploitation, the country has made significant progress over the past years promoting the working environment of workers and labour forces embracing various laws and policies for ensuring the well-being of workers as well as the compliances that employers must comply. Laws to protect sexual exploitation, and social protection guarded the public, especially the vulnerable including the poor, and people with disability. Although the country's legal frameworks cover the requirements, there are still limited

report in terms of actual enforcement which need to be taken care where a proper implementation plan and resources are needed.

Table 21: Gap Analysis of National Legal Framework and Policies of AIIB, IFAD and GCF

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
1	ESS1		PS1	Environmental and Social Assessment and Management	• Environmental Code and Natural Resource Management (2023), • Law on Water Resource Management (2007), • Law on fisheries (2026), • Sub-Decree on Water Pollution Control (1999), • Sub-Decree on Environmental Impact Assessment (1999), • Sub-Decree on Air Pollution Control and Sound Disturbance (2000), • Sub-Decree on Solid Waste Management (1999), • Prakas on the General Guideline for Preparing the Initial and Full Environmental Impact Assessment Reports (1999), • Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed (2015)	The RGC has established a wide range of regulations especially in the recent Environmental Code and Natural Resource Management (2023) that aim to environmental protection and natural resource management are well aligned to the provisions of the AIIB ESS1.	This ESCIA covers both direct, indirect, and cumulative impacts and mitigation measures, taking a holistic approach to the project and looking at impacts in an integrated way.
2	ESS2	S7	PS5	Land Acquisition and Involuntary Resettlement	• Law on Land Management, Urban Planning and Construction (1994), • Land Law (2001), • The Expropriation Law (2010), • RGC's Sub-Decree No. 22 ANK/BK (2018) on the Promulgation of the Standard Operating Procedures for Land Acquisition and Involuntary Resettlement (SOP-LAR) for Externally Financed Projects in Cambodia, • Sub-Decree No.19 on Social Land Concession of March 2003, • RGC's Sub-Decree No.118 ANK/BK (2005) on State Land Management, • RGC's Sub-Decree No.98 ANK/BK (2015) on River Basin Management	The RGC has the SOP-LAR which is well aligned with the provisions in the AIIB ESS 2. The AIIB ESS 2 on land acquisition and involuntary resettlement recognizes that project related land acquisition and land use can have impacts on communities. The RGC's SOP-LAR is consistent with the specific requirements under the AIIB ESS 2 on consultation, grievance redress, social support, resettlement assistance, standard of living of poor and vulnerable, entitlements for persons without title or legal rights except for land, information disclosure, payment of compensation and entitlements prior to	According the RGC's SOP-LAR, an income restoration program would be provided in order to re-estalbish sources of livelihoods for those affected households who have permanently lost their sources of livelihood. In this CAISAR project, the DRPs will include provisions to ensure livelihood restoration program are robust and can accurately meet the aim of livelihood restoration in line the AIIB ESS2.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
						physical displacement, and the supervision and monitoring of implementation of resettlement plans. However, there are gaps on negotiated settlement and livelihood restoration. The SOP-LAR does not describe procedures for negotiated settlement and lack of clear benchmark to assist monitoring and evaluation to confirm if the affected households restore their livelihood to the level prevailing prior to the beginning of the project implementation.	
3	ESS3	S4	PS7	Indigenous Peoples	• The Constitution of Cambodia (1993) • Land Law (2001)	No detailed regulations on how to avoid impacts to Indigenous Peoples or how to include them in project benefits. Lack of requirement to consult IP(s) in a manner that is culturally appropriate and special disclosure and consultation requirements as described in the AIIB ESS3.	An IPPF has been prepared on the basis of the AIIB ESS3. The IPPF details procedures on the preparation of IPP(s) and how to conduct meaningful consultation and disclose that is culturally appropriate.
4	ESS1	S1	PS6	Biodiversity conservation	• Environmental Code and Natural Resource Management (2023),	The code requires a proper consideration of biodiversity resources and payment of ecosystem services which support the conservation process. There is limited guidance on how to compensate in the ecosystem services once its pristine condition is affected.	This ESCIA include the biodiversity assessment and management plan.
5	ESS1	S2	PS3	Resource efficiency and pollution prevention	• Environmental Code and Natural Resource Management (2023), • Sub-Decree on Environmental Impact Assessment (1999), • Sub-Decree on Air Pollution Control and Sound Disturbance (2000),	The RGC has in place a set of separate provision and requirements for pollution prevention and management that are well align with the AIIB ESS 1 that aims to promote the sustainable use of	This ESCIA has included all relevant national laws and regulation as well as the requirement for AIIB ESS1.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
					• Sub-Decree on Solid Waste Management (1999), • Prakas on the General Guideline for Preparing the Initial and Full Environmental Impact Assessment Reports (1999), • Prakas on the Launch of Standards of the Quantity of Toxins or Hazardous Substances Allowed to be Disposed (2015)	resources and avoid or minimize the pollution from sources/project activities.	
6	ESS1	S3	PS8	Cultural heritage	• Environmental Code and Natural Resource Management (2023), • Law on the Protection of Cultural Heritage (1996)	The RGC has in place the law on protection of cultural heritage aligns with the requirement of the AIIB ESS1. However, there is lack of detail procedures for protection of the intangible cultural heritage.	This ESCIA provided details procedures and requirement to protect both tangible and intangible cultural heritage through Chance Find Procedure (Annex xx).
7	ESS1	S5	PS2	Labor and working conditions	• Labor Law (1997), • Law on Taxation (1997), • Sub-Decree on Construction Permit (1993), • Law on Social Security Schemes for Persons defined by the Provision of the Labor Law (2002), • Sub-Decree on Establishment of Social Security Scheme "Health Care Scheme" for Persons Defined by the Provisions of the Labor Law (2016)	The RGC has in place a set of law and regulations on labour and working conditions which is consistent with the requirement of the AIIB ESS1. However, the enforcement of these law and regulation is still limited. For example, regulation against forced labor and using child labor are not strictly enforced.	The ESCIA provides provisions to monitor compliance by contractor and of their primary suppliers in bidding documents and supervision contracts in order to prohibit using forced labour and child labour.
8	ESS1	S6	PS4	Community health and safety	• Law on Road Traffic (2014), • The Law on Suppression of Human Trafficking and Sexual Exploitation 2008, • Law on the Protection and the Promotion of the Rights of Persons with Disabilities 2009,	The RGC has established Labor Law the protect the health and safety of the workers. However, the concern and mitigation are more on individual rather than community as a whole. The AIIB ESS1 aims on protection of both individual and community for health and safety.	The ESCIA provides provisions to monitor compliance by contractor on community and health safety in bidding documents and supervision contracts. The requirement on raising awareness to local community on health and safety are also included in the bidding documents.

No.	Standards/ Policies			Coverage	RGC's Corresponding Legal Framework	Gap Analysis and suggestions	Proposed measures to address the gaps
	AIIB	IFAD	GCF				
9	ESS1	S9	PS1	Climate change	• Environmental Code and Natural Resource Management 2023	The newly adopted code requires all relevant sectors to integrate climate resilient concepts into their strategic action plan along with different measures to tackle the issues. No gap being identified.	

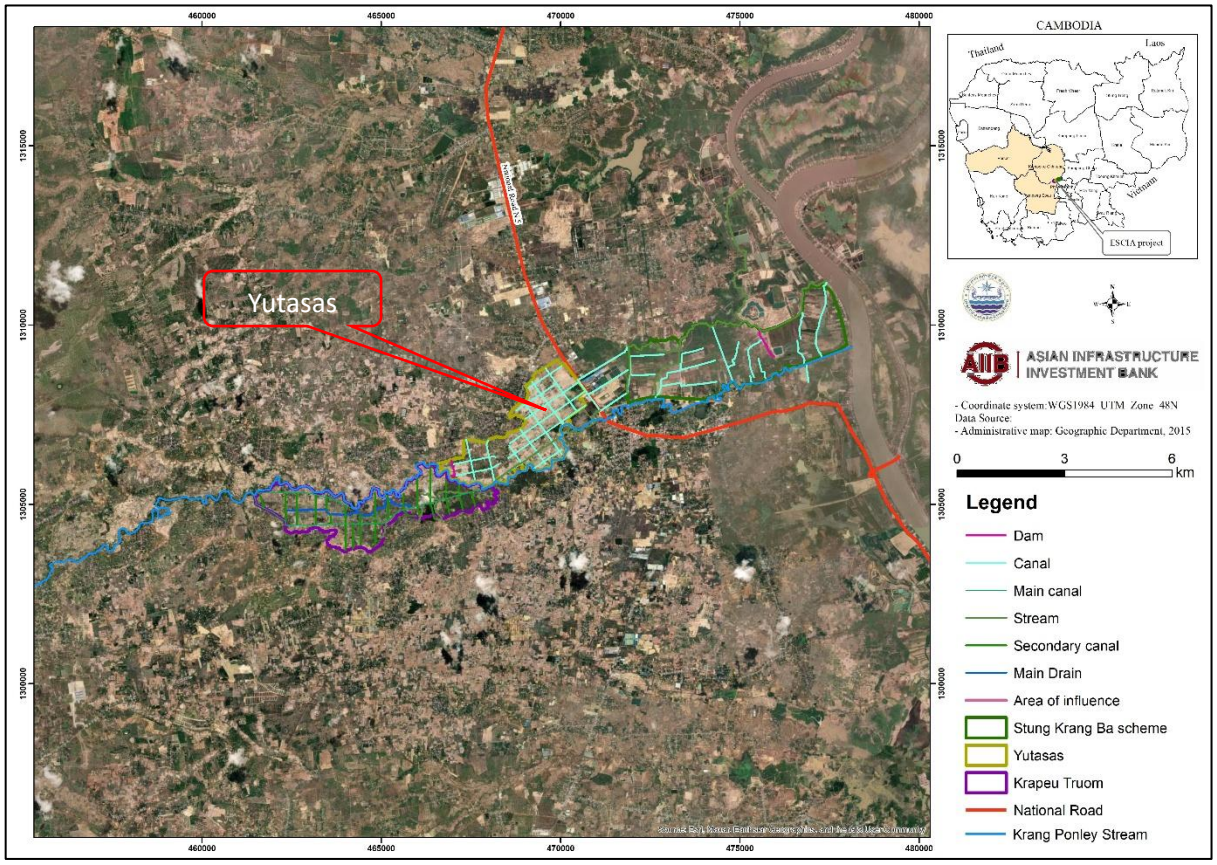
4. PROJECT AREA OF INFLUENCE

Under CAISAR, since project design is still ongoing, area of influence is anticipated based on: a) target command area of each scheme (where most proposed project activities will take place during project construction, and later during project operation), and b) the environmental footprint that are likely caused by project activities during project construction (as direct and indirect impacts due to activities under Component 2), and by project activities (mainly cumulative impacts due to intenstified crop production activities under component 1).

These above anticipated areas of influence need to be updated when more information becomes available to allow a more reliable assessment, particularly when project detailed design is completed, and construction measures proposed by construction constractors are identified. Future update on area of influence (at respective sub-scheme) will be made on the basis of updated environmental and social assessments once a) locations of construction sites, auxiliary facilities (such as borrow pits), and logistics operations are confirmed, and b) the full scope of the project's impacts (direct, indirect, and cumulative) is firmed up based on detailed engineering design (for Component 2) and project implementation approach (for Component 1).

It is noted that while direct and indirect impacts could be reasonably anticipated based on currently proposed scope of works and prior experience for similar works, cumulative impacts, particularly their spatial extent and severity (over the time) require collection of supporting scientific evidence from data collected under project's environmental and social monitoring program.

Figure 5: Locations of irrigation structures in Yutasas,



4.1 Description of Key Components that Potentially Cause the Influential Impact

4.1.1 Air, Noise and Vibration

The area of influence for air quality, noise, and vibration during the construction and rehabilitation of irrigation systems extends beyond the construction site, affecting nearby communities and the environment. Dust, emissions from machinery, and material handling can temporarily increase particulate matter and pollutants in the air. Noise from heavy equipment may disturb residents and wildlife, while vibrations from activities like dredging and excavation can affect nearby structures, potentially causing discomfort or minor damage. These impacts, though short-term, typically extend up to 100 meters from the site, with heavier activities affecting a larger area. Post-construction, greenhouse gas emissions from farming activities could have minimal long-term impacts at a global scale. Each of the sub-scheme the area of influence include:

- Surrounding the sites of the rehabilitated/dredged rivers/stream
- Surrounding the rehabilitated main and tertiary canals, and
- Surrounding the rehabilitated/upgraded structure
- Along the road used for transporting materials by the construction activities

These effects occur only during the construction period while the emission of greenhouse gas emission from farming activities. The following are maps indicating the area of influence at each sub-scheme.

4.1.2 Water Quality

The construction and operation of irrigation systems can significantly impact water quality, both in terms of surface water and groundwater.

Construction Phase:

- **Surface Water:** During the construction phase, sedimentation due to excavation, dredging, and earthworks is a primary cause of water quality degradation. Loose soil can be washed into nearby water bodies, increasing turbidity, reducing light penetration, and altering the aquatic habitat. Additionally, the use of machinery and equipment introduces risks of oil spills, fuel leaks, and chemical contamination, which can enter water sources through surface runoff, affecting aquatic life and water usability downstream.
- **Groundwater:** Construction activities, such as drilling and excavation, can disrupt the soil and rock layers, potentially allowing contaminants from surface activities, such as chemicals, to infiltrate groundwater. Chemical spills or leaching from construction materials can further degrade groundwater quality. Additionally, the disruption of natural flow patterns in the subsurface may allow pollutants to spread more easily, threatening water quality over a wide area.

Operation Phase:

- **Surface Water:** Once the irrigation system is in operation, water quality can be affected by the increased use of fertilizers and pesticides in the command areas. Runoff from agricultural fields may carry these chemicals into nearby rivers, streams, and lakes, causing nutrient pollution, algal blooms, and eutrophication, which can lead to oxygen depletion and harm aquatic ecosystems. Over-irrigation can also lead to increased runoff, carrying sediments and pollutants into surface water bodies.
- **Groundwater:** The operation of irrigation systems may result in groundwater contamination, particularly through leaching of agricultural chemicals such as nitrates and phosphates. Excessive irrigation can cause these chemicals to infiltrate the soil and reach groundwater aquifers, leading to long-term contamination. Furthermore, changes in water table levels due to extensive irrigation can alter the flow patterns of groundwater, potentially mobilizing contaminants that would otherwise remain contained.

In both phases, the key impacts on water quality include contamination of water resources with sediments, nutrients, chemicals, and reduced ecosystem health in the affected water bodies. These impacts can lead to long-term environmental damage and human health effects downstream along Stung Krang Ponley due the reduction of the availability of clean water for agricultural, and domestic uses.

4.1.3 Soil Quality

The area of influence for soil quality during the construction and operation of irrigation systems extends well beyond the immediate project site, affecting surrounding agricultural land, natural habitats, and downstream regions impacted by runoff and water movement. In both phases, the area of influence

extends beyond the construction site, impacting nearby agricultural land, natural habitats, and drainage systems. Proper management is essential to minimize long-term soil degradation across the broader irrigation zone.

Construction Phase:

- **Soil Erosion:** The area of influence for soil erosion encompasses not just the construction site but also adjacent areas, as excavation, grading, and vegetation removal expose large sections of land to wind and water erosion. This can lead to topsoil loss, affecting soil fertility on-site and causing sedimentation in nearby fields and water bodies.
- **Soil Compaction:** The influence of soil compaction extends several meters beyond the worksites, particularly where heavy machinery is used for construction or access. Compacted soil reduces water infiltration and root penetration, impacting surrounding agricultural land and natural ecosystems.
- **Soil Contamination:** While soil contamination from fuel spills and construction debris is often localized, it can spread through surface runoff during rainfall or irrigation, affecting nearby fields and watercourses, potentially degrading soil quality in those areas.

Operation Phase:

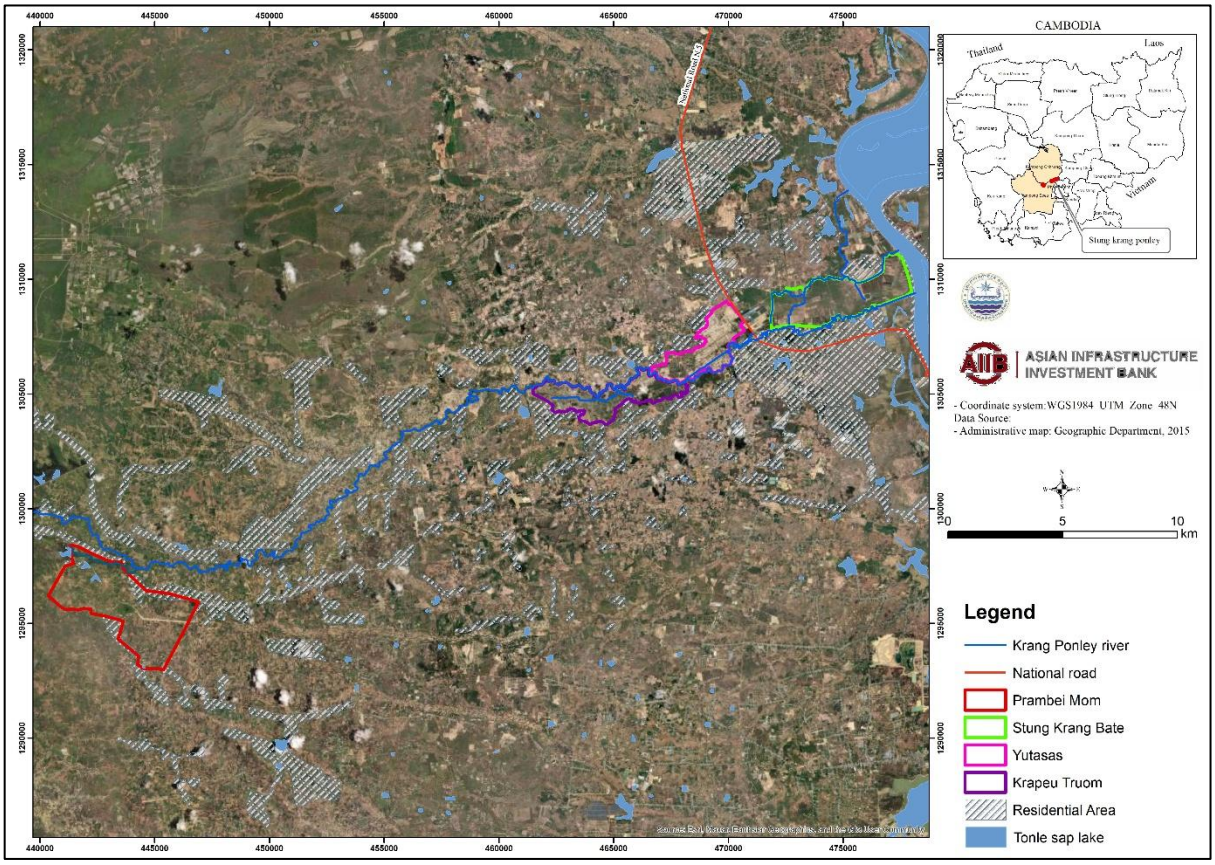
- **Salinization:** The area of influence for soil salinization covers the entire irrigated zone. Poor drainage and excessive irrigation can lead to salt buildup, particularly in low-lying areas, reducing soil productivity across large sections of the command area.
- **Nutrient Imbalance:** Nutrient leaching or accumulation affects the entire irrigated region and nearby fields. Over-irrigation can cause essential nutrients to wash away, while poor management of fertilizers can lead to nutrient buildup, creating imbalances that degrade soil quality.
- **Waterlogging:** The impact of waterlogging is concentrated in the irrigated fields but can extend to neighboring areas due to the movement of water through the soil layers. Prolonged waterlogging reduces soil aeration and affects soil structure, ultimately diminishing productivity.

4.1.4 Biodiversity

The area of influence for the Yutasas irrigation renovation scheme encompasses the direct and indirect impacts of the project. This includes:

- **Direct Impacts:** The immediate area where the irrigation infrastructure will be constructed and operated, including canals, pumping stations, and reservoirs.
- **Indirect Impacts:** The surrounding areas that may be affected by changes in water flow, land use, or other project-related activities. This includes the Stueng Krang Ponlai River, the Tonle River, and the habitats of endangered species within the Yutasas command area.

Figure 6: Map of Construction Sites and Residential Area in Stung Krang Ponley



(Source: ESCIA Study, 2024)

4.1.5 Extent of Social Impacts

The Project's Area of Influence for social aspects extends beyond the immediate project site to include the broader region where the project's effects will be felt throughout its implementation phases. This area encompasses not only the physical location of the project but also regions affected by environmental, physical, and biological changes resulting from project activities. Social interactions in this area of influence may involve communities and stakeholders impacted by changes in land use, water availability, employment opportunities, and local infrastructure development. These interactions might include shifts in livelihoods, migration patterns, or community dynamics because of project-related opportunities and disruptions, land acquisition and resettlement along the main canals, feeder canal, polder system, and farm roads, ethnic minority, gender, and loss of access to natural resources. Additionally, the area of influence considers the indirect impacts on health, education, and social services, as local populations respond to new economic and environmental conditions brought about by the project's operations. The social area of influence often aligns with the environmental footprint but also includes areas affected by induced socio-economic changes and community adaptations to these footprints. In addition, although the construction activities are at the existing systems, the impacts on cultural sites need to be carefully considered at the surrounding area ranging up to 500 m from the identified cultural sites.

4.1.6 Summary of the Project Areas of Influence

As per the description above, the Project Area of Influence can be summarized as Table 22 Below.

Table 22: Summary of the project area of influence

No	Sub-Scheme	Direct/Indirect Impact Areas	Receptors and Scale of Impacts
1	**Yutasas**	Main canals in sub-scheme, drainage canals in Yutasas where construction occurs. Noise, vibration, and air quality from construction activities and noise from worker camps are potential occur along the transport roads while water quality impact can go directly at the site as well as beyond the areas such as downstream water body.	• Residential, school, pagoda and hospital areas along the river, streams, canals where construction occurs and camp site. • Downstream water body where water can carry pesticides and other contaminated substances to downstream.

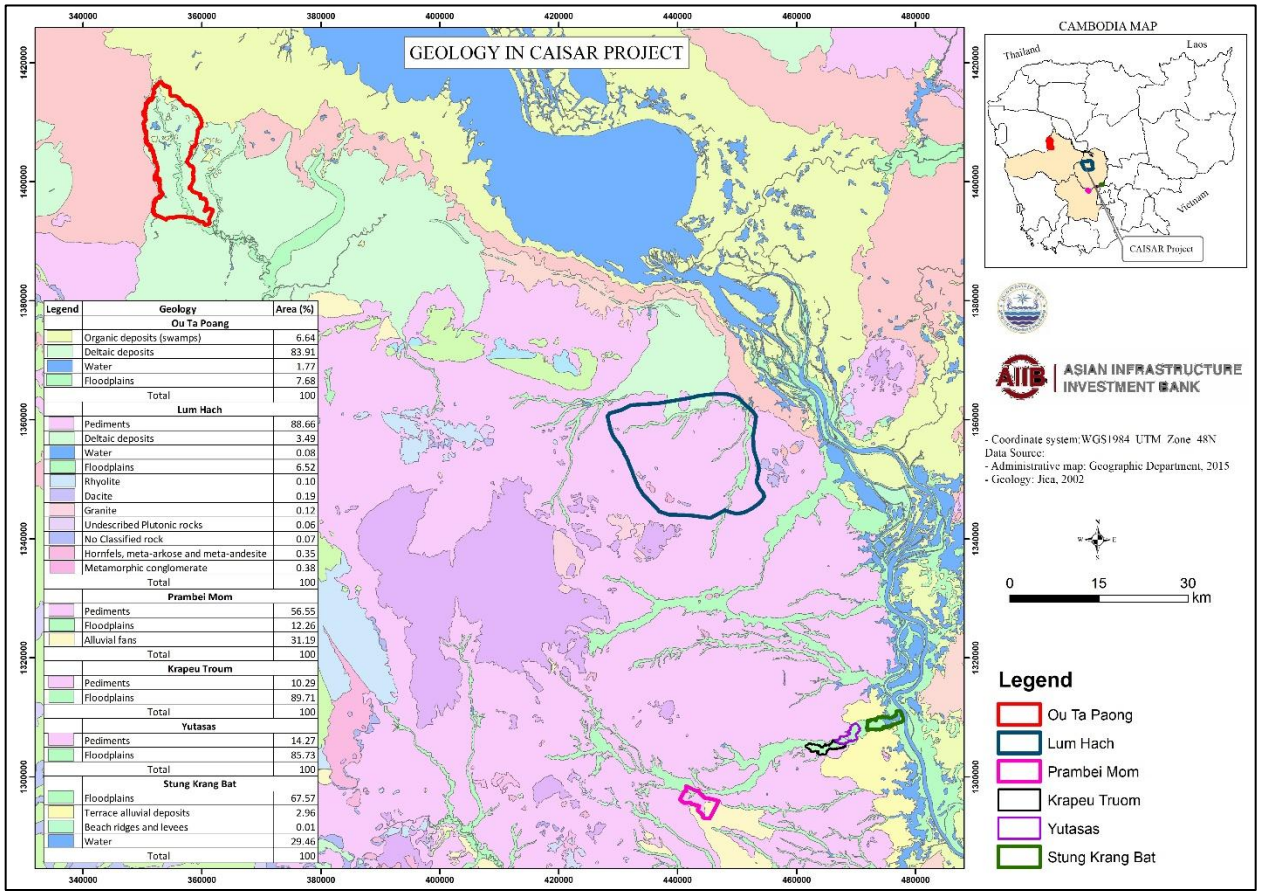
5. BASELINE CONDITIONS

5.1 Physical Conditions and Environmental Condition

5.1.1 Geological Conditions

Yutasas is dominated by floodplains, which constitute 85.73% of the area, indicating frequent flooding and fertile soil suitable for agricultural practices. Pediments cover 14.27% of the area, suggesting some eroded rock formations. This geological composition highlights the importance of water management in this sub-scheme due to the extensive floodplain areas.

Figure 7: Geological Map of the sub-schemes

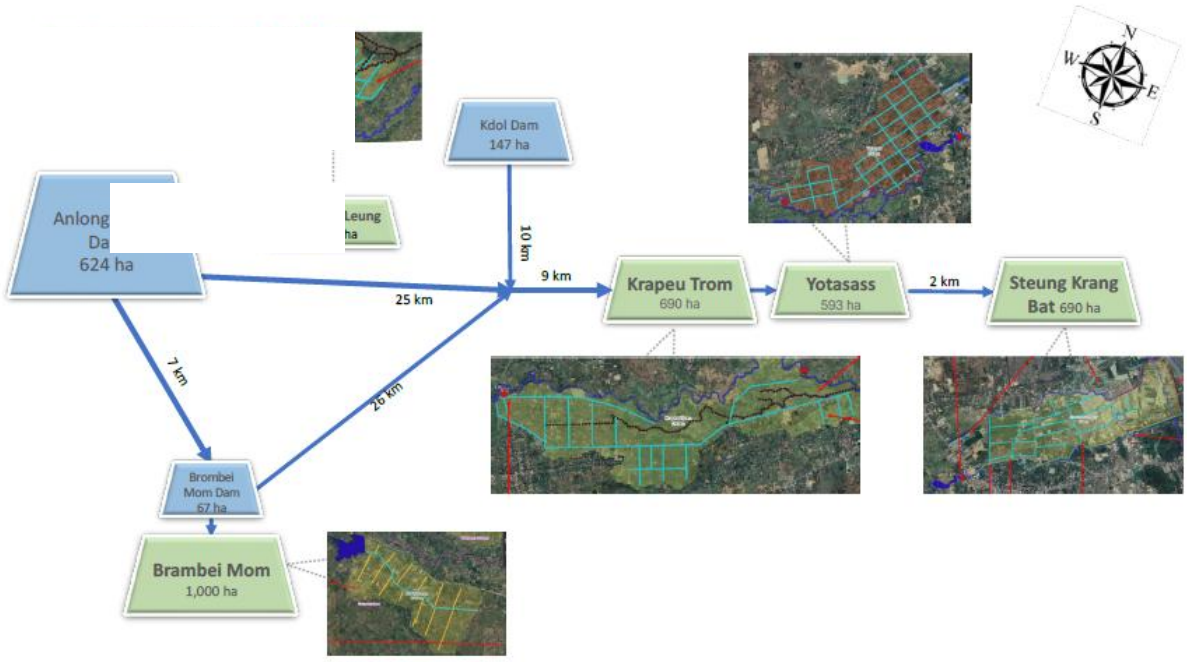


Legend	Geology	Area (%)
	Ou Ta Poang	
	Organic deposits (swamps)	6.64
	Deltaic deposits	83.91
	Water	1.77
	Floodplains	7.68
	Total	100
	Lum Hach	
	Pediments	88.66
	Deltaic deposits	3.49
	Water	0.08
	Floodplains	6.52
	Rhyolite	0.10
	Dacite	0.19
	Granite	0.12
	Undescribed Plutonic rocks	0.06
	No Classified rock	0.07
	Hornfels, meta-arkose and meta-andesite	0.35
	Metamorphic conglomerate	0.38
	Total	100
	Prambei Mom	
	Pediments	56.55
	Floodplains	12.26
	Alluvial fans	31.19
	Total	100
	Krapeu Troum	
	Pediments	10.29
	Floodplains	89.71
	Total	100
	Yutasas	
	Pediments	14.27
	Floodplains	85.73
	Total	100
	Stung Krang Bat	
	Floodplains	67.57
	Terrace alluvial deposits	2.96
	Beach ridges and levees	0.01
	Water	29.46
	Total	100

Yutasas is part of the larger Stung Krang Ponley basin, as the basin serves as the primary water source for a number of sub-schemes. Within the basin, there are three main reservoirs—Anlong Chrey, Brambei Mom, and Kdol dam. These reservoirs have improved water availability for downstream irrigation and play a significant role in flood protection. However, the Anlong Chrey reservoir, with a capacity of only 30 million cubic meters (Mm^3), is small compared to the estimated annual inflow of 123 Mm^3 and the irrigation demands of the area. A small hydropower station was installed at the site, but it remains unused due to insufficient water supply.

Water availability for Yutasas sub-scheme is dependent largely on the water supplying from Anlong Chrey reservoir. However, the reservoir's capacity is insufficient to meet full irrigation demands during the dry season. The primary management goal is to release water early in the wet season (May and June) to allow for the timely planting of Early Wet Season crops, followed by a Late Wet Season paddy crop. Nevertheless, challenges remain, including potential conflicts between hydropower generation and irrigation needs, a lack of clarity in reservoir operating rules, and inconsistent runoff that may prevent the reservoir from reaching full capacity in some years.

Figure 8: Length from Sub-Scheme to Another of Krang Ponley



5.1.2 Topography

The area is another low-elevation sub-scheme with terrain less than 40 meters. The topography here is mostly flat, with large expanses of floodplains. The presence of pediments suggests there may be minor elevations or gentle slopes within the otherwise flat landscape. However, the general topography is primarily low-lying, prone to seasonal floods, and likely situated near river systems. This type of terrain is typically fertile but may face waterlogging challenges.

5.1.3 Land Cover and Water Use

The land cover across all four sub-schemes is predominantly rice fields, with only a limited presence of bushes along streams, rivers, and the edges of the rice fields. Sharing the same water sources, farmers in this irrigation system face several key challenges, including water shortages during the dry season, limited market access, pest infestations, and conflicts arising from water scarcity. These issues are primarily driven by the lack of reliable water sources and the impacts of climate change, which have extended the duration of dry seasons. During the dry season, the canal frequently lacks sufficient water, and if there is no rainfall at the start of the wet season, the canal remains dry. Additionally, inefficient irrigation management results in water losses, while extreme heat negatively affects market conditions.

One of the most critical concerns is the water shortage during the rice reproductive stage, as there is no consistent water supply to the fields, leading to significant crop damage. Farmers are often forced to wait for water, which only reaches them after upstream farmers have secured an adequate supply. The Water User Community is responsible for managing the irrigation system, but the current canal infrastructure presents challenges, as the canals are shallow and can only store a limited amount of water. During the

dry season, the canals frequently run dry, forcing villagers to take turns pumping water, a process that is both time-consuming and inefficient.

5.1.4 Soil Types

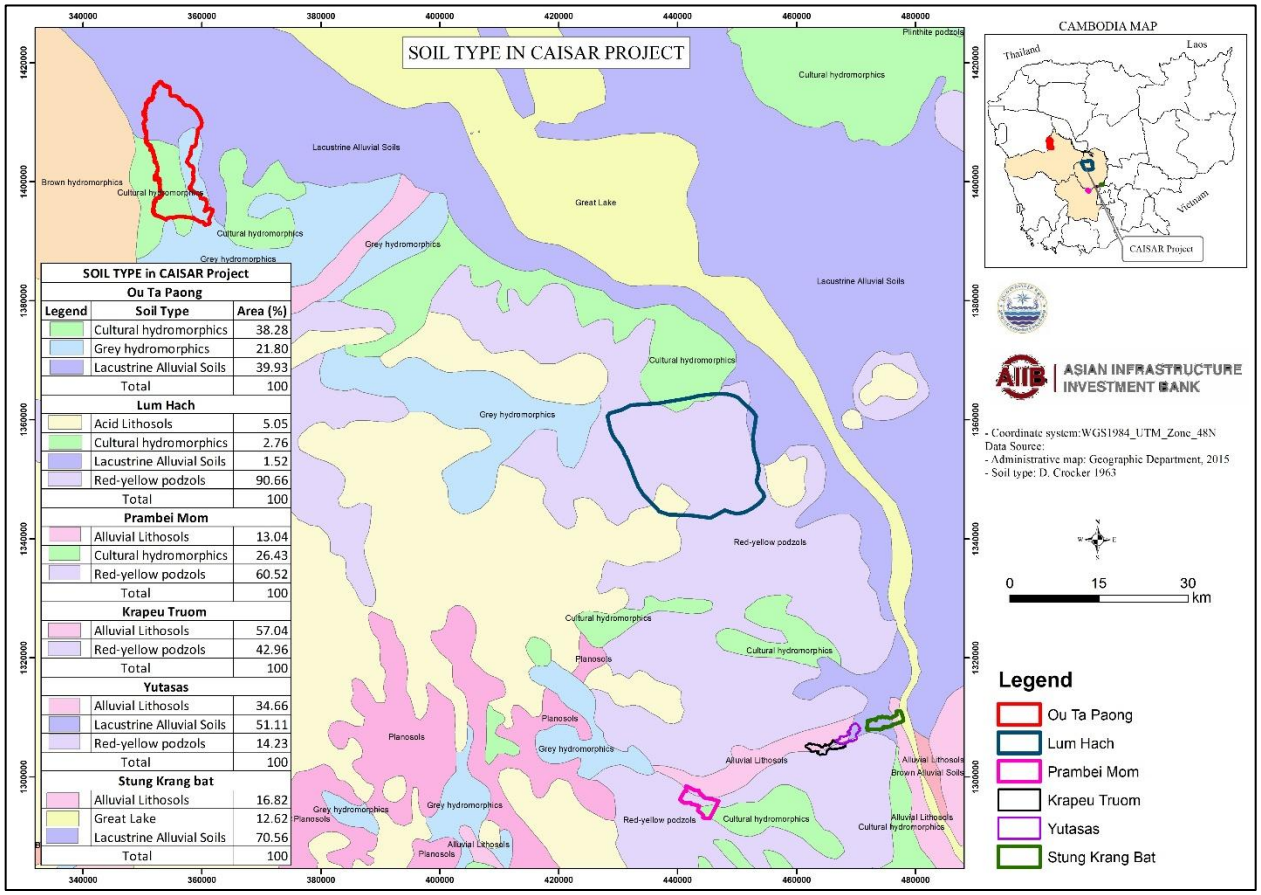
Dr. Crocker travelled across Cambodia to create a map, with a scale of 1 to 1,000,000 and it was publicly published by the Ministry of Agriculture in 1963 (Crocker, Charles D, 1962). The soil of Cambodia is classified into 16 types according to the soil taxonomy of the Ministry of Agriculture, the United States of America. Table below is the detailed information on 16 types of soil in Cambodia (please see in table 23).

Table 23: Soil types and area in Cambodia

No.	Classification	Land area	
		Km^2	%
1	Red, yellow podzols	22,763.00	12.57%
2	Latosols	7,123.00	3.93%
3	Planosols	1,666.00	0.92%
4	Plinthite podzols	17,147.00	9.47%
5	Cultural hydromorphics	12,896.00	7.12%
6	Grey hydromorphics	17,252.00	9.53%
7	Plenthitic hydromorphics	1,275.00	0.70%
8	Brown hydromorphics	6,701.00	3.70%
9	Alumisols	2,782.00	1.54%
10	Regurs	6,570.00	3.63%
11	Acid lithosols	45,271.00	25.01%
12	Basic lithosols	3,418.00	1.89%
13	Alluvial soils	17,064.00	9.43%
14	Brown alluvials	2,764.00	1.53%
15	Lacustrine alluvials	10,373.00	5.73%
16	Coastal complex	2,229.00	1.23%
	Total (land area)	177,295.00	97.94%
	Water area	3,721.00	2.06%
	Total	**181,035.00**	**100.00%**

(Source: Crocker, 1962)

Figure 9: Map of soil types within the sub-schemes



SOIL TYPE in CAISAR Project		
Ou Ta Paong		
Legend	Soil Type	Area (%)
	Cultural hydromorphics	38.28
	Grey hydromorphics	21.80
	Lacustrine Alluvial Soils	39.93
	Total	100
Lum Hach		
	Acid Lithosols	5.05
	Cultural hydromorphics	2.76
	Lacustrine Alluvial Soils	1.52
	Red-yellow podzols	90.66
	Total	100
Prambei Mom		
	Alluvial Lithosols	13.04
	Cultural hydromorphics	26.43
	Red-yellow podzols	60.52
	Total	100
Krapeu Truom		
	Alluvial Lithosols	57.04
	Red-yellow podzols	42.96
	Total	100
Yutasas		
	Alluvial Lithosols	34.66
	Lacustrine Alluvial Soils	51.11
	Red-yellow podzols	14.23
	Total	100
Stung Krang bat		
	Alluvial Lithosols	16.82
	Great Lake	12.62
	Lacustrine Alluvial Soils	70.56
	Total	100

(Source: ESCIA Study 2024)

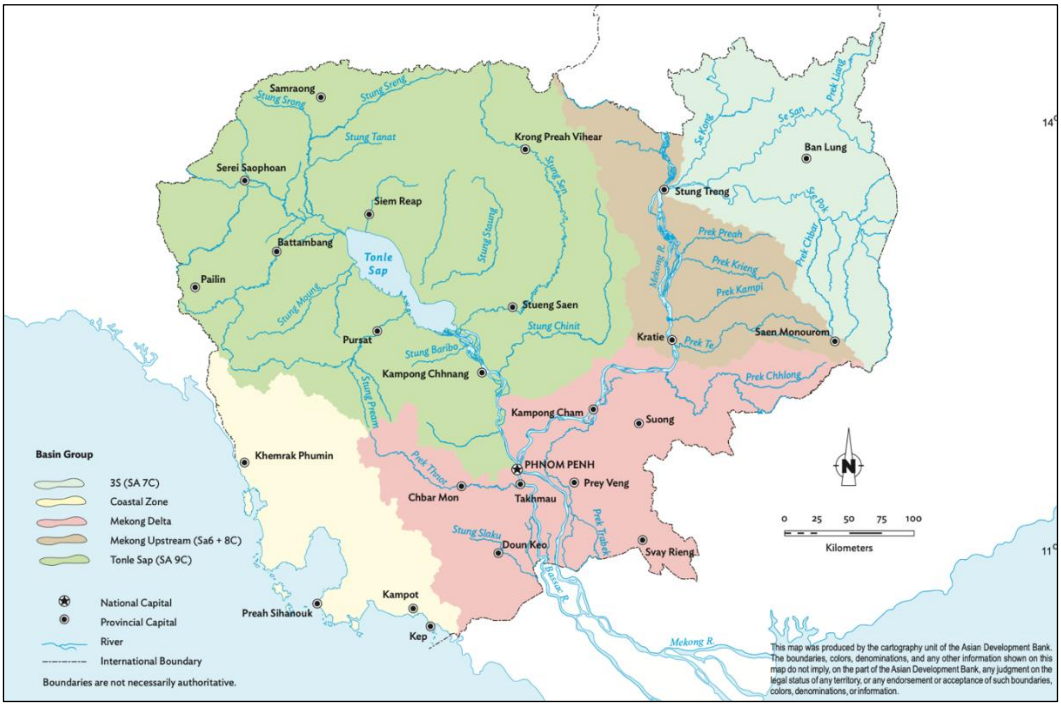
Yutasas presents a diverse soil composition with three (3) types present. Lacustrine alluvial soils are the most common, covering 51.11% of the area, followed by alluvial lithosols at 34.66%. Red-yellow podzols are less common, comprising 14.23% of the site. The predominance of lacustrine alluvial soils suggests their significant role in shaping agricultural and land use practices in the Yutasas area.

5.1.5 Hydrological Resources

Cambodia has considerable water resource potential, with abundant surface water and aquifers and a high level of seasonal rainfall. In spite of the abundance of water sources, many areas in the central plains and plateaus lack water in the dry season and are therefore dependent on unreliable rainfall patterns. The country's water resources are dominated by the Mekong River system (86% of country's territory), including the catchments of the Bassac River, the Tonle Sap River, and the Lake Tonle Sap and its tributaries[2], and the river system flowing into the Gulf of Thailand (remaining 14%) as per shown in Figure 6.8.

[2] The Mekong River and Lake Tonle Sap are connected by the Tonle Sap River, which twice a year reverses its direction of flow. From July to October, when the level of the Mekong is high, water flows into the Tonle Sap River, which fills Lake Tonle Sap, thereby increasing the size

Figure 10: River Basin Groups in Cambodia



(Source: Ministry of Water Resources and Meteorology, 2019)[3]

However, **75% renewable freshwater comes from upstream transboundary** sources via the Mekong River system (355.5 km^3/year of surface water), mainly from Lao PDR (91.3%), but also Thailand (8.4%) and Viet Nam (0.3%). As an intermediate basin country, up to 471.51 km^3/year of surface water flows out of the country to Vietnam through the Mekong and its tributaries. This emphasizes the critical inter-dependency of Mekong states, and their sensitivity to the actions of neighboring countries, particularly those that are upstream[4]. In terms of groundwater, 17.6 km^3/year is estimated to be produced in-country, although there is no register of transboundary for inflow or outflow of groundwater.

Agriculture accounts for 96% of all **water use,** domestic rural use 1%, and industry, domestic urban, and aquaculture use less than 1%5. Although the amount of water used is estimated to be only about 2% of total surface water volume[6], water shortages do occur during the dry season, especially in the Tonle Sap River system—due to the lack of stored water and limited access to water. [7] Cambodia's water resources sector faces a range of multisectoral, geographical, and hydro-meteorological issues. The Mekong River,

of the lake from 2,600 km^2 to about 10,500 km^2 at its maximum. The storage capacity of Lake Tonle Sap is estimated at 72 km^3. In November, when the level of the Mekong decreases, the Tonle Sap river reverses its flow, and water flows from Lake Tonle Sap to the Mekong river and thence to the Mekong Delta (https://wateractionhub.org/geos/country/37/d/cambodia/).

[3] Irrigated Agriculture Improvement Project: National Water Resources Data Management Center and Water Resources Information System Report

[4] https://tableau.apps.fao.org

[5] Government of Cambodia. 2019. *National Water Resources Management and Sustainable Irrigation Road Map and Investment Program 2019–2033*. Phnom Penh.

[6] ADB. 2014. Cambodian National Water Status Report 2014. Phnom Penh.

[7] https://MoWRAM.adb.org/sites/default/files/publication/689106/adb-brief-171-surface-water-resouces-rbgs-cambodia.pdf

particularly the Lower Mekong Basin (LMB), has been identified as a region that is highly vulnerable to the impacts of climate change, more frequent and intense. Climate change is affecting the water cycle, bringing change in the hydrology of major rivers and tributaries as well as groundwater recharge. Recurrent floods occurred in the last decade, with important economic losses, mainly on rice crops, but also people's lives[8]. Farmers, who depend on rain-fed agriculture, will be increasingly at risk of disasters, and especially droughts and floods, causing severe damage to rice harvests[9]. In short, Cambodia faces the common climate change challenges of **too much** water in the wet season, **too little** in the dry season, and gradually **too dirty** due the increasing pollution, particularly in populated cities.

The feasibility study report indicates that Cambodia is likely to face changes in water balances and flood regimes due to projected increases in temperature and altered precipitation patterns. An increase in consecutive dry days is expected to worsen water scarcity, especially during the dry season, impacting communities in rain-fed areas around the Tonle Sap more severely than those with year-round access to the Mekong River or irrigation systems.

Yutasas, the remaining sub-schemes, also depend heavily on water from Anlong Chrey Dam and Kdol Dam. Yutasas, added to the CAISAR project in 2023, is located between Krapeu Truom and Steung Krang Bat, and shares a similar layout with its neighboring schemes. Steung Krang Bat, with an extensive canal network, includes over 13 kilometers of main canals and over 20 kilometers of drainage canals. While functional, the scheme requires repairs to its crosscheck and offtake structures and extensions to its drainage system. Both schemes face infrastructure challenges but remain vital to the region's irrigation system, with ongoing efforts needed to ensure sustainable water availability.

5.1.6 Climatic Conditions

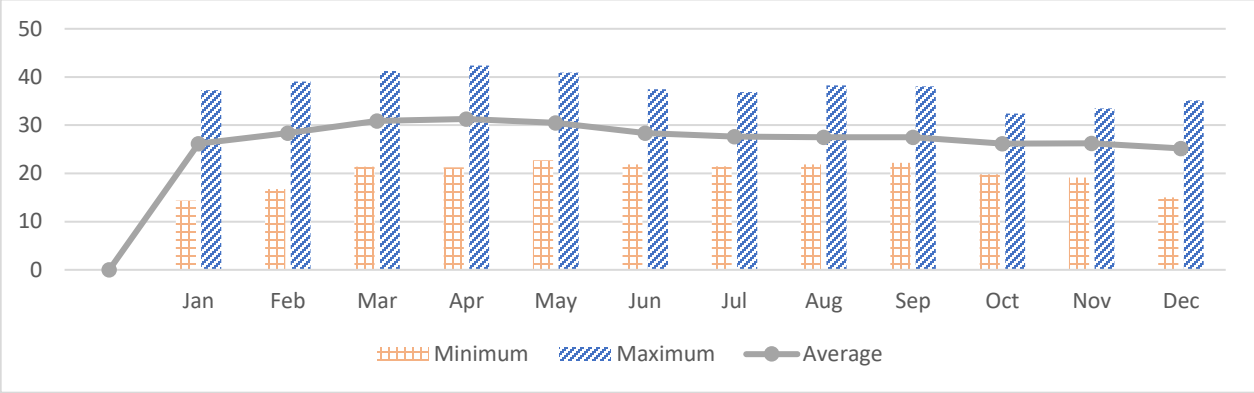
Temperature

Temperatures in the Stung Krang Ponley scheme area for the last 10 years between 2013-2022 using NASA POWER data. According to the table below shown, the annual average temperature was 27.96 °C, the annual average minimum temperature was 14.37 °C in 2014, and the annual average maximum temperature in 2016 at 42.4 °C. Regarding monthly temperature extremes, the lowest minimum temperature of 14.37°C was observed in January, and the highest maximum temperature of 42.4°C occurred in April.

[8] i.e. Floods accounted for 70% of rice production losses between 1998 and 2002, whereas droughts accounted for 20% of those losses. The most recent report on floods showed that the country had lost 40, 45, 188, 250, and 43 lives in 2020, 2014, 2013, 2011, and 2009, respectively. In addition, the economic loss was estimated at USD 1.000, 521, 70, and 132 million due to floods in 2013, 2011, 2010, and 2009, respectively.

[9] Mak Sithirith (2017). Water Governance in Cambodia: From Centralized Water Governance to Farmer Water User Community. MDPI.

Figure 11: The maximum, average, and minimum monthly temperature for the last 10 years (°C)

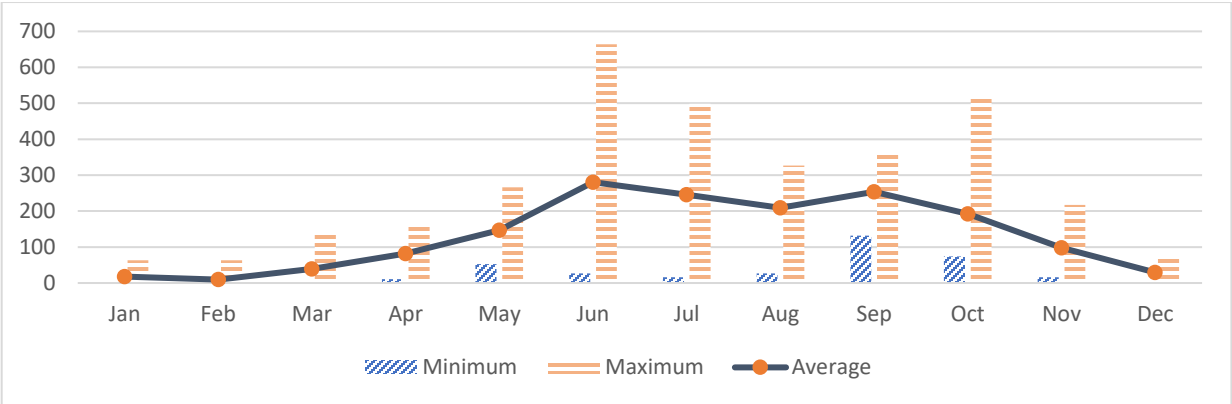


Source: NASA POWER (2024)

Precipitation

The Stung Krang Ponley scheme area shows an average annual precipitation of 1604.14 mm over the decade from 2013 to 2022. The annual minimum precipitation was recorded in 2016 at 653.91 mm, while the annual maximum precipitation occurred in 2020, reaching 2293.95 mm. The lowest minimum rainfall data were found in January, February, March, and December at 0 mm. In October, the highest average monthly rainfall was 516.6 mm.

Figure 12: The maximum, average, and minimum monthly precipitation for the last 10 years (mm)

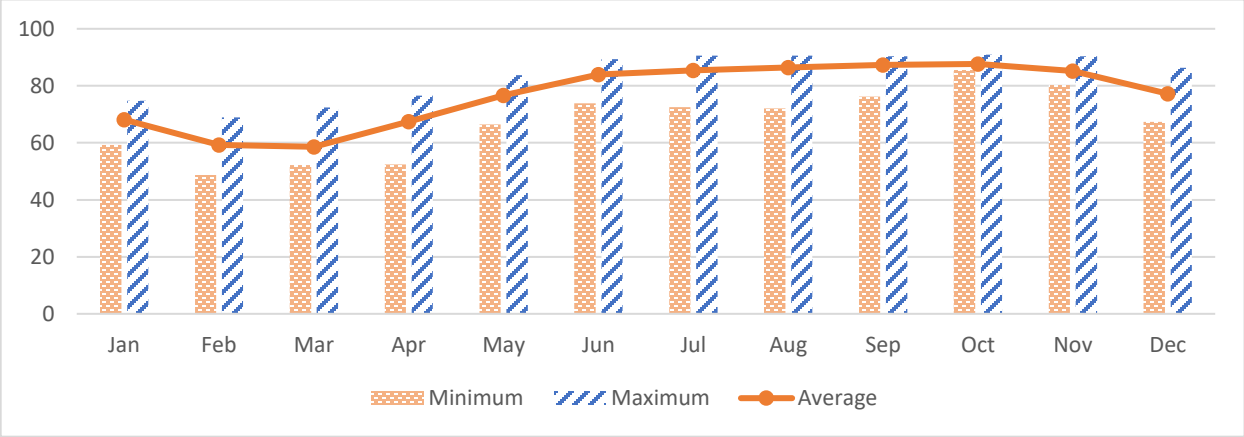


Source: NASA POWER (2024)

Humidity

The table presents monthly humidity data for the Stung Krang Ponley scheme area from 2013 to 2022. The annual minimum average humidity was 69.44% in 2016, while the maximum annual average humidity was 82.81% in 2022. In additional, the annual average humidity was 77.03% over the decade. Regarding monthly variations, the highest monthly maximum humidity was observed in October 2020 at 90.88%, and the lowest monthly minimum humidity was recorded in January 2016 at 48.69%.

Figure 13: The maximum, average, and minimum monthly humidity for the last 10 years (%)

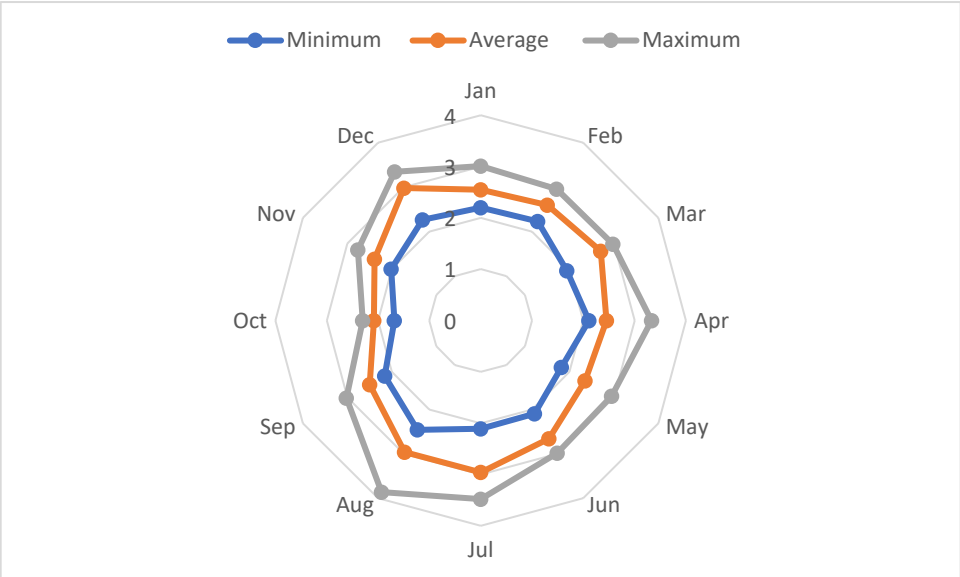


Source: NASA POWER (2024)

Wind Speed

The monthly wind speed data for the Stung Krang Ponley scheme area from 2013 to 2022. The annual minimum average wind speed was 2.45 m/s in 2022, and the maximum annual average wind speed was 2.85 m/s in 2016. While the annual average wind speed was 2.60 m/s in the last 10 years. Regarding monthly variations, the highest monthly maximum wind speed was in August 2016 at 3.86 m/s, and the lowest monthly minimum wind speed was recorded in October 2013 at 1.68 m/s.

Figure 14: The maximum, average, and minimum monthly wind speed for the last 10 years (m/s)



5.2 Baseline Environmental Quality

5.2.1 Unexploded Ordnances (UXO)

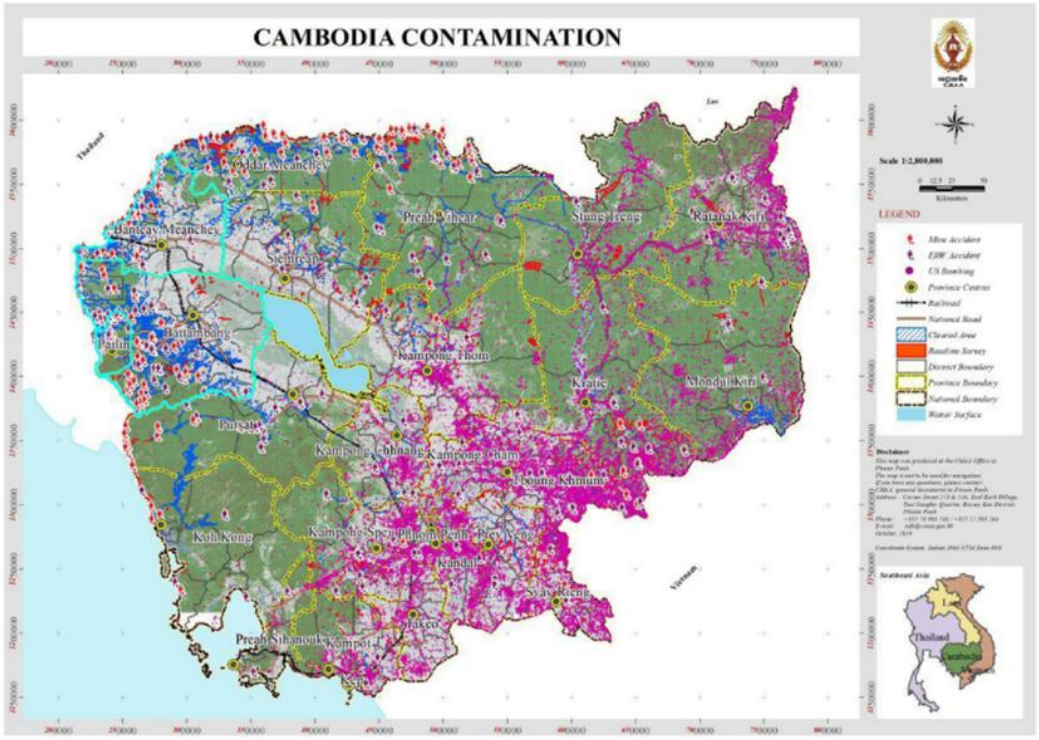
Cambodia remains one of the most heavily landmine-contaminated countries globally, a legacy of decades of conflict that has left a significant portion of its territory affected by landmines and unexploded ordnance (UXO). This contamination poses ongoing threats to safety and hinders socio-economic development, particularly in rural areas. According to the Cambodian Mine Action and Victim Assistance Authority (CMAA), as of 2023, approximately 1,854 square kilometers of land remain contaminated, affecting more than 1.1 million people.[10]

This contamination has caused thousands of casualties over the years and continues to hinder socio-economic development by restricting land use, infrastructure projects, and agricultural expansion. Among the affected provinces, Pursat, Kampong Chhnang, and Kampong Speu have been identified as high-risk areas due to their history of intense conflict and strategic military significance. While mine clearance operations have made progress in these regions, large tracts of land remain dangerous, necessitating ongoing demining efforts to ensure safety and sustainable development. These provinces are critical for agriculture and infrastructure projects, making landmine clearance an urgent priority to enable safe land use and improve local livelihoods.

For construction projects, strict adherence to mine-related regulations is essential. Before initiating any construction activities, risk assessments and clearance operations must be conducted. This includes engaging professional demining organizations to carry out detailed surveys, safely remove and dispose of any detected UXO, and obtain official clearance certificates from recognized authorities like the CMAA. Ensuring compliance with these legal requirements is not only critical for the safety of construction personnel and future occupants but also aligns with Cambodia's national and international commitments to UXO and landmine management.

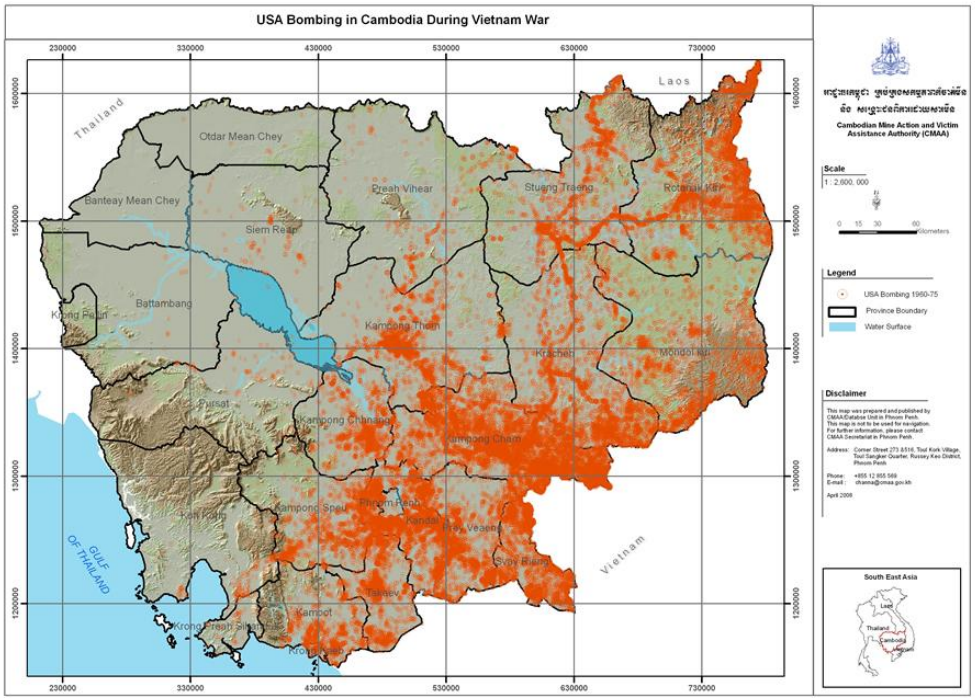
[10] Yet another Cambodian province bids farewell to landmines - UCA News

Figure 15: The landmine contamination map in Cambodia



(Source: Cambodian Mine Action and Victim Assistance Authority (CMAA) 2020)

Figure 16: Map of USA Bombing in Cambodia



(Source: Cambodian Mine Action and Victim Assistance Authority (CMAA) 2020)

Summary of the result of the landmine reports from local community is provided as Table below:

Table 24: Mine and UXO situation

No.	Sub-scheme	Mine and UXO Situation
1	Yutasas	The province was declared a mine-free province in October 2023. However, there was a report of mine-discovered in the 2024 in Yutasas sub-scheme.

UXO = Unexploded Ordnance.

5.2.2 Ambient Air quality, Noise and Vibration

5.2.2.1 Air Quality

Stung Krang Ponly located in two (2) provinces – Kampong Chhnang and Kampong Speu. At provincial level, the air pollution level in Kampong Chhnang province is considered moderate. The air pollution level in Kampong Speu province also consider moderate. The AQI is 5811, which is equivalent to 12.7 µg/m3. The Yutasas, a sub-scheme within Stung Krang Ponley, is in the rural settings; therefore, the baseline ambient air quality, noise and vibration is considered generally good. Ambient air quality is sometime affected by dust from tillage and unpaved road users, including smoke from burning of rice stubble after harvest and burning from swidden cultivation activities. Whilst noise and vibration disturbance are sometime affected by motorist. However, the impacts are minor and short time. The air testing results from another project located about 6 km from Yotasas reported that all five parameters (CO, NO2, SO2, TSP, and PM10) followed the standard of the Ministry of Environment at all durations (8 and 24 hours). The actual air quality testing prior and during construction are required to be conducted. Further air quality tests can be conducted during the preparation of the domestic EIA

Table 25: Air quality testing result

Parameters	**Unite**	**Testing Result**	**Standard (MoE)**
CO	mg/m^3	1.237	**20**
NO_2	mg/m^3	0.038	**0.1**
SO_2	mg/m^3	0.062	**0.3**
O_3	ppm	0.074	**0.2**
TSP	mg/m^3	0.018	**0.33**
PM10	mg/m^3	0.009	**0.05**
PM2.5	mg/m^3	0.007	**0.025**
Pb	mg/m^3	ND	**0.005**

Source: Laboratory of MoE (2023)

Figure 17: Yutasas sub-scheme

[11] https://www.iqair.com/cambodia/kampong-speu, accessed on 23rd September 2024.

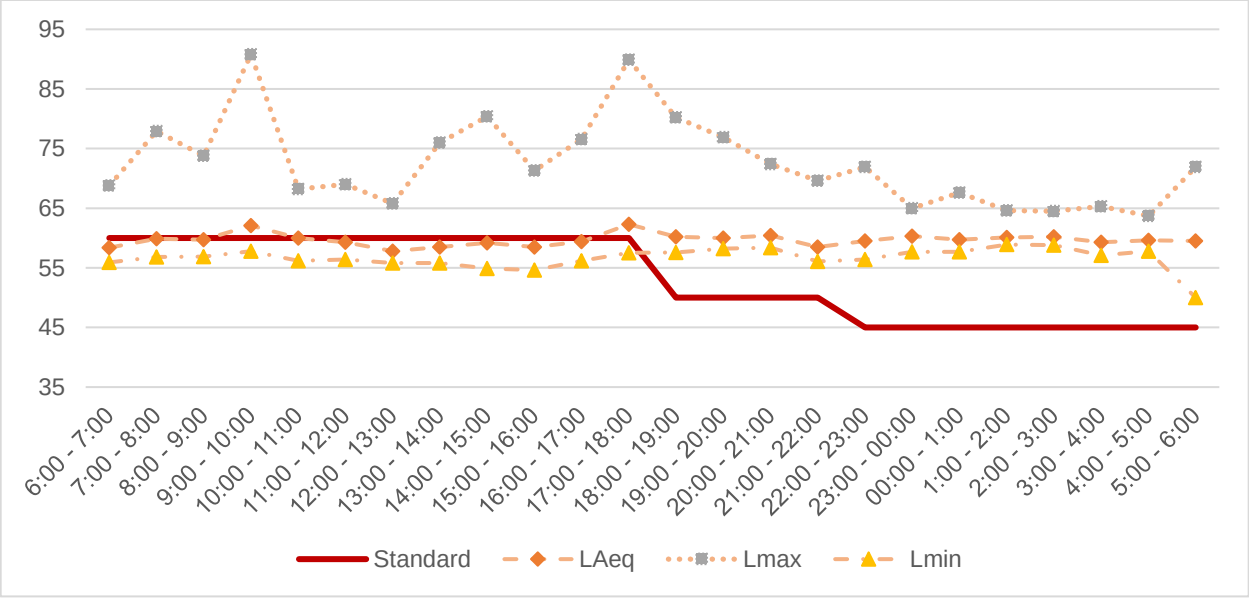


5.2.2.2 Noise and Vibration

Noise and vibration of the project locations in each sub-scheme are currently affected mainly by the commuters mainly along the roads within the areas which can be either the national or local road. As they are subjected to change over time, the testing of noise and vibration are required to be conducted right before the beginning of the construction.

Interviews with 14 village chiefs revealed that 64% of them perceived their villages as slightly (43%) or moderately (21%) noisy, primarily during the evening, with traffic and neighbors' activities being the main sources of disturbance. In addition, the noise testing result of the Animal Feeding Plant project in 2024 located 6 km from Yutasas (shown in Figure below) can be used as the reference for the baseline of this project as it is situated within the same environmental condition as the project areas. Further noise and vibration tests can be conducted during the preparation of the domestic EIA.

Figure 18: Results of noise analysis at location 1



(Source: Laboratory of the Ministry of Environment, 2024)

5.2.3 Soil Quality

The soil quality study for this project took soil samples from five agricultural locations across different schemes in the region. The Yutasas sub-scheme was represented by soil sampling (SS.05). The analysis results, presented in the table below, provide valuable insights into the physical, chemical, and biological properties of the soils at these locations, which can inform agricultural management practices and decision-making.

Table 26: Soil analysis results in an agricultural context

No.	Description Parameter		Result of SS.05
1	Particle Size (Pipette Method)	(<0.002mm), Clay %	7.30
		(0.002-0.02 mm), Fine Silt, %	21.10
		(0.02-0.05 mm), Coase Silt, %	11.70
		(0.05-0.2 mm), Fine Sand, %	30.29
		(0.2-2 mm), Coase Sand, %	28.78
2	Ninnu Moisture %, (Oven dry at 105 °C and 24 hours)		2.62
3	Total Carbon (Black & Walkey Method), C%		1.87
4	Total Nitrogen (Kjeldal Sulfuric Method), N%		0.17
5	C/N Ratio (Unit)		11
6	Organic Matter (OM) %		3.22
7	Total Phosphorus (Nitric Digestion) P %		0.094
8	Available Phosphorus (Bray II), P (ppm)		37
9	Cation Exchange Capacity C.E.C meq/100g Soil (Method,1M Ammonium Acetate at pH=7 & Leach with 10% NaCl)		16.30
10	Exchangeable Cation (meq/100g Soil), (Method,	Calcium (Ca)	5.43
		Magnesium (Mg)	1.48
		Sodium (Na)	1.50

No.	Description Parameter		Result of SS.05
	IM Ammonium Acetate at H=7)	Potassium (K)	0.35
	Total Exchangeable Bases (meq/100g soil)		8.76
11	Bass Saturation %		54
12	Exchange Acidity meq/100g Soil, (1 M KCI Method)		10.00
13	Exchange Al meq/100g Soll, (1 M KCI Method)		0.12
14	Electrode Conductivity µS/cm, (1:5 Soil: water)		63.00
15	pH H2O (1:5 Soil: water)		5.66
16	pl KCL (1:5 (Soil: IN KCL)		4.47

(Source: Laboratory of the General Directorate of Agriculture, MAFF, 2024)

Soils in Krang Ponley are also sandy loam, with similar challenges of low water retention due to the high sand content. The pH ranges from slightly acidic to neutral (4.47-7.41), and nutrient analysis shows low nitrogen and potassium levels. Despite these limitations, the soil is generally suitable for agriculture with careful nutrient and water management.

Overall, in the area show potential for agriculture, but improvements in nitrogen, potassium, and organic matter, along with proper irrigation, are necessary for sustained productivity.

5.2.4 Surface Water Quality

Water quality does not seem to be a critical issue for surface water, but the overuse of fertilizers and domestic wastewater are important threads. It is known to be a black market of all sorts of fertilizers, pesticides, insecticides, rodenticides, etc. sold at the borders with Viet Nam and applied indiscriminately by farmers to increase the numbers of crops a year[12]. The collected water samples were measured at the premises as well as at the laboratory, commissioned by Innovation Lab which is partner of Royal University of Phnom Penh (RUPP).

Table 27: Result of surface water quality

No	Parameter	Unit	Yutasas	Standard (MoE)	
			SW6	River	Lake and reservoir
1	Arsenic	mg/l	0.005	<0.01	<0.01
2	Cadmium	mg/l	0.001	<0.003	<0.003
3	Lead	mg/l	0.005	<0.01	<0.01
4	pH	-	6.91	6.5-8.5	6.5-8.5
5	Total dissolved solids	mg/l	91.58	<1000	<1000
6	Total suspended solids	mg/l	43	<100	<100
7	Total Nitrogen	mg/l	17.7	<3	<2
8	Total Phosphorus	mg/l	0.9	<0.25	<0.15
9	Total coliform	CFU/ 100mL	157,500	<1000	<1000
10	Electrical conductivity	µs/cm	183.4	500-1500	500-1500

[12] The sustainable rice platform, supported by MAFF, is working towards controlling this market and training farmers on proper use (products' labels are not translated to Khmer). https://sustainablerice.org

11	Temperature	^{0}C	33.4	<45	<45
12	Dissolved oxygen	mg/l	5.65	>3	>4

(Source: Water Innovation Lab, 2024)

Figure 19: Yutasas sub-scheme



5.2.5 Groundwater Quality

5.2.5.1 Sampling Locations

Groundwater quality was collected from various locations within the project sites. Water testing is used to determine the existing groundwater quality at the project sites before construction and operation. Note that the GW1 is a dug well with a depth of up to 40 meters that can be used in both dry and wet seasons. In the dry season, the water level is about 25 meters, while in the rainy season, the water level is about 7 meters above the surface. GW2 and GW2 is a type of open well with a depth of 10 meters and can only be used during the rainy season. In both wells, the water level is around two meters above the surface during the rainy season.

The geographical positions and descriptions of the groundwater sampling points are given in Table 28. The results of the groundwater quality analysis are summarized in Table 29.

Table 28: Groundwater sampling locations

No.	Location				UTM	
	Province	District	Commune	Village	X	Y
GW2	Kampong chhnang	Rolea Bíer	Prasneb	Prey Sampov	443830	1355685

3.2.4.1 Results of the Groundwater Quality Testing

The selected samples were analysed and the results of the testing both at the field and at laboratory is provided in Table 29 below. In addition to the selected samples, another groundwater quality testing result

from another ESIA was also included to compare the groundwater quality of the sites. The reference sample was named “GWR1” and only some of the parameters are available for comparison due to the purpose of the ESIA was different.

Table 29: Result of groundwater quality

No	Parameter	Unit	GW2	CDWQS
1	Arsenic	mg/l	0.005	0.05
2	Cadmium	mg/l	0.001	0.003
3	Lead	mg/l	0.005	0.01
4	pH	-	**6.5**	6.5-8.8
5	Total dissolved solids	mg/l	58.12	800
6	Total suspended solids	mg/l	5	-
7	Total Nitrogen	mg/l	3.5	-
8	Total Phosphorus	mg/l	0.29	-
9	Total coliform	CFU/ 100mL	1,600	0
10	Electrical conductivity	µs/cm	116.1	-
11	Temperature	^{0}C	30.3	-
12	Dissolved oxygen	mg/l	1.45	-

(Source: Water Innovation Lab, 2024)

Test results show that almost all parameters are below Cambodia's drinking water quality standards of the Ministry of Industry, Science, Technology, and Innovation (MISTI) in 2004, except pH parameters are below the standard range and the total coliform exceeds the standard. Total coliforms are a common group of related bacteria found in soil, vegetation, and water. Boiling or filtering groundwater before drinking is required. Overall, the quality of groundwater in the project sites are safe for daily use, such as cooking, bathing, as well as laundry but not for drinking.

5.3 Biological Resources

5.3.1 Existing Species

A comprehensive biodiversity assessment, utilizing the Integrated Biodiversity Assessment Tool (IBAT) and a thorough literature review, the identified endangered and critically endangered species across reptiles, mammals, birds, fish, amphibians, plants, and fungi in Yutasas sub-scheme is provided in Table below:

Table 30: Screening list of Endangered and Critically Endangered Species in Yutasas

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=5)	Confirmed Species in Round 3 (Total = 3)
I. Reptile species						

1	អណ្តើកព្រាច	Elongated Tortoise	Indotestudo elongata	CR	Yes	Yes
II. Fish species						
2	ត្រីក្រសក់ក្រហម	Jullien's Golden Carp	Probarbus jullieni	CR	Yes	Yes
3	ត្រីចង្វាស្ទឹង	Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	Yes	Yes
4	ត្រីកាហោ /ត្រីគុលរ៉ាង	Mekong giant barb/Giant Carp	Catlocarpio siamensis	CR	Yes	Yes
II. Bird species						
5	ទាព្រៃស្លាបស	White-winged Duck	Asarcornis scutulata	EN	Yes	No

5.3.2 EN and CR Species Confirmation

The Yutasas area supports several endangered species. Confirmations were made for Elongated Tortoise (Indotestudo elongata), Jullien's Golden Carp (Probarbus jullieni), Leaping barb/Flying Minnow (Laubuka caeruleostigmata), and Mekong giant barb/Giant Carp (Catlocarpio siamensis). These species were confirmed after three rounds of screening, which aimed to identify EN and CR species potentially present in the Yutasas area. The screening process involved consultations with local stakeholders and was based on the IBAT (Integrated Biodiversity Assessment Tool) report.

5.4 Socio-Economic and Cultural Conditions

5.4.1 Administrative and Social Structure

5.4.1.1 Administrative System

Cambodia's administrative system at sub-national level is organized into three (3) tiers: capital city/province, district/municipality/khan, and sangkat/commune. Phnom Penh, the capital, is divided into khans and further into sangkats, while provinces are divided into municipalities and districts, with municipalities subdivided into sangkats and districts into communes and sangkats. The sub-national government is guided by organic laws, including the Law on Administration of Commune/Sangkat and the Law on Administration of Capital City, Province, Municipality, District, and Khan, supporting decentralization and deconcentration. Commune/sangkat administrations operate with legal, financial, and administrative autonomy, governed by elected councils responsible for budgets, development, and public order. Higher levels, such as provinces and districts, are governed by councils (legislative) and boards of governors (executive), with council members indirectly elected by commune/sangkat councils and supported by technical committees. Boards of governors, nominated by the Ministry of Interior, implement policies and supervise ministry units in their jurisdiction. Recent legal amendments aim to expand local administrations' authority over civil servants from national bodies, awaiting implementation through sub-decrees.

5.4.1.2 *None-Governmental Organizations*

Another institution which are playing an important role in the development of the country at sub-national level is the civil society. The civil society in Cambodia, particularly the NGOs plays a vital role in development and democratization. These organizations address challenges such as poverty, education, human rights, gender equality, and environmental conservation, filling gaps in governance and social services. NGOs contribute by providing microfinance, vocational training, and livelihood programs to alleviate poverty; supporting education through school construction, scholarships, and inclusive learning; and improving health outcomes with maternal health programs, HIV/AIDS awareness, and mental health support. They advocate for human rights, labor rights, and good governance, engaging in election monitoring and raising awareness about corruption and land rights. Additionally, NGOs promote environmental sustainability and climate resilience while advancing gender equality by combating violence and discrimination and empowering women in leadership. Within the project area, there are a number of NGOs being identified within the area in different sectors including environment, community development, such as Wildlife Conservation Society (WCS), Adventist Development Relief Agency (ADRA), Advocacy Policy Institute (API), and People in Need (PIN).

5.4.1.3 *Community-Based Organizations*

Another social organization is Community-based organizations (CBOs). Cambodia, CBOs play a critical grassroots role, directly addressing local needs. Unlike NGOs, they are often less formalized and focus on mobilizing local resources for infrastructure, livelihood improvements, and strengthening community networks. CBOs contribute significantly to disaster resilience, especially in flood-prone areas, and foster cultural preservation and social cohesion through community events and initiatives. Together, NGOs and CBOs empower communities, protect rights, and promote inclusive development, offering hope for a more equitable and sustainable future despite ongoing challenges. Types of CBOs include Community Fishery, Forestry Community, Agricultural Cooperatives, and social organizations such as saving groups, old age association, etc. All of these types are reported within the project target areas.

The identified agriculture-related community-based association is provided in Table below:

Table 31. Type of Associations

No.	Types of Associations	Krang Ponley
1	Agricultural Cooperatives	One agricultural cooperative located in Yutasas which focus on rice and vegetable.
2	Farmer Water User Community	Yutasas exist of farmer utilizing water, but the systems are not operational due to a lack of cooperation in paying contributions user and unstable water support.
3	Community Forestry	No community forestry in the command area.
4	Community Fishery	No community fishery within this sub-scheme

5.4.1.4 Culture and Religion

Cambodia's culture reflects its rich history and diversity, shaped by the ethnic Khmer majority (90%) and minority groups like ethnic Vietnamese, Cham Muslims, and indigenous highland communities. While Khmer is the official language, many minorities maintain unique languages and traditions. Buddhism, practiced by 95% of the population, deeply influences cultural norms, often blended with Hindu and animist elements such as ancestor worship. As per the commune database and consultation with local authorities regarding the indigenous people, there is no indigenous people being present within the target areas.

5.4.2 Social Conditions

The command area of Yutasas is 650 ha. Administratively, the command areas located Kampong Chhnang province, span across in Svay commune, giving the total of 5 villages, giving the total households of 1,229 HHs with a total population of 5,330 people (out of which 2,773 are females).

Table 32: Administrative and population coverage of Yutasas sub-scheme

No.	Province/ District	Communes	Number of Villages	Total HH	Total Population	Female Population
	Yutasas					
1	Sameakki Meanchey (Kampong Chhnang)	Svay	5	1,339	5,330	2,773
	Sub-Total	**1**	**5**	**1,339**	**5,330**	**2,773**

HH = Household.

(Source: Ministry of Planning, Commune Database, 2023)

5.4.3 Demographic and Facilities

As per the description from above section on sociological condition, the ESCIA extracted the data from Commune Database, Ministry of Planning to obtain the statistics of all villages located within and nearby the command areas. It is noticeable that not all households hold the land assets within the command areas whereas it is possible that villagers from the other residential locations can also own the land within the command areas. The later population are not included in this information describes in the following section. It is noted that the commune database in 2023 is the full recorded information of village chief in every village across the country being submitted to commune further submitted to district, province and national level for compilation. Annually the data is collected during June or July and the release will be around 6 to 8 months later.

According to the commune database in 2023, the total number of households who are residing within and nearby the command area is 1,339 HH (out of which 247 HHs (18%) are female headed), giving the total population of 5,330 people (2,773 females). Moreover, the population are young with 69% of them are aging below 34 years old. Less than half of the people (31%) completed education at primary school and below whereas those with secondary, high school, and higher education are 42%, 21%, and 2%, respectively. It is noticeable that illiterate people have still existed at 4%.

Table 33: Demographic information of the HH living within and the vicinity of the command areas

Parameters	Number	Parameters	Number
Overall		**Educational Level**	
Total HH	1,339	Kindergarten	20.7%
Female HH Head	247 (18%)	Primary school	10.5%
Total Population	5,330	Secondary school	41.6%
Female	2,773	High School	21.0%
Age		College/University	1.7%
<18 years old	37%	TVET	0.2%
18 – 34 years old	32%	Illiterate	4.2%
35 – 60 years old	24%		
> 60 years old	7%		

(Source: Ministry of Planning, Commune Database, 2023)

Energy access of the population within the target area was found to be high, giving its proportion at 100% access to electricity. Moreover, the sources of water for domestic consumption were high 64% of them having access to water supply system while the rest continue using pump well, tube-well, rainwater, pond and river, indicating the access to clean water continue to be a huge amount within the project target areas. A good sign for the people is how they are using water for drinking purposes which was found to be almost all using safe water for drinking (tape water 39%, filtered water 40%, and boiled water 21%). There is a concern, however, regarding the reliability of the tape water quality which may create a significant impact on people's health, if they are not properly monitored. Interestingly, almost all the people within the target areas own a toilet showing their understanding of the importance of water, sanitation and hygiene.

Table 34: Access to energy and water and sanitation facilities

Parameters	Percentage	Parameters	Percentage
Source of Energy		**Drinking Water**	
Electricity	100%	Tape water	39%
Battery	0%	Filtration	40%
Solar	0%	Boiled	21%
Biogas	0%		
Water Source for HH consumption		**Toilet**	
Tape water	64%	Pour Toilet	100%
Pump well	19%	Flush toilet	0%
Wells	2%	Total toilet	100%
Opened Well	0%		
Pond	4%		
Rainwater	11%		
River	0%		

(Source: ESCIA Field Survey, 2024, Ministry of Planning, Commune Database, 2023)

5.4.4 Socio–economic Conditions of the Beneficiaries

In the command area, full-time workers in the private sector were reported as the main occupation of the population. While rice and crop production are the second highest proportion (22%) for all command areas. For the secondary occupation, a full-time worker in the private sector maintains its dominance among the population while rice and crop production account for the second largest proportion (13%).

Table 35: Occupation of the HHs living within and the vicinity of the command areas

Parameters	Percentage	Parameters	Percentage
Main Occupation		**Secondary Occupation**	
Rice and crop production	22.34%	Rice and crop production	12.77%
Trade	2.13%	Animal production	6.74%
Service	3.55%	Trade	1.77%
Handicrafts	0.71%	Service	2.13%
Government staff	4.96%	Handicrafts	0.71%
Workers (full-time, private sector)	23.05%	Government staff	3.55%
Workers, (seasonal, private sector)	3.55%	Workers (full-time, private sector)	21.99%
Housewife	3.19%	Workers, (seasonal, private sector)	3.55%
Student	19.15%	Housewife	3.90%
Other	3.55%	Student	19.15%
No job	13.83%	Other	2.84%
		No job	20.92%

(Source: ESCIA Field Survey, 2024)

A significant proportion of the population with poor 1 & 2 is reported at 14%, indicating the level of economic condition of the areas while the proportion of the people with disability (PWD) is only 0.5%. People are migrated to both inside and outside the country with the highest one is within the country (7.7%) while only 1.5% migrated to abroad. This makes the total migration of 9.2%.

Table 36: Migration and vulnerability of the people within the sub-schemes

Parameters	Percentage	Parameters	Percentage
Vulnerability		**Migration**	
Poor 1	5%	Inside the country	7.69%
Poor 2	9%	Out of the country	1.54%
Total	**14%**	**Total**	**9.23%**
Disable person	0.36%		
Old people	0.13%		
Orphan	0.06%		
Total	**0.54%**		

(Source: ESCIA Field Survey, 2024, Ministry of Planning, Commune Database, 2023)

Semi-permanent houses are the most dominant shelter of the people comprising 49% of the total settlement. Wooden house with thatched roof is the second most popular (43%) while the rest is one or more floor brick wall and. The assets that people own the most are Television (95%), followed by motorbike (73%), and bicycle (49%), and power tiller (8%) while the rest are in small proportion.

Table 37: Houses and Assets of the HHs within the Sub-Schemes

Parameters	Percentage	Parameters	Percentage
Assets		**Type of Houses**	
Power Tiller	8.1%	One floor or more/brick wall	7.69%
Threshing Machine	0.1%	Semi-permanent	49.23%
Car	8.4%	Wooden house, thatched	43.08%
Motorbike	73.0%		
Tricycle	0.7%		
Bike cycle	48.9%		
TV	95.2%		

(Source: ESCIA Field Survey, 2024, Ministry of Planning, Commune Database, 2023)

The table reveals a 0.5% rate of family violence, followed by drug use (0.2%) and land issues (0.3%), while stolen cases and crime each occur at 0.1%. Importantly, no cases of sexual harassment or human trafficking were reported within the Yutasas sub-scheme.

Table 38: Issues in the project communities

Parameters	Yutasas sub-scheme	Total
Sexual Harassment	0.0%	0.0%
Human Trafficking	0.0%	0.0%
Violence in the family	0.5%	0.5%
Drug using	0.2%	0.2%
Crime	0.0%	0.0%
Stolen Cases	0.1%	0.1%
Land Issues	0.3%	0.3%

5.4.5 Cultural Sites

In Yutasas, there is no cultural sites will be impact by the project.

5.4.6 Agricultural Production

5.4.6.1 Rice Production

In Yutasas, rice is the main crop cultivated by most farmers, with a small number of households also growing cash crops like watermelon and vegetables. The average land size for rice production ranges from 1 to 1.5 hectares. Common rice varieties include Reang Chey, Changkuah Ampeak, Angka No 55, and Angka No 85. Farmers use between 70 to 200 kg of rice seeds per hectare, with traditional varieties being self-produced, while Angka No 55 and 85 are purchased from the market.

Fertilizer use varies between the wet and dry seasons, with 100-300 kg of chemical fertilizer and 40-60 kg of compost applied per hectare during the wet season, and 100-320 kg of chemical fertilizer during the dry season. Pesticide usage is focused on controlling pests and weeds, with application occurring 2-4 times for pests and 1-2 times for weeds in the wet season, and 4-5 times for pests and 1-2 times for weeds in the dry season. Labor for rice farming is primarily sourced from households, but rented labor is used for soil preparation, pesticide spraying, harvesting, and transporting rice.

The average rice yield ranges from 2.5 to 5 tons per hectare in the wet season and about 3 tons per hectare in the dry season. Farmers face several challenges, including water scarcity for both rice and crop production, with canals often lacking water and no inflow sources. Other issues include limited capital, pest infestations (such as the walker pest during the boosting stage), and weed management.

After harvesting, straw is either kept for cow feed or sold, while stubble is typically left in the field for 2-3 months before being burned or plowed under. The average cost of rice production is between 1,500,000 and 2,000,000 riel (US$325 and US$ 500) per hectare. In terms of capacity building, some groups have received training on rice production (three times) and crop production (once), but one group has not received any training.

Table 39. Rice production during wet and dry season

Parameters	Percentage	Parameters	Percentage
Wet season		**Dry season**	
Land size (m2)	5,691	Land size (m2)	4,157
Yield (kg/year)	1,478	Yield (kg/year)	1,197
Income (USD/year)	492	Income (USD/year)	337

(Source: ESCIA Field Survey, 2024)

5.4.6.2 Vegetable Production

In the area, vegetable cultivation includes a variety of crops such as cucumber, watermelon, curly cabbage, luffa gourd, wax gourd, morning glory, long bean, and peanut. The average land size for vegetable farming ranges from 1,000 to 10,000 square meters. Farmers employ both traditional and chemical cultivation practices, using water sourced from canals, ponds, and wells from the Yutasas scheme. Some areas have agricultural associations.

Expenditures for vegetable farming per household range from USD 250 to USD 3,500, covering seeds, manure, fertilizers, pesticides, pump machines, petroleum, straw, nets, drip systems, and soil covering materials. Income varies between USD 500 and USD 6,000, with higher earnings in areas that use land covering and irrigation systems.

Vegetables are sold at local markets, through brokers for Phsar Doem Kor, Phsar Odoung, and supermarkets. Key challenges include insect pests, diseases, low soil fertility, and water shortages. Farmers have received agricultural services such as growing techniques, compost making, market information from social media, and support from trainers and agriculture district officers.

Table 40: Vegetable production during wet and dry season

Parameters	Percentage	Parameters	Percentage

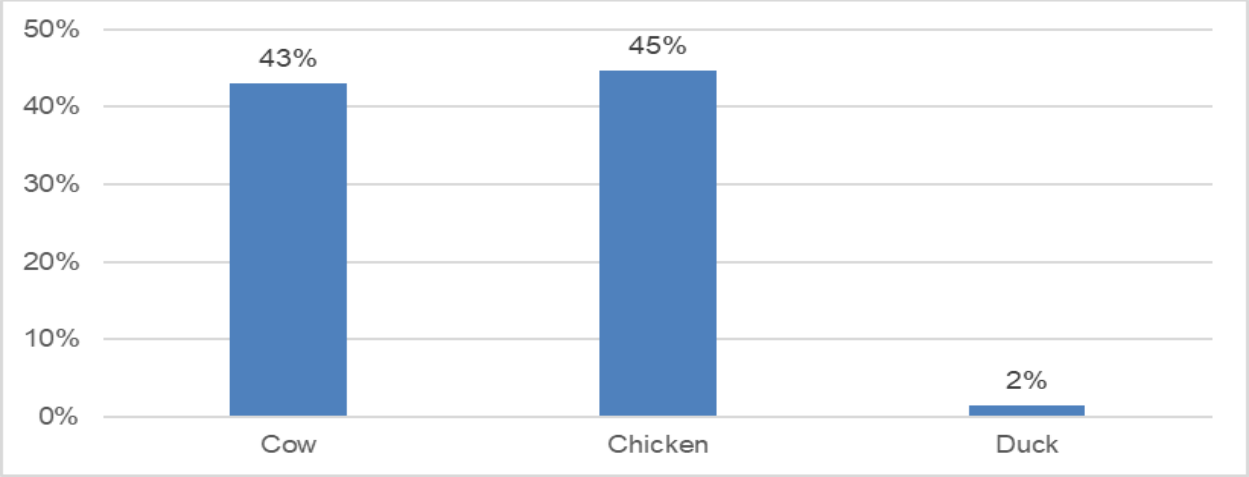
Wet season		Dry season	
Land size (m2)	1,039	Land size (m2)	995
Yield (kg/year)	385	Yield (kg/year)	477
Income (USD/year)	169	Income (USD/year)	209

(Source: ESCIA Field Survey, 2024)

5.4.6.3 Animal Production

In Yutasas, a diverse range of animal production activities is prevalent among local households. Chicken farming is the most widespread, with 45% of households while 43% raise cows. reflecting their significant role in the local economy and diet. Ducks are the least common among the livestock options, with just 2% of households raising them. This distribution highlights the varied livestock practices within the area, with a strong emphasis on poultry farming and a notable presence of cattle farming.

Figure 20: Type of animal in command area



(Source: ESCIA Field Survey, 2024)

5.4.7 Gender

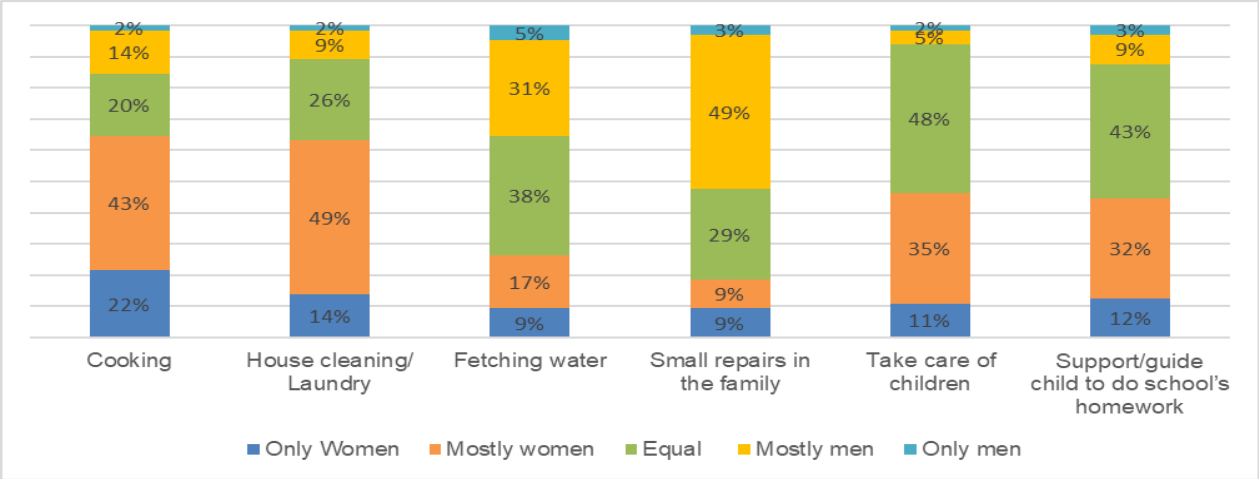
5.4.7.1 Labor Division

CAISAR Gender Assessment and Social Inclusion Plan reported that men spend on average of 59.4% of their time for farming whereas women spend only 40.5%. In traditional farming context, men involve the most during cultivation stage while women are more engaged in the later production. Heavy duty tasks such as land preparation are designated to men while seedling preparation and weeding are commonly assigned to women. Transplanting, uprooting, harvesting, and marketing are generally shared by both. However, the practices have been changed lately due to the presence of mechanization where land preparation, harvesting and threshing have been replaced by machinery.[13]

[13] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

Coming to household chores; women handle 90% of the workload. During the COVID-19 outbreak, women spent even more time on domestic and caregiving tasks. Elderly family members bear the full responsibility for raising grandchildren when their mothers have migrated. In the project area, similarly, in families where women work in nearby garment factories or migrate for paid employment, domestic duties are often shifted to young girls and the elderly.[14] The ESCIA field survey showed that cooking, housing and cleaning, are mainly at the hand of women, except repairing in the household, men involve the most while fetching water, child caring, and schooling men and women involved equally (Figure 13).

Figure 23: Division of Roles in Household Chores (n=65)

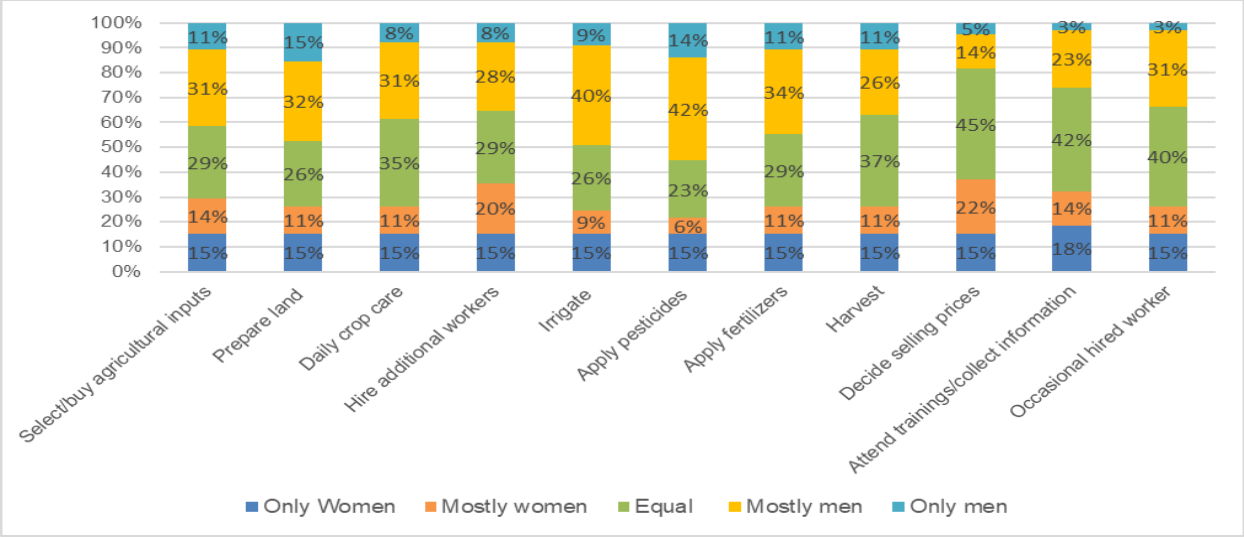


(Source: ESCIA Field Survey, 2024)

In crop production, the distribution of labor was found to be male dominated for majority of the tasks, especially at production level. However, both men and women were found to be a joint together during harvesting and decide to sell. As the result, male and women cooperate to each other in plant cultivation (Figure 14).

[14] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

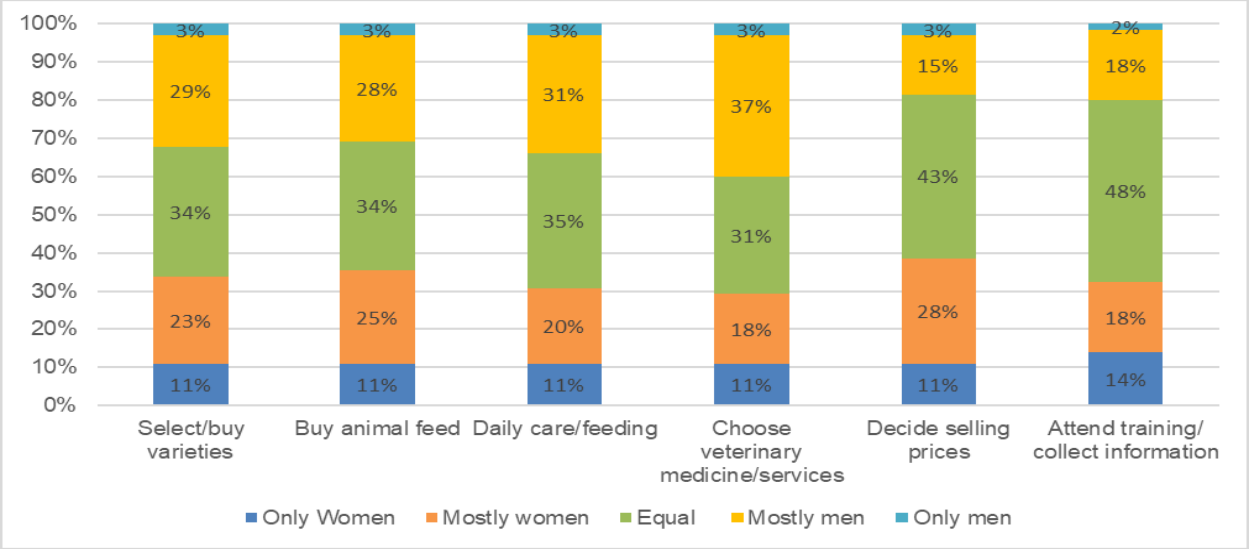
Figure 22: Share of Roles in Crop Cultivation (n=65)



(Source: ESCIA Field Survey, 2024)

In animal production, the distribution of labour is found to be equally involved both male and female almost at all stage exception choose varieties and selecting veterinary medicine mostly response by male.

Figure 23: Share of roles in Animal Husbandry (n=65)



(Source: ESCIA Field Survey, 2024)

5.4.7.2 Income

The CAISAR Gender Assessment and Social Inclusion Plan revealed notable findings regarding income differences by gender. On an individual level, the average monthly income for female household members is $121.4 (n=238), which is lower than the $166.6 earned by male members (n=366), showing a statistically significant income gap of $45.2. However, at the household level, there is no significant difference in average income between female-headed and male-headed households, with a small mean difference of $17.3. Nationally, 48% of married men (aged 15–49) reported making joint decisions with

their wives on income use, 46% said their wives mainly make these decisions, and 6% said they decide alone. Additionally, 97% of married women (aged 15–49) who earn cash from employment participate in decisions about their earnings, with 63% making these decisions mainly on their own.[15]

5.4.7.3 Decision Making

Regarding decision-making, the matters related to children, such as education, childcare, and marriage, are typically decided by both husband and wife. However, a significant number of households have women as the sole decision-makers on child-related issues. When it comes to daily livelihoods, decisions such as household expenses, sales of home-produced goods, and visiting friends or family are usually made jointly. Still, a notable portion of respondents indicated that women alone make decisions regarding their own livelihoods, family expenses, attending trainings, and similar matters. While women tend to take the lead on child and livelihood issues, decisions concerning agricultural activities, like cultivation and animal husbandry, are mostly handled by men. This is largely due to the physically demanding and sometimes hazardous nature of agricultural work, such as pesticide application.[4]

6. ENVIRONMENTAL & SOCIAL RISKS, IMPACTS, AND MITIGATION

In this section, the E&S risks and impacts (that potentially arise during activity implementation and operationalization) are identified, analysed, and evaluated at project level — with regards to the nature, scope, scale, and the potential extent of activity impacts — through classification of such risks and impacts as direct, indirect, and cumulative. The assessment of E&S risks and impacts in this chapter is based on the following grounds that is fundamental to proposing measures to avoid, minimize, and mitigate for the impacts in the next chapter:

Project's original technical reports

- Feasibility Studies (August 2023)
- Feasibility Studies (updated by November 2023).
- Additional Pre–Feasibility for Ou Ta Pong Sub–scheme.
- Environmental and Social Management Framework – ESMF (Updated by September 2024)
- IBAT reports for Ou Ta Pong.

Stakeholder Consultations (national, provincial, district, commune, and village levels)

- Community Meetings
- Focus Group Discussions
- Key Information Interview.

[15] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

Field observation, using

- Transect walks.
- Drones (for E&S screening and biodiversity assessment)

External technical reports

- Statistical reports/database.
- Publications and Technical Reports from national and internation institutions.

6.1 Environmental Risks and Impacts on Preparation and Construction Stage

6.1.1 Unexploded Ordnances (UXO)

Construction and rehabilitation activities, particularly those involving earthworks, soil excavation, and river dredging, pose a significant risk of unexploded ordnance (UXO). Despite past demining efforts and clearance of the UXO existence in some sub-scheme as per the report in the Baseline, mortar shells, aerial bombs, and other UXO may still be present within the subproject area. This risk is particularly high in areas where deep excavation is required for structural upgrades or dredging.

The potential detonation of UXO poses a substantial threat to residents, construction workers, animals, and any other entities located near the construction sites. The risk of encountering UXO is considered moderate due to the country's long history of civil war and the limitations of past demining operations, which are often focused on surface-level clearance.

❖ **Mitigation Measures**

- Carry out UXO screening/assessment by certified UXO experts before any physical/ construction activities are allowed.
- In case UXOs are found by certified experts during on-site screening, removal of UXO will be carried out by certified experts.
- A UXO clearance certificate shall be obtained from related authority for each sub-project prior to commencing any subproject activities.
- As part of site-specific ESCMP, conduct training and awareness activities for local community with regards to UXO risks and chance finds.

6.1.2 Environmental, Health, And Safety

6.1.2.1 Noise and Vibration

During construction phase, noise and vibration will be generated where machineries such as excavator, bulldozer, cement concrete mixing, and trucks are operated. While noise will be a nuisance to construction workers and nearby residents, these impacts are anticipated to local and intermittent during mostly during

daytime. During night–time, noise may be occasionally generated from workers' camps due to living activities and occasional maintenance of machinery and equipment. These impacts are expected to have no or minimal impact on local residents as workers' camps will be located near construction site and far away from residential area. However, people who live along the national road (e.g. in Stung Krang Ponley) and small roads that project's trucks use to carry project's equipment and materials, may experience occasional traffic noise during daytime. Given the nature and scope of physical works under this scheme, impact of noise on local residents is expected to be none to minor, and temporary.

❖ **Mitigation Measures**

- Before commencing the irrigation system restoration, the Ministry is requested to organize public forums in collaboration with the commune to gather feedback from the local population, especially from residents who may be affected by the project. Moreover, training sessions for the commune help them understand the project's processes, including the size of the infrastructure systems and the standards for excavation and construction. This will ensure that the commune is well-informed about the project
- Locate the workers' camp far away from the residential area as much as possible
- Avoid night-time construction in populated/village areas.
- Minimize project transportation through community areas where possible.
- Ensure proper maintenance and proper operation of construction machinery to minimize noise generation.
- No construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and during religious or cultural events near the subproject
- All construction equipment and vehicles must be well maintained, regularly inspected for noise emissions
- Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located (houses, schools, temples, hospitals, etc.
- Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.

6.1.2.2 Air pollution

During construction phase, a number of project activities may cause air pollution. These include physical activities such as movement of trucks (for transportation of materials), clearing & grubbing, grading, excavation, levelling, truck hauling, stockpiling, disposal of solid waste, dredging which may generate dust and particulate matter (PM10 and PM2.5) (if water spraying does not apply). Exhaust emissions from trucks and heavy machinery will release nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO^2), and volatile organic compounds (VOCs) which may contribute to smog formation and greenhouse effect. Burning of waste (by contractors) may release harmful pollutants into the air. While air pollution due to dust, particulate matter, and exhaust emissions from trucks and engines, are anticipated, location where pollution is generated vary and impact for one (1) location is temporary, intermittent, and minor, and are particularly for residents who live along the project's roads.

❖ **Mitigation Measures**

- Avoid burning solid waste or construction waste
- Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition
- Conduct proper maintenance of machineries and equipment
- Place sitting concrete mixing plants, crushing plants, quarries and other facilities far from settlement and other sensitive receptors
- Use cover for vehicles that transport all construction materials such as cements and excavated soils
- Test air quality (NO_2, SO_2, CO, TSP, PM10, PM2.5) prior and during the construction to assess the level of impact

6.1.2.3 Impact on Water

Water pollution is anticipated, primarily due to physical activities that involves dredging and excavation near or in water course/ source. Such activities do not only cause turbulence for water but also cause increased sedimentation. Disturbed soil – caused by excavation to improve irrigation canal, for instance, may contaminate water at places where water is collected for domestic purpose. The impact is anticipated particularly for planned dredging operation. However, water pollution would be minimized through construction methods and time.

Wastewater (released from workers' camps) and leaks of hazardous materials (e.g., oil, diesel, chemical) could make their way into nearby water bodies and during rainy season which cause water contamination and leave varying level impacts on the receptors. The main receptors vulnerable to water pollution during construction include nearby residents and construction workers. Due to the scope and scale of physical works anticipated for each of the six schemes, project impact due to water pollution is anticipated to be minor and localized.

The Sedimentation due to excavation, dredging, and earthworks is a primary cause of water quality degradation. Loose soil can be washed into nearby water bodies, increasing turbidity, reducing light penetration, and altering the aquatic habitat. Additionally, the use of machinery and equipment introduces risks of oil spills, fuel leaks, and chemical contamination, which can enter water sources through surface runoff, affecting aquatic life and water usability downstream.

❖ **Mitigation Measures:**

- Implement a waste management plan to ensure the proper disposal of all construction waste, including wastewater.
- Use environmentally friendly construction materials and techniques to reduce the amount of pollutants that are released into the environment
- Install erosion and sediment control measures, such as silt fences, and sediment basins.
- Properly manage construction chemicals, fuels, and waste to prevent water pollution.

- Regularly inspect and maintain construction equipment to prevent leaks and spills.
- Wash construction vehicles and machinery only in designated areas where runoff will not pollute natural surface water bodies.
- Train construction workers on the importance of preventing water pollution.
- Construct of retaining structures.
- Test surface water quality (Depth, pH, EC, As, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform)

6.1.2.4 Solid and Hazardous Waste

During project implementation, solid wastes – both non–hazardous and hazardous, are anticipated to be generated, primarily due to rehabilitation of irrigation canals and rural roads. In particular, solid waste could be generated from operations that involved site clearing, excavation, trenching, demolition of existing cement and earthworks structures, construction and disassembly of worker camps, maintenance of machineries, and so forth. Regarding dredged and excavated material, the construction activities can lead to surface erosion and sedimentation, particularly in water bodies. However, the estimates for the amount of dredged or excavated material per scheme do not estimate amounts for reuse or disposal. Improper handling of solid waste generated from the above operation may result environmental pollution that may include soil and water contamination, habitat disruption, visual pollution and give rise to concerns of public health.

❖ **Mitigation Measures**

- All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering.
- The Contractor will be required to train the workers in proper waste management.
- Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum).
- Non-hazardous, non-recyclable solid waste will be temporarily deposited and managed together at existing landfill/dumpsite.
- Safe temporary storage of hazardous waste as required.
- Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations.
- Vehicles, machinery, and equipment maintenance and re-fueling will be carried out in such a way that spilled materials do not seep into the soil.
- Oil traps will be provided for service areas and parking areas.
- Fuel storage and refilling areas will be located at least 50m from canals and channels and will be protected by temporary drainage bunds to contain spills.
- Use or reuse the dredge material on properties with a residential or recreational use (dredging material, if planned for reuse, will be subject to testing to ensure the material is safe for reuse).

6.1.2.5 Wastewater

During construction phase, generation of wastewater is expected, mainly from a) workers' camp (e.g. domestic wastewater), b) cleaning and washing of machinery, c) treatment of leakage and spill, etc. Depending how wastewater is managed, receptors of wastewater may include immediate receiving environment which may include soil, water bodies which may subsequently affect human including construction workers, residents nearby, and fauna and flora along the way wastewater goes.

❖ **Mitigation Measures**

- Reduce, recycle, and reuse waste [e.g. plastic waste, electronic waste, agricultural waste (natural, animal faces for later use as manure, plant waste)] wherever and whenever possible.
- Latrines must be built at construction sites and camp sites for appropriate domestic waste management.
- Hazardous waste, including any spills of chemicals or fuels, should be collected separately and disposed of following environmental regulations.
- Ensure construction sites have enough well-maintained sanitation facilities to prevent the direct discharge of untreated wastewater.
- Promote clean living practices, reduce plastic usage, and improve waste management.
- The construction company must regularly monitor the workers' living conditions, waste management, and ensure there are proper sanitation facilities and adequate housing for the workers.
- The company provides education and guidance on maintaining cleanliness and hygiene for the workers (such as proper waste disposal and handling of oil) and prohibits activities like fish.

6.1.3 Occupational Health and Safety

6.1.3.1 Physical Hazards

The construction or rehabilitation of irrigation canals and farm roads during the construction phase of the project presents significant physical hazards to workers and those in close proximity to the construction sites. These hazards can result in a range of consequences, from minor injuries requiring medical attention to severe and potentially fatal accidents. The sources highlight several specific types of physical hazards, including Falls from Heights, Drowning and Water-Related Injuries, Falling Objects, Falls into Open Holes, and Injuries from Heavy Equipment.

The impact receptors for physical hazards are primarily construction workers, but also include inspectors, visitors, and nearby residents and children, as well as domestic animals. The sources assess the risk of physical hazards as high, acknowledging that working in the construction field can result in injuries or fatalities if safety standards are not met. The sources emphasize that unsafe practices by construction companies can lead to accidents, injuries, illnesses, and fatalities. While the overall risk might be lower due to the anticipated number of workers involved, stakeholders at the community, district, and provincial levels have expressed concerns about the potential hazards posed to both workers and community

members.

❖ **Mitigation Measures**

- Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines.
- Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements.
- Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks.
- Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m.
- Carry out daily toolbox meetings (safety briefings).
- Maintain an accident record book where all major or minor accidents and incidents are recorded with actions taken.
- Educate the workers on construction hazards.
- Train drivers in safe driving skills and traffic regulations.
- Appoint an Environment, Health and Safety Officer who is a qualified engineer.
- Make adequate first aid equipment available on site.
- Carry out training and awareness of the workers on HIV-AIDS prevention.
- Ensure that all workers are equipped with and use Personal Protective Equipment (PPE).

6.1.3.2 Heat Stress

The construction phase of the project, which includes rehabilitating irrigation canals and ponds, presents potential risks of heat stress to workers. This is particularly concerning given Cambodia's tropical climate, characterized by high temperatures and humidity. Construction activities are often physically demanding and performed outdoors, increasing the risk of heat-related illnesses.

Construction workers exposed to prolonged high temperatures and humidity may experience heat stress, potentially leading to heat exhaustion or heat stroke. This can result in reduced productivity, increased accidents, and even fatalities. Heat stress can also exacerbate existing health conditions. The project's Environmental and Social Management Framework (ESCMF) highlights the importance of considering temperature extremes during the construction phase, emphasizing the need for mitigation measures to ensure worker health and productivity.

❖ **Mitigation Measures**

- Providing regular breaks and shaded rest areas for workers to cool down and rehydrate.
- Ensuring access to cool drinking water throughout the workday.
- Adjusting work schedules to avoid the hottest hours of the day, if feasible.

- Providing training to workers and supervisors on recognizing the signs and symptoms of heat stress and appropriate first aid measures.
- Encouraging the use of personal protective equipment, such as light-colored, loose-fitting clothing and wide-brimmed hats, to minimize heat absorption.
- Monitoring weather conditions and adjusting work practices accordingly.
- Developing and implementing an emergency response plan for heat-related illnesses.
- Providing adequate ventilation and cooling systems in worker accommodations.
- Encouraging workers to maintain good physical fitness and hydration levels.
- Regularly monitoring workers for signs of heat stress and taking appropriate action.

6.1.4 Community Health and Safety

Construction activities may disrupt local transportation networks and increase traffic volume, including heavy trucks and machinery, impacting communities and businesses along transportation routes. Construction sites pose health and safety risks to workers and nearby communities. Accidents and exposure to construction-related hazards can have serious consequences. The influx of construction workers from different regions may increase the risk of spreading communicable diseases such as HIV/AIDS to the local community.

Open canals and ponds during rehabilitation work pose a risk of drowning, particularly to children and individuals unfamiliar with the area. Construction activities may increase the depth or alter the flow of water, further increasing the risk. Construction sites can attract curious individuals, particularly children, who may be unaware of the potential hazards. This includes the risk of falls, being struck by moving machinery or vehicles, and contact with hazardous materials. It is important to secure construction areas, implement safety awareness campaigns, and enforce hygiene and sanitation standards at construction camps.

❖ **Mitigation Measures**

- Prior to start of construction work, the contractor in cooperation with the PIU will consult with the local authorities and potentially affected residents/private landowner. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM).
- The contractor shall fence off the construction area and control access to the site.
- A speed limit of 30 km/h for construction related traffic through inhabited areas.
- The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities.
- The contractor in cooperation with the local authorities shall implement traffic management to ensure a smooth traffic and prevent congestion.

6.1.5 Biodiversity

6.1.5.1 Hunting, trading, and consumption of wildlife

During the construction phase of the irrigation infrastructure project, the influx of a new labor force presents a significant risk to hunting, trading, and consumption of wildlife. The arrival of workers from other regions can increase the demand for exotic local foods, including wildlife and endangered species, which are often perceived as interesting delicacies or possessing health-promoting properties. The hunting may be done for relaxation or belief that wildlife is tasty or making people healthy. This heightened demand can drive illegal hunting and trading activities, posing a severe threat to biodiversity and the stability of local ecosystems.

The impact receptors of this risk are primarily aquatic and terrestrial species, and endangered. The potential impact on endangered species, as their rarity often increases their market value, further incentivizing unsustainable hunting and trading practices that can lead to their extinction.

❖ **Mitigation Measures**

- Conduct thorough biodiversity inspections along access roads and at quarry sites before starting land clearing works to identify habitats or nesting sites of endangered/protected species.
- Provide mandatory training for contractors' management staff and site workers on the Code of Conduct, Standard Operating Procedures (SOP) for wildlife protection and handling, and human-wildlife conflict management.
- Incorporate a policy in the Project Administration Manual (PAM) and Worker's Agreement that prohibits employees and/or subcontractors from possessing, purchasing, trading, or collecting wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List.
- Undertake regular monitoring of all access roads to prevent poaching activities.
- Properly handle and rescue wildlife encountered during land clearing and construction, following the SOP for wildlife protection and handling.
- Educate the community on local wildlife behavior, avoidance techniques, and deterrent methods.
- Report observed/recorded incidents of illegal activities to relevant authorities.
- Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species.
- Collaborate with local communities to monitor wildlife populations and report any suspicious activities.

6.1.5.2 Loss of fauna and flora

The primary activity contributing to this risk is the construction of canals expansion and roads, particularly in areas that require clearing vegetation and disrupting natural habitats. The construction activities can lead to both direct and indirect impacts on fauna and flora:

- Habitat loss and fragmentation due to construction activities like canal and farm road rehabilitation,

land use changes, and altered water management practices can affect species survival and connectivity. These activities may involve dredging, excavation, or modification of existing water channels and infrastructure, leading to habitat destruction and disturbance to nesting and foraging sites.

- Increased vehicle movement increases the chance of collisions with wildlife.

The impact receptors for the loss of fauna and flora are diverse and include various species in the Yutasas sub-scheme. The biodiversity study has confirmed species include: Elongated Tortoise, Jullien's Golden Carp, leaping barb/Flying Minnow, and Mekong giant barb/Giant Carp.

❖ **Mitigation Measures**

- Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction by relocating them to safer habitats, following the Standard Operating Procedure (SOP) for wildlife protection and handling.
- Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur.
- Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur.
- Develop a system in which drivers report locations of wildlife crossings and wildlife sightings.
- The contractor shall install signs to ban hunting or catching wildlife in the area.
- Apply Find Chance Procedure

6.1.6 Climate Change

6.1.6.1 GHG emission

The main activities that contribute to this risk is the use of heavy machinery and trucks for excavation, transportation, and rehabilitation of irrigation canals and farm roads. The operation of these machineries releases carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) into the atmosphere. Waste burning at worker campsites may also contribute to GHG emission.

❖ **Mitigation Measures**

- Construction vehicles and machinery will be maintained to a high standard to minimize emissions and ensure compliance with the National exhaust emission standards. All mobile equipment should be fitted with catalytic converters.
- Use energy-efficient machinery and equipment during construction to reduce fuel consumption and emissions.
- All open burning of construction and demolition of waste material and refuse will be prohibited.
- Implement proper maintenance programs for equipment and vehicles to ensure they operate efficiently and with lower emissions.

- Engage with local communities and stakeholders to raise awareness of emission reduction practices and encourage their participation in sustainability efforts.

6.2 Environmental Risks and Impacts on Operation Stage

6.2.1 Environmental, Health and Safety Aspect/Issue

6.2.1.1 Water Management

During the operation phase of the irrigation infrastructure project, alterations to hydrology present potential risks. The main activity that causes these risks is increased irrigation. This can lead to the depletion of water sources if proper management practices are not implemented.

The impact receptors for these risks include the Tonle Sap Lake, upstream watersheds, wetlands, aquatic ecosystems, and downstream communities. The assessment of the impact of hydrology changes during operation is moderate. This takes into consideration the potential for both positive and negative impacts of irrigation systems. Poor water management can result in downstream water scarcity, altered hydrology, and damage to aquatic ecosystems. However, well-designed and properly managed irrigation systems can contribute to improved agricultural productivity and water resource management.

❖ **Mitigation Measures**

- A water user community should be organized prior to construction to participate in identifying key locations and ensure there are caretakers in place.
- Establish detailed water management plans that ensure equitable water distribution and allocation, considering the needs of various users and the environmental flow requirements to maintain healthy aquatic ecosystems.
- Integrate natural infrastructure, such as wetlands and forests, into water management strategies. Protect and restore degraded habitats to enhance their water regulation capabilities, improve water quality, and support biodiversity.
- Establish and provide training to FWUCs on sustainable water management practices, equitable water rights, and allocation procedures. These communities play a vital role in the operation and maintenance of the irrigation system, ensuring its long-term sustainability.

6.2.1.2 Water pollution

The primary activity that causes this risk is the intensification of agricultural production in the command areas as irrigation water becomes readily available. This intensification can lead to an increased use of chemicals, such as fertilizers and pesticides, to enhance crop yields. These chemicals infiltrate the soil and reach groundwater aquifers, leading to long-term contamination. The excessive application of these chemicals can result in contamination of both surface and groundwater resources. Furthermore, changes in water table levels due to extensive irrigation can alter the flow patterns of groundwater, potentially mobilizing contaminants that would otherwise remain contained.

The assessment of the impact of water pollution during operation is moderate. The potential for significant water quality degradation due to the widespread use of chemical fertilizers and pesticides in rice

production. High concentrations of these chemicals in water resources can harm biodiversity, not only within the Yutasas sub-scheme but also in the downstream river systems and the Tonle Sap Lake.

❖ **Mitigation Measures**

- Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing.
- Encourage farmers to adopt IPM techniques that minimize pesticide use and rely on biological control methods, thereby reducing the increased risk of chemical contamination of water resources.
- Provide training and extension services to farmers on the judicious use of fertilizers and, ensuring they apply the correct type and amount based on soil nutrient levels.
- Promote the adoption of organic fertilizers and soil amendments, such as cover crops and green manures, which can improve soil fertility and reduce the need for chemical fertilizers.
- Implement a robust water quality monitoring program to track the levels of pesticides, nitrates, and other pollutants in surface and groundwater resources within and around the command areas.
- Encourage the adoption of water-saving irrigation methods, such as alternate wetting and drying (AWD) in rice cultivation, which can reduce water consumption and minimize the leaching of agrochemicals.

6.2.1.3 Soil pollution

During the operation phase of the irrigation infrastructure project, soil pollution/quality reduction poses a considerable risk. The primary activity contributing to this risk is the increased agricultural production facilitated by the improved irrigation infrastructure. This intensification can lead to the overuse of agri-chemicals, such as chemical pesticides and fertilizers, if farmers lack adequate training or support in adopting environmentally friendly practices.

The impact receptors for soil pollution/quality reduction are multifaceted, encompassing such as soil health, water quality, and biodiversity. The impact of soil pollution/quality reduction during the operation phase as moderate. This assessment considers the potential for increased agricultural production to lead to the overuse of agri-chemicals if sustainable farming practices are not adopted.

❖ **Mitigation Measures**

- Implement Simplified Pesticide Management Plan
- Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing

6.2.2 Climate Change

6.2.2.1 GHG emission

During the operation phase, the intensification of farming activities is expected to result in a rise in greenhouse gas (GHG) emissions. This increase will stem primarily from the greater energy requirements associated with boosting agricultural production. The operation of machinery and equipment for various

farming tasks, including tillage, irrigation, harvesting, and transportation, will demand a substantial amount of energy. If this energy comes from fossil fuels, it will lead to higher carbon emissions. The practice of burning rice straw after harvest, a common agricultural method in the region, also releases significant amounts of GHGs, such as carbon dioxide and methane, into the atmosphere. Additionally, the intensification of farming often results in greater use of chemical fertilizers, and the production and application of these fertilizers also contribute to GHG emissions.

The main impact receptor for GHG emissions is the atmosphere. The increase in GHG emissions adds to the problem of global climate change, which can have a wide range of negative consequences. These consequences include rising temperatures, shifts in weather patterns, sea-level rise, and an increase in the frequency and intensity of extreme weather events.

❖ **Mitigation Measures**

- The project needs to introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production.
- The project needs support training farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution.
- The project promotes the utilization of efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions.
- The project needs to advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.

6.2.3 Annual Crop Management Plan

6.2.3.1 Water resource efficiency

In this phase, inefficient irrigation practices can lead to a reduction in water resource efficiency. Moreover, people in community faced with flooding in wet season and drought in dry season generally. Additionally, farmers also pose with climate change issue which harm to their crop. The increased demand for irrigation, coupled with poor water management practices and lack of infrastructure, can result in the over-extraction of water resources. This over-extraction can have several detrimental effects on the surrounding environment and communities:

- Downstream Water Scarcity: Excessive withdrawal of water for irrigation can deplete water sources downstream, leading to water shortages for other users, such as communities, industries, and ecosystems.
- Altered Hydrology: Over-extraction can disrupt the natural flow patterns of rivers and other water bodies, affecting the balance of aquatic ecosystems and the services they provide.
- Damage to Aquatic Ecosystems: Reduced water flow and altered water levels can harm fish populations, other aquatic organisms, and the overall health of downstream ecosystems.

The impact receptors for inefficient water resource use are downstream communities and aquatic ecosystems, including those in the Tonle Sap Lake and its surrounding watersheds, this impact as the moderate. This assessment highlights the importance of implementing effective water management

strategies to ensure the sustainable use of water resources and minimize negative impacts on downstream users and ecosystems.

❖ **Mitigation Measures**

- Water use monitoring system to track consumption and identify areas for improvement.
- implementing appropriate irrigation scheduling based on crop water requirements and weather conditions.
- Utilizing efficient irrigation systems, such as drip irrigation or sprinkler systems, to minimize water loss.
- Exploring opportunities for water reuse, such as capturing and reusing runoff water.

6.2.3.2 Soil erosion and soil erosion risk

The various agricultural activities can elevate the risk of soil erosion and contribute to the degradation of soil health. Land preparation practices, such as tillage and site clearing, along with the use of heavy machinery, can disrupt the soil structure, making it more vulnerable to erosion by wind and water. Additionally, the intensification of farming can lead to changes in vegetation cover, reducing the natural protection against erosion.

Soil erosion poses significant threats to both the environment and agricultural productivity. The loss of topsoil, the fertile upper layer of soil rich in nutrients and organic matter, is a primary concern. This loss diminishes soil fertility, impacting its ability to retain water and nutrients crucial for plant growth. Consequently, agricultural yields decline, and farmers may experience reduced productivity. Furthermore, eroded soil particles contribute to increased sedimentation in water bodies such as rivers and lakes. This sedimentation can harm aquatic ecosystems and degrade water quality, increasing the costs associated with treating water for human consumption.

The impact receptors for soil erosion are soil health, water quality, and agricultural productivity. The sources assess the impact of soil erosion during the operation phase as high, emphasizing the need for sustainable land management practices to prevent and mitigate soil erosion.

❖ **Mitigation Measures**

- Minimize soil compaction and disturbance by using appropriate machinery and timing land preparation activities.
- Consider erosion management practices such as contour planting, terracing, and grass barriers.
- Adopt reduced tillage or no-till farming practices to minimize soil disturbance.
- Establish cover crops during fallow periods or in rotation with main crops to protect the soil from erosion.
- Practice contour farming on sloping land to reduce runoff and erosion.
- Construct terraces on steep slopes to prevent soil loss.
- Establish windbreaks or shelterbelts to reduce wind erosion.

- Install erosion control structures, such as grassed waterways or sediment basins, to manage runoff.
- Apply much to the soil surface to protect it from rainfall impact and erosion.

6.2.3.3 Nutrient application and management

The excessive or improper application of fertilizers poses a significant risk to water quality and the health of aquatic ecosystems. The intensification of agricultural production, driven by improved irrigation, can lead to an increased reliance on chemical fertilizers to enhance crop yields.

The impact receptors for nutrient runoff and leaching are water quality, aquatic ecosystems, and human health. High levels of nutrients, particularly nitrogen and phosphorus, in water bodies can lead to eutrophication, a process that causes excessive growth of algae. This algal bloom can deplete oxygen levels in the water, harming fish and other aquatic organisms. Additionally, contaminated water sources can pose risks to human health if used for drinking or recreational purposes.

The sources assess the impact of nutrient application and management during the operation phase as high, emphasizing the urgent need for sustainable farming practices that optimize fertilizer use and minimize the risks of nutrient pollution.

❖ **Mitigation Measures**

- Conduct periodic soil analysis to determine nutrient needs and avoid over-fertilization.
- Establish buffer zones near watercourses to filter nutrient runoff.
- Consider using green manures and cover crops to replenish soil nutrients and reduce leaching.

6.2.3.4 Use and effectiveness of pesticides

The use of pesticides to protect crops from pests and diseases can pose significant risks to human health, biodiversity, and the environment. The intensification of farming often leads to an increased reliance on pesticides to maintain high crop yields. However, the effectiveness of pesticides can decline over time as pests develop resistance, requiring farmers to apply higher doses or switch to more potent chemicals.

This cycle of pesticide use, and resistance can have several negative consequences. Pesticide exposure can pose health risks to both farmers who handle and apply these chemicals and consumers who ingest pesticide residues on food. Pesticides can harm non-target organisms, including beneficial insects, pollinators, and soil organisms, disrupting the balance of ecosystems. Environmental Contamination: Pesticides can contaminate soil and water resources, potentially affecting water quality and the health of aquatic ecosystems.

The sources assess the risks and impacts associated with pesticide use and effectiveness as high, highlighting the need for integrated pest management strategies that minimize reliance on chemical pesticides.

❖ **Mitigation Measures**

- Promote Integrated Pest Management (IPM) strategies to minimize pesticide use.
- Implement training and awareness programs for farmers on the safe handling and application of

pesticides.

- Providing training materials that are user-friendly and accessible to farmers with varying literacy levels.
- Including climate information and agrometeorology services in training materials when available.
- Preparing training materials for rice and other crops such as vegetables, poultry, and aquaculture.
- Organizing trainings on "climate-informed agriculture decisions and planning" and having trained individuals disseminate information.

6.2.3.5 Pesticide residues on site soil

The repeated application of pesticides, especially persistent pesticides, and the improper disposal of pesticide containers can lead to the accumulation of pesticide residues in the soil. This accumulation can have several detrimental effects on the environment such as contamination of Groundwater and impacts on Soil Organisms.

The impact receptors for pesticide residues on-site soil are soil health, biodiversity, and water quality. The sources assess the risk of pesticide residue accumulation in the soil as high, emphasizing the need for judicious pesticide use, proper disposal of pesticide containers, and integrated pest management strategies to minimize the risks associated with pesticide contamination.

❖ **Mitigation Measures**

- Promote the use of pesticides with low persistence and mobility in the environment.
- Implement a soil monitoring program to assess pesticide residue levels.
- Consider crop rotation and the use of cover crops to help break down pesticide residues.
- Minimize pesticide use by adopting IPM strategies.
- Conduct soil testing to monitor pesticide residue levels.
- Utilize cover crops to improve soil health and enhance pesticide degradation.

6.2.3.6 Pesticide residues on produce

During the operation phase of the irrigation project, the application of pesticides close to harvest, improper pesticide application techniques, and inadequate pre-harvest intervals can lead to pesticide residues on produce, posing risks to consumer health. Consuming produce with pesticide residues can have adverse effects on human health.

The main impact receptor for pesticide residues on produce is human health, specifically consumers who ingest the contaminated food. The sources assess the impact of pesticide residues on produce as moderate. This assessment highlights the importance of implementing safe pesticide application practices, adhering to pre-harvest intervals, and promoting alternative pest control methods to minimize the risks to consumer health.

❖ **Mitigation Measures**

- Enforce pre-harvest intervals to allow for pesticide breakdown before harvest.

- Promote the use of pesticides with low toxicity to humans.
- Properly wash and handle produce to remove surface residues.
- Implement a monitoring program to test produce for pesticide residues.
- Ensure compliance with established MRLs for pesticide residues on produce.

6.3 Social Risks and Impacts on Preparation Stage

6.3.1 Land Acquisition

6.3.1.1 Land acquisition and resettlement

The land acquisition for the construction of the irrigation system within the Yutasas sub-schemes has been limitedly anticipated since the construction of the new system has been avoided the most. The land acquisition in the Yutasas sub-scheme is primarily driven by the construction of infrastructure components such as Embankment, Main Canal, Main Drain, and second drain. These activities are projected to affect a total land area approximately 24,180 m^2. Consultation result addressed that they have concerns of land affected by construction near irrigation systems or the placement of construction projects, with some areas of land that people are using being close to harvest time and potentially rendered unusable but due to the project announcement the project implementation will be inform 6 months in advanced where this issue will be encounter. The affected households will feel not well due to land impact.

Consultation with the Provincial Department of Land Management, Urban Planning and Construction (PDoLMUPC) has revealed that all the land required for this sub-scheme falls under public ownership. Therefore, the land acquisition process is anticipated to proceed without impacting any private property.

❖ **Mitigation Measures**

- The preparation of Land Impact and Land Acquisition Assessment Screening Report or Checklist to confirm the impact is required or the Abbreviated Land Resettlement Plan.

6.3.1.2 Economic displacement

The risk of economic displacement is linked to activities like the rehabilitation of irrigation canals and farm roads, and land acquisition. These activities can disrupt existing economic activities and displace households and businesses. The upgrading of irrigation systems may result in the removal of informal farming areas due to dredging, impacting those who rely on these areas for income. Additionally, during the construction phase, local businesses and transportation routes might face disruptions due to construction activities, affecting the community's daily life and economic activities. The Yutasas Sub-scheme encompasses various infrastructure components, including Embankment, Main Canal, Main Drain, and second drain.

The impact receptors for economic displacement include households who have production land along the water bodies, informal land users, informal settlers, and nearby construction site business owners. The assessment regard this impact of economic displacement as moderate.

❖ **Mitigation Measures**

- The households who own the land along the rehabilitated canals which will be expanded at the public land should be properly informed prior to the construction to avoid their crops will be damaged at the time of construction.
- Although the acquired land is the public land, there are a need of a proper consultation and information to be conducted to inform and obtain agreement from the affected households.

6.4 Risks and Impacts at Construction Stage

6.4.1 Protecting The Workforce

6.4.1.1 Child Labor

The risk of child labor emerges due to the demand for unskilled labor in rural areas where the use of child labor is prevalent. Contractors and subcontractors involved in the project's construction activities may employ children or youth under the legal working age due to labor shortages or the drive to minimize costs. This practice exploits vulnerable children, depriving them of education and opportunities, and perpetuates a cycle of poverty.

The risk of child labor, particularly due to the influx of labor and pre-existing societal inequalities. Vulnerable groups, such as poor and near-poor households, female-headed households with dependents. Children from these groups are often driven to work due to economic hardship, and the increased demand for labor during project construction can exacerbate this situation. Migrant workers, often facing precarious working conditions and separated from support systems, are also highly vulnerable to exploitation, including child labor. The project's Gender Assessment identifies the lack of local wage jobs and increasing migration as key challenges that could further heighten the risk of child labor.

❖ **Mitigation Measures**

- Apply LMP for age check prior to engagement of labor with regular monitoring through proper screening and registering all workforce for the work
- To mitigate the risk of child labor, the project will implement strict measures to ensure compliance with national and international labor laws. Regular monitoring and inspections will be conducted to identify and address any instances of child labor.
- Additionally, awareness-raising campaigns will be implemented to educate communities about the harmful effects of child labor and the importance of sending children to school. The project will also collaborate with local authorities and NGOs to strengthen law enforcement and provide support services to vulnerable children and their families.

6.4.1.2 Forced Labor

In the construction phase, the risk of forced labor is anticipated, especially for vulnerable individuals who may be coerced into working against their will. Forced labor can manifest in various ways, including:

- Economic Coercion: Individuals may be forced to work due to financial pressures, such as the need to repay debts or support their families.

- Exploitation of Young People: Young people, particularly those from impoverished backgrounds, may be forced to work to contribute to family income or due to a lack of educational opportunities.
- Debt Bondage: Workers may be trapped in a cycle of debt by unscrupulous employers who advance them loans with exploitative terms, effectively binding them to work until the debt is repaid.
- The rehabilitation of irrigation canals and farm roads creates a demand for local labor which can be exploited by those who seek to profit from forced labor.

❖ **Mitigation Measures**

- Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children
- The Project Owner and Sub-Contractors will collaborate with the relevant Government Agency to disseminate information to local communities. This information will include the Contractor's Code of Conduct and the minimum working age as mandated by national laws and international standards.
- The Ministry of Water Resources and Meteorology (MOWRAM) will provide information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.

6.4.2 Community Health and Safety

6.4.2.1 Disease transmission

During construction phase, the risk of disease transmission is anticipated due to the influx of construction workers, the potential for their lack of hygiene in living conditions, and their interaction with local community members. The influx of workers increases the likelihood of spreading and contracting communicable diseases, both among the workers themselves and between workers and the local community. Workers may experience poor eating habits, homesickness, stress, and unhygiene living conditions which make them susceptible to diseases.

❖ **Mitigation Measures**

- Conduct public awareness raising activities (IEC) to ensure local people and contractors know about the risks of contracting and spreading communicable diseases such as COVID-19, HIV/AIDS, and water-borne diseases (e.g., amoebiasis, giardiasis, and toxoplasmosis. etc.
- In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising to the risk groups.
- Conduct training to workers on communicable diseases prior to mobilization to construction sites.
- For water-borne diseases that arise due to polluted or contaminated water, mitigations measures may include:
- Implement filtration, chlorination, or UV disinfection to ensure safe drinking water.
- Build and maintain proper sewage systems and latrines to prevent water contamination.

- Promote handwashing, safe food preparation, and proper sanitation practices in communities.
- Control and properly dispose of waste to prevent water pollution.
- Test water sources frequently for contamination and take corrective actions promptly.

6.4.2.2 Sexual Exploitation and Abuse, Sexual Harassment

The risk of Sexual Exploitation and Abuse/ Sexual Harassment (SEA/SH) is envisaged due to several factors. The influx of workers estimated to be approximately 171 in Krang Ponleng river, as the Yutasas is a part of this scheme, frequent visits by project personnel, and pre-existing SEA/SH issues in the area all contribute to this risk. This risk is primarily associated with the rehabilitation of irrigation canals and farm roads. The influx of labor includes not only construction workers but also individuals who provide logistical services, increasing the potential for exploitation.

❖ **Mitigation Measures**

- Contractors need to explicitly state zero tolerance for sexual harassment, exploitation, and abuse within the workplace.
- Require Code of Conduct (CoC) to be signed by all construction workers.
- For victims coming forward: referral to qualified SEA/SH service provider. The GRM will include a confidential channel for reporting SEA/SH.
- Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children
- Training on SEA/SH and VAC for community members, in particular women and girls (may be done separately for men and women).
- Ensuring workers' sites are situated (at least 500m) from schools and/or other areas where children congregate.
- Ensure access to grievance redress mechanisms for all project-affected persons, including both stakeholders and workers, to address Sexual Exploitation and Abuse, and Sexual Harassment. Support (in the form of training, awareness raising, etc.) to local law enforcement to act on community complaints regarding SEA/SH and VAC.
- Provision of information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.
- Provide counselling services for male and female workers, wives and other female partners of contractors' workers.
- Build partnerships with local health providers and SEA/SH service providers to conduct community awareness activities, and referrals.
- Implement public awareness campaigns to address sexual harassment in transport services and hubs, and training of police on women's security needs when using transport.

6.4.2.3 Traffic safety & Security

During construction phase, traffic safety is among the local concerns. The rehabilitation of irrigation canals and farm roads necessitates increased transportation of construction materials and equipment, potentially leading to road accidents, especially if safety measures are not strictly enforced. Construction activities can also attract unauthorized individuals seeking to steal or vandalize equipment and materials, further compromising security. The influx of construction workers into the project area may also contribute to a perceived or actual increase in crime rates, impacting the sense of safety among residents.

People subject to risk of traffic accident include anyone which may include project workers and local people who live near the construction sites or travel on transportation routes.

❖ **Mitigation Measures**

- Arrange security guard or engage local authority to guard the construction sites
- Conduct public awareness raising activities (IEC) to ensure local people and road user are aware of road safety regulations and risks and act accordingly while using road.
- Monitor and observe speed limit.

6.4.2.4 Community Health and diseases

During the construction phase, community health and safety risks extend beyond disease transmission and include the potential for accidents and injuries related to construction activities. Rehabilitation work on canals and ponds poses drowning risks, especially for children and those unfamiliar with the altered water bodies. Trespassing in construction zones, which may contain storage areas, camps, lay down areas for construction materials, vehicles, and machinery, presents further risks of incidents and accidents for community members. Additionally, construction activities can lead to traffic and access disruptions that may cause safety issues for the community. The presence of construction workers and associated activities can also lead to potential conflicts with local communities. Construction sites also pose risks of accidents and exposure to construction related hazards.

❖ **Mitigation measures:**

- Establish clear and well-marked construction exclusion zones to prevent unauthorized access, especially to areas with open water, heavy machinery, and storage areas.
- Implement fencing and barriers to prevent trespassing and ensure community safety around construction areas.
- Provide warning signs in local languages to inform communities about the dangers and restricted access to construction areas.
- Install safety barriers around construction sites to minimize risks to the community and workers.
- Ensure proper storage of construction materials, with no materials left unsecured and scattered around the site.
- Develop and implement traffic management plans to minimize traffic and access disruptions and ensure pedestrian and vehicle safety.

- Conduct community awareness campaigns to educate the community about the potential risks and safety measures during construction.
- Establish and maintain a grievance mechanism to address community complaints and issues promptly.
- Implement safety measures around canals and ponds to prevent drowning incidents, such as installing safety barriers and providing warning signs in local languages.
- Create and enforce clear rules regarding access to canals and ponds during construction, and post those rules.
- Implement strict health and safety regulations at all construction sites to protect both workers and the nearby communities.
- Provide training to workers on safety protocols, including how to work safely around water, avoid accidents and minimize risks to the community.
- Ensure all workers are provided with necessary personal protective equipment (PPE) and enforce its use.

6.4.2.5 Personal Protective Equipment

The construction or rehabilitation of irrigation canals and farm roads during the construction phase presents significant risks to worker safety and health due to the potential lack of personal protective equipment (PPE). These activities involve Embankment, Main Canal, Main Drain, and second drain, which expose workers to various hazards, such as Falling Debris, Sharp Objects, and Heavy Machinery.

The absence of proper PPE significantly increases the likelihood of injuries, such as cuts, fractures, or head trauma. Workers without respiratory protection may inhale dust, fumes, or toxic substances, potentially leading to respiratory problems. Similarly, inadequate eye and hearing protection can result in vision impairment or hearing loss due to flying particles and high noise levels. Furthermore, the lack of proper footwear and gloves increases the risk of slips, trips, and falls, and exposure to hazardous materials.

The impact receptors for risks associated with the lack of PPE are primarily construction workers but also include inspectors and visitors to the construction sites. The sources assess the risk associated with inadequate PPE as high, particularly in rural construction settings where cost-cutting measures might compromise worker safety. The sources emphasize that the absence of PPE not only jeopardizes individual safety but also reduces productivity and increases liability risks for the project.

❖ **Mitigation Measures**

- Continue and active use of PPE at all times of construction.
- Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual
- Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out.

- Proper use of PPE should be part of the recurrent training programs for employees.

6.4.2.6 Working conditions and Management of Worker

The construction or rehabilitation of irrigation canals and farm roads during the construction phase of the project carries a risk of underpaid pay and unequal treatment for local workers hired by project contractors. This risk is exacerbated by the lack of written contracts for unskilled workers, particularly those recruited locally. Without a formal contract, these workers are vulnerable to being underpaid compared to the demands and scope of their work.

The potential for underpayment to occur based on gender and temporary work status, further marginalizing already vulnerable groups. The absence of clear contractual terms also increases the risk of late wage payments or even non-payment, jeopardizing the workers' livelihoods and potentially delaying the project's progress. The impact receptors for underpaid pay and unequal treatment are primarily unskilled workers (mostly local people) and construction workers, particularly women.

❖ **Mitigation Measures**

- Implement a grievance mechanism for workers where workers can report issues related to underpayment or unequal treatment without fear of retaliation.
- Advise companies to provide equal opportunities for employment and promotions to all workers, regardless of gender, ethnicity, or background, to avoid discrimination.
- Regularly monitor and audit payroll and employment practices to ensure compliance with labor regulations and address any disparities.
- Offer training and capacity-building programs for all workers to enhance their skills and qualify them for higher-paying roles.
- Ensure that subcontractors and suppliers also adhere to fair wage and equal treatment policies.
- Set up worker committees or unions to allow collective bargaining and ensure workers have a voice in addressing wage and treatment issues.
- Provide accessible information to workers about their rights, entitlements, and the proper channels to address grievances through the establishment of the GRM for workers.
- Labor Rights and the Workers' Code of Conduct Regularly engage with labor rights organizations or third-party auditors to evaluate labor conditions and make improvements where necessary.

6.4.3 Cultural Heritage

No significant cultural sites being presented within the sub-scheme. However, there is a possibility that construction activities might unearth archaeological artifacts buried deep in the soil as the sub-scheme is nearby to Longvek leading to the possibility that treasures or artifacts of historical significance were hidden underground. The impact receptors for cultural heritage risks are primarily underground cultural sites, and the sources assess the risk as minor.

❖ **Mitigation Measures**

- Implement Find Chance Procedure

6.4.4 Cross-Cutting

6.4.4.1 Loss access to land and other assets

In the construction phase, activities like upgrading existing canal, and implementing river training measures, carries a moderate risk of temporarily or permanently restricting access to natural resources for local communities. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could strain local resources, including water sources and forest products, potentially leading to overexploitation and environmental degradation.

❖ **Mitigation Measures**

- The project will prioritize avoiding physical resettlement and minimizing land acquisition. Design adjustments will be made to avoid or reduce land requirements, especially on private land. Public land will be prioritized for any necessary acquisition.
- Where land acquisition is unavoidable, the project will employ a negotiated settlement process with affected households. This process, guided by the RGC's Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR), aims to ensure that affected households receive fair and adequate compensation for their losses and maintain or improve their income and livelihood status.
- All individuals with assets within the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation, regardless of their legal status. Compensation will be provided for various losses, including land, structures, crops, trees, and income-generating activities.
- Recognizing the potential disruption of income streams during relocation or construction, the project will provide transitional allowances to affected households. These allowances will help cover living expenses and bridge the gap until they can resume their livelihoods.
- A multi-tiered GRM will be established to address grievances from any project-affected person. The GRM will operate based on the principles of the Green Climate Fund (GCF) and be accessible at no cost to the complainant.

6.4.4.2 Loss access to natural resources

The construction phase of the irrigation project, specifically activities like upgrading existing canal, carries a moderate risk of temporarily or permanently restricting access to natural resources for local communities. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could strain local resources, including water sources and forest products, potentially leading to overexploitation and environmental degradation.

❖ **Mitigation Measures**

- Implement efficient water management practices during construction and operation to prevent over-extraction of water resources from reservoirs and rivers and ensure equitable distribution for downstream communities and ecosystems.
- Use environmentally friendly construction materials and techniques to reduce the risk of pollution. Properly manage construction chemicals, fuels, and waste to prevent water pollution and

contamination of natural resources. Prepare and implement a waste management plan to handle waste generated from construction activities and worker camps.

- Optimize construction material use and recycle, when possible, to minimize the extraction of new resources. Implement energy-efficient construction practices and use renewable energy sources where possible.
- Maintain ongoing communication with affected communities, including farmers, fishers, and downstream communities, to address concerns about natural resource access. Provide information and education to construction workers about responsible use of local resources and respect for community access rights. This suggestion is informed by the sources but is not directly stated in them.
- Ensure the GRM is accessible to all community members to address complaints related to natural resource access.

6.4.4.3 Social inequality

The engagement and consultation processes during the design and construction phases of the irrigation project present a moderate risk of social inequality. The sources indicate that while landowners in the project areas are mainly from local communities, suggesting relatively equal access to the consultation process, vulnerable groups without farmland may have limited opportunities to participate and benefit from the rehabilitated irrigation system.

This potential for exclusion raises concerns about the fair distribution of project benefits. While the overall impact of social inequality during the construction phase is assessed as moderate.

❖ **Mitigation Measures**

- Conduct participatory planning and regular consultations with local communities, particularly marginalized groups (e.g., women, smallholder farmers, indigenous communities).
- Prioritize hiring local labor, with special provisions for disadvantaged groups (e.g., youth, women, minorities) in both skilled and unskilled positions.
- Develop and enforce water allocation plans that ensure fair access to water resources for all users, including small-scale and subsistence farmers, during and after construction.
- Implement fair and transparent compensation or resettlement plans for those displaced or affected by construction activities, especially vulnerable households.
- Establish accessible and responsive grievance redress mechanisms, ensuring all community members can raise concerns or complaints during construction.
- Conduct regular social impact assessments, with a focus on identifying inequality trends, and adjust project strategies to mitigate negative effects.
- Provide support and training for affected communities to diversify their livelihoods, especially for those whose livelihoods may be disrupted by construction (e.g., farmers, traders).
- Ensure transparency in the contracting process, including the selection of subcontractors and

suppliers, with opportunities for local businesses, especially those run by marginalized groups.

6.4.4.4 Elite capture

The risk of elite capture is anticipated given the fact these local elite could potentially influence the project to provide them project benefits. While the majority of landowners within the command areas are from the local community, which reduces the likelihood of large-scale land grabbing by powerful individuals or groups, the sources acknowledge the potential for the wealthy to use their influence, connections, or resources to encroach upon protected areas for personal gain. The risk of elite capture is assessed as moderate.

❖ **Mitigation Measures**

- Consultation will be conducted farmers in potential command area, focusing on vulnerable/disadvantaged groups
- Alternative livelihoods for vulnerable group are identified based on their needs vis-à-vis project's investment eligibility
- Conduct consultation at community level (in the command area) to achieve a consensus on how water needs are balanced between different groups in one command area.
- During subproject design, water availability, storage capacity, and water needs of upstream and downstream population are calculated to inform design, and water use coordination during project operation.
- Water user groups should be established for upstream and downstream population and should be coordinated by a higher-level committee/group to negotiate and optimize water coordination
- Guidelines/Manual should be developed to provide guideline for upstream and downstream communities at subprojects to meet, discuss, and achieve consensus on how water is distributed for equal use between upstream and downstream population

6.4.4.5 Gender inequality

The risk of gender inequality due to limited access for women to training, resources, and decision-making processes related to irrigation and agriculture. This risk stems from pre-existing gender inequalities in Cambodia, where women often face barriers in accessing resources, technology, and leadership roles. The impact receptors for this risk are women farmers and laborers, who may be excluded from the full benefits of the project.

❖ **Mitigation Measures**

- Implement the Gender Action Plan and measures to promote women beneficiaries' improved participation in project planning and implementation, and their economic empowerment.
- Ensure women have access to training, resources, and decision-making processes related to irrigation and agriculture. This includes providing training in local languages at times and locations convenient for women. Childcare provisions can facilitate women's attendance.
- Set targets for women's participation in all project activities.

- Raise awareness of the importance of sharing household chores and farming workloads. This can give women more time to learn new skills, attend training, and participate in project activities.
- Promote women's access to skills and business development training centered around project target value chains for commodities such as rice, poultry, vegetables, and fish.
- Encourage the use of labor-saving technologies that can help reduce women's workloads in farming and household activities.
- Support women's involvement in off-farm activities, such as processing and value addition as well as investments in green products and women-led green enterprises.

6.5 Risks and Impacts at Operation Stage

6.5.1 Community Health and Safety

The potential for water uses conflicts during the operation phase, particularly between upstream and downstream users, and recognizes the risk of accidental drowning, especially among children. The introduction of irrigation infrastructure and increased agricultural activity may alter existing water allocation patterns, leading to disputes between upstream and downstream communities. Upstream users may prioritize their own irrigation needs, potentially reducing water availability downstream, affecting livelihoods and ecosystems. This situation could exacerbate competition for water resources. The construction of rehabilitation and farm road introduces open water bodies into the landscape, increasing the risk of accidental drowning, particularly for children.

❖ **Mitigation Measures:**

- The project will promote IWRM principles to ensure the equitable and sustainable allocation of water resources. This involves considering the needs of all stakeholders, including upstream and downstream communities, as well as environmental flow requirements for maintaining healthy ecosystems.
- Establishing a system for monitoring water use and enforcing water allocation regulations will help prevent over-extraction and ensure a reliable water supply for all users. This may involve installing flow meters, conducting regular water audits, and implementing penalties for non-compliance.
- The project will strengthen the capacity of FWUCs to manage water resources at the local level. This includes training on water allocation, conflict resolution, and operation and maintenance of irrigation infrastructure. Effective FWUCs can play a crucial role in mediating disputes and ensuring fair water distribution within their communities.
- Raising awareness about water safety and the risks associated with open water bodies, especially among children, is essential. Educational campaigns, signage, and community outreach programs can help promote responsible behavior and prevent accidents. This information could be included in the training programs that will be provided to farmers and communities.
- The project will consider incorporating safety features into the design of irrigation infrastructure. This may include fencing around canals and reservoirs, installing safety ladders, and providing

designated swimming areas away from irrigation structures.

6.5.2 Cross-Cutting

6.5.2.1 Gender inequality

The sources emphasize that women are less resilient to climate change than men and face unique vulnerabilities in terms of income, housing, and access to information and support systems. Socially defined gender roles can also hinder the adoption of climate-smart technologies among women. As a result, women may experience unequal access to water resources, limited participation in Farmer Water User Communities (FWUCs), and a disproportionate burden of negative impacts on their livelihoods.

The Yutasas sub-scheme is a part of the CAISAR project. The social studies in this project show that, women-led households made up 15% of all sub-schemes, which is seen as a significant percentage. There is still gender disparity, which makes it difficult for them to participate in and profit from the project. Men often overestimate, which diverts women's attention from the involvement. Increased gender-based trainings for men and increased support for all vulnerable groups should be proposed by the local government and project implementer.

❖ **Mitigation Measures**

- The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices.
- The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology.
- The project should monitor gender equality indicators and should make adjustments as needed to ensure that women are benefiting from the project.

6.5.2.2 Social inequality

In this phase, the concerning the competition for water resources among different user groups (farmers, communities, industries) and the potential displacement or restricted access to land due to irrigation infrastructure expansion, presents a minor risk of social inequality. Although the project aims to engage and consult with communities during the design and construction phases, vulnerable groups may still face limited access to irrigation water during the operation stage. This risk is especially relevant for farming communities, indigenous populations (if present), landless or land-poor households, and other vulnerable groups.

The vulnerable groups without farmland might have limited opportunities to benefit from the rehabilitated irrigation system. The impact of this social inequality is considered minor due to the relatively small proportion of poor people within the command area. However, it is important to note that the limited access to resources and capacity could hinder the full potential of efforts to support these vulnerable groups.

❖ **Mitigation Measures**

- Ensure Equitable Water Access: Mechanisms should be in place to support vulnerable and marginalized communities in accessing water resources.

- FWUCs will manage the irrigation systems and ensure sustainability through fee collection. The project will invest in establishing and training FWUCs, emphasizing inclusivity and capacity building for vulnerable groups.
- Implement a Simplified Integrated Pest Management (IPM) Plan.

6.5.2.3 Elite capture

The operation of the irrigation system during the operation phase creates a minor risk of elite capture due to the potential for unequal distribution of project benefits. This could result in powerful individuals or groups gaining a disproportionate share of the benefits at the expense of the intended beneficiaries. This risk is linked to the engagement and consultations conducted during the design and construction phases, as those processes might not fully prevent elite capture during the operational phase.

The main impact receptors are smallholder farmers, marginalized communities, and other vulnerable groups. Despite the project's efforts to ensure equitable access to resources, the sources highlight that wealthy individuals or groups could potentially leverage their power, connections, and resources to secure a larger share of water resources or control over irrigation infrastructure. This situation could further exacerbate existing social disparities and undermine the project's goal of improving livelihoods for all community members. The sources assess the risk of elite capture during the operation phase as minor. This assessment considers factors like the predominance of local landowners within the command areas and the current high land prices, which make large-scale land grabbing economically unfeasible.

❖ **Mitigation Measures**

- Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress mechanisms are essential to prevent manipulation and ensure equitable water distribution.
- Regular monitoring and evaluation: Continuous monitoring of project impact, especially on vulnerable groups, can identify and address elite capture.
- Strengthened land tenure security: Clarifying land rights can protect smallholder farmers and marginalized communities from land grabbing.
- Community engagement: Active community participation, especially from vulnerable groups, empowers them and ensures their needs are met.

6.6 Summary of the Mitigation measures for the Environmental and Social

Based on the ESC risks and impacts identified and assessed, a summary of proposed mitigations measures is presented in table below.

6.6.1 Mitigation Measures for the Environmental and Climate Risks and Impacts

Table 41: Preconstruction, Construction, and Operation Phase Environmental Mitigation Measures

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
Preconstruction phase				
1	Unexploded Ordnance (UXO) survey & removal			
	Risk of injuries or fatalities among workers or members of the public	• Carry out UXO screening/assessment by certified UXO experts before any physical/ construction activities are allowed. • In case UXOs are found by certified experts during on-site screening, removal of UXO will be carried out by certified experts. • A UXO clearance certificate shall be obtained from related authorities for each sub-project prior to commencing any subproject activities. • As part of site-specific ESCMP, we conduct training and awareness activities for local community with regards to UXO risks and chance finds.	PMU Contractor	Before construction
Construction phase				
ENVIRONMENTAL, HEALTH, AND SAFETY				
1	Noise and Vibration			
	• Earthmoving activities and the operation of machineries at construction sites will generate dusts and exhaust fumes. • Construction activities, operation of vehicular movement, excavation machinery, concrete mixing, and other construction activities will generate noise and vibration and will be a nuisance to workers and residents near the site. • Noise may be generated from workers' camp, particularly during living activities or entertainment at nighttime, or due to certain maintenance /repair of equipment, machinery, vehicles.	• Maintain all exhaust systems in good working order and undertake regular equipment maintenance to ensure compliance with applicable regulations and manufacturers' instructions. • Implementation of operating and maintenance practices of equipment and machinery to ensure that they are well-maintained. • Ensure that noise control options such as silencers and mufflers are fitted to exhausts, compressors and fans for construction equipment (such as hydraulic excavator, bulldozer, front loader, backhoe and trucks). • Provide advance warning to the community on timing of noisy activities. Seeking suggestions from community members to reduce noise annoyance and notify the communities about how to raise their concerns (if any) through the Grievance Redress Mechanism. • Undertake noise monitoring at the closest residential area and other noise sensitive receptor during times with ongoing construction work to ensure compliance with the relevant noise standards. • The contractor shall provide all construction personnel working in the vicinity of noisy construction activities (defined as those activities generating noise levels greater than 80 dB(A)), or any construction	• PMU • Contractor	Daily/ Every 06 months

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		personnel who request hearing protection, with hearing protection equipment. • A speed limit of 30 km/h for construction related traffic through inhabited areas. • The contractor shall conduct noise testing at the sensitive locations as per the detail engineering design comparing to the IFC EHS Guideline • Avoid night-time construction in populated/village areas. • No noisy construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and during religious or cultural events near the subproject • Provide temporary noise barriers (3–5-meter-high barrier can reduce 5–10 dB(A)), as necessary, if site works will generate high noise levels that could disturb nearby households, hospital, school and other sensitive receptors. • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.		
2	**Air pollution**			
	• Dust and particulate matter (PM10 and PM2.5) generation from soil disturbances, stockpiles, and road works • Exhaust emissions from trucks and heavy machinery (NOx, CO, SO2, VOCs) • Waste disposal, particularly through burning	• Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition. • Select Borrow sites located as close as possible to the construction to reduce distances. • If Concrete batching facilities are in need, it will be located at least 500 m (0.5 km) downwind from the nearest dwellings to reduce the impact of dust and fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions. • Water will be regularly sprayed to suppress fugitive dust at construction sites, material handling areas, access road and borrow pits. • Trucks carrying dry construction materials such as earth or waste will be covered with tarpaulins or other suitable cover. • Construction vehicles and machinery will be maintained to a high standard to minimize emissions and ensure compliance with the National exhaust emission standards. All mobile equipment should be fitted with catalytic converters. • A speed limit of 30 km/h for construction related traffic through inhabited areas and on the access road will be enforced. • All open burning of construction and demolition waste material and refuse will be prohibited. • Testing air quality (NO_2, SO_2, CO, TSP, PM10, PM2.5)	• SEO • E&S specialist consultants • PMU	Daily/ Every 06 months
3	**Impact on Water**			
	• Dredging projects along the rivers and canals • Sedimentation can reach downstream areas, including the Tonle Sap Lake, if not properly mitigated.	• Installation of temporary non-erodible ditches or bunds at the construction site to divert clean runoff away from exposed areas and convey potentially dirty runoff to sediment control devises. • Stockpiles and materials will be stored at least 50 m from surface waters with drainage directed away from the canals and streams or water sources.	• SEO • E&S specialist consultants • PMU	Daily/ Every 06 months

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Infiltration of wastewater from workers' camps can contaminate groundwater. • Leakage of hazardous materials like oil and diesel from machinery and vehicles can pollute both surface and groundwater.	• The sediment quality of the dredge spoil will need to be tested and assessed against an appropriate standard before re-use in the structure of embankments. The sediment testing results will confirm safe re-use of the material • No washing or repair of machinery within 50 m of surface waters. • Portable toilets and small wastewater treatment units will be provided at the construction site and labour camps. All sanitary facilities will be located at least 50 m from surface water bodies. All workers must be instructed to use these facilities, which should be always kept clean. • Pit latrines and septic tanks should be placed at least 2 m above the groundwater table, which must be located at least 50 m from surface water bodies and water wells and in areas of suitable soil profiles. • All hazardous materials including hazardous waste will be stored on an impervious surface, under cover, in adequate tanks or containers and within secondary containment.. • Areas where spills of fuel or oil may occur will be equipped with easily accessible spill control kits to assist in prompt and effective spill control. • Hazardous waste (oil waste) shall be properly collected and stored in closed containers under shelter for recycling or disposal by a duly authorized enterprise. • Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform) and pesticide residues in water (to be conducted overseas).		
4	**Solid and Hazardous Waste**			
	• Hazardous wastewater, such as oil or fuel, polluting materials used for machinery and construction processes at the construction site.	• Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations. • Vehicles and equipment shall be properly staged in designated areas to prevent contamination of soil and surface water. • Vehicles, machinery, and equipment maintenance and re-fueling will be carried out in such a way that spilled materials do not seep into the soil; • Oil traps will be provided for service areas and parking areas; • Fuel storage and refilling areas will be located at least 50m from canals and channels and will be protected by temporary drainage bunds to contain spills.	• PMU • Contractor	Daily
5	**Waste and Wastewater**			
	• Domestic wastewater comes from workers/staff's water consumption daily.	• Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum). • Safe temporary storage of hazardous waste as required • To the extent possible, a duly authorized waste company will be contracted to recycle hazardous waste. • Non-hazardous, non-recyclable solid waste will be temporarily deposited and managed together at existing landfill/dumpsite. • All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering.	• PMU • Contractor	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• The Contractor will be required to train the workers in proper waste management.		
6	**OCCUPATIONAL HEALTH AND SAFETY**			
		• Prepare a health and safety plan containing site-specific precautions in accordance with relevant occupational health and safety guidelines; • Inspect and check the relevant construction equipment to ensure that it meets the applicable mechanical and safety requirements; • Inspect the worksite to ensure that the equipment can be safely mobilized and operated, and that there are no unmitigated risks; • Install appropriate fencing and control access to the site; • Install appropriate safety signage and markings; • Provide fall protection when workers are exposed to unguarded platforms or walkways higher than 2 m; • Ensure there are safe ways to enter and exit the excavation; • Keep excavations dry; • Provide safety precautions when using high voltage electric power tools; • Carry out daily toolbox meetings (safety briefings); • Maintain an accident record book where all major or minor accidents and incidents are recorded with actions taken; • Educate the workers on construction hazards; • Train drivers on safe driving skills and traffic regulations; • Appoint an Environment, Health and Safety Officer who is a qualified engineer; • Make adequate first aid equipment available on site; • Carry out training and awareness of the workers on HIV-AIDS prevention; • implement emergency preparedness and response procedures Response Plan as planned in the CEMP. • Ensure that all workers are equipped with and use Personal Protective Equipment (PPE). • The Contractor will set out an Emergency Response Plan	• PMU • Contractor	Daily/Weekly
7	**COMMUNITY HEALTH AND SAFETY**			
		• Prior to the start of construction work, the contractor in cooperation with the PIU will consult with the local authorities and potentially affected residents/private landowners. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM). • The contractor shall fence off the construction area and control access to the site. • A speed limit of 30 km/h for construction related traffic through inhabited areas. • The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities.	• PMU • Contractor	Daily/Weekly

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• The contractor, in cooperation with the local authorities, shall implement traffic management to ensure a smooth traffic and prevent congestion.		
BIODIVERSITY				
1	**Hunting and trading, and consumption of wildlife**			
	• The influx of a new labor force can increase demand for exotic local foods, including wildlife and endangered species, which are often seen as interesting and delicious. This may be done for relaxation or belief that wildlife is tasty or making people healthy.	• Develop and enforce a strict Code of Conduct/ethics against wildlife collection, possession, and trafficking. This includes clear policies and sanctions for employees and subcontractors. • Provide mandatory training for contractors' management staff and site workers on the Code of Conduct, Standard Operating Procedures (SOP) for wildlife protection and handling, and human-wildlife conflict management. • Incorporate a policy in the Project Administration Manual (PAM) and Worker's Agreement that prohibits employees and/or subcontractors from possessing, purchasing, trading, or collecting wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List. • Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species. • Implement strict penalties for violating wildlife protection laws. • Collaborate with local communities to monitor wildlife populations and report any suspicious activities.	• SEO • PMU • Contractor	Daily/Weekly
2	**Loss of fauna and flora**			
	• Construction activities, particularly in areas like Lum Hach with community forestry, can significantly impact wildlife habitats. • New canals and roads require vegetation clearance, further fragmenting habitats. • Habitat loss poses a serious threat to endangered species like the Elongated Tortoise, Giant Asian Pond Turtle, and Hairy-nosed Otter.	• Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction by relocating them to safer habitats, following the Standard Operating Procedure (SOP) for wildlife protection and handling. • Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur. • Train field workers to recognize and avoid wildlife. • Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur. • Develop a system in which drivers report locations of wildlife crossings and wildlife sightings. • Workers will receive training on frequently encountered wildlife. • The contractor shall install signs to ban hunting or catching wildlife in the area. • Apply Find Chance Procedure	• SEO • E&S specialist consultants • PMU	Daily/Weekly
3	**GHG emission**			
	• The construction and operation of heavy machinery, such as excavators	• Use energy-efficient machinery and equipment during construction to reduce fuel consumption and emissions.	• SEO	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	and bulldozers, during these projects release carbon dioxide (CO2) into the atmosphere, i.e. the energy requirements for construction works can result in increased carbon emissions • At the time of construction, there are possibility of smoke generated by burning of straw in the rice field.	• Optimize construction logistics to reduce the number of vehicle trips and machinery usage, minimizing fuel use and emissions. • Implement proper maintenance programs for equipment and vehicles to ensure they operate efficiently and with lower emissions. • Reduce deforestation and land-use changes that contribute to carbon emissions by preserving vegetation and replanting trees in affected areas. • Use low-carbon materials and construction techniques that reduce the embodied carbon in construction materials. • Offset unavoidable GHG emissions by investing in carbon offset projects, such as reforestation or renewable energy initiatives. • Engage with local communities and stakeholders to raise awareness of emission reduction practices and encourage their participation in sustainability efforts.	• E&S specialist consultants • PMU	
DURING OPERATION				
ENVIRONMENTAL				
1	**Water Management**			
	• Irrigation systems have both benefits and drawbacks. • Proper design and management are crucial. • Minimizing negative impacts on the natural water cycle is essential.	• Implement water-saving irrigation technologies like drip irrigation and sprinkler systems to reduce water consumption and minimize the strain on water resources. • Encourage the adoption of the AWD technique in rice cultivation to optimize water use and reduce water withdrawals for irrigation. • Establish detailed water management plans that ensure equitable water distribution and allocation, considering the needs of various users and the environmental flow requirements to maintain healthy aquatic ecosystems. • Design and construct robust irrigation infrastructure, including canals, ponds, and storage areas, capable of withstanding extreme weather events like floods and droughts. This investment should also include lining canals and refurbishing storage areas to reduce water losses and improve water storage capacity. • Integrate natural infrastructure, such as wetlands and forests, into water management strategies. Protect and restore degraded habitats to enhance their water regulation capabilities, improve water quality, and support biodiversity. • Establish and provide training to FWUCs on sustainable water management practices, equitable water rights, and allocation procedures. These communities play a vital role in the operation and maintenance of the irrigation system, ensuring its long-term sustainability.	• PMU	Annually
2	**Water Pollution**			
	• Increased use of chemicals, such as fertilizers and pesticides, to enhance crop yields. The excessive application of these chemicals can result in	• Implement Simplified Pesticide Management Plan • Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing.	• PMU	Annually

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	contamination of both surface and groundwater resources.	• Encourage farmers to adopt IPM techniques that minimize pesticide use and rely on biological control methods, thereby reducing the risk of chemical contamination of water resources. • Provide training and extension services to farmers on the judicious use of fertilizers, ensuring they apply the correct type and amount based on soil nutrient levels. • Promote the adoption of organic fertilizers and soil amendments, such as cover crops and green manures, which can improve soil fertility and reduce the need for chemical fertilizers. • Implement a robust water quality monitoring program to track the levels of pesticides, nitrates, and other pollutants in surface and groundwater resources within and around the command areas. • Encourage the adoption of water-saving irrigation methods, such as alternate wetting and drying (AWD) in rice cultivation, which can reduce water consumption and minimize the leaching of agrochemicals.		
3	**Soil Pollution**			
	• Increased production could lead to overuse of Agri-chemicals if farmers are not adequately trained or supported in adopting environmentally friendly practices.	• Implement Simplified Pesticide Management Plan • Conduct regular water quality test to track the change in water quality due to pesticide application using oversea laboratory testing	• PMU	Annually
CLIMATE CHANGE				
1	**GHG emission**			
	• Increased GHG emissions from farming activities: - Fertilizer use - Livestock production - Rice cultivation • Increased energy requirements: - Rice field preparation - Flood control systems - Transportation	• The project is to promote sustainable practices like crop rotation and agroforestry to reduce energy consumption and improve soil health. • The project needs to introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production. • The project needs to support on training farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution. • The project promotes the utilization of efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions. • The project needs to advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.	• PMU • Farmer	Daily
ANNUAL CROP MANAGEMENT PLAN				
	❖ **WATER**			
1	**Water resource efficiency**			
	• Over-extraction of water resources can lead to downstream water scarcity, altered hydrology, and damage to aquatic ecosystems.	• Project needs to implement efficient water management practices to prevent over-extraction and ensure equitable water distribution. This can include: • Water uses monitoring systems to track consumption and identify areas for improvement. • implementing appropriate irrigation scheduling based on crop water requirements and weather conditions.	• PMU • FWUC	Daily

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Utilizing efficient irrigation systems, such as drip irrigation or sprinkler systems, to minimize water loss. • Exploring opportunities for water reuse, such as capturing and reusing runoff water.		
	❖ **SOIL AND SOIL MANAGEMENT**			
2	**Soil erosion and soil erosion risk**			
	• Soil erosion can lead to loss of topsoil, reduced soil fertility, and increased sedimentation in water bodies.	• Minimize soil compaction and disturbance by using appropriate machinery and timing land preparation activities. • Consider erosion management practices such as contour planting, terracing, and grass barriers. • Adopt reduced tillage or no-till farming practices to minimize soil disturbance. • Establish cover crops during fallow periods or in rotation with main crops to protect the soil from erosion. • Practice contour farming on sloping land to reduce runoff and erosion. • Construct terraces on steep slopes to prevent soil loss. • Establish windbreaks or shelterbelts to reduce wind erosion. • Install erosion control structures, such as grassed waterways or sediment basins, to manage runoff. • Apply mulch to the soil surface to protect it from rainfall impact and erosion.	• PMU • Agricultural extension officers	After significant rainfall events Annually
3	**Nutrient application and management**			
	• Over-fertilization and nutrient runoff can contaminate water resources, negatively impacting aquatic ecosystems and potentially leading to eutrophication.	• Conduct periodic soil analysis to determine nutrient needs and avoid over-fertilization. • Establish buffer zones near watercourses to filter nutrient runoff. • Consider using green manures and cover crops to replenish soil nutrients and reduce leaching.	• PMU • Farmers	Before and after fertilizer application Regularly during the growing season
	❖ **PESTICIDE**			
4	**Use and effectiveness of pesticides:**			
	• Pesticide use can have adverse effects on human health, non-target organisms, and the environment. Pesticide resistance can develop, requiring increased application rates.	• Promote Integrated Pest Management (IPM) strategies to minimize pesticide use. • Implement training programs for farmers on the safe handling and application of pesticides. • Ensure proper disposal of pesticide containers and leftover products.	• PMU • Agricultural extension officers	Regularly during the growing season
5	**Pesticide residues on site soil**			
	• Pesticide residues can accumulate in the soil, potentially harming soil organisms and affecting water quality.	• Promote the use of pesticides with low persistence and mobility in the environment. • Implement a soil monitoring program to assess pesticide residue levels. • Consider crop rotation and the use of cover crops to help break down pesticide residues. • Minimize pesticide use by adopting IPM strategies. • Conduct soil testing to monitor pesticide residue levels. • Rotate crops to break pest cycles and reduce the need for repeated pesticide applications. • Utilize cover crops to improve soil health and enhance pesticide degradation.	• PMU • Third-party laboratories	Periodically (e.g., annually or before planting sensitive crops)

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Consider bioremediation techniques to remove pesticide residues from contaminated soil.		
6	**Pesticide residues on produce**			
	• Pesticide residues on produce can pose a risk to consumer health.	• Enforce pre-harvest intervals to allow for pesticide breakdown before harvest. • Promote the use of pesticides with low toxicity to humans. • Properly wash and handle produce to remove surface residues. • Implement a monitoring program to test produce for pesticide residues. • Ensure compliance with established MRLs for pesticide residues on produce.	• PMU • Third-party laboratories	Before harvest

UXO = Unexploded Ordnance, PMU = Project Management Unit, SEO = Social and Environmental Officer, E&S = Environmental and Social, IFC = International Finance Corporation, EHS = Environmental, Health, and Safety, GHG = Green House Gas, FWUC = Farmer Water User Communities, ESCMP = Environmental, Social, and Climate Management Plans.

6.6.2 Mitigation Measures for the Social Risks and Impacts

Table 42: Preconstruction, Construction, and Operation Phase Social Risks, Impacts and Mitigation Measures

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
BEFORE CONSTRUCTION				
LAND ACQUISITION				
1	**Land acquisition and resettlement**			
	• Yutasas is expected to require minimal land acquisition due to their smaller scale and lack of planned canal system expansion.	• Conduct precise land participates to accurately determine the exact land requirements, ensuring that only necessary land is acquired. • Verify land ownership and usage rights meticulously to prevent disputes and ensure fair compensation.	PMU Contractor	Before construction
2	**Economic displacement**			
	• The potentially disrupting existing economic activities and displacing households and businesses, including informal farmers and businesses. Yutasas is a part of the Krang Ponley scheme. There are 1,249 households using land along the infrastructure that may be affected, with 20 households across all sub-schemes facing land acquisition.	• The households who own the land along the rehabilitated canals which will be expanded at the public land should be properly informed prior to the construction to avoid their crops will be damaged at the time of construction. • Although the acquired land is public land, there are a need of a proper consultation and information to be conducted to inform and obtain agreement from the affected households.	PMU Contractor	Before construction
DURING CONSTRUCTION				
	CHILD LABOR & FORCED LABOR			
1	**Child Labor**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• Project activities will occur in rural areas where child labor is prevalent. • Construction contractors and subcontractors may employ children under 18 years old for unskilled labor. • Local children may be particularly vulnerable to exploitation due to poverty and limited educational opportunities.	• Apply LMP for age check prior to engagement of labor with regular monitoring through proper screening and registering all workforce for the work • To mitigate the risk of child labor, the project will implement strict measures to ensure compliance with national and international labor laws. Regular monitoring and inspections will be conducted to identify and address any instances of child labor. • Additionally, awareness-raising campaigns will be implemented to educate communities about the harmful effects of child labor and the importance of sending children to school. The project will also collaborate with local authorities and NGOs to strengthen law enforcement and provide support services to vulnerable children and their families.	• Contractors • PMU	Daily Screening prior to engaging services of primary supplier
2	**Forced Labor**			
	• The risk of forced labor, particularly for vulnerable individuals, is due to economic coercion, exploitation of young people, and debt bondage. The increased demand for local labor during irrigation and road rehabilitation could exacerbate this risk.	• Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children • The Project Owner and Sub-Contractors will collaborate with the relevant Government Agency to disseminate information to local communities. This information will include the Contractor's Code of Conduct and the minimum working age as mandated by national laws and international standards. • The Ministry of Water Resources and Meteorology (MOWRAM) will provide information to local communities about the contractor's policies and responsibilities, including the Contractor's Code of Conduct and minimum working age.	• Contractors • Primary supplier • PMU	Daily Screening prior to engaging services of primary supplier
COMMUNITY HEALTH AND SAFETY				
3	**Disease transmission**			
	• Disease transmission risks are anticipated due to the influx of construction workers, potentially exacerbated by unhygienic living conditions and interaction with the local community. This influx increases the risk of spreading communicable diseases among workers and between workers and residents, with workers' susceptibility potentially increased by factors like poor diet, stress, and unhygienic conditions.	• Conduct public awareness raising activities (IEC) to ensure local people and contractors know about the risks of contracting and spreading communicable diseases such as COVID-19, HIV/AIDS, and water-borne diseases (e.g., amoebiasis, giardiasis, and toxoplasmosis. etc. • In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising to the risk groups. • Conduct training to workers on communicable diseases prior to mobilization to construction sites. • For water-borne diseases that arise due to polluted or contaminated water, mitigations measures may include: o Implement filtration, chlorination, or UV disinfection to ensure safe drinking water. o Promote handwashing, safe food preparation, and proper sanitation practices in communities. o Control and properly dispose of waste to prevent water pollution. o Provide access to clean water supplies, such as bottled water or tankers, during outbreaks or disasters. o Promote immunizations against water-borne diseases like cholera and typhoid in high-risk areas.	• PMU • Contractors • Local health authorities	• Monthly • During outbreaks • Periodic community health awareness campaigns

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
4	**Sexual Exploitation and Abuse, Sexual Harassment**			
	• The project's influx of approximately 171 in the Krang Ponleng river, as the Yutasas is a part of this scheme, including construction and logistical personnel, along with frequent project staff visits and pre-existing SEA/SH issues, creates a risk of sexual exploitation and abuse/harassment, particularly during irrigation and road rehabilitation.	• Contractors need to explicitly state zero tolerance for sexual harassment, exploitation, and abuse within the workplace. • Require Code of Conduct (CoC) to be signed by all construction workers. • For victims coming forward: referral to qualified SEA/SH service provider. The GRM will include a confidential channel for reporting SEA/SH. • Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children • Training on SEA/SH and VAC for community members, in particular women and girls (may be done separately for men and women). • Ensuring workers' sites are situated (at least 500m) from schools and/or other areas where children congregate. • Children are prohibited from construction sites and worker's camp. • Ensure access to grievance redress mechanisms for all project-affected persons, including both stakeholders and workers, to address Sexual Exploitation and Abuse, and Sexual Harassment. Support (in the form of training, awareness raising, etc.) to local law enforcement to act on community complaints regarding SEA/SH and VAC. • Build partnerships with local health providers and SEA/SH service providers to conduct community awareness activities, and referrals. • It is necessary to consider deploying specialists to educate and raise awareness about issues of violence.	• Contractors • PMU	• Monthly and during subproject cycle • Reported to PMU within 48 hours if occurred
5	**Traffic safety & Security**			
	• Increased transport of materials and equipment in the construction stage raises the risk of road accidents, theft, vandalism, and a perceived or actual increase in crime, affecting project workers, community members, and those living or traveling near construction sites.	• Arrange security guard or engage local authority to guard the construction sites • Conduct public awareness raising activities (IEC) to ensure local people and road user are aware of road safety regulations and risks and act accordingly while using road. • Monitor and observe speed limit.	• PMU • Contractors	• Daily during construction • Weekly during construction • Monthly during operation
6	**Community Health and diseases**			
	• Construction activities, including canal and pond rehabilitation, pose community health and safety risks beyond disease transmission, encompassing drowning, accidents from trespassing in construction zones (including storage and laydown areas), traffic disruptions, potential community conflicts, and general construction site hazards.	• Establish clear and well-marked construction exclusion zones to prevent unauthorized access, especially to areas with open water, heavy machinery, and storage areas. • Implement fencing and barriers to prevent trespassing and ensure community safety around construction areas. • Provide warning signs in local languages to inform communities about the dangers and restricted access to construction areas. • Install safety barriers around construction sites to minimize risks to the community and workers. • Ensure proper storage of construction materials, with no materials left unsecured and scattered around the site.	• PMU • Contractors	• Monthly • During outbreaks • Periodic community health awareness campaigns

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		• Conduct community awareness campaigns to educate the community about the potential risks and safety measures during construction. • Establish and maintain a grievance mechanism to address community complaints and issues promptly. • Implement safety measures around canals and ponds to prevent drowning incidents, such as installing safety barriers and providing warning signs in local languages. • Provide training to workers on safety protocols, including how to work safely around water, avoid accidents and minimize risks to the community. • Ensure all workers are provided with necessary personal protective equipment (PPE) and enforce its use.		
7	**Personal Protective Equipment**			
	• The activities involve Canal Rehabilitation and Construction, Structure Construction and Rehabilitation, and Drainage Improvement, which expose workers to various hazards, such as Falling Debris, Sharp Objects, and Heavy Machinery.	• Continue and active use of PPE at all times of construction. • Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual • Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out. • Proper use of PPE should be part of the recurrent training programs for employees.	• Contractors • PMU	• Regular inspections/training
8	**Working conditions and Management of Worker**			
	• The lack of written contracts for unskilled, especially locally recruited, workers increase their vulnerability to underpayment, unequal treatment based on gender and temporary status, and late or non-payment of wages, impacting their livelihoods and potentially hindering project progress.	- Advise companies to provide equal opportunities for employment and promotions to all workers, regardless of gender, ethnicity, or background, to avoid discrimination. - Regularly monitor and audit payroll and employment practices to ensure compliance with labor regulations and address any disparities. - Offer training and capacity-building programs for all workers to enhance their skills and qualify them for higher-paying roles. - Ensure that subcontractors and suppliers also adhere to fair wage and equal treatment policies. - Provide accessible information to workers about their rights, entitlements, and the proper channels to address grievances through the establishment of the GRM for workers. This includes training on topics such as: • Environmental and Social Safeguards • Gender Awareness and the Gender Action Plan • Sexual Exploitation, Abuse, and Harassment (SEA/SH) - Labor Rights and the Workers' Code of Conduct Regularly engage with labor rights organizations or third-party auditors to evaluate labor conditions and make improvements where necessary.	• Contractors • PMU	• Regular payroll audits • Periodic worker satisfaction surveys • Prompt investigation of any reported grievances
9	**CULTURAL HERITAGE**			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	Yutasas is a part of the Krang Ponley scheme, situated nearby the historical and cultural heritage with potential for encountering archaeological artifacts during construction due to the history of the ancient city of Longvek.	• Implement Find Chance Procedure	• Contractors • PMU	• Daily • Reported to PMU within 48 hours
CROSS-CUTTING				
10	**Gender inequality**			
	• Women are more vulnerable to climate change impacts due to unequal access to resources, information, and decision-making power, often hindered by social gender roles. While women-led households represent a significant portion of project sub-schemes, they still face barriers to participation and benefits. The project area includes a substantial number of vulnerable individuals, including the poor, disabled, elderly, and parentless, highlighting the need for targeted support.	• The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices. • The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology. • The project should monitor gender equality indicators and should adjust as needed to ensure that women are benefiting from the project.	• Contractors • PMU	• Daily/ weekly
11	**Social inequality**			
	• Risk of being unequally engaged and treated, during the design phase and construction. The vulnerable are likely to be limitedly consulted and have limited access to available irrigation water.	• Conduct participatory planning and regular consultations with local communities, particularly marginalized groups (e.g., women, smallholder farmers, indigenous communities). • Prioritize hiring local labor, with special provisions for disadvantaged groups (e.g., youth, women, minorities) in both skilled and unskilled positions. • Implement fair and transparent compensation or resettlement plans for those displaced or affected by construction activities, especially vulnerable households. • Conduct regular social impact assessments, with a focus on identifying inequality trends, and adjust project strategies to mitigate negative effects. • Provide support and training for affected communities to diversify their livelihoods, especially for those whose livelihoods may be disrupted by construction (e.g., farmers, traders). • Ensure transparency in the contracting process, including the selection of subcontractors and suppliers, with opportunities for local businesses, especially those run by marginalized groups.	• Contractors • PMU	• Continuously
12	Elite capture			

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
	• The rich have the resources to grab both available land and water resources, creating greater social disparities	• Consultation will be conducted farmers in potential command area, focusing on vulnerable/disadvantaged groups • Alternative livelihoods for vulnerable group are identified based on their needs vis-à-vis project's investment eligibility • Conduct consultation at community level (in the command area) to achieve a consensus on how water needs are balanced between different groups in one command area. • During subproject design, water availability, storage capacity, and water needs of upstream and downstream population are calculated to inform design, and water use coordination during project operation. • Water user groups should be established for upstream and downstream population and should be coordinated by a higher-level committee/group to negotiate and optimize water coordination • Guidelines/Manual should be developed to provide guideline for upstream and downstream communities at subprojects to meet, discuss, and achieve consensus on how water is distributed for equal use between upstream and downstream population	• PMU • Contractors	• Throughout project implementation • Regular community meetings and consultations
13	**Loss access to land and other assets**			
	• Construction activities, particularly land acquisition for canals and roads, can displace communities or restrict their access to land, homes, and other assets. • Temporary restriction of irrigation access during construction may occur in some areas, potentially impacting livelihoods, even though the project area is mainly rainfed.	• The project will prioritize avoiding physical resettlement and minimizing land acquisition. Design adjustments will be made to avoid or reduce land requirements, especially on private land. Public land will be prioritized for any necessary acquisition. • Where land acquisition is unavoidable, the project will employ a negotiated settlement process with affected households. This process, guided by the RGC's Standard Operating Procedures on Land Acquisition and Involuntary Resettlement (SOP-LAR), aims to ensure that affected households receive fair and adequate compensation for their losses and maintain or improve their income and livelihood status. • All individuals with assets within the Corridor of Impact (COI) before the Cut-Off-Date (COD) will be eligible for compensation, regardless of their legal status. Compensation will be provided for various losses, including land, structures, crops, trees, and income-generating activities. • Recognizing the potential disruption of income streams during relocation or construction, the project will provide transitional allowances to affected households. • A multi-tiered GRM will be established to address grievances from any project-affected person. The GRM will operate based on the principles of	• Contractors • PMU	• Before land acquisition • During land • After resettlement

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		the Green Climate Fund (GCF) and be accessible at no cost to the complainant.		
14	**Loss access to natural resources**			
	• Construction activities and project operations can restrict communities' access to forests, fishing grounds, water sources, or other natural resources they depend on for livelihoods	• Implement efficient water management practices during construction and operation to prevent over-extraction of water resources from reservoirs and rivers and ensure equitable distribution for downstream communities and ecosystems. • Establish construction exclusion zones around sensitive habitats, such as wetlands and forests, to prevent disturbance and minimize impacts on fishing grounds and biodiversity. Implement habitat restoration programs in areas where construction has occurred. • Use environmentally friendly construction materials and techniques to reduce the risk of pollution. Properly manage construction chemicals, fuels, and waste to prevent water pollution and contamination of natural resources. Prepare and implement a waste management plan to handle waste generated from construction activities and worker camps. • Maintain ongoing communication with affected communities, including farmers, fishers, and downstream communities, to address concerns about natural resource access. Provide information and education to construction workers about responsible use of local resources and respect for community access rights. This suggestion is informed by the sources but is not directly stated in them. • Ensure the GRM is accessible to all community members to address complaints related to natural resource access.	• PMU • Contractors	• Regular water quality and quantity monitoring • During project implementation: Monitor the effectiveness of mitigation measures.
DURING OPERATION				
1	**COMMUNITY HEALTH AND SAFETY**			
	• Water use conflicts, especially between upstream and downstream users, are a potential risk due to altered water allocation from new irrigation infrastructure, exemplified by the Anlong Chrey reservoir's limited capacity, and increased drowning risk, particularly for children, due to new canals.	• The project will promote IWRM principles to ensure the equitable and sustainable allocation of water resources. This involves considering the needs of all stakeholders, including upstream and downstream communities, as well as environmental flow requirements for maintaining healthy ecosystems. • Establishing a system for monitoring water use and enforcing water allocation regulations will help prevent over-extraction and ensure a reliable water supply for all users. This may involve installing flow meters, conducting regular water audits, and implementing penalties for non-compliance. • The project will strengthen the capacity of FWUCs to manage water resources at the local level. This includes training on water allocation, conflict resolution, and operation and maintenance of irrigation infrastructure. Effective FWUCs can play a crucial role in mediating disputes and ensuring fair water distribution within their communities. • Raising awareness about water safety and the risks associated with open water bodies, especially among children, is essential. Educational campaigns, signage, and community outreach programs can help promote responsible behaviour and prevent accidents. This information could be	• PMU • PDWRAM	• Daily for site inspections • Monthly for reports and consultations • Within 48 hours for reporting accidents, disease outbreaks.

No.	Resources/Area	Mitigation Measures	Responsibility	Timeline/Frequency of monitoring
		included in the training programs that will be provided to farmers and communities.		
CROSS-CUTTING				
2	**Gender inequality**			
	• Women are more vulnerable to climate change due to limited access to resources, information, and decision-making power, often exacerbated by gender roles, resulting in unequal access to water, limited participation in water management, and disproportionately negative impacts on their livelihoods.	• The project should actively encourage women's participation in the formation of FWUCs, empowering them through critical decision-making roles and equipping them with the necessary skills and resources to amplify their voices. • The project should ensure that women have equal access to training programs and resources, such as land, credit, and technology. • The project should monitor gender equality indicators and should adjust as needed to ensure that women are benefiting from the project.	• PMU • PDWRAM	• Monthly for data collection and reporting
3	**Social inequality**			
	• The competition for water and land displacement, and despite project consultations, vulnerable groups, particularly landless or land-poor households, may still experience limited access to irrigation benefits, though the impact is lessened by the relatively small proportion of poor within the area.	• Ensure Equitable Water Access: Mechanisms should be in place to support vulnerable and marginalized communities in accessing water resources. • FWUCs will manage the irrigation systems and ensure sustainability through fee collection. The project will invest in establishing and training FWUCs, emphasizing inclusivity and capacity building for vulnerable groups. • Implement a Simplified Integrated Pest Management (IPM) Plan.	• PMU • PDWRAM	• Monthly for data collection and reporting
4	**Elite capture**			
	• The rich have the resources to grab both available land and water resources, creating greater social disparities	• Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress mechanisms are essential to prevent manipulation and ensure equitable water distribution. • Regular monitoring and evaluation: Continuous monitoring of project impact, especially on vulnerable groups, can identify and address elite capture. • Strengthened land tenure security: Clarifying land rights can protect smallholder farmers and marginalized communities from land grabbing. • Community engagement: Active community participation, especially from vulnerable groups, empowers them and ensures their needs are met.	• PMU • PDWRAM	• Regularly during FWUC meetings and project implementation • Continuously through the GRM.

PMU = Project Management Unit, LMP = Labour Management Plan, NGOs = Non-governmental Organizations, HIV/AIDS = Human immunodeficiency virus/Acquired immunodeficiency syndrome, UV = Ultraviolet, GRM = Grievance Redress Mechanism, SEA = Sexual Exploitation and Abuse, SH = Sexual Harassment, VAC = Violence Against Children, ESHS = Environmental Social Health and Safety, STDs = Sexually transmitted diseases, PPE = Personal Protective Equipment, IPM = Integrated Pest Management, PDWRAM = Provincial Department of Water Resources and Meteorology, FWUCs = Farmer Water User Communities.

7. STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

7.1 Purpose and Process of Stakeholder Engagement

Public consultation is a key component of CAISAR, and it was pivotal in preparation of the Environmental, Social, Climate Impact Assessment report (ESCA) Report and the Environmental, Social, Climate Management (ESCM) Plan. The consultations were conducted with relevant institutions, non-governmental organizations, local authorities, and local people during the preparation of ESCIA and ESCMP for CAISAR project. The data collection and consultations were conducted over four periods:

- The first consultation was conducted between 26 and 28 July 2024 to capture information regarding biodiversity and environmental condition in the project area.
- The second consultation was conducted to consult with forestry and fishery communities, local authorities and key informants to understand the situation and concerns related to the presence of the project. The consultation was conducted between 03 and 09 August 2024.
- The third consultation was conducted at household, village, and commune level stakeholders focusing on status, concerns and feedback regarding the project implementation. This consultation was conducted between 10 and 18 August 2024.
- The last consultation was conducted between 21 and 23 August 2024 with the district and provincial stakeholders, mainly focusing on the opinion, and feedback regarding the implementation of the project.

In addition to the stated consultations, there are also continuous consultations being conducted with AIIB, IFAD, and CAISAR PMU including the PMU management, SECAP team, and engineering team to ensure that the disclosed information being aligned with the most updated information of the project.

During project preparation, various stakeholders have been consulted in July and August 2024. Table below summarizes the number of people consulted by consultation techniques:

Table 43. Type of stake holder during consultation

Levels	Househouse survey	Focus Group Discussions	Key Informant Interviews	**Total**
Village level	65	42	3	110
Commune level			1	1
District level			2	2
Provincial level			22	22
			Total	135

7.2 Consultation Process

The purposes of the consultation were to:

- Inform local people and interested stakeholders of the purpose of the rehabilitation and construction of the irrigation system,
- Share the project information and the design options from the draft engineering design,

- Highlight subproject's key activities that are potentially associated with them, and
- Collect their opinion, concern and feedback on the project focusing on background information, project potential impacts (positive and negative), suggestions for impact mitigations, and consultation mechanism.

The consultation agenda with stakeholders included (i) the introduction of the study team, (ii) sharing project information using illustration materials, (iii) discussion and consultation on potential benefits and impacts of the project, (iv) suggestions on the mitigation measures, (v) grievance process and concerns, and (vi) final wrap up for the consultation. The study team were trained to introduce themselves to the purpose of the consultation, followed by the introduction about the project's component and activities expected to be implemented within the area. Materials including leaflet on project information and map of the command area were shared and explained to stakeholders prior to the consultation. Lastly, the consultation began with an overall discussion and specific questions as per the relevant aspect to the stakeholder. Opinions, concerns and suggestions were gathered and confirmed prior to the end of the consultation.

7.3 Stakeholder Engagement during Sub–Scheme Preparation

7.3.1 Environment, Biodiversity and Climate Change Impact

7.3.1.1 Pollution prevention and resource efficiency

Concerns

- The construction process can release dust, which will disturb the local community and surface water quality.
- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site will negatively impact local air quality and surface water.

Suggestions from the consulted people

- Regularly watering on the road transports construction materials and soil to reduce dust that may disturb nearby residents.
- Relevant ministries should conduct a visit to evaluate and address the issue of liquid waste from the construction activities in the commune.

7.3.1.2 Biodiversity

Concerns

- CAISAR project may cause changes in water quality, dust generation, air pollution, soil erosion, improper waste disposal, and hazardous waste from machinery.
- The fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the reirrigation infrastructure and canal upgrading.

Suggestions from the consulted people

- Contractors must regularly monitor and inspect of living conditions of the workers, manage waste effectively, and provide adequate housing and sanitation facilities to them.
- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.

- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.

7.3.1.3 GHG Emission

Concerns

- Waste and pollution may contribute to the emission of GHG

Suggestions from the consulted people

- Contractors are advised to refrain from using outdated machinery.

7.3.2 Social Aspects

7.3.2.1 Labor and Working Conditions

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.
- Under 18 years old workers may be involved for the construction phase as they are illegible to work in factories or other companies that adhere to laws,
- At the construction sites, some men may undervalue women's work. The gender disparities continue to exist, with some men holding the belief that women are not capable or willing to work.

Suggestions from the consulted people

- The construction companies should hire local workers to offer them jobs and strictly abide to laws and reducing the concerns about gender-based violence or sexual violent.
- Construction companies and relevant departments should provide training on gender issues, violence, labour laws, and social protections to their staff and workers.
- Additional support and monitoring measures should be implemented to prevent abuse, and any incidents should be promptly addressed to prevent recurrence.
- Local authorities should regularly monitor and inspect construction sites to ensure no children are working there, taking immediate action if any issues arise.

7.3.2.2 Community Health and Safety

Concerns

- The presence of workers could result in sexual abuse of women and children living near the project site,
- Drug trafficking and consuming among workers may cause unsafe environment for both workers and surrounded residents,
- After the construction complete, there may also be the risks of humans and animals falling into the canals causing drowning,
- Waste generated from worker camps and construction activities during the project could degrade water quality, negatively impacting human health, livestock, and crops.

Suggestions from the consulted people

- The construction companies should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community,
- The project should promote gender awareness, enforce stricter punishments for offenders, and prevent drug trafficking in the workplace,
- Separate accommodations for men and women should be provided,
- The construction companies must collaborate with local authorities in all activities to make a proper management, control and monitoring during construction, and
- The project should conduct gender education at the district to prevent and address gender-based violence,
- The project should establish gender outreach committees at the commune and village levels to monitor the gender related issues within the project areas, especially during construction,
- The project should equip the solar lights along the roads to promote the safety of travellers during nighttime

7.3.2.3 Land acquisition, economic and physical displacement

Concerns

- While the project supports agricultural production, it may not benefit poor families who do not have land for farming,
- Conflicts between the project and affected families could emerge, often fuelled by external instigators rather than the families themselves, and
- Farmers who own land may lose it for farming, which could force them to migrate, heightening their vulnerability to exploitation and potentially causing their children to drop out of school.

Suggestions from the consulted people

- The project should conduct a preliminary study on land issues before construction is going to be implemented, addressing specific aspects of land impact and conducting evaluations for each affected property,
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project,
- If business land is impacted, the government or provincial authorities should provide temporary business premises,
- Advocacy for voluntary land contributions should be encouraged, as the project benefits both the community and individuals, and the restoration of old canals is supported to improve agricultural activities, and
- The construction company should submit quarterly monitoring reports on implementation activities to the provincial department to identify and quickly resolve any issues which affecting the livelihood of the community people.

7.3.2.4 Cross–cutting risks and impacts

Concerns

- Unequal water distribution among farmers leads to partisanship and disputes, often because farmers do not adhere to water distribution instructions or announcements from authorities,
- The FWUC could not generate income, causing the management of the water being difficult such as having no budget for repair, resulting in unproper operation of the system,
- Besides water issues, farmers also struggle with pests, diseases, inadequate labour, lack of capital, limited production technique, flooding, unstable sale price (vegetable and animal) and high agricultural input costs,
- The provincial department lacks budget to support water user conflict resolution,
- Tensions arise between upstream and downstream villages when water use upstream results in flooding downstream due to excess water being released during the wet season. Conversely, during the dry season, upstream water flow to downstream areas is insufficient.
- Manure for fertilizer is declining due to reduced animal raising and lower cattle prices are prompting farmers to reduce livestock raising.

Suggestions from the consulted people

- A proper handover to local authorities upon project completion should be conducted to avoid quiet handovers,
- Women should be engaged and be promoted as the members of Water User Community to promote water distribution equality regarding water allocation from the system,
- Closed monitoring and support to FWUCs are critical and should be conducted regularly by all levels,
- Water use and maintenance support should be provided including technical and management training, along with problem-solving techniques, to effectively control and manage water distribution,
- Ensure transparent water supply to prevent disputes by holding meetings to plan water use and distribution, involving the district governor, commune council, and relevant stakeholders,
- Prior to starting irrigation rehabilitation, organize a public forum to gather feedback from local residents, disseminate project information to people and stakeholders, and announce the construction period in advance.
- Increase the number of commune agricultural technical officers to provide training and monitor farmers' cultivation techniques.
- Build more water storages, and reservoir such as ponds or wells and conduct training on water-saving techniques to adapt to actual water availability.
- Installing and upgrading the damaged sluice gates to improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Facilitate the development of additional agricultural markets.

7.4 Stakeholder Engagement during Sub–Scheme Implementation

During the implementation of the sub–scheme, particularly prior to construction, when locations of contractor's office, workers' camp, disposal sites for construction debris and construction waste, and labor management plan, etc. are identified – based on Contractor's ESMP, environmental and social risks and impacts associated with Contractor's specific construction methods and measures will be updated in C-ESMP and disclosed for continued consultation with local people and local authorities to avoid/minimize E&S risks and impacts.

7.5 Information disclosure

This ESCMP will be disclosed to the public in both English and Khmer language. The English version will be disclosed in full version whereas the Khmer version will be disclosed as Executive Summary. The documents will be disclosed on the website of MOWRAM (as Project Implementation Unit), and on the website of AIIB, IFAD and GCF before project appraisal and project approval – as per disclosure guidelines required by each donors.

8. GRIEVANCE REDRESS PROCEDURES

8.1 Objectives of the Project GRMs

The objective of the GRM is to provide affected people with redress procedures that can be conveniently used to raise a project related concern or grievance. The GRM guides how a complaint can be lodged, including forms and channels through which a complaint can be submitted. To facilitate the grievance resolution process, grievances received will be acknowledged in writing and solved within a specified timeframe. During the resolution process, where necessary, dialogue will be held with aggrieved people for mutual understanding and effective resolution. Once a complaint is resolved, the aggrieved person will be notified of the resolution results.

The GRM has sequential steps that aggrieved person can use. If the aggrieved person is not satisfactory with the grievance resolution result, or if their complaint is not resolved within the timeframe specified for a particular step, aggrieved person can move on to the next step which is higher in resolution hierarchy. The project has an appeal process where complainants can resort if they are not satisfied with a resolution decision at a particular step, or their complaints are not resolved within a specified timeframe.

8.2 Summary of National Legislation Related to Grievance and Complaint

The RGC has various laws and sub-decrees that have been in place to guide the implementation of the complaint resolution process. These documents specify the right of the complainants as well as the responsibilities of concerned governmental agencies as to complaint resolution. Relevant legal documents include:

- Law on Expropriation (dated 26 February 2010)
- Labor Law (dated 13 March 1997, amended on 20 July 2007 and 26 June 2018)

- Law on Prevention of Domestic Violence and Protection of Victims (dated 24 October 2005)
- Sub-decree No. 22 ANK/BK (2018) on Standard Operating Procedures for Land Acquisition and Involuntary Resettlement for Externally Financed Projects in Cambodia. Guidelines for Grievance Redress Mechanism (Appendix 8)
- Law on Administrative Management of Capital, Provinces, Municipalities, Districts and Khans (dated 22 May 2008) – Section 6 on Solution of Local Conflicts
- Sub-decree No. 22 (25 March 2002) on Decentralization of Roles, Functions, and Power to Commune Councils (Article 61: duty to promote the role of conciliating disputes between citizens)
- Sub decree No 47 ANK.BK (31 May 2002) on Organization and Functioning of the Cadastral Commission (Chapter 4 – District/Khan Level Conciliation).

8.3 Principles of the Project GRMs

Under CAISAR, the following principles will be applied:

- Channels. Different channels are established to enable affected person to submit their grievances, including submission to village committee, as well as district and provincial levels.
- Forms. Grievances can be submitted in writing and verbally, and either directly by the affected households, or by a person delegated by the complainant.
- Complainant can delegate a representative who acts on their behalf. A person lodging a grievance can ask assistance from their family or from individual to act as their representative.
- Disclosure. GRM procedures are disclosed in public domain (e.g., websites of PMU, public notice board at village hall, and in front of substation).
- Documentation. A grievance logbook will be maintained at substation (subproject level) and at PMU level (through PMU GRM focal point).
- Transparency. Grievance procedures include steps, time frame for grievance resolution for each step, notification to affected person, how decision is made.
- Acknowledgement. The unit in charge of complaint resolution will notify complainant upon complaint receipt and will initiate the complaint resolution process.
- Appeal. If the agency in charge does not resolve a grievance in a manner that is satisfactory to the affected person, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court.
- Monitoring. All grievances received are recorded by PMU and relevant substations, and are processed/resolved in a given timeframe, and are monitored by PMU GRM focal point.
- Time-limit. Time-limit is specified for each step in the grievance resolution process.

- Complainants bear no costs. Complaint resolution is free of charge to aggrieved person. However, if the complaints bring their case to court, they will bear the costs associated with their lawsuit.

- Any grievance concerning urgent health and safety issues shall be resolved immediately.

8.4 Project's Redress Procedures

The project has in place complaint handling procedures for three types of potential grievances, including grievances related to 1) land acquisition, 2) labour and working conditions, and 3) sexual exploitation and abuse and sexual harassment (SEA/SH/GBV/GBV), and 3) general complaints. These procedures are established based on the above GRM principles and are in accordance with pertinent national legislation. The GRM for complaints related to land acquisition is provided in the project's Resettlement and Policy Framework (RPF) and that for IPs is provided in the project's IPPF. Summary for the above four procedures is provided below:

8.4.1 Redress Procedure for Complaints related to Land Acquisition

Under this project, to facilitate the grievance redress, the informal and formal steps are combined for convenient use of affected people, as follows:

- Step 1 − Commune/Sangkat level. APs will seek assistance from commune/Sangkat chief or community elderlies who will discuss with the leader of the PRSC-WG to find a solution. Verbal grievance can be provided to the commune/Sangkat chief or community elderlies. So, no written complaint is required. It is noted that even if the complaint is made verbally, the complaint will be registered in project's logbook, including resolution process and result for such verbal grievance for monitoring purpose. Upon receipt of the verbal complaint, the PRSC-WG will consult with the IRC-WG to ensure the complaint is addressed timely. If the grievance is not resolved to the satisfaction of the AP, or if the AP prefers, s/he may lodge their complaint through the formal route which includes the steps below.

- Step 2 − District level. AH can lodge a written complaint to the Head of the District Office (where the subproject is located). The AH can bring a community elderly or their representative to discuss their grievance at the District Office. A conciliation meeting shall be held, and a decision be made within 15 working days from the date of complaint is received by the District Office. If the complaint is resolved to the satisfaction of the AH, the IRC-WG will inform GDR's Department of Internal Monitoring and Data Management (DIMDM) who will review and seek the approval of the Director General of GDR for appropriate remedial action. GDR will inform the AF of the decision/ remedial action within 15 working days from the receipt of the grievance by the District Office. If the complaint is rejected at this step, District Office will inform the AH of the rejection in writing. If the complainant is not satisfied with the decision/resolution result, s/he can proceed to step 3 (below).

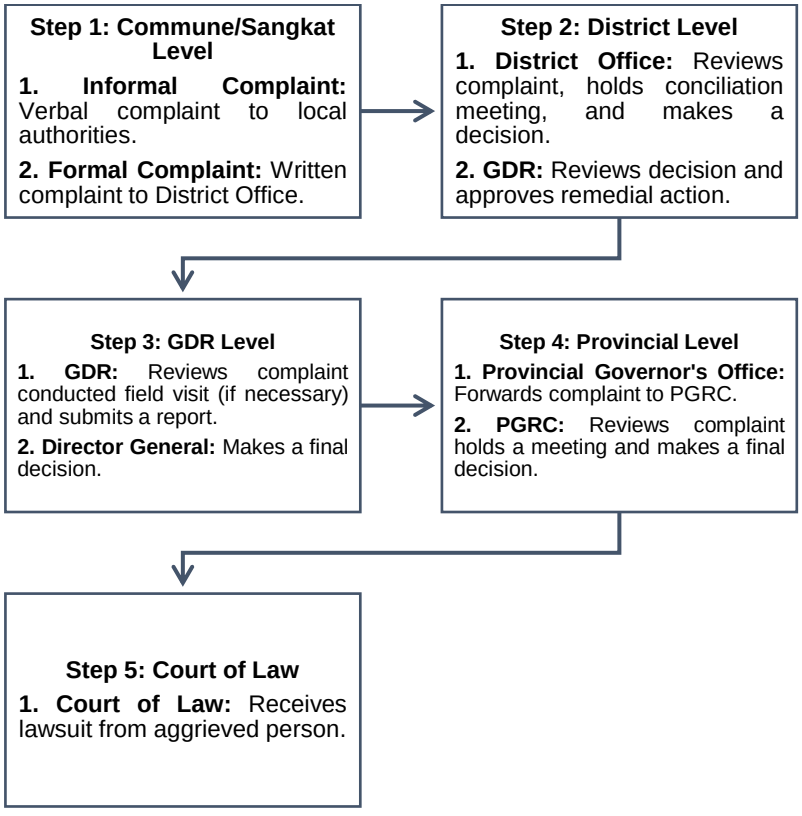
- Step 3 − GDR level. The complainant who is not satisfied with proposed resolution from Step 2 shall lodge a written complaint to the GDR for resolution. The GDR, through its DIMDM, will carry out a holistic review of the complaint and submit a report on its findings with the relevant recommendations, if any, to the Director General of GDR for review and decision. GDR may conduct a field visit to meet the complaint and the IRC-WG to gather

relevant information. The final report must be completed within 30 working days from the date of receipt of the complaint by GDR for submission to the Director General of GDR who will make a final decision within 5 working days of receipt of the final report. In the event that the subject matter requires a policy level intervention, it will be referred to the IRC for a decision which may require that an additional 10 working days be extended from the original deadline for final decision.

- Step 4 − Provincial level. AH will submit a written complaint to the PGRC through the Provincial Governor's Office. The complainant or a representative will be given an opportunity to present its case during a meeting and the PGRC may consider any compelling and special circumstances of the AH to inform their decision. The GDR will send a representative, as a non-voting member, to provide an explanation to the rejection of the complaint at Step 3 with the GDR. The decision of the PGRC must be made on a consensus basis and will be final and binding except when the matter relates to government's policy. Decisions related to government's policy matters on land acquisition and resettlement are decided by the IRC. The PGRC will have 40 working days from the date of receipt of the complaint to reach a final decision. The decision of the PGRC will be sent to the IRC (through the GDR) for endorsement before any remedial action is taken. There are no fees or charges levied on the AH for their lodgment of complaint and for complaint resolution for the above 4 steps.

- Step 5 − Court of Law. If the aggrieved person prefers filing a lawsuit at the Provincial/Municipal Courts, as applicable, to seek a resolution, AP can do so but will bear cost related to the lawsuit as per the Expropriation Law. When the case is brought to a Court of Law, there is no involvement of the GDR, PRSC or IRC-WG unless there is a judicial order from the competent courts.

Figure 4. Redress Procedure for Complaints related to Land Acquisition



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8.4.2 Redress Procedure for Complaints Related to Labor and Working Conditions

Project workers can lodge their grievance/complaint as follows:

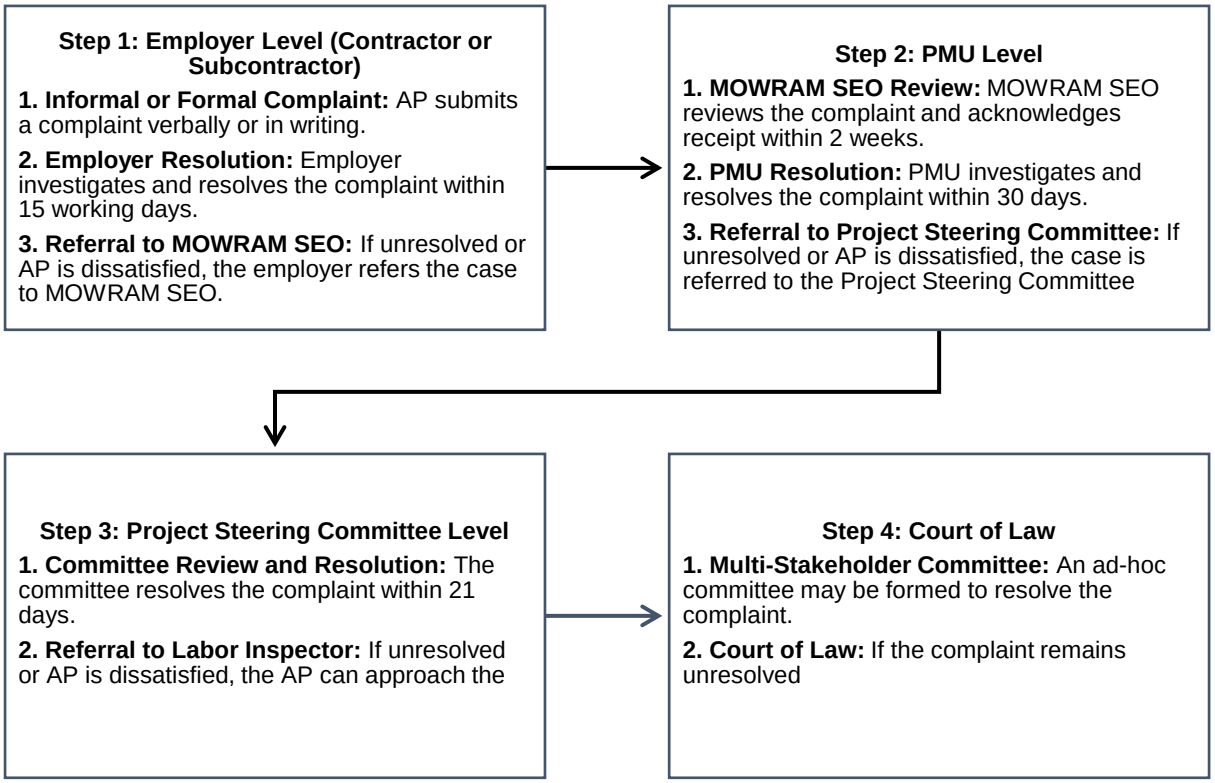
- Step 1 – Employer Level (Contractor and Subcontractor). Aggrieved person (AP) can submit their grievance to their Employer who serves as the first focal point for receiving and resolving grievance. Grievance can be lodged verbally or in writing, in person or by phone, text message, mail or email (anonymous complaint is accepted). The Employer involved will resolve the case no later than 15 working days. Once resolved and the AP is satisfactory, the Employer will report the case, including resolution process and results, to the SEO of the MOWRAM for information and record. If the AP is not satisfied with the resolution of their Employer, the Employer will refer the AP to the SEO of MOWRAM, if needed and inform the AP of this referral. It is noted that if a complaint concerns the safety and health of one or several individuals, such complaint shall be resolved as soon as possible – depending on the nature and urgency of the grievance.

- Step 2 – PMU level. MOWRAM SEO will resolve the complaint referred to by the Employer (Step 1) and acknowledge receipt of the AP's complaints within two weeks from the date of complaint receipt. If the SEO of MOWRAM cannot resolve the complaint, the SEO Team will consult with the Project Manager/Director for resolution. The SEO of the MOWRAM will inform the AP (in writing) of the PMU's resolution result within 30 days from the date of complaint receipt. If the AP is not satisfied with the resolution result proposed by PMU, PMU will refer the case to the Project Steering Committee of the project and shall inform the AP (in writing) of this referral.

- Step 3 – Project Steering Committee level. At this level, the case will be resolved no later than 21 days. The AP will be informed of the resolution decision in writing. In case the grievance has not been solved within the specified timeframe, or the AP does not agree with the proposed resolution, the AP can approach the Labor Inspector of his/her province or municipality.

- Step 4 – Court of Law. If the AP is not satisfied with the resolution proposed above, a multistakeholder committee will be established (ad-hoc) to resolve the dismissed grievance – as an alternative for affected person going to court. If the grievance could not be resolved satisfactorily by the multistakeholder committee, the affected person may resort to the court of law. The cost associated with the lawsuit shall be borne by the AP. The decision of the Court will be final.

Figure 5. Redress Procedure for Complaints Related to Labor and Working Conditions



8.4.3 Redress Procedure for Complaints Related to SEA/SH/GBV

Under the project, the GRM for SEA/SH/GBV mainly serves to: (i) refer complainants to a local GBV service provider; and (ii) record resolution of the complaint. In line with the above, the following principles apply so as to recognize SEA/SH/GBV victim as principal decision makers in their own care, and treat them with agency, dignity and respect for their needs and wishes: § Multiple channels are in place for easy access and lodge complaints.

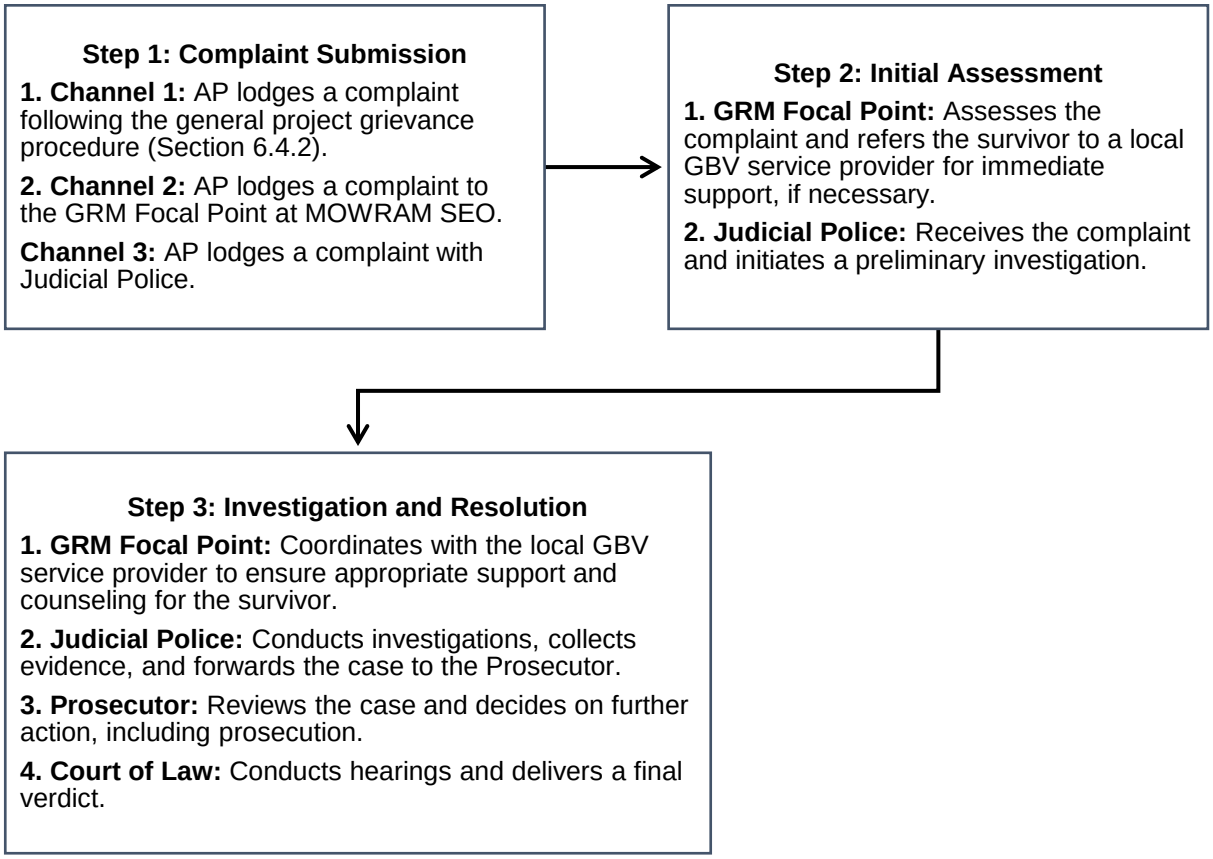
- SEA/SH/GBV survivors will be referred to a local GBV service provider for immediate support if they make a complaint directly to PMU.
- Confidentiality of survivors is protected. GM operator (at PMU and local GBV service providers) will keep confidential for SEA/SH/GBV allegation report.
- No identifiable information on the survivor shall be collected and stored in Project Grievance Logbook.
- Costs of operating the SEA/SH/GBV GRM will be covered by the project.

It is noted that under this project, GBV service provider will be engaged for subprojects that are rated “High” or “Substantial” for SEA/SH/GBV risks − as part of site-specific ESMP. based on SEA/SH/GBV risk assessment The following channels can be used to submit a grievance related to SEA/SH/GBV:

- Channel 1 – AP who believe the SEA/SH/GBV incidence is related to project workers can follow steps outlined in Section 6.4.2 (above) to lodge a SEA/SH/GBV complaint.
- Channel 2 – Alternatively, AP can lodge their complaint, verbally or in writing, to the GRM’s Focal Point within the SEO of MOWRAM for advice and resolution (contact of GRM Focal Point is provided in Section 5.1 (Resources).

- Channel 3 – If AP wants to bring the case to the Court of Law, AP can follow steps below for prosecution. Prosecution related to SEA/SH/GBV is administered under the Criminal Code and the Code of Criminal Procedure and is as follows:

Figure 6. Redress Procedure for Complaints Related to SEA/SH/GBV



- Step 1 – Judicial Police. SEA/SH/GBV victim or a representative can submit their grievance to a local Judicial Police (JP) Officer. JPs include a) Commune/ Sangkat Chief, b) Commune/ Sangkat/ District/ Provincial/ National Police, and c) District/ Provincial/ National Military Police. The JP is responsible for receiving, recording complaints, and may conduct preliminary investigations to identify and arrest the perpetrator. The JP will also collect evidence to support the prosecutors. If the SEA/SH/GBV happens at home and/or falls under the domain of domestic violence (as per Law on the Prevention of Domestic Violence and Protection of Victims), the SEA/SH/GBV survivor may seek support from a local qualified Judiciary Police Officer (appointed by the Ministry of Women's Affairs) who can act as a complaining party on behalf of the SEA/SH/GBV survivor15.
- Step 2 – Prosecutor. Upon receiving the completed written record from the JP, the prosecutor can decide on if the prosecutor will hold a file without processing it further or conduct proceedings against the perpetrator. The prosecutor may bring the case to the Court of Law and present the evidence in Court hearings.
- Step 3 – Investigation by Judge. During this step, the investigating Judge will conduct interrogation of the charged person and perform other required investigation procedure.

- Step 4 – Hearing. After issuing an order of indictment, the investigating Judge will submit the case to the trial court president who shall arrange a date for the trial. The decision of the Court on SEA/SH/GBV resolution is final.

8.4.4 Redress Procedure for General Complaints

In case individuals, households, or communities are affected by any other aspects, for instance, environmental impacts such as increased dust, noise, or lack of safety measures that increase risks of traffic accident to road users or to local EM, various channels will be established for convenient use by affected parties, including IPs. These include:

- PMU GRM focal point's telephone (See Section 5.1 – Resources). o Local EM leaders (in case affected individual/households are EM)

- Contractor's hotline: to report cases that they think contractors can solve timely (contact detail of Contractors will be posted at construction sites, and distributed to IPs (through Subproject Information Booklet) during consultation, and post at public billboard of Commune/Sangkat offices, pagodas, etc.

- Commune/Sangkat offices

8.5 Registration of Project Grievance

The SEO, Project 6. Managers within MOWRAM is responsible to establishing and maintaining the project grievance logbook (PGL). The PGL will be established by the SEO to record all concerns/ grievance that are submitted by project stakeholders during project implementation. In case there is serious complaint, the World Bank should be notified of these complaints within 24 hours of complaint receipt (See Annex 3 for Guidance for establishing and maintaining Project Grievance Logbook).

The GRM is an integral project management element that intends to seek feedback from beneficiaries and resolve of complaints on project activities and performance. The GRMs for the project are based on IAAB, IFAD, UN, and GCF requirements and, most importantly, national requirements for solving potential problems between project owners and residents/persons affected by the subproject(s).

9. IMPLEMENTATION ARRANGEMENTS

9.1 Environmental and Social Duties of the PMU/Detail Design Consultants

9.1.1 MOWRAM'S PMU

The MOWRAM's PMU will work closely with PDWRAM in planning and implementing subprojects located within their province. The PDWRAMs will also supervise project officers at the district-level Department of Water Resource and Meteorology, and are responsible for:

- Coordinating effectively with all project stakeholders, including MOWRAM's SEO, consultants, contractors, local authorities, provincial departments, and project communities.
- Supporting provincial and district-level project officers in monitoring and evaluating progress and performance of consultants and contractors.

- Supporting MOWRAM'S SEO to conduct training on labor, gender, SEA, SH, VAC, and HIV/AIDS.
- Supporting MOWRAM'S SEO to disseminate project information and conduct consultation activities, as well as ensuring effective grievance redress resolution within their province.
- Supporting MOWRAM'S SEO to conduct screening and scoping of the subprojects, and identifying environment, social, land acquisition impacts and screening for presence of IPs in the subproject area.
- Liaising with village authorities in subproject area to encourage vulnerable groups to apply for jobs that may be offered by project's contractors.
- Collaborating with relevant departments involved in land acquisition and/or other environment or social mitigation measures.

9.1.2 NCDD'S PMU

NCDD's PMU will work closely with Provincial Cabinet in planning and implementing subproject located within their province. NCDD PMU will be responsible for day-to-day project implementation, monitoring and evaluation of Project Component 1, 2.1 and 2.2 in collaboration with MAFF. PMU will work under the oversight and guidance of NCDDS and will be responsible for all aspects of environmental and social performance, including E&S monitoring and evaluation, reporting of E&S performance, and relevant incidence during project implementation.

9.1.3 Provincial Department of Water Resources and Meteorology

PDWRAM's main responsibility includes:

During subproject preparation:

- Support design parties in their surveys and consultation to prepare Feasibility Study and Detailed Design for sub-scheme.

During construction:

- Oversee construction activities under Component 2, particularly construction of the new irrigation canal in the command area

During operation:

- Collaborate with other relevant technical departments, especially PDAFF at provincial level, farmer water user groups (FWUG) to ensure its regulators (located within the water distribution network) are operated effectively, and in a manner that minimizes water use conflicts among target water user community in the command area.
- Conduct regular maintenance of the reservoir and irrigation canals during subproject operation and maintenance stage.

9.1.4 Provincial Department of Agriculture, Forestry and Fisheries

PDAFF is responsible for implementing activities under Component 1, 2.1 & 2.2. Under this subproject, PDAFF is responsible for developing and implementing agricultural techniques that make full use of improved water access (under Component 1) to enable farmers in the command area to produce more food in a sustainable manner which improves farmers' income and livelihoods. PDAFF will focus on the following:

- Promoting crop diversification for farmers in the command area (e.g. crop rotation for rice and horticulture production improves soil conditions whereas enhancing vegetation production for household's better nutrition and income.
- Introducing to farmers new agricultural engineering techniques to promote a) mechanization to increase productivity in crop production (e.g. mechanization in soil preparation using laser land leveling, use of combine harvester to save labor and reduce production costs, b) save water by applying alternate wet and dry (AWD) and drip irrigation for horticultural activities, c) reduce GHG.
- Scaling up Crop Production and engaging Private Sector in value chain development for specific farm product (e.g. rice, bean, and other cash crops such as vegetables…) and relevant agricultural services through agricultural cooperatives, producer groups, etc.

9.2 Contractor's Environmental and Social Management Plan (C-ESMP)

The civil works contractor is responsible for implementing the Environmental and Social (E&S) mitigation measures outlined in this ESMP for Component 2, which involves constructing the irrigation canal and related structures like gates and regulators. Based on the ESMP and the project's Labour Management Plan (LMP), the contractor will:

- Prepare and submit a Contractor's Environmental and Social Management Plan (C-ESMP) for each contract, detailing how E&S risks related to construction activities, workers, camps, machinery, and vehicles will be mitigated. The C-ESMP must also include a labor management plan (C-LMP) and be site-specific, addressing risks based on the contractor's capacity and site conditions.
- If subcontractors are engaged, they must prepare their own E&S plan aligned with the ESMP and LMP, outlining how they will manage identified risks and impacts. Reporting arrangements between the subcontractor and the main contractor must be detailed, with the main contractor consolidating subcontractor reports into monthly E&S performance reports to the PMU, with quarterly reporting potentially required.
- If changes occur to the proposed works and activities during the contract period, the contractor must update the C-ESMP to reflect these changes, including relevant subcontractor plans. The C-ESMP should include:
    - A policy statement outlining the contractor's commitment to the site-specific ESMP.
    - Document details (issue date, revision status, distribution list, and signatures).
    - Applicable laws, regulations, and required permits.
    - Plans to manage E&S risks, including mitigation measures, a Workers' Code of Conduct, and a Contractor's LMP.
    - A list of required environmental and social training for all personnel, including occupational health and safety, SEA/SH/VAC risks, and emergency response.
    - Financial resources and responsibilities for implementing the C-ESMP, including subcontractor responsibilities and training for local workers.
    - Monthly environmental reports, covering accident/incident reporting within 48 hours to MoWRAM, compliance with the C-ESMP, challenges, non-compliance issues,

subcontractor activities, and meeting minutes with MoWRAM.

The contractor must ensure timely funding, human resources, and implementation of pre-construction and construction mitigation measures, along with any additional E&S mitigation required.

9.3 Contractor's Safety, Social and Environmental Officer (SSEO)

The contractor must appoint a competent on-site Safety, Social, and Environment Officer (SSEO), trained in environmental management, to oversee contractors and subcontractor personnel. The SSEO's responsibilities include:

- Supervising subcontractor compliance with the Contractor's LMP and C-ESMP.
- Submit the LMP and C-ESMP to the PMU/DDIS for approval before mobilizing staff.
- Conducting site inspections and audits to ensure compliance with environmental and social mitigation measures.
- Monitoring and reporting on E&S compliance and preparing audit reports.
- Investigating complaints, recommending corrective actions, and addressing non-compliance.
- Informing the contractor, PMU, and DDIS of any E&S issues, and maintaining detailed records.
- Collaborating on labor issues and preparing the Contractor's LMP and C-ESMP, including OHS regulations.
- Maintaining employment records, verifying minimum working age, and ensuring signed Workers' Codes of Conduct.
- Providing regular training on occupational safety, SEA/SH/VAC, and community relations.
- Ensuring primary suppliers address SEA/SH/VAC, child labor, forced labor, and OHS risks.
- Developing and implementing a grievance mechanism for contracted workers, resolving grievances promptly, and reporting to the PMU.
- Ensuring all workers sign the Code of Conduct and implement measures to prevent SEA/SH.
- Developing and enforcing COVID-19 prevention and mitigation plans.

Incident reporting

The contractors are required to inform DDIS and PMU any incidents listed below within agreed timeframe (e.g. 48 hours):

- Any violations to national laws, regulations, or international agreements.
- Any serious accidents or fatalities,
- Significant impacts that cause losses to personal property such as traffic accidents, damages to local houses/roads and other incidents.
- Serious surface/ground water pollution.

- Failures of embankments at disposal sites that cause serious pollutions to the surroundings,
- Fire related to worker's behaviours,
- Any claims related to SEA/SH/VAC, or any other incidents related to children, and
- Receive a complaint about pollution or damages.

9.4 Contractor's obligation as to contractual requirements

The contractor and its subcontractors, if any, shall comply with the ESMP. In particular, the Contractor must prepare a Contractor's ESMP (C-ESMP) to elaborate this ESMP based on a) site condition, b) capacity of the Contractors and their subcontractors (if any), c) national regulations that are active by the time of subproject implementation.

To ensure that necessary action has been undertaken and that steps to avoid adverse impacts and/or reoccurrence have been implemented, the Project Manager, the Safeguard Focal Persons, and/or contractor must report to PMU within 48 hours of any serious incidents of non-compliance that may have serious consequence. In the event of working practices being deemed dangerous either by the subproject, the local authorities, or the other concerned agencies, immediate remedial action must be taken by the contractors. The contractor must keep records of any incidents and any corrective action taken. The records of non-compliance that could be practically addressed (not cause serious impacts) will be reported to the DDIS with a copy to PMU monthly.

The contractor will be responsible for dealing with any reports/grievance forwarded by the local communities, authorities, police or other agencies as soon as practicable, preferably within one hour but always within 48 hours. The Project Manager/Safeguard Focal Persons will monitor and ensure that the contractor has taken appropriate action. Where appropriate, approval of remedial actions may require an agreement from the local authorities and/or other government agencies. Procedures should be put in place to ensure, as far as is reasonably practical, that necessary actions can be undertaken to avoid recurrence and/or serious damage.

10. ENVIRONMENTAL AND SOCIAL MONITORING PROGRAM

Based on the ESC risks and impacts identified and assessed (in sector 6), a summary of proposed mitigations measures is presented below.Environmental Monitoring Program

10.1 Environmental Monitoring Program

To ensure the effectiveness of environmental management, the environmental monitoring program is prepared to monitor the environmental quality. The contractor and/or sub-contractor are responsible for monitoring using appropriate method, equipment and system. Details on monitoring parameters are shown on the table below:

Table 44: Environmental monitoring plan during Pre-construction, Construction, and Operation phase

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Pre-construction phase					
UNEXPLODED ORDNANCES (UXO)	• UXO screening by certified experts required before any construction. • Found UXOs to be removed by certified experts. • UXO clearance certificate required before subproject activities. • UXO risk training and awareness for the local community.	Along the canales (construction site)	• Confirm all relevant areas are clear from UXO by consulting national military. • Obtain a certificate of UXO clearance	Before construction	PMU Contractor
During construction phase					
	ENVIRONMENTAL				
Noise and Vibration	• Avoid working during night-time from 21:00 hours to 06:00 hours • Provide ear sets for workers to prevent noise if the noise level exceeds the standard • Check and maintain construction machinery regularly to avoid noisy and high vibration • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures	Construction site Nearby sensitive structures	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
	Measuring noise and vibration level	Construction site, there is one location for noise and vibration level sampling. ANV 6 X: 470186 Y: 1305388	Measuring equipment and/or appropriate monitoring methods	Every 06 months	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Air quality	• Spray or sprinkle water on the work surfaces and other piled materials to minimize dust at least 3-6 times per day in windy and dry weather and/or based on the weather condition • Solid waste or construction waste activities • Construction machinery operation and maintenance • Distance of sitting concrete mixing plants, crushing • plants, quarries and other facilities to settle and other sensitive receptors • Transportation of construction materials	Construction site	Site inspection Visual observation Monitoring equipment and/or appropriate monitoring methods	Daily	SEO E&S specialist consultants PMU
	Testing air quality (NO2, SO2, CO, TSP, PM10, PM2.5)	There is one location for air quality sampling. ANV 6 X: 470186 Y: 1305388	Air quality monitoring equipment	Every 06 months	
Impact to Water	• Wastewater management • Design and capacity of septic tank • Digging of side drain at campsite • Construction of retaining structures	Construction site	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
	• Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform).	There is one location for surface water quality sampling. SW6 X:469642 Y:1306016	Water quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU
	• Testing of soil quality is going to be analyzed in the agriculture context: - Soil classification or particle size, - Soil moisture, - Nitrogen (N), Phosphorus (P), Potassium (K),	There is one location for soil quality sampling. S5 X: 469602 Y: 1306117	Soil quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	Magnesium (Mg), Sodium (Na), - Organic Metter - Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio), - Total phosphorus (P), - Cation exchange capacity (CEC), - pH, - Electrode Conductivity.				
Solid and hazardous waste	• Solid and liquid waste management plan in the project construction sites. • Install septic tanks at the construction camp to prevent the discharge of polluted sewage into the outside. • Implement waste segregation of reusable construction materials, biodegradable, and non-biodegradable wastes. • Orient workers on the solid waste segregation system and prohibit them from indiscriminate throwing wastes outside of waste bins in the construction sites. • Provide sufficient waste bin and proper storage before transportation to dispose at an authorized landfill. • Fuel storage tank will be provided with retention areas to contain accidental spills.	Construction site	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Wastewater	• Establishment of proper wastewater management systems, including adequate sanitation facilities for workers.	Construction site/Camp	• Monitoring wastewater discharge for parameters such as temperature, pH, TSS, DO, COD, BOD_5. • Regular checks for leaks or spills from sanitation facilities.	Daily	PMU, Contractor

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Physical Hazards	• Incidence of worker injuries due to physical hazards (e.g., falls, cuts, being struck by objects) • Unsafe working conditions (e.g., inadequate lighting, lack of proper safety equipment, slippery surfaces) • Compliance with safety regulations and use of personal protective equipment (PPE)	• Construction sites • Worker camps • Access roads	• Site inspections • Incident reports • Safety audits.	• Daily during construction Weekly safety meetings	Contractors PMU
Chemical hazards	• Exposure of workers and communities to hazardous chemicals (e.g., pesticides, fuels, solvents) • Improper storage, handling, and disposal of chemicals • Air and water quality monitoring to detect chemical contamination	• Construction sites • Worker camps • Areas surrounding construction sites	• Site inspections • Training for workers	Regular inspections of chemical storage and handling areas	Contractors PMU
Heat Stress	• Implementation of safety measures and provision of break times for workers during extreme weather events. • Provision of adequate drinking water and shelter.	Construction site/Worker camps	• Monitoring weather conditions, including temperature and humidity. • Observation of worker breaks and access to shade and drinking water. • Records of any heat-related incidents.	Daily	Contractors PMU
	BIODIVERSITY				
Habitat Loss and Fragmentation	• Area of habitat lost or fragmented. • Changes in vegetation cover. • Number of isolated habitat patches • Presence of wildlife corridors.	Construction site	Site inspection Visual observation GIS analysis (if available) Drone surveys (if available)	Daily/Weekly	SEO E&S specialist consultants PMU
Loss of biodiversity and ecosystem services	• Changes in species abundance and diversity • Decline in water quality • Changes in soil fertility • Reduced pollination services • Alterations in hydrological processes	Construction site	Site inspection Visual observation Biodiversity surveys	Daily/Weekly	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
Hunting and trading, and consumption of wildlife	• Avoid cutting of trees or destruction of vegetation • No hunting, fishing, or collection of animal and plant materials • Revegetation success will be monitored, particularly surrounding riparian vegetation along area where levee is installed for flood protection and for increased water retention.	Construction site	Site inspection Visual observation Community interviews	Daily/Weekly	SEO E&S specialist consultants PMU
Loss of fauna and flora	• Number of individuals of each species observed • Presence of endangered or threatened species • Changes in plant community composition	Construction site	Site inspection Visual observation Biodiversity surveys	Daily/Weekly	SEO E&S specialist consultants PMU
Destruction of farming ecosystem	• Area of farmland affected • Changes in crop yields • Impacts on livestock • Pollution of water sources used for irrigation	Construction site	Site inspection Visual observation Interviews with farmers	Daily/Weekly	SEO E&S specialist consultants PMU
Landscape and biodiversity	• Adopting good housekeeping and good construction practices. • Ensuring proper lining of canals and adequate assembling of pipes • Adopting slope stabilization techniques. • Implementing Biodiversity Action Plan (BAP)	Construction sites	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Protected Areas	• Exclude a subproject located in the community forestry, and Zone 3 of the protected area.	Construction sites	Site inspection	Daily	SEO
GHG emission	• Monitor the amount of fuel used by construction vehicles, heavy machinery, and generators. • Track the fuel efficiency of these machines to identify opportunities for improvement. • Assess the effectiveness of measures to control dust emissions from construction sites. • Monitor the types and quantities of waste generated and their disposal methods. • Track the amount of waste recycled or reused to reduce emissions associated with landfill disposal.	Construction site Nearby sensitive structures	Site inspection Visual observation Consultation	Daily	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	• Monitor the number and types of vehicles entering and leaving the construction site. • Track the efficiency of transportation methods used to deliver materials and equipment.				
During operation phase					
Water Quality	Testing surface water quality (Depth, pH, EC, AS, Cd, Pb, TN, TP, TDS, TSS, DO, and Total Coliform) and pesticide residues in water.	There is one location for surface water quality sampling. SW6 X:469642 Y:1306016	Site inspection Visual observation	Annually	SEO E&S specialist consultants PMU
Soil Pollution	• Testing of soil quality is going to be analyzed in the agriculture context: - Soil classification or particle size, - Soil moisture, - Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Sodium (Na), - Organic Metter - Ratio of the mass of carbon to the mass of nitrogen in organic residues (C/N Ratio), - Total phosphorus (P), - Cation exchange capacity (CEC), - pH, - Electrode Conductivity.	There is one location for soil quality sampling. SS5 X: 469602 Y: 1306117	Soil quality monitoring equipment	Annually	SEO E&S specialist consultants PMU
Biodiversity and Ecosystem Services	• Implementing Biodiversity Action Plan (BAP)	The entire sub-scheme	Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Habitat Loss and Fragmentation	• Area of habitat converted for agricultural use • Changes in the size and connectivity of habitat	The entire sub-scheme	Site inspection Visual observation	Annually	SEO E&S specialist

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	patches • Number of isolated habitat fragments				consultants PMU
Invasive Species	• Presence and abundance of invasive species • Area affected by invasive species • Effectiveness of control measures	The entire sub-scheme	Site inspection Visual observation Vegetation surveys	Annually	SEO E&S specialist consultants PMU
GHG emission	• Monitor the Knowledge, Attitude and Practices of farmers in farming activities that cause GHG emission	The entire sub-scheme	Site inspection Visual observation Consultation	Daily	SEO E&S specialist consultants PMU
	ANNUAL CROP MANAGEMENT PLAN				
Water resource efficiency	• Monitor water extraction rates from surface and groundwater sources. • Assess irrigation efficiency by measuring the amount of water applied versus the amount of water actually used by crops. • Monitor the implementation and effectiveness of water-saving irrigation methods (drip irrigation, sprinkler irrigation, AWD for rice). • Track water consumption per unit of crop yield (e.g., cubic meters of water per ton of rice produced).	Irrigation intake points Representative fields within the sub-scheme	Water flow measurements Soil moisture monitoring Crop water use assessments	Daily	PMU FWUC
Soil erosion and soil erosion risk	• Monitor soil erosion rates in different parts of the sub-scheme, particularly in sloping areas. • Assess the effectiveness of erosion control measures (contour planting, terracing, grass barriers). • Monitor soil organic matter content as an indicator of soil health and erosion resistance.	Representative fields Areas with different slopes and soil types	• Visual assessments of erosion features (gullies, rills) • Soil loss measurements using erosion plots or sediment traps • Soil organic matter analysis	After significant rainfall events Annually	PMU Agricultural extension officers
Nutrient application and management	• Monitor the types and amounts of fertilizers applied to different crops. • Conduct regular soil testing to assess nutrient	Representative fields Water sampling points near fields	• Fertilizer application records • Soil nutrient analysis • Water quality testing for	Before and after fertilizer application	PMU Farmers

Monitoring Parameters	Monitoring Indicators	Location	Measurements	Frequency	Responsibility
	levels and guide fertilizer application rates. • Monitor nutrient runoff from fields, especially near watercourses.		nutrients (nitrogen, phosphorus)	Regularly during the growing season	
Use and effectiveness of pesticides	• Monitor the types and amounts of pesticides used for different crops and pests. • Assess the effectiveness of pest control measures by monitoring pest populations and crop damage. • Track the incidence of pesticide-related health issues among farmers and workers.	Representative fields Pesticide storage facilities	• Pesticide application records • Pest scouting and monitoring data • Health records	Regularly during the growing season	PMU Agricultural extension officers
Pesticide residues on site soil	• Conduct soil sampling and analysis to measure pesticide residue levels in representative fields.	Representative fields Areas near pesticide storage facilities	• Soil residue analysis	Periodically (e.g., annually or before planting sensitive crops)	PMU Third-party laboratories
Pesticide residues on produce	• Collect and analyze samples of produce to determine pesticide residue levels. • Ensure that produce meets national and international standards for maximum residue limits (MRLs).	Representative fields at harvest time	• Laboratory analysis of produce samples	Before harvest	PMU Third-party laboratories

10.2 Social Monitoring Program

To ensure the effectiveness of social management, the social monitoring program is prepared to monitor social issues. The contractor and/or sub-contractor are responsible for monitoring using appropriate methods, equipment and system. Details on monitoring parameters are shown on the table below:

Table 452: Social monitoring plan during Pre-construction, Construction, and operation phase

Monitoring Parameters	Monitoring Indicators	Locations	Measurements	Frequency	Responsibility
Preconstruction phase					
Land acquisition/ Economic displacement	• Track the process of acquiring land for the project, ensuring fair compensation is provided to affected landowners. • Implement programs to help displaced individuals and communities restore their livelihoods. • Establish effective grievance mechanisms to address complaints and concerns related to economic displacement.	Construction sites	• Monitor the distribution of compensation payments and address any disputes or concerns. • Monitor the effectiveness of these programs.	• Daily • Reported to PMU within 48 hours	• PMU
During construction phase					
PROTECTING THE WORKFORC					
Child Labor/ Forced Labor	• Involvement of child labor/ forced labor in main contractor and subcontractors' workforce • Involvement of child labor/ forced labor among primarily supply workers	• Construction sites • Worksite of primary supplier	• Site inspection • Observation	• Daily • Screening prior to engaging services of primary supplier	
COMMUNITY HEALTH AND SAFETY					
Community Health and diseases	• Incidence of waterborne diseases • Prevalence of vector-borne diseases (e.g., malaria, dengue fever) • Respiratory illnesses related to dust and air pollution • Availability and accessibility of healthcare services • Community awareness of health risks and preventative measures	• Construction sites • Worker camps • Community and neighboring	• Health data collection • Site inspections • Health surveys and interviews • Consultation with	• Monthly • During outbreaks • Periodic community	• PMU • Contractors • Local health authorities

		areas	workers and community members	health awareness campaigns	
SEA/SH	• Before mobilizing workers to construction site, conduct orientation/training on SEA/SH (using sample Code of Conduct as a minimum) for all Contractors' managers and workers mobilized to construction site • As part of the above training/orientation, ensure all workers understand SEA/SH risks, disciplines and penalty, and understand project's grievance procedures related to SEA/SH • As part of the workers and manager's work contract, require all workers engaged for project (both workers mobilized to site or work in contractors' office) to peruse and sign Workers' CoC • Ensure Contractors appoint a focal point in charge of ESHS and grievance reception, processing and resolution • Apply all measures related to management of work camps	• Construction sites • Relevant local communities	• Number and percentage of workers trained on SEA/SH prior to mobilization to subproject site • Number and percentage of workers signing Code of Conduct as part of Work Contract • Percentage of workers perpetrating SEA/SH and percentage of cases reported to PMU and resolved • Name and contact of ESHS and grievance focal report reported in Contractor's ESMP.	• Monthly and during subproject cycle • Reported to PMU within 48 hours if occurred	• Contractors • PMU
Traffic safety and Security	• Security cautions • General disease prevalence • Worker health • Communicable diseases	• Construction sites • Access roads to construction sites • Newly constructed/rehabilitated roads	• Site inspections • Incident reports • Data collection • Consultation with workers and community members • Review of contractor safety plans	• Daily during construction • Weekly during construction • Monthly during operation	• Contractors • PMU • Local authorities
Community Health and diseases	• Consultations with target communities to assess the current social situation and social impacts of sub-projects. • Recommendations and solutions from communities obtained regarding negative social impacts.	• Target communities • Workers	• Assessment of social situation and social impacts. • Collection of	• During consultations	• Contractors • PMU

			community recommendations and solutions.		
Personal Protective Equipment	• Health and safety regulations enforced at construction sites. • Appropriate training and personal protective equipment (PPE) provided to workers.	• Construction sites and worker camps	• Monitoring that contractors provide appropriate PPE and enforce its use. • Observation of training sessions. • Review records of PPE distribution and training.	• Monthly monitoring during construction	• Contractors • PMU
Working conditions and Management of Worker	• Worker wages and benefits compared to legal requirements and industry standards • Instances of discrimination or unfair treatment based on gender, ethnicity, or other factors • Access to grievance mechanisms for workers to report unfair labor practices	• Construction sites • Worker camps	• Payroll records review: Verify worker wages and benefits. • Worker interviews: Confidential interviews to gather feedback on labor conditions and treatment. • Observation of worker interactions: Monitor for signs of discrimination or unfair treatment. • Review of contractor labor policies and practices: Ensure compliance with labor laws and ethical standards.	• Regular payroll audits • Periodic worker satisfaction surveys • Prompt investigation of any reported grievances	• Contractors • PMU
Cultural heritage	• Unexpected impacts on heritage resources	• Construction sites	• Site inspection • Observation • Report by local people/local authority	• Daily • Reported to PMU within 48 hours	• PMU • Contractors

CROSS-CUTTING					
Loss access to land and other assets	• Number of households affected by land acquisition or temporary restrictions on land use • Types of assets affected (e.g., land, houses, crops, trees) • Adequacy of compensation and resettlement measures for affected households	• Project areas where land acquisition is required • Areas affected by temporary restrictions on land use	• Land surveys and asset inventories • Consultations with affected households • Review of compensation and resettlement plans • Monitoring of resettlement implementation	• Before land acquisition • During land • After resettlement	• Contractors • PMU
Loss access to natural resources:	• Impacts on community access to water resources (e.g., for drinking, irrigation, fishing) • Impacts on access to forests and other natural resources • Measures to mitigate impacts and provide alternative access to resources	• Areas downstream of irrigation schemes • Areas surrounding project activities that may affect natural resources	• Water quality and quantity monitoring: Assess impacts on water resources downstream of project activities. • Consultations with communities: Gather feedback on impacts on natural resource access and use. • Development and implementation of mitigation plans: Address impacts and provide alternative access to resources.	• Regular water quality and quantity monitoring • During project implementation: Monitor the effectiveness of mitigation measures.	• PMU • Relevant government agencies • Contractors
Social inequality	• Any actions on the part of Contractors' workers or community member that cause social conflicts (e.g. SEA/SH, the way construction activities are carried out [pollution, restricted access, loss of local income/livelihoods, accidents…)	• Construction sites • Relevant local communities	• Number of social conflicts arising and nature and scope of conflict	• Daily • Monthly	• Contractors • PMU

	• Conflicts between upstream farmers who prioritize water storage for their crops and downstream farmers who require a consistent water supply for their agricultural needs.	• Local communities are living downstream and upstream.	• Number of social conflicts resolved by contractors within 7 days • Number of social conflicts resolved by local authorities • Number of serious cases that have happened and reported to PMU within 48 hours		
Elite capture	• Equitable distribution of project benefits among community members • Transparency and accountability in decision-making processes • Mechanisms for community participation and feedback	• Project implementation areas • Community meetings and consultations	• Monitoring of benefit distribution: Track who is receiving project benefits and ensure fairness. • Observation of decision-making processes: Assess inclusivity and transparency. • Community feedback mechanisms: Establish channels for communities to voice concerns and provide input.	• Throughout project implementation • Regular community meetings and consultations	• PMU • Contractors • Community representatives
Gender inequality	• Percentage of female beneficiaries • Percentage of beneficiaries who are youth • Average percentage women consulted • Number of action plans integrating specific women's • Average percentage FWUC with women in leadership positions • Women/youth trained in O&M • Number of training on gender and social inclusion delivered to	• Project sites • Community level	• Data collected through surveys and consultations • Review of project documents, training plans, and meeting minutes	• Monthly monitoring • Quarterly • Semi-annually • Annually	• PMU • Contractors •

	MOWRAM staff				
During operation phase					
COMMUNITY HEALTH AND SAFETY	• Number of accidents and fatalities related to construction activities • Number of disease outbreaks and environmental pollution incidents • Number of reported cases of worker health issues	• Construction sites • Camp site and Worker camps • Nearby community	• Site inspection reports • Accident/Incident reports • Medical records/reports • Consultation minutes/reports	• Daily for site inspections • Monthly for reports and consultations • Within 48 hours for reporting accidents, disease outbreaks.	• PMU • PDWRAM
CROSS-CUTTING					
Gender inequality	• Percentage of female workers in different roles (skilled, unskilled) • Number of reported cases of gender-based violence or discrimination • Participation of women in FWUCs and decision-making processes related to water management.	• Construction sites • FWUC meetings • Community consultations	• Observation of worker roles and interactions. • Records of complaints and their resolution. • Attendance records and meeting minutes.	• Monthly for data collection and reporting	• PMU • PDWRAM
Social inequality	• Employment rates of vulnerable groups (poor, ethnic minorities, people with disabilities) in project activities. • Access to project benefits (training, information, resources) among different social groups.	• Construction sites • Training sessions • Community consultations	• Employment records and beneficiary lists. • Attendance records and feedback surveys. • Consultations with community members and representatives of vulnerable groups.	• Monthly for data collection and reporting	• PMU • PDWRAM
Elite capture	• Participation and representation of different social groups in decision-making bodies (FWUCs, committees). • Transparency and accountability in the allocation of project resources and benefits. • Monitoring of complaints related to favoritism or exclusion in decision-making.	• FWUC meetings • Community consultations • Project implementation records	• Observation of meeting dynamics and representation • Analysis of resource allocation records. • Records of complaints	• Regularly during FWUC meetings and project implementation	• PMU • PDWRAM

			and their resolution.	• Continuously through the GRM.	

11. ESTIMATED COSTS

11.1 Estimated Costs for ESCMP Implementation

The costs of implementing the ESCMP listed below are related to PMU costs in addition to the dedicated safeguards PMU personnel budget line item. The main costs of implementing this ESCMP are the additional cost which have not been budgeted within the project, exclusive of the actual budget for the land resettlement and land acquisition which will be estimated by the end of the year as per the newly approval on the final conceptual design. For example, the project component 1 focus on establishment, capacity building and strengthening the FWUCs, therefore the concern regarding water management and water distribution inequality have already covered. Moreover, the sustainable agricultural practices and agricultural value chain is already in the project action plans. In this regard, the concern regarding GHG emission from the farming activities have been already addressed. The proposed budget therefore is the additional cost which are added to the existing one.

Table 46: Estimated cost for ESCMP implementation

No.	Items	Qty	Unit	Cost (USD)	Total (USD)
1	UXO clearance	Lum-sump	1	50,000	50,000
2	Preparing National EIA Report	Lum-sump	1	100,000	100,000
3	Implementing Biodiversity Management Plan	Year	5	7,500	37,500
4	ESCMP awareness raising and sensitization with key stakeholders and communities (5 times)	Times	2	3,000	6,000
5	Community outreach at the project area	Sub-scheme	1	15,000	15,000
6	Consultation facilitation	Sub-scheme	1	10,000	10,000
7	Monitoring activities	Lum-sump	1	18,500	18,500
	Total				**237,000**

11.2 Estimated Costs for ESMCP Monitoring Program

The monitoring cost will be budgeted only for the activities which are supposed to be additional expenditure which are not included in the social and safeguard consultant. The cost for monitoring is mainly focused on the monitoring cost for soil, water, and air quality.

Table 47: Estimated cost for ESCMP monitoring program

No.	Items	Unit	Qty	Cost	Total
1	Soil quality monitoring (every six months* 1 location * 1.5 year)	Times	3	1,500	4,500
2	Air quality, noise and vibration quality monitoring (every six months * 1 locations * 1.5 year)	Times	3	2,000	6,000
3	Water Quality monitoring (every six months* 1 location * 1 year) and groundwater (Annually * 1 location * 1 year) for around half of the total sample for surface water	Times	4	2,000	8,000
	Total				**18,500**

Annex

Annex 1. Screening checklist for E&S impacts for Yutasas Sub-scheme

Circle screening conclusion:

- If the answers to the checklist questions are “No”, there is no need for further action.
- If the answers to the questions are “Yes”, then consult the relevant procedures /guidelines for assistance in addressing issues of concerns.

A	Environmental and Social Impacts	No	Yes	Notes
Location				
1	Are there environmentally sensitive areas (forests, pastures, rivers, and wetlands) or threatened species that could be adversely affected by the sub-project?		√	
2	Does the sub-project area (or components of the project) occur within or adjacent to any protected areas designated by government (national park, national reserve, world heritage site, etc.)?	√		
3	If the sub-projects are outside of, but close to, any protected area, is it likely to adversely affect the ecology within the protected areas (e.g., interference with the migration routes of mammals, fish, or birds)?	√		
4	Will the sub-projects reduce people’s access to pasture, water, public services, or other resources that they depend on?	√		
5	Might the sub-projects alter any historical, archaeological, or cultural heritage site or require excavation near such a site?	√		
Physical and biological environment				
6	Will projects require large volumes of construction materials (e.g. gravel, stones, water, timber, firewood)?	√		
7	Might the projects lead to soil degradation or erosion in the area?		√	
8	Might the projects affect soil salinity?		√	
9	Will the projects create solid or liquid waste that could adversely affect local soil,	√		

	vegetation, rivers, streams, or groundwater?			
10	Might river or stream ecology be adversely and remarkably affected due to the installation of structures such as weirs, etc.?	√		
11	Will the projects have adverse impacts on natural habitats that will not have acceptable mitigation measures?	√		
12	Do the projects have human health and safety risks, during construction or later?		√	OHS safety and Dam safety
13	Might the projects lead to migration into the area?		√	
Alternatives				
14	Is it possible to achieve the objectives above in a different way, with fewer environmental and social impacts?	√		
B	**Land Acquisition and Social Issues**			
1	Have all groups within the community been consulted about the proposed project?		√	
2.	Which groups have not been consulted?	√		
3	Will the projects require acquisition of land (public or private) and/or other assets for its development?		√	Need to re-assess when the final design being made available
4	Will anyone be prevented from using economic resources (e.g. pasture, community places, forests etc.) to which they have had regular access?		√	Need to re-assess when the final design being made available
5	Will the projects result in the involuntary resettlement of individuals or families?		√	Need to re-assess when the final design being made available
6	Will the projects result in temporary or permanent loss of crops, fruit trees and household infrastructure such as granaries, toilets, kitchens etc.?		√	Need to re-assess when the final design being made available
7	Will the projects affect the livelihoods of particular groups within the communities, especially vulnerable groups such as the landless?	√		
8	Will the projects affect the well-being and livelihoods of women, particularly female-headed households?		√	Need to re-assess when the final design being made available
9.	Will the projects benefit all groups within the community equally?		√	
10.	Are there ongoing land or water disputes within the community/with neighboring communities?		√	

C	**Pesticides and Waste Materials**			
1	Will the project result in the introduction of pesticides or an increase in pesticide use if the use of such products exists?		√	
2	Will the project result in the production of solid or liquid waste (e.g. water, domestic or construction waste), or will it result in an increase in waste production during construction or operation?		√	Need to reassess when the final design and needs in construction being made available
D	**Is there a probability of the presence of unexploded ordinance (UXO) at or near the proposed sub-project area?**		√	

Annex 2: Layout of Yutasas sub-scheme

Figure 1. Administrative map of Stung Krang Ponley sub-command area....160
Figure 2. Length from Sub-Scheme to another of Krang Ponley 160
Figure 3. Concept design of Yutasas irrigation scheme....161
Figure 4. Map of Construction Sites and Residential Area in Stung Krang Ponley....161
Figure 5. Location of soil sample selection....162
Figure 6. Map of groundwater sampling locations....162

Figure 1. Administrative map of Stung Krang Ponley sub-command area

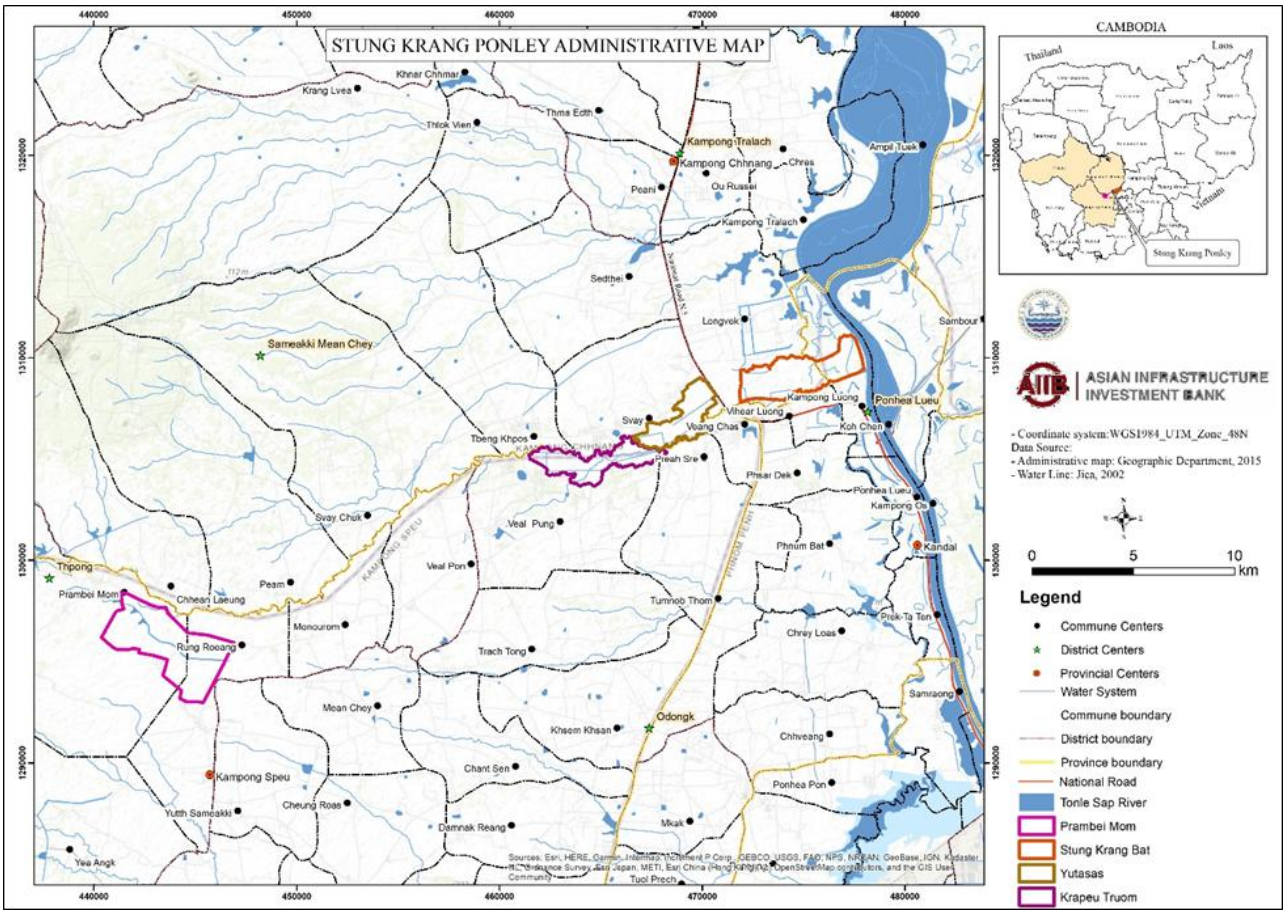


Figure 2. Length from Sub-Scheme to another of Krang Ponley

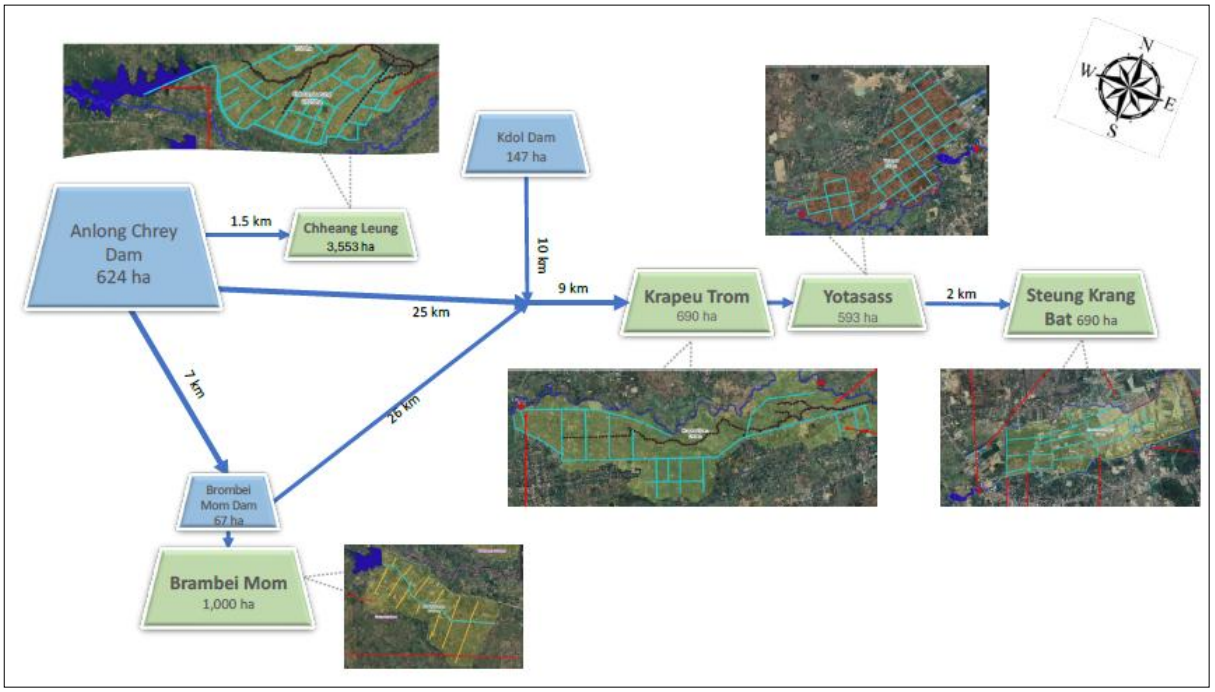


Figure 3. Concept design of Yutasas irrigation scheme

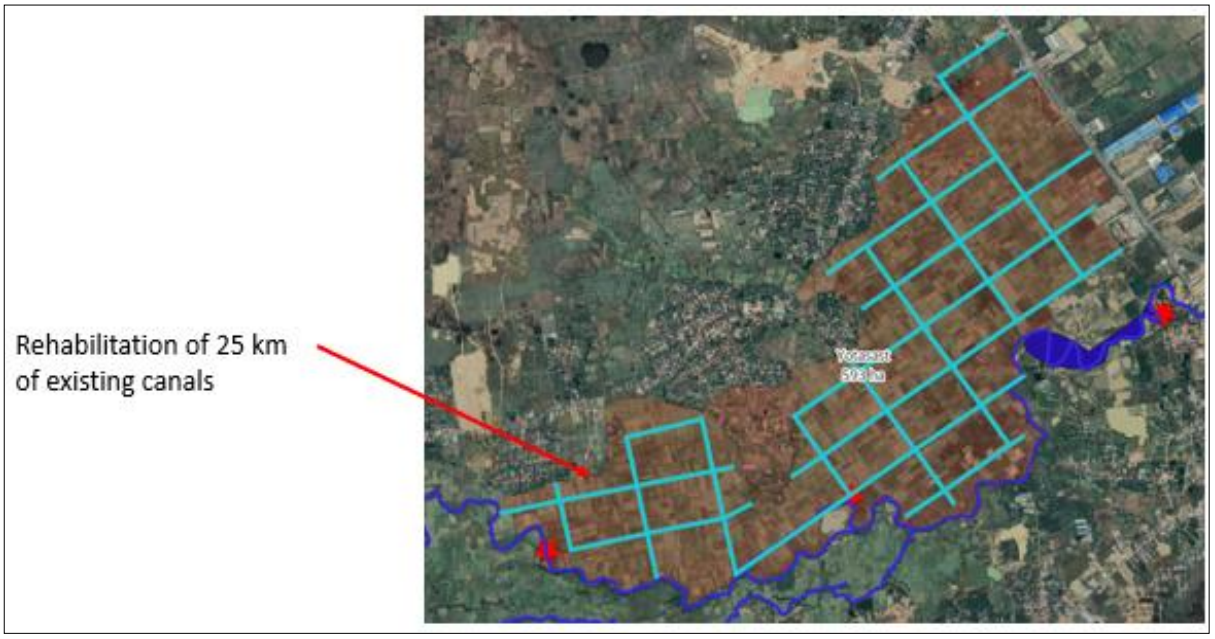


Figure 4. Map of Construction Sites and Residential Area in Stung Krang Ponley

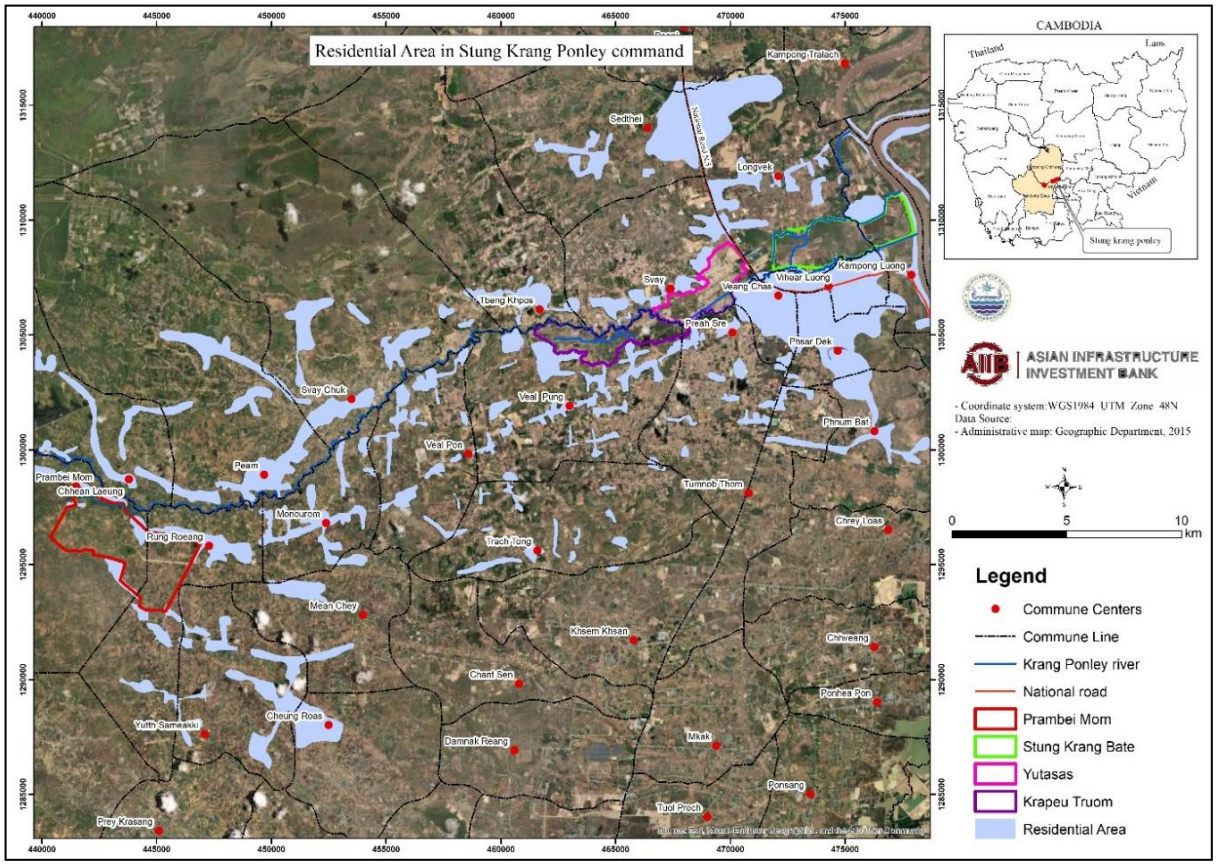
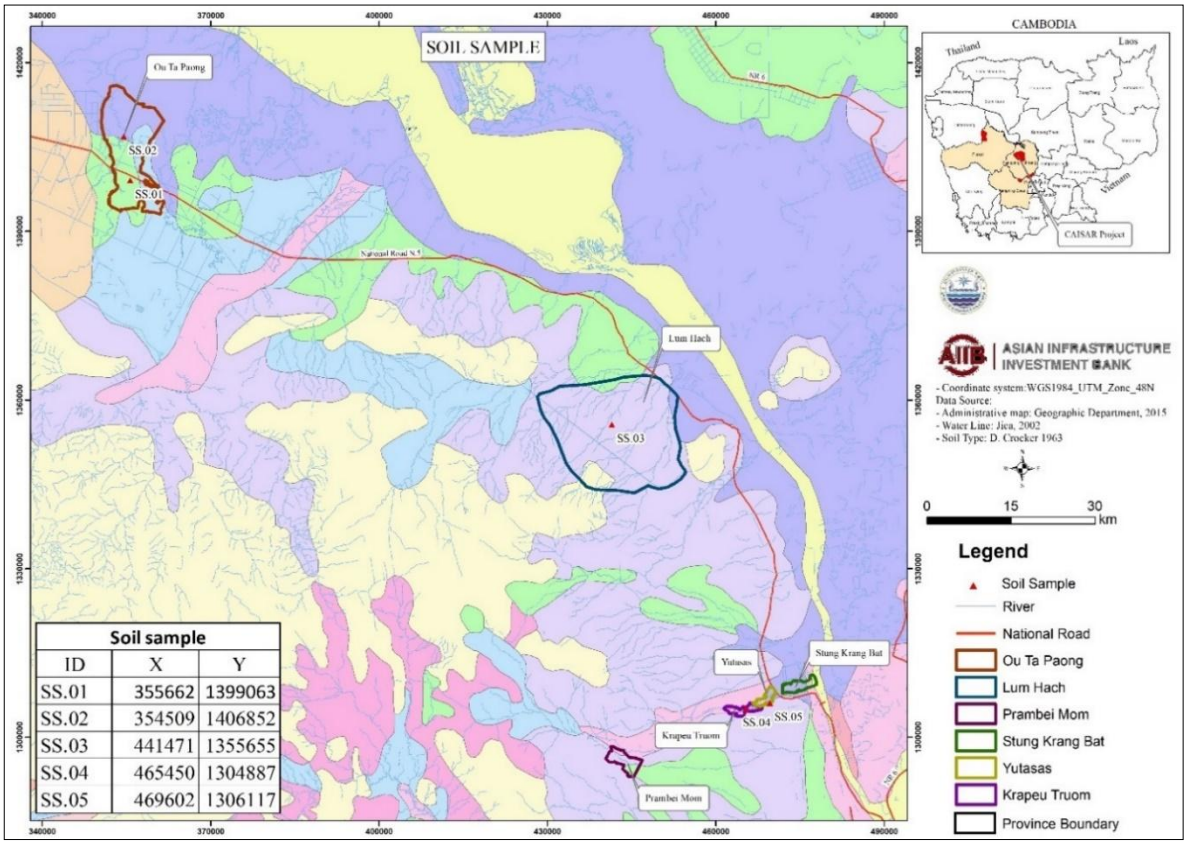
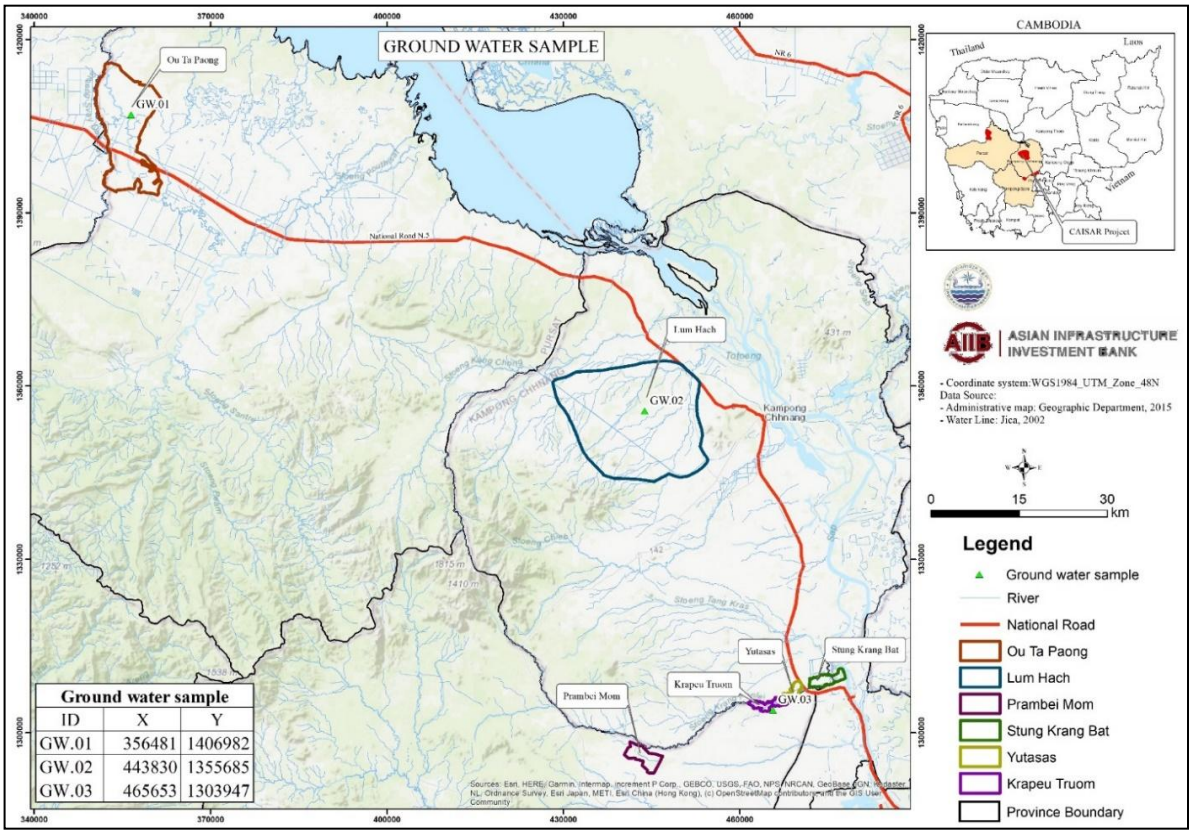


Figure 5. Location of soil sample selection



Soil sample		
ID	X	Y
SS.01	355662	1399063
SS.02	354509	1406852
SS.03	441471	1355655
SS.04	465450	1304887
SS.05	469602	1306117

Figure 6. Map of groundwater sampling locations



Ground water sample		
ID	X	Y
GW.01	356481	1406982
GW.02	443830	1355685
GW.03	465653	1303947

Annex 3. Grievance Monitoring

1.1 Reportable Incidents

The following incident types are to be reported using the environmental and social incident response process.

- **Fatality**: Death of a person(s) that occurs within one year of an accident/incident including from occupational disease/illness (e.g., from exposure to chemicals/toxins).
- **Lost Time Injury**: Injury or occupational disease/illness (e.g., from exposure to chemicals/toxins) that results in a worker requiring 3 or more days off work, or an injury or release of substance (e.g., chemicals/toxins) that results in a member of the community needing medical treatment.
- **Acts of Violence/Protest**: Any intentional use of physical force, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, deprivation to workers or project beneficiaries, or negatively affects the safe operation of a project worksite.
- **Disease Outbreaks**: The occurrence of a disease in excess of normal expectancy of number of cases. Disease may be communicable or may be the result of unknown etiology.
- **Child Labor:** An incident of child labor occurs: (i) when a child under the age of 14 (or a higher age for employment specified by national law) is employed or engaged in connection with a project, and/or (ii) when a child over the minimum age specified in (iii) and under the age of 18 is employed or engaged in connection with a project in a manner that is likely to be hazardous or interfere with the child's education or be harmful to the child's health or physical, mental, spiritual, moral or social development.
- **Forced Labor:** An incident of forced labor occurs when any work or service not voluntarily **performed** is exacted from an individual under threat of force or penalty in connection with a project, including any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor- contracting arrangements. This also includes incidents when trafficked persons are employed in connection with a project.
- **Environmental pollution incident:** Exceedances of emission standards to land, water, or air (e.g., from chemicals/toxins) that have persisted for more than 24hrs or have resulted in harm to the environment.
- **Discrimination based on SOGI:** Discrimination means creating a distinction, exclusion, or restriction which has the purpose or effect of impairing or excluding a person based on their real or perceived sexual orientation, gender identity, gender expression, or sex characteristics from being on an equal basis with others.
- **Sexual Exploitation:** Any actual or attempted abuse of position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially, or politically from the sexual exploitation of another. In Bank financed operations/projects, sexual exploitation occurs when access to or benefit from a Bank financed Goods, Works, Non-consulting Services or Consulting Services is used to extract sexual gain.
- **Sexual Abuse:** Actual or threatened physical intrusion of a sexual nature, whether by force or under **unequal** or coercive conditions. In Bank financed operations/projects, sexual abuse

occurs when a project related worker (contractor staff, subcontractor staff, supervising engineer) uses force or unequal power vis a vis a community member or colleague to perpetrate or threat to perpetrate an unwanted sexual act.

- **Sexual Harassment:** Any unwelcome sexual advance, request for sexual favor, verbal or physical conduct or gesture of a sexual nature, or any other behavior of a sexual nature that might reasonably be expected or be perceived to cause offence or humiliation to another, when such conduct interferes with work, is made a condition of employment, or creates an intimidating, hostile or offensive work environment. In Bank financed operations/projects, sexual harassment occurs within the context of a subcontractor or contractor and relates to employees of the company experiencing unwelcome sexual advances or requests for sexual favor or acts of a sexual nature that are offensive and humiliating among the same company's employees.
- **Other**: Any other incident or accident that may have a significant adverse effect on the environment, the affected communities, the public, or the workers, irrespective of whether harm had occurred on that occasion. Any repeated non-compliance or recurrent minor incidents which suggest systematic failures that PMU deems needing the attention of the WB.

1.2 For environmental and social incidents

1.2.1 Form to be completed by PMU within 48 hours

Q1: Incident Details	
1. Date of Incident:	
2. Time:	
3. Date Reported to PMU:	
4. Date Reported to WB:	
5. Reported to PMU by:	
6. Reported to WB by:	
7. Notification Type (Email/'phone call/media notice/other):	
8. Full Name of Main Contractor:	
9. Full Name of Subcontractor:	
Q2: **Type of incident (please check all that apply)**	
1. ☐ Fatality 2. ☐ Lost Time Injury 3. ☐ Displacement Without Due Process 4. ☐ Child Labor 5. ☐ Acts of Violence/Protest 6. ☐ Disease Outbreaks 7. ☐ Forced Labor 8. ☐ Unexpected impacts on heritage resources 9. ☐ Unexpected impacts on biodiversity resources 10. ☐ Environmental pollution incident 11. ☐ Dam failure 12. ☐ Other	

Q3: Description/Narrative of Incident
For example: 1. What is the incident? 2. What were the conditions or circumstances under which the incident occurred (if known)? 3. Are the basic facts of the incident clear and uncontested, or are there conflicting versions? What are those versions? 4. Is the incident still ongoing or is it contained? 5. Have any relevant authorities been informed?

Q4: Actions taken to contain the incident			
Short Description of Action	**Responsible Party**	**Expected Date**	**Status**

For incidents involving a contractor:

1. Have the works been suspended under the Contract GCC8.9?
   a) ☐ Yes
   b) ☐ No
2. Name of Contractor: **……**

Q5: What support has been provided to affected people?

1.2.2 Form to be completed by PMU (following investigation)

Q6. Fatality/Lost time Injury information	
Cause of fatality/injury for worker or member of the public (please check all that apply): 1. ☐ Caught in or between objects 2. ☐ Struck by falling objects 3. ☐ Stepping on, striking against, or struck by objects 4. ☐ Drowning 5. ☐ Chemical, biochemical, material exposure 6. ☐ Falls, trips, slips 7. ☐ Fire & explosion 8. ☐ Electrocution 9. ☐ Homicide 10. ☐ Medical Issue 11. ☐ Suicide 12. ☐ Others	*Vehicle Traffic:* 13. ☐ Project Vehicle Work Travel 14. ☐ Non-project Vehicle Work Travel 15. ☐ Project Vehicle Commuting 16. ☐ Non-project Vehicle Commuting 17. ☐ Vehicle Traffic Accident (Members of Public Only)

Name	**Age/DOB**	**Date of Death/injury**	**Gender**	**Nationality**	**Cause of Fatality/Injury**	**Worker (Employer)/Public**

Q7: Financial Support/Compensation Types (To be fully described in Corrective Action Plan template)

1. ☐ Contractor Direct
2. ☐ Contractor Insurance
3. ☐ Workman's Compensation/National Insurance
4. ☐ Court Determined Judicial Process
5. ☐ Others
6. ☐ No Compensation Required

Name	Compensation Type	Amount (US$)	Responsible Party

Q8: Supplementary Narrative:

1.3 For SEA/SH Incident

1.3.1 Incident Form for SEA/SH (to be completed by PMU within 48 hours)

Q9. Incident Details		
Date of incident intake by project/GM:	Date Reported to PMU:	Date Reported to AIIB:
Reported to project/GM by: 1. Survivor 2. Third party 3. Others:	Reported to PMU by: 1. GM operator 2. Directly, by Survivor 3. Directly, by third party 4. Others:	Reported to AIIB by: 1. PMU 2. Directly, by Survivor 3. Directly, by third party 4. Other:

Q10. Is a record of this incident in GM?

a) ☐ Yes
b) ☐ No

Q11: Incident type (please check all that apply) See Appendix 1 for definitions

c) Sexual exploitation
d) Sexual abuse
e) Sexual harassment

Q12: Provide the following details from the GM record.

1. Age of survivor (if recorded in GM):

2. Have the national legislation or mandatory reporting requirements been followed?

f) ☐ Yes
g) ☐ No

3. Sex of survivor (if recorded in GM):

a) ☐ Male
b) ☐ Female
c) ☐ Others

4. Was the survivor referred to service provision?

	a) ☐ Yes b) ☐ No
5.	Is the survivor employed by the project (as indicated by the survivor or complainant and reported in the GM)? a) ☐ Yes b) ☐ No
6.	Is the alleged perpetrator employed by the project (as indicated by the survivor or complainant and reported in the GM)? a) ☐ Yes b) ☐ No
Q13: Basis for further action	
1.	Has the complainant provided informed consent to lodge a formal complaint? a) ☐Yes b) ☐ No
2.	Does the employer have a suitable administrative process and capacity in place to investigate misconduct relating to SEA/SH in a survivor-centered way? a) ☐ Yes b) ☐ No
3.	Has the survivor provided informed consent to be part of an investigation into misconduct? a) ☐ Yes b) ☐ No
4.	Has the complaint been filed anonymously or through a third party? a) ☐ Yes b) ☐ No
5.	If the answer to any of these questions is no, has the GM assessed the risks and benefits of carrying out an investigation into the alleged misconduct, taking into account the survivor's safety and wellbeing? a) ☐ Yes b) ☐ No
6.	Will an investigation into misconduct be undertaken in addition to an investigation into adequacy of project systems, processes or procedures? a) ☐ Yes b) ☐ No

1.4 Incident Form for SEA/SH (to be completed by PMU following SEA/SH investigation)

Q14: Findings of the investigation	
1.	Have sanctions against a perpetrator been recommended as part of an investigation into misconduct? a) ☐ Yes b) ☐ No
2.	Has an investigation into adequacy of project systems, processes or procedures been undertaken? a) ☐ Yes b) ☐ No
Q15: Corrective actions to be implemented (To be fully described in Corrective Action Plan)	

Short Description of Action (SEA/SH examples)	Responsible Party	Timeline for completion/Status
1. Referral of Survivor to holistic care services		
2. Undertake disciplinary investigation in accordance with GM timelines and confirmed process		
3. Disciplinary actions, including sanctions, to be applied following misconduct investigation by employer		
4. Increased training on Codes of Conduct (CoC)		
5. Audit of implementation of SEA/SH safety mitigation		
6. Strengthened awareness training on project-related risks, CoC and how to report incidents for project-affected community		
7. Training for project supervisors on the need to follow guidelines of behavior in CoC and their supervisory responsibilities		
8. Plan to improve coverage/quality of service provision		
9. Any other system strengthening measures or corrections for system failures that are necessary		

3.1 Project's Grievance Logbook

3.1.1 Sample for Local Levels

No	Name of complainant (or anonymous)	Addresses	Sex	Age	Contact information	Date Received	Details of nature of grievance (Environmental impacts, social impacts, labor, health, etc.)	Which of the three GRM that was used?	Actions taken to resolve grievance, by whom	How many steps that have been used in the relevant GRM	Date grievance was finally resolved/closed?	Notes

3.1.2 Sample for PMU Level to be elaborated on Excel spreadsheet with filter function

No	Questions	Response
1	**Date Received:**	
2	**Name of Complaint** (or anonymous):	
3	**Sex:**	
4	**Age:**	
5	**Contact information** (Phone number/email, other channel(s):	
6	**Location of Complainants** (Province, District, commune, village):	
7	**Form of grievance received** (Writing or Verbal (face to face, telephone, online), SMS, MOWRAM and DoWRAM comment box in designated Website/Face book/What's App, etc.	

8	**Channel of Receipt** (Direct to PMU GRM Focal Point, or Relayed from other channels (Provide details)	
9	**Key topics of Grievances** a) Labor and Working Condition Resettlement (incl Voluntary Land Donation) b) SEA/SH c) Environmental impacts d) Community Health and Safety Accidents	
10	**Nature of complaints?** a) Resolution required b) Clarification required c) Suggestion n only (for project improvement) d) General Concerns	
11	**Step 1 of GRM Procedure:**	
	a) Date receipted:	
	b) Date solved/transferred:	
	c) Duration spent (in days):	
12	**Step 2,3,4** (Replicated in Excel spreadsheet):	
13	**Closing of Case** (At which Steps, date of case closing):	
14	**Notes:**	

Annex 4 – Worker's Code of Conducts

The Annex has two Code of Conduct (COC): one is for ESHS and SEA/SH/VAC, and the other is for working with local Ethnic Communities.

1.1 Code of Conduct related to ESHS and SEA/SH/VAC

Instructions:

This Code of Conduct shall be perused and signed by all individual workers who enter direct work contract with a) PMU, b) PMU's consulting firms and service providers, c) contractors who renovate existing HCFs.

I,_____, acknowledge that adhering to environmental, social, health and safety (ESHS) standards, following the project's occupational health and safety (OHS) requirements, and prevention of Sexual Exploitation & Abuse (SEA)/Sexual Harassment (SH), are important.

I understand that that failure to follow ESHS and OHS requirement, or to partake in activities constituting SEA/ SH -- be it at the project site, the surrounding area of the project site, workers' camps, or the project communities, including community members and project workers, constitute acts of gross misconduct and are therefore grounds for sanctions, penalties, or potential termination of employment. Prosecution by the Police of those who commit SEA/SH may be proceeded as applicable under relevant Laws.

I agree that while working on the project, I will:

- Carry out my duties competently and diligently.
- Comply with this Worker's Code of Conduct and all applicable laws, regulations, and other requirements, including requirements to protect the health, safety and well-being of other project workers, and any other person and community members.
- Maintain a safe working environment including by:
    - Ensure that workplaces, machinery, equipment, and processes under each person's control are safe and without minimal risk to health and safety of those involved.
    - Use appropriate measures relating to chemical, physical and biological substances, and agents; and
    - Follow applicable emergency response procedures.
- Report works situations that I believe unsafe or unhealthy to either project workers and/or community and remove myself and inform those relevant to remove themselves from a work situation which I reasonably believe imminent and dangerous to safety, life, and health of those involved.

- Consent, if required, to a background check in any place I have worked for more than six months.
- Attend and actively partake in training courses related to ESHS, OHS, SEA/SH and VAC, as requested by my employer.
- Always wear my personal protective equipment (PPE), as required while at work or engaged in project related activities.
- Take all practical steps to implement the environmental and social management plan (ESMP), which may include OHS Management Plan.
- Abide by a zero-tolerance policy as to SEA/SH/VAC and alcohol consumption during work activities, and refrain from use of narcotics or other substances which can impair worker's expected working ability and judgement.
- Respect women, children (persons under 18 years of age), and the elderlies regardless of their ethnic background, language, religion, personal opinions, disability, and/or other socioeconomic status.
- Shall not use language or behavior that are inappropriate to community members and project workers, particularly women, children, and the elderlies,
- Shall not commit any sexual abuse and or exploit, and/or sexual harassment of any kinds to community members in the project area and any project workers.
- Shall not engage in sexual harassment of project personnel and staff — for instance, making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature (looking somebody up and down; kissing, howling or smacking sounds; hanging around somebody; whistling and catcalls; in some instances, giving personal gifts.
- Shall not engage in offering any work-related favors such as making promises of favorable treatment (i.e., promotion), or make threats of unfavorable treatment (i.e., loss of job), or make payments in kind or in cash depending on sexual acts — or other forms of humiliating, degrading or exploitative behavior.
- Shall not engage in using prostitution service -- in any form and at any time during project implementation.
- Shall not participate in sexual contact or activity with children under 18 years of age — including grooming or contact through digital media. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not considered a defense or excuse.
- Consider reporting through the project's GRM, or to my manager, any suspected or actual SEA/SH deed by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.
- Complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation & Abuse, Sexual Harassment, and Violence Against Children (VAC).

- Report violations of this Code of Conduct; and

With respect to children under the age of 18:

- Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
- Wherever possible, ensure that another adult is present when working in proximity to children.
- Shall not invite unaccompanied children unrelated to my family into my home unless they are at immediate risk of injury or in physical danger.
- Not use any computers, mobile phones, video, and digital cameras or any other medium to exploit or harass children or to access child pornography (see also “Use of children's images for work related purposes” below).
- Avoid, in all circumstances, any verbale and/or physical punishment or discipline of children.
- No hiring of children (under 18) in any project activity.
- Comply with all relevant local regulations, including labor law in relation to child labor and forced labor.
- Take appropriate caution when photographing or filming children (see also section below). Photos or films of children should not be taken under the project, except for instances showing the benefits or impacts of road works, such as impacts to schools or school safety trainings.

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

- Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this, I must explain how the photograph or film will be used.
- Ensure photographs, films, videos present children in a dignified and respectful manner and not in a manner that is vulnerable or submissive. Children should be adequately dressed up and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Raising Concerns

If any person observes behavior that I believe may represent a violation of this Code of Conduct, or that otherwise concerns me, I will raise the issue promptly. This can be done in either of the following ways:

1. Contact [enter name of the Employer's Social Focal Point] to handle these incidences.
2. Call Employer's telephone number (See contact detail at Section 5 of project's Stakeholder Engagement Plan).

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. PMU will take all reports of possible misconduct seriously and will investigate and take appropriate action. In case of SEA/SH, PMU will provide referral to local service provider who will provide support to SEA/SH victims (See also Section 6.4 of project's Stakeholder Engagement Plan).

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

Sanctions

I understand that if I breach this Workers' Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning.
- Formal warning.
- Additional Training.
- Termination of employment.
- Report to the Police if warranted.

I understand that it is my responsibility to:

Ensure that the Environmental, Social, Health and Safety requirements are met. Adhere to the Occupational Health and Safety Management Plan

Avoid actions or behaviors that could be construed as SEA/SH/VAC. Any such action will be a breach of this Workers' Code of Conduct.

I hereby acknowledge that I have perused the foregoing part of this Workers' Code of Conduct, agree to comply fully with the requirements contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, SEA/SH/VAC issues. I understand that any actions that are inconsistent with this Workers' Code of Conduct, or failure to act as mandated by this Workers' Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

1.2 Code of Conduct for Working with Local Ethnic Communities

This Code of Conduct is grounded on the objectives of the WB's ESS7, which are:

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To avoid adverse impacts of projects on Indigenous Peoples, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a manner that is accessible, culturally appropriate and inclusive.
- To improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the Indigenous
- To recognize, respect and preserve the culture, knowledge, and practices of Indigenous Peoples, and to provide them with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.

Annex 5 – Simplified Pest Management Plan

1.1 Rationale

In Cambodia, around 90% of cultivated land is used for rice production. Rice alone accounts for about 70% of the country's total calorie supply. Rice production contributes an estimated 44% of rural household income, making the rice sector an area for strategic development in the country. Despite rice is the major crop in Cambodia, rice production is characterized by widespread misuse of pesticides. This is due to inconsistent enforcement of current regulation and a lack of information on pesticide safety and alternative pest management techniques among rice farmers. Most pesticides are imported and labelled in a foreign language incomprehensible to farmers. It is common that rice farmers mix two to five pesticides by intuition, leading to pesticide poisoning among farmers and adverse impact on environment[16]. Rice farmers tend to apply more pesticide when they see pests on their field[17]. Vegetable farmers also typically mix various types of pesticides per spray which is not good practice[18].

The CWSIP project will 1) improve overall water security for all stakeholders in the targeted basins in three provinces, 2) exploit the potential of the unused water resources and increase agricultural productivity in the targeted basin, and 3) enhance the overall capacity of the water resources management of the central government, concerned local governments, and concerned communities. Through three out of five project components, the project will improve 1) Water Service Delivery, 2) Agricultural Productivity, and 2) Water Resources Management. The project does not involve procurement of pesticides.

Under CWSIP, the project will support target farming population in irrigated area to improve their use of good agricultural practices, including integrated crop water management, climate-smart agriculture (diversification into high-value crop plantation, public-private-partnership and commercialization), as well as agribusiness and trade development. The CWSIP does not involve procurement of chemical fertilizers, pesticides, and/or other toxic agrochemicals nor promote use of chemical agricultural inputs during project implementation. However, rehabilitation /upgrading of existing reservoirs/irrigation system, etc. to be financed under the Project are expected to increase the agricultural command areas, including the number of crops per year. This increased crop may give rise to increased use of fertilizers, pesticides, and/or other toxic agrochemicals in the subproject areas which are unintended impact of the project.

1.2 Key Pesticide Management Outcomes in Cambodia

[16] https://ipmil.cired.vt.edu/our-work/projects/rice-ipm-for-cambodia/

[17] Matsukawa, M., Ito, K., Kawakita, K. et al. Current status of pesticide use among rice farmers in Cambodia. Appl Entomic Zool51, 571–579 (2016). https://doi.org/10.1007/s13355-016-0432-5.

[18] Sim Skooching, Keo Socheat and Sarom Moldiest. 2021. Pesticide Use Practices in Cambodia's Vegetable Farming. CDRI Working Paper Series No. 128. Phnom Penh: CDRI.

Pesticide Use and IPM implementation in Project Provinces: General Directorate of Agriculture (GDA)'s survey in 2014 and nation-wide inspections in 2013 of pesticide and herbicide suppliers in provincial capitals and other main distribution hubs, indicate that the most commonly sold products include: abamectin, chlorpyrifos, cypermethrin, glyphosate, imidacloprid. In the Northern provinces, where a large part of the herbicide use is on corn and rubber plantations, the main products sold are the herbicides Glyphosate, Paraquat and Atrazine. Nowadays, on Rice and Maize cultivation farmers don't use pesticide accept some vegetables. These inspections have also shown that the most problematic highly hazardous products, such as monocrotophos, methyl parathion, methamidophos, mevinphos, endosulfan, etc., are no longer found on the market with the exception of the occasional old bottle. The only banned products that still are found regularly are paraquat and methomyl. This is because these products were banned only recently (2010) and are still permitted in the neighboring countries from where they are informally brought in by users or retailers. The banning of highly hazardous pesticides in China does not seem to have led to dumping of old stocks in Cambodia. There are no known large stocks of obsolete pesticides.

Insecticides are used mainly on vegetables (such as Long Yard Bean, Chilly, Cabbage, Chinese Cabbage) marketable high-value crops and plantation crops, notably rubber. Field surveys by the national IPM program and GDA indicate there still is wide-spread abuse of pesticides among farmers. Lack of knowledge among farmers is a major constraint. Abuse includes mixing without justification (just to be sure), use of wrong pesticides, use of wrong dosages, etc. Adequate protective gear is hardly being used. Shops often have gloves and masks for sale, but these tend to be inadequate for protection against hazardous chemicals. Buyers of pesticides rarely also buy protective gear, and shops do not provide it for free. Half used pesticide bottles or packages are often stored within the house or near homesteads, often in easy reach of children. Empty pesticide containers are often discarded at the border of fields or in drainage ditches.

1.3 Government Regulation Related to Pest Management

Pest management practices in Cambodia have been promoted through the expansion of the National Integrated Pest Management (IPM) Program by both the government and NGOs. These agencies have been working together to establish a Pesticide Reduction Network to develop awareness of the risks associated with pesticide use amongst farmers.

As a key function, Ministry of Agricultural and Forestry (MAFF) has been examining and implementing various international legal guidelines and instruments relating to regulating the trade, distribution and use of pesticides in Cambodia. These include adherence to the FAO Code of Conduct on the Distribution and Use of Pesticides, the Stockholm Convention on Persistent Organic Pollutants, and the WTO sanitary and phytosanitary measures.

Following the promulgation of the Law on Management of Pesticides and Fertilizers as Royal Kram Number 0112/005 on 14th January 2012, MAFF had developed five Prakas in relation to Procedures for Registration and Business Operations, as follows:

- Prakas No. 415/MAFF dated 17 August 2012, on Procedures and Standard Requirements for Fertilizer Registrations.

- Prakas No. 456/MAFF dated 19 October 2012, on Procedures and Standard Requirements for Pesticide Registrations.
- Prakas N. 484/MAFF dated 26 November 2012, on List of Pesticides in the Kingdom of Cambodia.
- Prakas No. 119/MAFF dated 11 April 2013, on Procedures for Management of Fertilizers for Business Operations.
- Prakas No. 120/MAFF dated 11 April 2013, on Procedures for Management of Pesticides for Business Operations.

  Within MAFF, the Department of Agriculture Legislation and GDA are mandated to oversee all pesticide regulations and use.

1.4 International Code of Conduct on the Distribution and Use of Pesticides

The following rules are observed for IPM:

- The standards of conduct set forth in this Code: 1.7.6. are designed to promote Integrated Pest Management (IPM) (including integrated vector management for public health pests).
- Concerted efforts should be made by governments to develop and promote the use of IPM. Furthermore, lending institutions, donor agencies and governments should support the development of national IPM policies and improved IPM concepts and practices. These should be based on scientific and other strategies that promote increased participation of farmers (including women's groups), extension agents and on-farm researchers.
- All stakeholders, including farmers and farmer associations, IPM researchers, extension agents, crop consultants, food industry, manufacturers of biological and chemical pesticides and application equipment, environmentalists and representatives of consumer groups should play a proactive role in the development and promotion of IPM.
- Governments, with the support of relevant international and regional organizations, should encourage and promote research on, and the development of, alternatives posing fewer risks: biological control agents and techniques, non- chemical pesticides and pesticides that are, as far as possible or desirable, target-specific, that degrade into innocuous constituent parts or metabolites after use and are of low risk to humans and the environment.
- Governments should provide extension and advisory services and farmers' organizations with adequate information about practical IPM strategies and methods, as well as the range of pesticide products available for use.
- Governments should ensure that any pesticide subsidies or donations do not lead to excessive or unjustified use which may divert interest from more sustainable alternative measures.

1.5 Current Governmental Implementation Arrangements Related to Pest Management

Integrated Pest Management (IPM) refers to all pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

Under MAFF, Plant Protection Centers and their branches in provinces as well as Agricultural Extension Centers at district level are governmental agencies that coordinate and work on Integrated Pest Management Programs. These activities are built on the National IPM program that was initiated with assistance from the FAO, DANIDA and other donors since early 1990s which is largely being maintained using national budget.

IPM activities implemented by these local authorities and technical backstopping by experts from GDA include conducting field surveys, making forecast, monitoring and checking progress of on-field pest development. Using the forecast based on the timing, scale and level of damage that the key pests may cause, provincial plant protection authorities recommend policies, plans, and measures for pest management purposes.

Relevant authorities such as Plant Protection Centers and Agricultural Extension Centers also conduct IPM training for farmers. Farmers learn how to implement various integrated measures such as pest identification, pest control, pest analysis, pest surveillance, and apply measure to control pest, such as applying chemical and botanical control agent, promoting application of biological measures for pest management, reducing chemicals and practice sustainable IPM. Farmers are also trained on proper use of chemical pesticide and fertilizers to ensure efficiency in pest management, ensuring safety for human, natural enemy, and the environment. Communication campaigns on plant protections and quarantine legislations and advance IPM technics to the farmers are also carried out depending on budget availability, etc.

GDA's Plant Protection Center, including the national IPM program, has developed a 3-day curriculum for a Farmer Training on Pesticide Risk Reduction (FT-PRR) which is intended to raise awareness, develop capacity and help rural communities formulate and implement their own action plans for pesticide risk reduction. As of June 2014, some 4,900 Lao farmers (including 1,600 women) have participated in FT-PRR courses in 149 villages of 34 Districts in 9 provinces. Season-long Integrated Pest Management training through Farmers Field Schools (FFS) often includes these short-duration FT-PRR courses. These FFSs allow farmers to learn about and adopt Integrated Pest Management to reduce overuse of pesticides in crop production. 10. The National IPM Program has implemented 806 season-long IPM Farmers Field Schools, with over 24,350 rice, vegetable and fruit farmers trained. More, however, remains to be done. Pesticide Risk Reduction and IPM adoption at farm level remains a priority for the Government.

Operational costs of plant protection agencies are allocated from state funds. Their staff also work on projects and programs that are financed by other international funding and conduct additional annual trainings (using international budget) for farmers.

1.6 Objective of Simplified Pest Management Plan

This Simplified Pest Management Plan (S-PMP) aim to see out plan and measures to ensure the project does not unintentionally give rise to increased overuse of chemical agricultural inputs (such as chemical pesticide, fertilizers, and plant growth regulators, etc.). This S-PMP will be integrated into on-going pest management program and effort that provincial DAFF in project provinces have been doing and make sure pest management efforts target areas where water access is improved through project investment activities.

To mitigate this potential impacts as a 'good practice', the subproject owner will prepare and implement a S-PMP aiming to increase famers knowledge on Government regulations, policies, and/or technical guidelines related to safe use (application, storage, and disposal) of pesticides and toxic agrochemicals likely to be used by farmers as well as promote the application of an Integrated Pest Management (IPM) practice that are appropriate for the agriculture productions in the subproject area through training and other capacity building activities.

Key Elements - The elements of the S-PMP include the followings:

- Preventing pest problems.
- Monitoring for the presence of pests and pest damage.
- Establishing the density of pest population, which may be set at zero, that can be tolerated or corrected with a damage level sufficient to warrant treatment of the problem based on health, public safety, economic or aesthetic threshold.
- Treating pest problems to reduce population below those levels established by damage thresholds using strategies that may include biological, cultural, mechanical and pesticidal control methods and that shall consider human health, ecological impact, feasibility and cost effectiveness; and
- Evaluating the effects and efficacy of pest treatments.

Decision Making

Detecting a single pest under the Project will not always mean control is needed. A decision to use pesticides will be taken only as the very last resort and will also be based on conclusions reached from an agroecosystem analysis and trials. The decision will also depend on the number of pests and diseases found in the respective crop and the level of damage they are doing. If it is necessary to spray crops with pesticides, use of selective rather than broad-spectrum pesticides shall be strictly observed.

Pest Monitoring and Surveillance

A process for the reporting and identification of unusual plants, animals and pests will be established to

track and document all pest cases, be it minor or major in a pest inventory register. Pest surveys will be conducted on a regular basis to detect new infestations and will include the types, abundance, location of pest plants, date when first spotted or seen, and date when reported. This information will be

gathered from surveillance or monitoring system to be put in place, periodic surveys to be conducted and feedback from farmers/farm assistants. The data will be managed in a standardized way so that trends can be established. A rapid response process for the management of new infestations will be established to treat and manage new pest infestations as soon as they are identified.

Table 1. Potential impacts and proposed mitigation for pest

Potential Impacts	Proposed Mitigation
Contamination of ground water resources	Conducting trials on relatively flat land with less than 2% slope reducing the possibility of run off and at more than 500m away from water sources
Effect of pesticides on non-target species	Use pesticides that are systemic and narrow range and specific to sucking insects.
Effect of pesticides on grazing areas, settlements	Spraying in the morning hours when the weather is cool and less windy to reduce spray drifts. Locating trials or plots at distance of between 500-1000m away grazing areas or human settlements
Possibility of increasing resistance of pests to the pesticide	Training of field staff responsible on recommended usage of the pesticide
Harmful effects on staff applying pesticides	Provision and usage of safety clothing and working gear to staff
Harm to people within the homestead where the chemical is stored	Designation of a separate and secured storage room for pesticide Warnings and notices to increase awareness

1.7 Mitigation Measures

It is expected that there will be no procurement of pesticides under the project and that pesticide use, overall, will decline as a result with the introduction of good agricultural practices. To ensure the tendency of increased overuse of pesticide does not happen with subproject where project intervention take place, the project will prohibit procurement of large pesticides using the “negative list” and provide training to key staff and farmers on integrated pest management, safe use of pesticides, and organic farming practices. This will be integrated as part of the safeguard training. This S-PMP will be applied to the project activities that involve:

a) Any rehabilitation/upgrading of weirs/reservoirs/dams/existing irrigation schemes that are likely to prompt farmers to increase their use of pesticides:

b) Change/introduction of best agricultural practices such as integrated crop water management, Climate-smart agriculture, and

c) Promotion of agribusiness and trade related to farm products produced from target command area, and neighboring areas.

The plan is comprised of three parts:

(i) Application of government regulation on pesticide control.

(ii) Training of the integrated pesticides concept and/or other approaches for the safe use of pesticides; and

(iii) Monitoring.

Annex 6. Biodiversity Assessment Findings for Yutasas Sub-scheme

1. Proposed project activities and potential risks and impacts

Given the presence of endangered and critically endangered species and the sensitive habitat in the Yotasas command area, the proposed irrigation renovation scheme must be implemented with careful consideration to minimize negative impacts on biodiversity. By carefully considering the ecological implications of the project, it is possible to balance the needs of agriculture with the conservation of endangered species and their habitats. Under Yutasas, various activities will be carried out that cause the following E&S risks and impacts:

Table 1: Projection activities that may cause potential impacts on the environment and social aspects at Yutasas sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes, and water management practices	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.
2	Increased agricultural activities, sedimentation, and pollution	**Water quality degradation** could impact aquatic ecosystems and species that rely on clean water.
3	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. Changes in water levels and habitat quality could force endangered species to relocate,

		potentially leading to competition with other species or exposure to new threats.
4	Use of chemicals and nutrient loading	**If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.**
5	**Biodiversity degradation, and soil erosion**	The **potential** impacts of the project on water flow, water quality, and sedimentation patterns. The changes in microclimate.
6	Barriers to fish migration routs	Irrigation structures, such as dams and weirs, can obstruct fish migration, preventing them from accessing critical spawning grounds or nursery areas. This disruption of their natural life cycles can lead to reduced populations and species decline. To mitigate these negative impacts, it's essential to design and operate irrigation systems with fish-friendly considerations. Addressing this issue may includes incorporating measures like fish passage facilities[19], such as fish ladders or fish lifts, to enable safe movement upstream and downstream. Additionally, implementing effective water quality management practices and raising public awareness about the importance of protecting fish populations, particularly near fish passage areas, can contribute to the conservation of aquatic ecosystems.

2. Areas of Influence

The area of influence for the Yatasas Yotasas irrigation renovation scheme encompasses the direct and indirect impacts of the project. This includes:

- **Direct Impacts:** The immediate area where the irrigation infrastructure will be constructed and operated, including canals, pumping stations, and reservoirs.
- **Indirect Impacts:** The surrounding areas that may be affected by changes in water flow, land use, or other project-related activities. This includes the Stueng Krang Ponlai River,

[19] Fish passage is essential for fish to navigate water systems and access diverse habitats. Fish passage technologies, like fish ladders, help preserve fish populations and aquatic ecosystems. Fish need to migrate 10 miles or 1,000 miles to access different habitats, food, and environments that support their life cycles.

the Tonle River, and the habitats of endangered species within the Yotasas Yotasas command area.

3. Analysis to prepare for determining CH status

1.8 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

1.9 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Yutasas. The coordinates of Yutasas (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 6 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 3 reptile species, and 3 fishes (See list of 11 EN and CR species in Table below).

Description of screening for narrowing down

For Yutasas, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the Yutasas area of influence, covering reptiles and fish. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 5 EN and CR species were identified in the Yutasas area of influence (See Table 9 below). In the 3rd round of screening (in August 2024), however, 3 (out of a total of 5 species) were confirmed as "potentially present" in the Yutasas's area of influence.

So, the assessment for Yutasas focuses on the confirmed list of **3 species of fish** that are categorized by IUCN as EN and CR species (see map in Krapeu Trom section above).

Table 2: Confirmed List of endangered and critically endangered species for the Yutasas sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=5)	Confirmed Species in Round 3 (Total = 3)
I. Reptile species						
1	អណ្តើកព្រាច	Elongated Tortoise	Indotestudo elongata	CR	Yes	Yes

II. Fish species						
2	ត្រីត្រសក់ក្រហម	Jullien's Golden Carp	Probarbus jullieni	CR	Yes	Yes
3	ត្រីជង្ហាស្ទឹង	Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	Yes	Yes
4	ត្រីកាហោ /ត្រីគុលរ៉ាង	Mekong giant barb/Giant Carp	Catlocarpio siamensis	CR	Yes	Yes
II. Bird species						
5	ទាព្រៃស្លាបស	White-winged Duck	Asarcornis scutulata	EN	Yes	No

4. Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 3 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 3 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The Yutasas command area has been in existence since the 1970s. This command area is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the Stueng Krang Ponlai, are the sole ecological and hydrological connection between its upstream watershed and the downstream Tonle Sap River basin. This river is crucial for fish migration during the flooding season. However, reservoirs, spillways, and drought conditions have disrupted these essential ecological functions.

5. Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species (identified in the list of 3 EN and CR species) qualify for Critical Habitat features.

5.1 Habitat of significant importance to CE and EN species

As presented in Section 4.1.3.3 (Ecological State), species that qualify as critical habitat features include:

Based on the interviews and habitat assessments, three of the five endangered species were confirmed to be present in the Krapeu Trom section: Jullien's Golden Carp, Flying Minnow, and Mekong Giant Barb (see map above in Krapeu Trom section).

- **Jullien's Golden Carp:** A female fisher reported encountering this rare species in the lower part of the reservoir during a flood in 2022. She caught five individuals using a fishing net. The other informants had not seen this species in several years. After careful verification, it was determined that the fishers were familiar with the species and had not mistaken it for another.
- **Flying Minnow:** Two informants reported encountering this small fish species in 2022 and 2023. One caught them in the lower part of the Yotasass reservoir, where they had migrated from a downstream area. The other found them in her natural fish pond after pumping it. Both informants were confirmed to be familiar with the species.
- **Mekong giant Barb**: A key informant reported catching five individuals of this species in July 2022 after heavy rains. The fish were small, approximately 1.5 kilograms each, and were found in the lower part of the reservoir. The informant was familiar with the species and believed that they were attempting to migrate upstream but were trapped by the reservoir..

5.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Yutasas).

5.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for Yutasas, therefore is expected to qualify as critical habitats under this criterion.

5.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

5.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

Table 3: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Yutassas sub-scheme of the Project Area

English Name	Scientific Name	IUCN Status	Global population	Cambodia population	Migratory/ Congregatory	Habitat and Distribution	Likelihood of Occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Reptile									
Elongated Tortoise	Indotestudo elongata	CR	Unknown-kept declining	Unknown-kept declining	No	Endangered and elusive, inhabit the Tonle Sap Floodplain's diverse wetlands, including flooded forests and marshes. Their survival is threatened by habitat loss, hunting, and bycatch.	Not confirmed	There's some qualified habitat but lack of permanent and deep-water body. The species was confirmed present around 15 to 12 km way downstream far from the project area. Therefore, It's likely absent in the project AoI.	**Out**
Fish									
Jullien's Golden Carp	Probarbus jullieni	CR	Unknown-kept declining	Unknown-kept declining > 80% over three generations	Yes	*Probarbus jullieni* inhabits Cambodia's Mekong tributaries and large rivers, favoring deep, flowing lowland pools. Once widespread in the Mekong and Tonle Sap systems, its range is now fragmented and drastically reduced.	Low - Confirmed in AoI in 2024	Critically endangered due to overfishing, dams, and habitat loss, it is now extremely rare in Cambodian waters. This species migrates from Tonle Sap River system into the AoI through Stueng Krang Ponlai river system (Tonle Sap tributary). Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4threshold.	**IN**
Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	Unknown-kept declining	Unknown-kept declining	Yes	This species prefers clear, forested streams and tributaries across Cambodia's river systems. While likely widespread in suitable freshwater habitats, its precise distribution remains poorly documented.	Low - Confirmed in AoI in 2024	Endangered due to overfishing, dams, and habitat loss, it is now extremely rare. This species migrates from Tonle Sap River system into the AoI through Stueng Krang Ponlai river system (Tonle Sap tributary). Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4 threshold.	**IN**
Mekong giant barb/ Giant Carp	Catlocarpio siamensis	CR	Unknown-declined over 90% in the last three generations	Unknown-kept declining	Yes	*Catlocarpio siamensis* once lived in deep Mekong pools and tributaries but are now extremely rare and restricted to isolated spots due to overfishing and habitat loss.	Very Low - Confirmed in AoI in 2024	Critically endangered, with severe population declines attributed to overfishing, dam construction, and habitat degradation, rendering it exceptionally rare. It's reported that only juvenile individuals migrate from the Tonle Sap River system into the Area of Influence (AoI) via the Stueng Krang Ponlai River, a Tonle Sap tributary. Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4t hreshold.	**IN**
Bird									
White-winged Duck	Asarcornis scutulata	EN	Unknown	Unknown	No	Rare and poorly studied aquatic plant species endemic to Thailand, specifically found in the Chanthaburi Province.	Not confirmed	IUCN listed as EN and as the Endemic to the Thailand and therefore it has been screened out	**Out**

6. Mitigation Measures

To minimize the negative impacts of the irrigation renovation scheme on biodiversity, the following mitigation measures should be implemented:

6.1 Overviews

Yutasas: This sub-scheme has confirmed sightings of the critically endangered Jullien's Golden Carp, Leaping Barb (Flying Minnow), and Mekong Giant Barb. Construction activities, particularly worker presence, risk habitat disturbance and increased access for illegal fishing and capture, threatening these vulnerable species. Mitigation measures, including sensitive area avoidance, sustainable design, fish passageways, erosion control, and community-based conservation, are essential during all project phases.

6.2 Trigger of Implementation

Overall: The reports emphasize the urgent need for careful project planning and mitigation measures, including habitat restoration and sustainable water management, to minimize negative impacts on vulnerable species and their critical habitats. The project's area of influence extends beyond immediate command areas, requiring a holistic approach to conservation. Collecting and trafficking protected species are prohibited as described in the *Cambodia law/regulation:*

- Forestry Law (2002): This law provides the framework for the management and protection of forests, including wildlife. It prohibits hunting, capturing, and trading protected wildlife species without permission.
- Fisheries Law (2006): This law governs the management and protection of fisheries resources, including aquatic wildlife. It prohibits illegal fishing methods and the trade in endangered aquatic species.
- Protected Areas Law (2008): This law establishes and manages protected areas, such as national parks and wildlife sanctuaries, to conserve biodiversity, including threatened species. It restricts activities that could harm wildlife within these areas.
- Sub-decree on International Trade in Endangered Animals and Plant Species (2006): This sub-decree implements the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Cambodia. It regulates the import, export, and re-export of CITES-listed species.
- Penal code: he Cambodian Penal Code includes provisions that criminalize wildlife trafficking, with penalties including imprisonment and fines.

6.3 P1.1. Impact: Illegal wildlife collection, possession, and trafficking by site workers/ personnel.

Mitigation Measures:

<u>Pre-construction</u>:

- Develop a:
    a. Code of Conduct/ethics against wildlife collection, possession, and trafficking,
    b. SOP for wildlife protection and handling, and
    c. Training and awareness materials on human-wildlife conflict management. This should include biodiversity awareness training to raise their awareness on the:
        (i) ecological sensitivity of the site, importance of forest habitats, protected and threatened plants and animals within the Project area;
        (ii) proper protocols to adopt when wildlife is encountered;
        (iii) need to be cautious when operating machinery to avoid injury/mortality to fauna; and
        (iv) zero tolerance policy to possession of wildlife and forest resources. This should be applicable to both staff and contractors. These materials will also be used for Phase 2 and Phase 3 of the Project.

Responsible for Implementation:

- The PMC-Ecologist/Biodiversity Specialist to develop a) Code of Conduct/ethics against wildlife collection, possession and trafficking, b) an SOP for wildlife protection and handling, and c) training and awareness materials on human-wildlife conflict management.
- The PMC-Ecologist/Biodiversity Specialist to coordinate with the government agencies on wildlife conservation (MoE, MoAFF) and may seek technical assistance from NGO that has strong experience in wildlife protection, collection, possession, and trafficking, such as WCS, CI, and WA in developing the Code of Conduct, SOP for wildlife protection and handling and awareness and training materials on human wildlife conflict management.

- **Provide mandatory training for Contractors management staff and site worker on:**
    a. Code of Conduct/ethics against wildlife collection, possession and trafficking,
    b. SOP for wildlife protection and handling, and
    c. Human-wildlife conflict management.

Responsible for Implementation:

- The PMC is responsible in providing Training of Trainers to the CSCs and the CSCs are responsible to provide training on the Code of Conduct, SOP for wildlife protection and handling and awareness and training materials on human wildlife conflict management to all Contractors management staff and field workers prior to construction and operational Phases of the CAISAR project.

- The NGO and Cambodia conservation agency (WCS, CI, ANKO) staff can provide human resource in delivering the training.
- All management and field staff of the Construction Contractor are mandatory to attend the training on a) Code of Conduct/ethics against wildlife collection, possession and trafficking, b) SOP for wildlife protection and handling, and human-wildlife conflict management.

- Incorporate policy and associated systems and procedures inclusive of appropriate sanctions/contract termination actions that prohibit employees and/or subcontractors from possession, purchase, trade or collection of wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List, in the Project Administration Manual (PAM) and Worker's Agreement.

Responsible for Implementation:

- The PMU and PIU to incorporate the policy and associated systems and procedures in the PAM.
- The CAISAR Contractors and CAISAR Operators to incorporate the policy and associated systems and procedures in the Worker's Agreement.

Construction:

1. Minimize forest encroachment, wildlife poaching, and tree cutting due to improved access from new roads, a community-based management plan will be developed and implemented.

a. Minimize the increased potential for forest encroachment and wildlife poaching by people who could use new roads to access forest areas.
b. Avoid forest and land encroachment.
c. Minimize the intensity of poaching.
d. Tree cutting by the people, due to improved access to the area

Responsible to implement:

- Plan Development: Jointly develop a practical management plan with local communities and landowners.
- Guard Posts: Establish and maintain guard posts on temporary access and inspection roads near residential areas and priority biodiversity areas. (Include guard post construction costs in contractor agreements.)
- Surveillance: Conduct routine surveillance inspections on roads and in priority biodiversity areas (with landowner cooperation) to remove traps and deter hunting, logging, and plant removal.
- Signage**:** Install and maintain signs:
  - Banning unauthorized access on temporary roads.

- Prohibiting hunting, snaring, and other harmful activities, especially near priority biodiversity areas and working zones.

- Reporting**:** Report observed/recorded incidents of illegal activities to FiA, FA or other authorized agencies.

2. Undertake regular monitoring of all access roads (including all quarries and the cement batching plant) to secure them from poaching activities.

Responsible to implementation.

- The Contractor is responsible in undertaking regular monitoring of all access roads (including all quarries and the cement batching plant) to secure them from poaching activity.

3. Implement the PAM and Worker's Agreement which includes policy and associated systems and procedures inclusive of appropriate sanctions/contract termination actions that prohibit employees and/or subcontractors from poaching, possession, purchase, trade or collection of wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List. Corrective measures should be taken where necessary including appropriate actions against infringements.

Responsible for Implementation:

- The Contractor to implement the policy and associated systems and procedures.
- PIU should develop appropriate levels of penalisation against degree of infringement ranging from fines, suspension, and employment termination, and reporting to local authorities for prosecution (for most severe cases).

4. Check if feasible to control access road users during construction through use of security gates. If yes, security gates are to be manned by at least one (1) security officer 24 hours per day who will record the particulars (name, address, vehicle registration number, personal identification number) of all vehicles who are allowed into the access road. Visitors must also be always accompanied by a company representative. The security officers should be trained to identify behaviour associated with poachers and vehicle searches. The security gate should be equipped with 24-hour CCTV cameras. Evidence of such inspections/ vehicle searches to be recorded and available for review.

Responsible to implement:

- The CAISAR Contractor.

5. Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction Phase by to safer habitats. Handling and rescuing wild fauna will follow the SOP for wildlife protection and handling.

Responsible for Implementation:

- The is responsible handling, rescuing, and reporting encountered or caught wildlife during land clearing and construction works.

- The Contractor needs to coordinate with Cambodia conservation agency (FA, Phnom Tamao Wildlife Rescue Centre, or ACCB) in handling or rescuing the wildlife.
- Wildlife Encounter Protocols & Training: Implement protocols for wildlife encounters and train workers on appropriate responses, emphasizing non-interference and prohibiting harmful actions.
- Rapid Response Wildlife Unit: Establish a rapid response unit (potentially through a third party) to address human-wildlife conflict effectively.
- Community Information: Educate the community on local wildlife behavior, avoidance techniques, and deterrent methods.

Residual Impact: Minimal residual impact.

6.4 P1.2. Impact: Wildlife collisions with construction and quarry vehicles.

Trigger of Implementation:

The increase in vehicle movements such as trucks and excavators, particularly in quarry areas and access roads, will likely lead to increased chances of collisions with wildlife such as mammals and reptiles.

Mitigation measures:

Design/Pre-construction:

1. Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works. The inspections should be conducted to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur.

Responsible to implement:

- The Contractor is responsible to conduct the inspections and identify hotspots where collisions with wildlife are likely to occur.
- The CSC- Project Ecologist to provide technical assistance and guidance to the Construction Contractor in in conducting the inspections.

2. Provide general guidance to land clearance (refer to Appendix XX on Land Clearance SOP):
    a. When planning for expansion, ensure land clearance is undertaken in a Phased approach such that it complements wildlife shepherding activities.
    b. All proposed clearance areas will be marked in the field prior to any vegetation being cleared. The marking can use spray paint or marking tape. A briefing is to occur with personnel to outline the area proposed for clearing.
    c. An inspection is to occur following clearing to determine if clearing has been limited to the identified clearance area. Any clearing outside of the marked area is to be reported to the HSE Manager.

Responsible to implement:

- The Project Ecologist of CSC is responsible in providing guidance.

3. Prior to wildlife shepherding activities, undertake briefing with all involved personnel so they are aware of their roles and responsibilities; measures to deal with injured wildlife; occupational health and safety requirements; and requirements regarding the prohibition of hunting/ catching/ taking of fauna and flora. This will include incident reporting measures to relevant forestry authorities and stakeholders, and the reporting of any individual suspected or caught with fauna and flora to the relevant authority. Random inspections of personnel arriving and leaving the Project area can be considered. Refresher training is to occur with new employees.

Responsible to implement:

- The CSC- Project ecologist to train field workers to recognize and avoid wildlife.
- The field workers to report to the CSC HSE Manager of any wildlife sightings or collisions.

4. Provide features such as tunnels or rope bridges along temporary roads to enable wildlife movement and to reduce potential traffic incidents.

Responsible to implement:

- Design & Engineering Team: Responsible for incorporating wildlife crossing features (tunnels, rope bridges) into temporary road designs.
- Construction Contractor: Responsible for the physical implementation and construction of these features.

<u>Construction</u>:

1. Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur.

Responsible to implement:

- The Contractor to install the signage to alert drivers to the presence of wildlife and encourage them to slow down and drive with caution.

2. Implement speed limit (less than 40km/hour), to reduce the likelihood of collisions and give drivers more time to react to wildlife on the road.

Responsible to implement:

- The Contractor to implement the speed limit.

Residual impact: Minimal Residual Impact

6.5 P1.3. To prevent wildlife deaths and minimize disturbance to wildlife along access and inspection roads.

Management Actions: To prevent negative impacts of vehicle traffic on wildlife (animal collisions, disturbance etc.) the following actions will be implemented by Contractors:

Mitigation measures:

<u>Design/Pre-construction</u>:

1. Develop a system in which drivers report locations of wildlife crossing and wildlife sightings**.**

Responsible to implement:

- Project Environmental Team: Responsible for designing and implementing the wildlife sighting/crossing reporting system.
- Drivers/Transport Staff: Responsible for reporting observed wildlife crossings and sightings.
- Site Supervisors/Foremen: Responsible for collecting and relaying driver reports to the Project Environmental Team.

2. Information campaigns to explain to drivers about the biodiversity management objectives that seek to avoid wildlife collisions and disturbance, including:

Responsible to implement:

- Wildlife Awareness: Workers will receive training on frequently encountered wildlife (e.g., snakes, turtles, tortoises, nocturnal animals) and appropriate roadkill avoidance measures.
- Speed Limit Enforcement: Training will emphasize adherence to speed limits and the consequences of violations.
- Roadkill Reporting: A clear reporting system for animal collisions will be established, including reporting locations and designated recipients.

Construction:

3. Install and maintain signs in areas of frequent wildlife crossings, saying "beware of animal crossing" (complete with pictures of animals) in language understandable to all.

Responsible to implement:

- Environmental/Safeguards Team: Responsible for identifying high-risk crossing areas and designing appropriate signage.
- Construction Contractor: Responsible for the physical installation and maintenance of the signs.

Residual impact: Minimal Residual Impact

Annex 7. Chance Find Procedure

1. Purpose, Objectives and Scope

Construction of small infrastructure and facilities as well as livelihood supports related activities under the CAISAR project has the potential to alter tangible or intangible cultural heritages, unknown or unrecorded cultural and archaeological sites. The project will develop Chance Finds Procedure to define the steps on how Chance Finds will be managed once they have been discovered. MOWRAM PMU will ensure contractors and livelihood experts to be familiar with the possibility that they may discover unknown finds and know how to manage them.

The objectives of the Chance Finds Procedure are to:

- Define the steps which must be followed to manage the discovery of previously unknown sites, including the preservation and appropriate treatment of these finds, while minimizing any disruption to the construction schedule
- Enable compliance with all relevant national laws and regulations and other requirements.

MOWRAM PMU will make sure that the Chance Finds Procedure will be applied by all CAISAR contractors/ subcontractors at subproject sites.

2. Procedure and Implementation

Consultation. MOWRAM PMU will consult with all relevant parties, including relevant ministries at national level, provincial line technical departments, and district authority, in order to agree to the Chance Finds Procedure.

Laboratory and Other Support. MOWRAM PMU, with technical support from the Ministry of Culture and Fine Art and its provincial departments, will make arrangements for suitable laboratory test and other necessary facilities at provincial level or national level for identifying the find objects.

Training and Awareness. Where necessary, MOWRAM PMU, with support from cultural expert, will develop and implement a Cultural Heritage Training and Awareness. The training and awareness will include basic training in the identification of sites and objects relevant to the subproject sites, including the cultural significance of IC communities. The training and awareness shall be delivered to all relevant project implementation agencies at sub-national level, contractor, and subcontractor prior to their participation in subproject activities.

3. Implementation & Monitoring

Monitoring shall require the appropriately trained personnel to determine the significance of a chance find in accordance with the definitions provided in the CAISAR project's Cultural Heritage Management Framework and follow the Chance Find Flowchart provided in

Attachment 1.

Attachment 1 - Chance Find Flowchart

- Bound copy of Chance Finds Report Forms presented to MOWRAM PMU and provincial representative
- Verification of each Chance Find Report Forms to Chance Finds items completed
- Chance finds appropriately packed and labelled
- Inventory of Chance Finds Items placed inside packed boxes
- Outstanding issues relating to any or all of the above have been resolved
- MOWRAM PMU or provincial representative accepts transfer of Chance Finds items from contractor to relevant provincial department of Culture and Fine Art.

Contractor Representative	MOWRAM PMU Representative	Provincial Representative
Name	Name	Name
Signature	Signature	Signature
Date	Date	Date

4. Stop Work

a) Once cultural heritage objects sites are identified, contractor or sub-contractor shall immediately stop work within an approximate distance of the site.

b) Contractor/sub-contractor shall call MOWRAM PMU and provincial level to the location to make a rapid determination of the significance of the find.

c) Contractor/sub-contractor shall, in the event that a site of potentially high significance is discovered, demarcate, and secure the area.

d) MOWRAM PMU, provincial Department of Culture and Fine Arts and contractor shall evaluate sites or objects in accordance with the procedure required by the Ministry of Culture and Fine Arts.

e) If threated species such as animal and trees are found, these species must be kept intact, protected, and immediately reported to relevant site managers for appropriate handling. Wild animals spotted on the construction sites must not be caught for sale and/or consumption in any way.

5. Management of Chance Finds

In case the chance find site is a highly significant cultural sites, contractor and MOWRAM PMU shall work together to determine any requirements for community engagement

accordance to ESS10. The team will seek out and consult with the affected stakeholders and establish the appropriate action.

Management Options. The following management options will be considered:

- **Avoidance** to minimizes the impact to the site through partial or complete project redesign or relocation, should be the preferred option for cultural resource management perspective.
- **In-situ Management** This option includes the application of site protection measures. Appropriate protection measures will be identified and agreed between MOWRAM PMU, contractor, provincial department of culture and fine arts, and the local authority on a site-specific basis.
- **Destruction** If a site is assessed as having limited cultural significance, it may be destroyed once a complete photographic record has been made and the Chance Finds Report Form has been completed.

6. Reporting

All cultural heritage sites will be reported to MOWRAM PMU and provincial level and national level as part of contractor's monthly report, and will include a summary of:

- An update of the Key Performance Indicators
- Incidents of disturbance to known cultural heritage sites
- All cultural heritage sites identified, distinguishing between known and chance finds
- All Chance Finds, etc.

Annex 8 – Summary of Stakeholder Consultation

This section summarizes four consultation rounds carried out during the project preparation phase. These consultations involved discussions with relevant institutions, non-governmental organizations, local authorities, and local communities throughout the preparation process. The data collection and consultations were conducted over four periods:

1. First consultation

- The first consultation was conducted between 26 and 28 July 2024 to capture information regarding biodiversity and environmental condition in the project area.

2. Second consultation

- The second consultation was conducted to consult with forestry and fishery communities, local authorities and key informants to understand the situation and concerns related to the presence of the project. The consultation was conducted between 03 and 09 August 2024.

3. Result of consultation

- Based on the interviews and habitat assessments, three of the five endangered of fish species were confirmed to be present in the Yutasas sub-scheme: Jullien's Golden Carp, Flying Minnow, and Mekong Giant Barb.
- Proposed project activities: Given the critical habitats identified and the biodiversity assessment results, proposed project activities must prioritize conservation measures.

4. Third consultation

- The third consultation was conducted at household, village, and commune level stakeholders focusing on status, concerns and feedback regarding the project implementation. This consultation was conducted between 10 and 18 August 2024.
- The Yutasas sub-schemes have a predominantly young population, which suggests strong potential for future development, though higher education levels are low. Full-time private sector work is the main occupation, with 22% engaged in agriculture. For secondary jobs, full-time private sector work is the most common. About 14% of the population falls under poor categories 1 and 2, indicating economic challenges, while less percent of people with disabilities. Migration is notable, with 7.8% moving within the country and 1.5% abroad, totaling 9.3% of the population.
- Moreover, both men and women share together for household chore, agricultural involvement and decision making.

Table 1. List of participants of KII and FGD in Yutasas Command area

No	Name	Sex	Position	Commune	District
Key Informant Interview					
1	Nhem Non	M	Village Chief	Svay	Sameakki Mean Chey
2	Dik Hakk	M	Village Chief	Svay	Sameakki Mean Chey

3	Chea Sary	M	Deputy Village Chief	Svay	Sameakki Mean Chey
4	Chum Sam Ol	M	Commune Chief	Svay	Sameakki Mean Chey
Focus Group Discussion					
1	Iem An	M	Vegetable Farmer	Svay	Sameakki Mean Chey
2	Van Sarun	M	Vegetable Farmer	Svay	Sameakki Mean Chey
3	Aor Sat	F	Vegetable Farmer	Svay	Sameakki Mean Chey
4	Paok Raksmey	F	Vegetable Farmer	Svay	Sameakki Mean Chey
5	Sun Sreypov	F	Vegetable Farmer	Svay	Sameakki Mean Chey
6	Tum Siem	F	Rice Farmer	Svay	Sameakki Mean Chey
7	Mao Koeurng	F	Rice Farmer	Svay	Sameakki Mean Chey
8	Khut Vorng	M	Rice Farmer	Svay	Sameakki Mean Chey
9	Bel Soy	M	Rice Farmer	Svay	Sameakki Mean Chey
10	Sam Phorn	M	Rice Farmer	Svay	Sameakki Mean Chey
11	Poul Nhoeb	M	Rice Farmer	Svay	Sameakki Mean Chey
12	Phal Pheap	M	Rice Farmer	Svay	Sameakki Mean Chey
13	Iem An	M	Rice Farmer	Svay	Sameakki Mean Chey
14	Van Sarun	M	Rice Farmer	Svay	Sameakki Mean Chey
15	Aor Sat	F	Rice Farmer	Svay	Sameakki Mean Chey
16	Paok Raksmey	F	Rice Farmer	Svay	Sameakki Mean Chey
17	Sun Sreypov	F	Rice Farmer	Svay	Sameakki Mean Chey
18	Uoch Saren	F	Rice Farmer	Svay	Sameakki Mean Chey
19	Prak Bopha	F	Rice Farmer	Svay	Sameakki Mean Chey
20	Pak Maly	F	Rice Farmer	Svay	Sameakki Mean Chey
21	Chea Thy	F	Rice Farmer	Svay	Sameakki Mean Chey
22	Phorn Samley	F	Rice Farmer	Svay	Sameakki Mean Chey
23	Phoung Kroem	F	Rice Farmer	Svay	Sameakki Mean Chey
24	Seng Chanthy	F	Rice Farmer	Svay	Sameakki Mean Chey
25	Dum Korng	F	Rice Farmer	Svay	Sameakki Mean Chey
26	Reun Rith	M	Chicken Farmer	Svay	Sameakki Mean Chey
27	Chan Sothei	M	Chicken Farmer	Svay	Sameakki Mean Chey
28	Im Van	M	Chicken Farmer	Svay	Sameakki Mean Chey
29	Meng Dara	M	Chicken Farmer	Svay	Sameakki Mean Chey
30	Tom Nan	M	Chicken Farmer	Svay	Sameakki Mean Chey
31	Sam Nim	M	Chicken Farmer	Svay	Sameakki Mean Chey
32	Nim Ro	F	Chicken Farmer	Svay	Sameakki Mean Chey
33	Pov Kroeurn	M	Chicken Farmer	Svay	Sameakki Mean Chey
34	Sam Tha	F	Chicken Farmer	Svay	Sameakki Mean Chey
35	Hin Voeurn	M	Chicken Farmer	Svay	Sameakki Mean Chey
36	Vann Chhai	M	Duck Farmer	Svay	Sameakki Mean Chey
37	Pou Art	M	Duck Farmer	Svay	Sameakki Mean Chey
38	Chann Sothei	M	Duck Farmer	Svay	Sameakki Mean Chey
39	Norn Thoeurn	M	Duck Farmer	Svay	Sameakki Mean Chey
40	Norn Kroun	M	Duck Farmer	Svay	Sameakki Mean Chey
41	Pak Maly	F	Duck Farmer	Svay	Sameakki Mean Chey
42	Ek Yiem	F	Duck Farmer	Svay	Sameakki Mean Chey

Figure 1: Household survey in Svay commune



5. Fourth Consultation

The last consultation was conducted between 21 and 23 August 2024 with the district and provincial stakeholders, mainly focusing on the opinion, and feedback regarding the implementation of the project.

6. Consultation Results

6.1 Environment, Biodiversity and Climate Change Impact

6.1.1 Pollution prevention and resource efficiency

Concerns

- The construction process can release dust, which will disturb the local community and surface water quality.
- The disposal of solid, liquid, and domestic waste from the workers at the irrigation construction site will negatively impact local air quality and surface water.

Suggestions

- Regularly watering on the road transports construction materials and soil to reduce dust that may disturb nearby residents.
- Relevant ministries should conduct a visit to evaluate and address the issue of liquid waste from the construction activities in the commune.

6.1.2 Biodiversity

Concerns

- CAISAR project may cause changes in water quality, dust generation, air pollution, soil erosion, improper waste disposal, and hazardous waste from machinery.
- The fish populations in command areas may decrease due to disrupting the natural flow of water and the impact on their habitats from the implementation of the reirrigation infrastructure and canal upgrading.

Suggestions

- Contractors must regularly monitor and inspect of living conditions of the workers, manage waste effectively, and provide adequate housing and sanitation facilities to them.
- The project should avoid construction activities and improve irrigation on fish and aquatic habitats.
- Prevent damage from the construction activities to biodiversity, habitats, and other environmental components.

6.1.3 GHG Emission

Concerns

- Waste and pollution may contribute to the emission of GHG

Suggestions

- Contractors are advised to refrain from using outdated machinery.

6.2 Social Aspects

6.2.1 Labor and Working Conditions

Concerns

- The presence of construction staff and workers at the community may lead to sexual exploitation or affecting women workers and women and children in the community.
- Under 18 years old workers may be involved for the construction phase as they are illegible to work in factories or other companies that adhere to laws,
- At the construction sites, some men may undervalue women’s work. The gender disparities continue to exist, with some men holding the belief that women are not capable or willing to work.

Suggestions

- The construction companies should hire local workers to offer them jobs and strictly abide to laws and reducing the concerns about gender-based violence or sexual violent.
- Construction companies and relevant departments should provide training on gender issues, violence, labour laws, and social protections to their staff and workers.

- Additional support and monitoring measures should be implemented to prevent abuse, and any incidents should be promptly addressed to prevent recurrence.
- Local authorities should regularly monitor and inspect construction sites to ensure no children are working there, taking immediate action if any issues arise.

6.2.2 Community Health and Safety

Concerns

- The presence of workers could result in sexual abuse of women and children living near the project site,
- Drug trafficking and consuming among workers may cause unsafe environment for both workers and surrounded residents,
- After the construction complete, there may also be the risks of humans and animals falling into the canals causing drowning,
- Waste generated from worker camps and construction activities during the project could degrade water quality, negatively impacting human health, livestock, and crops.

Suggestions

- The construction companies should regularly place warning signs and water the roads, as well as schedule construction times to minimize noise pollution that could disrupt the community,
- The project should promote gender awareness, enforce stricter punishments for offenders, and prevent drug trafficking in the workplace,
- Separate accommodations for men and women should be provided,
- The construction companies must collaborate with local authorities in all activities to make a proper management, control and monitoring during construction, and
- The project should conduct gender education at the district to prevent and address gender-based violence,
- The project should establish gender outreach committees at the commune and village levels to monitor the gender related issues within the project areas, especially during construction,
- The project should equip the solar lights along the roads to promote the safety of travelers during nighttime.

6.2.3 Land acquisition, economic and physical displacement

Concerns

- While the project supports agricultural production, it may not benefit poor families who do not have land for farming,
- Conflicts between the project and affected families could emerge, often fuelled by external instigators rather than the families themselves, and

- Farmers who own land may lose it for farming, which could force them to migrate, heightening their vulnerability to exploitation and potentially causing their children to drop out of school.

Suggestions

- The project should conduct a preliminary study on land issues before construction is going to be implemented, addressing specific aspects of land impact and conducting evaluations for each affected property,
- The project/construction company must collaborate with local authorities to resolve land-related issues, and compensation should be provided to landowners affected by the project,
- If business land is impacted, the government or provincial authorities should provide temporary business premises,
- Advocacy for voluntary land contributions should be encouraged, as the project benefits both the community and individuals, and the restoration of old canals is supported to improve agricultural activities, and
- The construction company should submit quarterly monitoring reports on implementation activities to the provincial department to identify and quickly resolve any issues which affecting the livelihood of the community people.

6.2.4 Cross–cutting risks and impacts

Concerns

- Unequal water distribution among farmers leads to partisanship and disputes, often because farmers do not adhere to water distribution instructions or announcements from authorities,
- The FWUC could not generate income, causing the management of the water being difficult such as having no budget for repair, resulting in unproper operation of the system,
- Besides water issues, farmers also struggle with pests, diseases, inadequate labour, lack of capital, limited production technique, flooding, unstable sale price (vegetable and animal) and high agricultural input costs,
- The provincial department lacks budget to support water user conflict resolution,
- Tensions arise between upstream and downstream villages when water use upstream results in flooding downstream due to excess water being released during the wet season. Conversely, during the dry season, upstream water flow to downstream areas is insufficient.
- Manure for fertilizer is declining due to reduced animal raising and lower cattle prices are prompting farmers to reduce livestock raising.

Suggestions

- A proper handover to local authorities upon project completion should be conducted to avoid quiet handovers,

- Women should be engaged and be promoted as the members of Water User Community to promote water distribution equality regarding water allocation from the system,
- Closed monitoring and support to FWUCs are critical and should be conducted regularly by all levels,
- Water use and maintenance support should be provided including technical and management training, along with problem-solving techniques, to effectively control and manage water distribution,
- Ensure transparent water supply to prevent disputes by holding meetings to plan water use and distribution, involving the district governor, commune council, and relevant stakeholders,
- Prior to starting irrigation rehabilitation, organize a public forum to gather feedback from local residents, disseminate project information to people and stakeholders, and announce the construction period in advance.
- Increase the number of commune agricultural technical officers to provide training and monitor farmers' cultivation techniques.
- Build more water storages, and reservoir such as ponds or wells and conduct training on water-saving techniques to adapt to actual water availability.
- Installing and upgrading the damaged sluice gates to improve water distribution efficiency and prevent water loss in agricultural production and irrigation systems.
- Facilitate the development of additional agricultural markets.

Table 2. List of participants during the fourth consultation meeting

No	Name	Sex	Position	Organization
1	Pich Keomony	M	Deputy Provincial Governor	Provincial Hall
2	Un Sotha	M	Deputy Head of Admin Office	Provincial Hall
3	Kim Vanny	M	Head of Interdisciplinary Legal Affairs office	Provincial Hall
4	Heng Kimsreang	F	Deputy Director of Department	DAFF
5	Chum Maochandara	M	Officer	DAFF
6	Meach Phearith	M	Deputy Head of Office	DAFF
7	Yim Nimol	F	Deputy Director of Department	DoLVT
8	Rim Samang	M	Head of Office	DoLVT
9	Rouern Channa	M	Officer	DoLVT
10	Oeur Saroeurn	M	Deputy Director of Department	DoWRM
11	Pao Sophea	F	Director of Department	DoWA
12	Phin Phalla	F	Deputy Director of Department	DoWA
13	Lerng Sameth	M	Deputy Director of Department	DoE

14	Meas Sovanna	F	Head of Office	DoE
15	Khoun Chantheng	M	Deputy Head of Office	DoE
16	Chhun Sokomphea k	M	Deputy Director of Department	DoLMUPC
17	Aun Yada	F	Deputy Director of Department	DoCFA
18	Reach Panha	F	Nurse	Community Hope Org.
19	Moch Langheang	F	Assistant	Community Hope Org.
20	Vann Sambath	M	Director of Organization	Rural Water Supply, Sanitation & Hygiene Org.
21	Seng Vimean	F	Staff of GESDSI	Rural Water Supply, Sanitation & Hygiene Org.
22	Nhim Tith	M	Senior Water Resource Management	Rural Water Supply, Sanitation & Hygiene Org.
23	Sae Kem	F	Member of District Council	Sameakki Mean Chey District Hall
24	Hem Savet	F	Deputy District Governor	Sameakki Mean Chey District Hall

Figure 2: Consultation with Provincial Hall Officers, Kampong Chhnang Province



Figure 3: Consultation with Provincial Department of Women Affaire, Kampong Chhnang Province



Figure 4: Consultation with Sameaki Meanchey District officers, Kampong Chhnang Province



Annex 9: Laboratory Testing Result

Groundwater Quality Testing Result **210**
Surface Water Quality Testing Result **211**
Results of Soil Laboratory Testing **212**

Groundwater Quality Testing Result

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន លេប

WATER INNOVATION LAB

ផ្លូវជាតិលេខ៧ ភូមិអំពិលក្រោម ឃុំអំពិល ស្រុកកំពង់សៀម ខេត្តកំពង់ចាម

National Road 7, Ampil Krom Village, Ampil Commune, Kampong Siem District, Kampong Cham 030501, Cambodia

E-mail: lab@wil-kh.com; Tel: +855-16-668 900

Date: 19 August 2024
Reference No: 240006

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	GW2	Water Source:	Well
Client:	PPIC	Province:	Kampong Chhnang
Date received:	11-Aug-24	District:	Rolea Bier
Collection date:	10-Aug-24	Commune:	Prasneb
Preservation:	HNO3/Ice box	Village:	Prey Sampov

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.5		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	58.12	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	5		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	3.5	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.29	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	1,600	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	116.1	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.3	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	1.45	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

WATER INNOVATION LAB KINGDOM OF CAMBODIA

Samrach Phan

Surface Water Quality Testing Result

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន លេប

WATER INNOVATION LAB

ផ្លូវជាតិលេខ៧ ភូមិអំពិលក្រោម ឃុំអំពិល ស្រុកកំពង់សៀម ខេត្តកំពង់ចាម

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E-mail: lab@wil-kh.com; Tel: +855-16-668 900

Date: 19 August 2024
Reference No: 240013

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW6	Water Source:	River
Client:	PPIC	Province:	Kampong Speu
Date received:	11-Aug-24	District:	Odongk
Collection date:	10-Aug-24	Commune:	Preah Sre
Preservation:	HNO3/Ice box	Village:	Ta Cheal

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.91		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	91.58	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	43		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	17.7	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.9	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	157,500	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	183.4	0.0	
11	Temperature	Electrode	°C	10-Aug-24	33.4	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.65	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

Samrach Phan

Results of Soil Laboratory Testing

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ
អគ្គនាយកដ្ឋានកសិកម្ម

លេខ....អ.ន.ក

ថ្ងៃ...ទី...ខែ...ឆ្នាំ...ត.ស.២៥៦...
រាជធានីភ្នំពេញ ថ្ងៃទី...ខែ...ឆ្នាំ...

លទ្ធផលវិភាគដី

Soil Analysis Results

ឈ្មោះក្រុមហ៊ុន(Company Name): **PPIC Co.,Ltd**
អាសយដ្ឋានAddress:
ថ្ងៃខែទទួលសំណាក: 14/8/24 , NAL : 574-256

Lab. ID: 61 /24		LabNo. :	1
Description Parameter		Field ID:	SS 01
			X= 355662, Y= 1399063
Particle Size (Pipette Method)	(< 0.002mm)ដីដូ, Clay %		9.90
	(0.002-0.02 mm)ល្បាប់ ម៉ដ, Fine Silt , %		37.65
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		21.71
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ, Fine Sand,%		30.59
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		3.22
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			1.67
កាបូន Total Carbon (Black & Walkey Method) , C %			2.22
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.19
អនុបាត C/N Ratio (Unit)			12
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.82
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.051
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			51
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil			13.00
(Method ,IM Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, IM Ammonium Acetateat pH =7)	កាល់ស្យូម, Calcium Ca		3.06
	ម៉ាញ៉េស្យូម,Magnesium Mg		1.28
	សូដ្យូម,Sodium Na		1.42
	ប៉ូតាស្យូម,Potasium K		0.77
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			6.53
អត្រាចំអែតនៃកាចុង, Bass Saturation %			50
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			20.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.20
បញ្ជូនអ.ឌីម៉ែលជាតិប្រៃជី Electrode Conductivity µS/cm , (1:5 Soil: water)			96.80
ប៉េហាសិទីក, pH H2O , (1:5 Soil: water)			5.36
ប៉េហាស់អ៉ីបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.21

អាសយដ្ឋានលេខ: ៥៤ប/៤៩ផ្លូវ ផ្លូវលេខ ៣៩៥-៦៥៦ សង្កាត់ទឹកល្អក់៣ ខ័ណ្ឌទួលគោក រាជធានីភ្នំពេញ ទូរស័ព្ទលេខ:(០២៣) ៤៨៣ ៤២៧ ទូរសារលេខ:(០២៣) ៤៨៣ ៤២៧
Address# 54B/49F, Street 395-656, Sangkat Toeuk Laak3, Khan Tuol Kok, Phnom Penh. Cambodia, Phone : (023) 883 427, Fax : (023) 883 427

Lab. ID: 61 /24		LabNo. :	2
Description Parameter		Field ID:	SS 02
			X= 354509, Y= 1406852
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		14.01
	(0.002-0.02 mm)ល្បាប់ ម៉ត់, Fine Silt , %		35.55
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		22.69
	(0.05- 0.2 mm) ខ្សាច់ម៉ត់, Fine Sand,%		32.75
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		2.32
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			1.73
កាបូន Total Carbon (Black & Walkey Method) , C %			1.84
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.16
ផូស្វ័សសរុប Total Phosphorus (Nitric Digestion) P %			0.043
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			41
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil			12.40
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)		កាល់ស្យូម, Calcium Ca	3.77
		ម៉ាញ៉េស្យូម,Magnesium Mg	1.38
		សូដ្យូម,Sodium Na	0.75
		ប៉ូតាស្យូម,Potasium K	0.27
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			6.17
អត្រាចំអែតនៃកាចុង, Bass Saturation %			50
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			15.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បញ្ជូន.អ.នីមើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			36.10
ប៉េហាសសីក, pH H2O , (1:5 Soil: water)			5.29
ប៉េហាសអំបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.12

2

Lab. ID: 61 /24		LabNo. :	3
Description Parameter		Field ID:	SS 03
			X=441471, Y=1355655
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		1.23
	(0.002-0.02 mm)ល្បាប់ ម៉ត់, Fine Silt , %		3.40
	(0.02- 0.05 mm)ល្បាប់ គ្រឹម, Coase Silt , %		5.23
	(0.05- 0.2 mm) ខ្សាច់ម៉ត់, Fine Sand,%		33.52
	(0.2 - 2 mm) ខ្សាច់គ្រឹម, Coase Sand,%		55.72
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			0.20
កាបូន Total Carbon (Black & Walkey Method) , C %			1.80
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.10
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.046
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			46
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil			10.00
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)	កាល់ស្យូម, Calcium Ca		3.56
	ម៉ាញ៉េស្យូម,Magnesium Mg		1.58
	សូដ្យូម,Sodium Na		0.30
	ប៉ូតាស្យូម,Potasium K		0.13
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			5.57
អត្រាចំអែតនៃកាចុង, Bass Saturation %			56
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			5.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.04
បញ្ជូន.អ.ន៏មើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			99.30
ប៉េហាសសំទឹក, pH H2O , (1:5 Soil: water)			7.67
ប៉េហាសសំប៉ិល , pH KCL , (1:5 (Soil : 1N KCL)			6.51

Lab. ID: 61 /24		LabNo. :	4
Description Parameter		Field ID:	SS 04
			X=465450, Y=1304887
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		14.95
	(0.002-0.02 mm)ល្បាប់ ម៉ដ្ត, Fine Silt , %		30.00
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		19.81
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ្ត, Fine Sand,%		31.12
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		5.92
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			2.64
កាបូន Total Carbon (Black & Walkey Method) , C %			1.63
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.14
អនុបាត C/N Ratio (Unit)			12
សារធាតុសរីរាង្គ Organic Matter (OM) %			2.80
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.044
ផូស្វ័រអាឡាយ Available Phosphorus (Bray II) , P (ppm)			29
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil			16.50
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)		កាល់ស្យូម, Calcium Ca	8.30
		ម៉ាញ៉េស្យូម,Magnesium Mg	2.37
		សូដ្យូម,Sodium Na	2.57
		ប៉ូតាស្យូម,Potasium K	0.36
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			13.60
អត្រាចំរែតនៃកាចុង, Bass Saturation %			70
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			10.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បណ្តាន.អ.ន៏មើលជាតិប្រៃជី Electrode Conductivity µS/cm , (1:5 Soil: water)			108.40
ប៉ើហាស់ទឹក, pH H2O , (1:5 Soil: water)			7.41
ប៉ើហាស់អំបិល , pH KCL , (1:5 (Soil : 1N KCL)			6.23

4

Lab. ID: 61 /24		LabNo. :	5
Description Parameter		Field ID:	SS 05
			X=469604 , Y=1306117
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		7.30
	(0.002-0.02 mm)ល្បាប់ ម៉ដ់, Fine Silt , %		21.10
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		11.70
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ់, Fine Sand,%		30.29
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		28.78
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			2.62
កាបូន Total Carbon (Black & Walkey Method) , C %			1.87
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.22
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.094
ផូស្វ័រអាចយក Available Phosphorus (Bray II) , P (ppm)			37
សមត្ថភាពដោះដូរកាថុង Cation Exchange Capacity C.E.C meq/100g Soil (Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			16.30
កាថុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)		កាល់ស្យូម, Calcium Ca	5.43
		ម៉ាញ៉េស្យូម,Magnesium Mg	1.48
		សូដ្យូម,Sodium Na	1.50
		ប៉ូតាស្យូម,Potasium K	0.35
កាថុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			8.76
អត្រាចំរែតនៃកាថុង, Bass Saturation %			54
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			10.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បញ្ជូន.អ.ន៏មើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			63.00
រ៉ែហាស់ទឹក, pH H2O , (1:5 Soil: water)			5.66
រ៉ែហាស់អំបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.47

ចំណាំ:លទ្ធផលនៃការវិភាគមានតម្លៃតែលើសំណាកដែលបានបញ្ជូនមកវិភាគតែប៉ុណ្ណោះ(Note:Analysis result refers to the sumitted sample only).

ប្រធានមន្ទីរពិសោធន៍ជាតិកសិកម្ម

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ប្រតិភូរាជរដ្ឋាភិបាលកម្ពុជាទទួលបន្ទុកជាអគ្គនាយក

នៃអគ្គនាយកដ្ឋានកសិកម្ម

អគ្គនាយករង

ហ៊ូ ឥន្ទ្រា

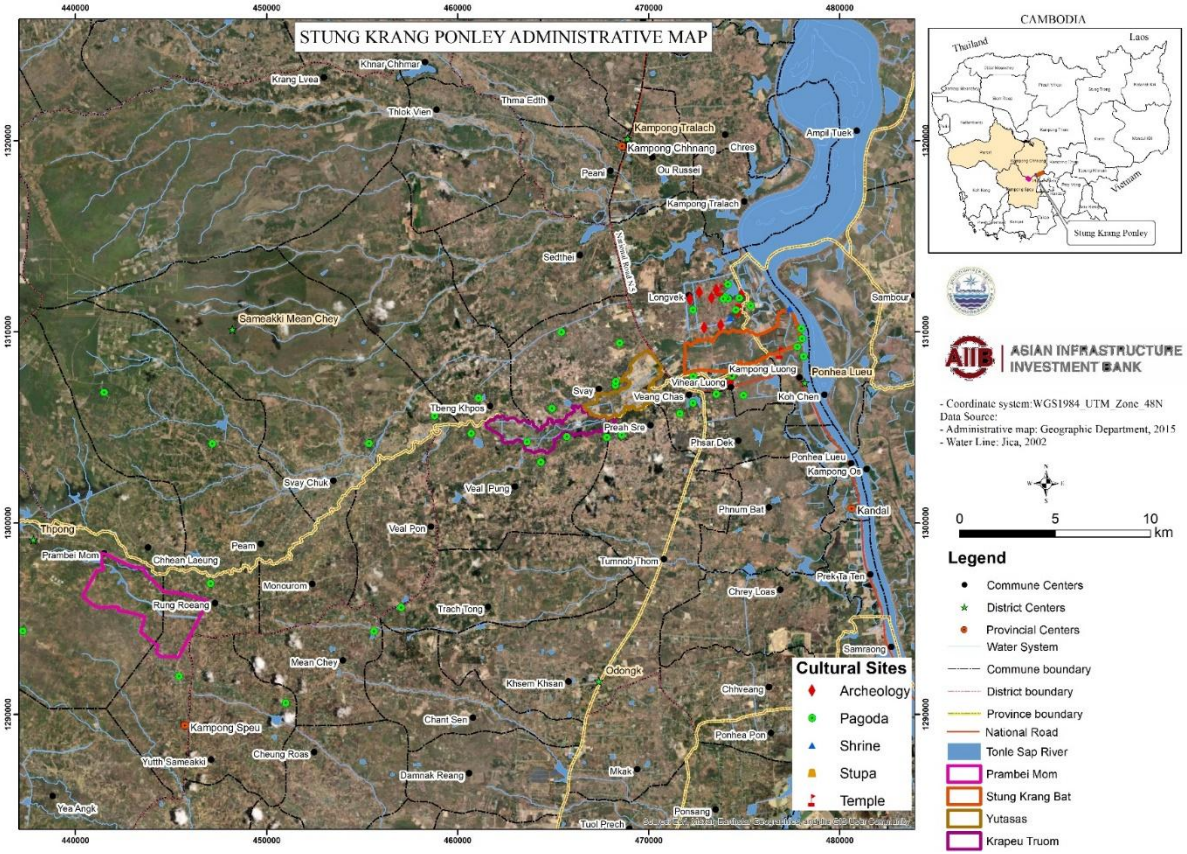
Annex 10. List of Archeological and Cultural Sites

The following are the list of the archeological and cultural sites within the command areas as per the statistics given by Provincial Department of Culture and Fine Arts in 2024.

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
1	Yutasas	វត្តទន្លាប់	Tonlab	Pagoda	Khyang Cheung	Svay	Sameakki Meanchey	Kampong Chhnang	468243	1307222
2	Yutasas	វត្តខ្យាង	Khyang	Pagoda	Khyang Tbuong	Svay	Sameakki Meanchey	Kampong Chhnang	468275	1307412
3	Yutasas	វត្តវាំងចាស់	Vaing Chas	Pagoda	Knong Veang	Veang Chas	Odongk	Kampong Speu	472311	1306273
4	Yutasas	វត្តព្រៃក្រាប	Prey Chrab	Pagoda	Prey Chrab Lech	Veal Pung	Odongk	Kampong Speu	467805	1304487
5	Yutasas	វត្តអង្គសណ្តាន់	Ang Sandan	Pagoda	Angk Sandan	Preah Sre	Odongk	Kampong Speu	468585	1304611
6	Yutasas	វត្តវិហារចាមសាមគ្គី	Vihear Cham Samaki	Pagoda	Thmei	Svay	Sameakki Meanchey	Kampong Chhnang	468475	1309425

(Source: Kampong Speu Provincial Department of Culture, and Fine Arts, 2024).

Figure 1: Maps of archeological and cultural sites in Stung Krang Ponley Sub-scheme



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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 14. c. ESCIA

Document Date:	28/07/2025
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Asia and the Pacific Division
Programme Management Department

ANNEX

ANNEX 1: BIODIVESITY ASSESSMENT REPORT

BIODIVESITY ASSESSMENT REPORT

Table of Contents

1. 395
   1.1. 396
   1.2. 396
   1.3. 399
   1.4. 399
2. 399
3. 402
   3.1. 402
   3.2. 403
      3.2.1. 403
      3.2.2. 403
      3.2.3. 403
   3.3. 403
      3.3.1. 403
      3.3.2. 404
      3.3.3. 404
   3.4. 404
   3.5. 404
   3.6. 404
   3.7. 404
4. 407
5. 407
   5.1. 407
   5.2. 409
   5.3. 409
      5.3.1. 409
      5.3.2. 409
      5.3.3. 411
      5.3.4. 422
   5.4. 424
      5.4.1. 425
      5.4.2. 430
      5.4.3. 430
      5.4.4. 430
      5.4.5. 430
   5.5. 430
      5.5.1. 431

5.5.2. 431
5.6. 437
6. 439
6.1. 439
6.2. 440
6.3. 440
6.3.1. 440
6.3.2. 440
6.3.3. 441
6.4. 442
6.4.1. 443
6.4.2. 443
6.4.3. 443
6.4.4. 444
6.4.5. 444
6.5. 444
6.5.1. 444
6.5.2. 444
6.6. 447
7. 448
7.1. 448
7.2. 449
7.3. 449
7.3.1. 449
7.3.2. 449
7.3.3. 449
7.4. 450
7.5. 451
7.5.1. 451
7.5.2. 451
7.5.3. 451
7.5.4. 451
7.5.5. 451
8. 452
8.1. 452
8.2. 452
8.3. 453
8.3.1. 453

8.3.2. 453
8.3.3. 453
8.4. 454
8.4.1. 454
8.4.2. 455
8.4.3. 455
8.4.4. 455
8.4.5. 455
9. 455
9.1. 455
9.2. 456
9.3. 457
9.3.1. 457
9.3.2. 457
9.3.3. 458
9.4. 458
9.4.1. 459
9.4.2. 459
9.4.3. 459
9.4.4. 459
9.4.5. 459
10. 461
10.1. 461
10.2. 462
10.3. 462
10.3.1. 462
10.3.2. 462
10.3.3. 464
10.4. 466
10.4.1. 466
10.4.2. 467
10.4.3. 467
10.4.4. 467
10.4.5. 467
10.5. 470
11. 471
11.1. 471
11.2. 472

11.3. 473
11.4. 476
11.5. 477
12. 478
12.1. 478
12.2. 478
12.3. 478
12.4. 479
12.5. 479
12.6. 480
12.7. 481
13. 481
14. 483
15. **Error! Bookmark not defined.**
15.1. **Error! Bookmark not defined.**

List of Tables

Table 1: Second screening list of Endangered and Critically Endangered Birds, Mammals, Reptile and Fishes 7
Table 2: Quantitative thresholds for criteria 1-3 relating to tier 1 and tier 2 critical habitat 12
Table 3: Projection activities that may cause potential impacts on the environment and social aspects at Ou Tapaong sub-scheme 13
Table 4: Confirmed List of endangered and critically endangered species for the Ou Tapaong sub-scheme 16
Table 5: list of internation and nation key expert were consulted to check and verify each all target EN and CR species 30
Table 6: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Ou Ta Paong sub-scheme of the Project Area 1
Table 7: Results of the prioritisation exercise to support BAP planning: priority biodiversity for BAP actions for Ou Tapong 1
Table 8: Projection activities that may cause potential impacts on the environment and social at the Lum Hach sub-scheme 3
Table 9: Confirmed List of endangered and critically endangered species for the Lum Hach sub-scheme 5
Table 10: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Lum Hach sub-scheme of the Project Area 1
Table 11: Results of the prioritisation exercise to support BAP planning: priority biodiversity for BAP actions for Lum Hach 1
Table 12: Projection activities that may cause potential impacts on the environment and social aspects at Brambei Mom sub-scheme 2
Table 13: Projection activities that may cause potential impacts on the environment and social aspects at Krapeu Trom sub-scheme 6
Table 14: Projection activities that may cause potential impacts on the environment and social aspects at Yutasas sub-scheme 2

Table 15: Confirmed List of endangered and critically endangered species for the Yutasas sub-scheme 4
Table 16: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Yutassas sub-scheme of the Project Area 1
Table 17: Projection activities that may cause potential impacts on the environment and social aspects at Stueng Krang Bat sub-scheme 2
Table 18: List of endangered and critically endangered species based on the IBAT Screening result vs. key informant interview at Stueng Krang Bat Sub-scheme 4
Table 19: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Stueng Krang Bat sub-scheme of the Project Area 10
Table 20: Results of the prioritisation exercise to support BAP planning: priority biodiversity for BAP action for Stueng Krang Bat 11

List of Figures

Figure 1 – Locations of six irrigation sub-schemes located in four provinces 3
Figure 2: Map showing the observed distribution of identified EN and CR species (with the potential movement of 1-2 km within and around suitable habitats (2020 to 2024) 17
Figure 3: Distribution of identified turtle and tortoise species in and outside the OTP Command Area 19
Figure 4: A spatial distribution map was generated for three bird species—the Bengal Florican, Greater Adjutant, and Milky Stork—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 21
Figure 5: Photograph of a Milky Stork foraging alongside a flock of Painted Storks (credit: Sang Mony, Sam Veasna Conservation Tour), and a map illustrating the distribution of Milky Stork sightings in Cambodia from 2020 to 2024, extracted from eBird data. 22
Figure 6. *Photo of Yellow-breasted Bunting (Emberiza aureola) and its distribution map from eBird data (2020-2024)recorded by birdwatcher and wildlife overserves.* 23
Figure 7: A spatial distribution map was generated for two primate species—the Indochinese Silvered Langur and Long-tailed Macaque—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 26
Figure 8: A spatial distribution map was generated for two fish species—the Siamese Tiger Perch, and Striped Catfish (old record-7 years ago)—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats. 28
Figure 9: Map of Ou Tapong Command Area and other existing protected areas under administered of the Ministry of Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministries of Water Resources and Meteorology 30
Figure 10: Land use and land cover map based on the satellite image from Sentinel-2 with 10m resolution. 32
Figure 11: Map of Ou Tapaong command area and other existing protected area within the Tonle Sap Basin 34
Figure 12: *Boeung Kansaeng located in Ou Tampaong's upper reaches, offers sighted records of Siamese Tiger Parch. The area's upper part in this photo is a settlement along the Svay Daunkav River.* 36
Figure 13: Overview of Boeung Kansaeng, located upstream of Ou Tapaong Command Area. A canal connects to Stueng Svay Daunkav River (left) and Ou Tapaong (right), a potential fish migration route during floods. 36

Figure 14: Aerial photograph depicting the Ou Tapaong Stream/canal fragmented by earth dams, roads, and ponds, illustrating its diversion for non-intended purposes. 36
Figure 15: Aerial photograph of intake flooded forest habitat within Tonle Sap Zone 3 and the continuous land encroachment, converting forest land for rice cultivation. 37
Figure 16: Green Peafowl distribution in Toul Samraong, Phnom Banon, and Chan Trak Community Forests, as confirmed by local sources from 2020 to 204. 6
Figure 17: The upperpart of Hum Hack next to Boribou river catchment area 7
Figure 18: Overview from the above of the general condition of Toul Samroang and Phnom Banon Community Forests 7
Figure 19: Overview from the above of the general condition of Chan Trak Community Forest 7
Figure 20: An expert consulted with the Toul Samraong CF management committee to verify the identification of a canine species, ensuring it was correctly identified as either a dhole or a jackal. 7
Figure 21: Interviewing and verifying Mekong Giant Barb with similar look of other fish species and their ecological niches 5
Figure 22: Local fishermen in Brabei Mom mistakenly identified their catch of Rohu (Labeo rohita) as Mekong Giant Barb. 5
Figure 23: A spatial distribution map was generated for four fish species at Krapeu Trom and Yotasas Command Area. 1 km buffer zones were included to approximate their minimum movement range around suitable habitats. 9
Figure 24: *Map showing the distribution of endangered (EN) and critically endangered (CR) species, with 1-2 km buffers indicating their potential movement ran ge within and around suitable habitats as identified by key informants sighted from 2020 to 2024.* 7

List of Abbreviations

ACCB	Angkor Centre for Conservation of Biodiversity
ANKO	Akphivath Neary Khmer Organization
AoA	Area of Analysis
ASAP	Asian Species Action Plan
BAP	Biodiversity Action Plan
BMP	Best Management Practices
CAISAR	Climate Adaptive Irrigation and Sustainable Agriculture for Resilience
CBD	Convention on Biological Diversity
CCTV	Closed-Circuit Television
CF	Community Forests
CFi	Community Fisheries
CH	Critical Habitat
CI	Conservation International
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CR	Critically Endangered (IUCN Red List category)
CSC	Construction Supervision Consultant
E & S	Environmental and Social
EN	Endangered (IUCN Red List category)
EOO	Extent of Occurrence
ESCIA	Environmental and Social Impact Assessment
ESCMP	Environmental, Social, and Climate Management Plan
ESMP	Environmental and Social Management Plan
EU	European Union
FA	Forestry Administration (Cambodia)
FiA	Fisheries Administration (Cambodia)
GCF	Green Climate Fund
GIS	Geographic Information System
GN	Guidance Note
HSE	Health, Safety, and Environment
IBAs	Important Bird Areas

IBAT	Integrated Biodiversity Assessment Tool
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
KBA	Key Biodiversity Area
KII	Key Informant Interviews
LH	Lum Hach (sub-scheme)
LoO	Likelihood of Occurrence
MoAFF	Ministry of Agriculture, Forestry, and Fisheries (Cambodia)
MoE	Ministry of Environment (Cambodia)
MoE	Ministry of Environment
MOWRAM	Ministry of Water Resources and Meteorology
NGO	Non-Governmental Organization
OTP	Ou Ta Paong (sub-scheme)
OTP	Ou Tapaong
PAM	Project Administration Manual
PIU	Project Implementation Unit
PKO	Punleu Komar Organization
PMC	Project Management Consultant
PMU	Project Management Unit
PPIC	Phnom Penh International Consultant Co. Ltd.
PS6	Performance Standard 6
SK-CFi	Sdok Khlouk Community Fishery
SKB	Stung Krang Bat
SMY-CFi	Samraong Muk Yeik Community Fishery
SOP	Standard Operating Procedure
STSF	Southern Tonle Sap Floodplain
ToR	Terms of Reference
TSA	Tonle Sap Authority
TSRB	Tonle Sap River Basin
VU	Vulnerable

WA	Wildlife Alliance
WCS	Wildlife Conservation Society
WHS	World Heritage Sites

DEFINITIONS

Modified habitat. Areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. 5 Modified habitats may include areas managed for agriculture, forest plantations, reclaimed6 coastal zones, and reclaimed wetlands.

Natural habitats. Areas that are composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

1. Introduction

The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project in Cambodia is designed to support the Royal Government of Cambodia's National Water Resources Management and Sustainable Irrigation Road Map and Investment Program (2019-2023). The project's primary objective is to enhance the irrigation sector's resilience to climate change while promoting sustainable agricultural practices that also reduce greenhouse gas emissions. CAISAR focuses on improving smart irrigation systems, incorporating renewable energy, and advancing farming techniques to address climate change impacts such as altered rainfall patterns and water-related disasters.

The project's strategy is based on a Theory of Change that posits that upgrading irrigation infrastructure, disseminating knowledge of energy-efficient agricultural technologies, and strengthening agricultural value chains will foster a more resilient and sustainable agricultural sector in Cambodia. This approach is expected to improve crop production, reduce greenhouse gas emissions, enhance climate adaptation, and reinforce the institutional framework for managing these changes.

Financially supported by international organizations such as the Asian Infrastructure Investment Bank (AIIB), the International Fund for Agricultural Development (IFAD), and the Green Climate Fund (GCF), the project targets climate adaptation and livelihood improvement in four Cambodian provinces: Pursat, Kampong Chhnang, Kampong Speu, and Kandal. It is structured around three main components: enhancing farm-level climate resilience, upgrading water infrastructure, and strengthening institutional capacities.

To ensure that environmental, social, and climate considerations are effectively addressed, the Ministry of Water Resources and Meteorology (MOWRAM) will conduct Environmental, Social, and Climate Impact Assessments (ESCIA) and Environmental, Social, and Climate Management Plans (ESCMP), collectively referred to as the “E&S study.” This assessment report focuses primarily on Component 2 of the project and aims to align with relevant standards, contributing to the project's goals of climate resilience and sustainable development.

Furthermore, this study is fully aligned with the International Finance Corporation's Guidance Note 6 (IFC Guidance 6), a comprehensive framework for biodiversity conservation and sustainable management of living natural resources in business operations. IFC Guidance 6 offers guidance on avoiding, minimizing, and mitigating impacts on biodiversity and ecosystems. This biodiversity assessment prioritizes the protection of endangered and critically endangered species and their habitats, promotes sustainable natural resource management, and ensures that development activities adhere to international conservation standards. It also outlines best practices for preserving ecosystem services and fosters stakeholder engagement and equitable benefit-sharing from natural resource use.

The "area of influence" was defined as the geographical region, encompassing globally threatened species or ecosystems, potentially affected, directly or indirectly, by the proposed project. This initial assessment was crucial for identifying and evaluating potential environmental impacts beyond the immediate project site. The area of influence includes the physical and biological environment that could be affected by the project, such as air quality, water resources, soil quality, flora and fauna, human settlements, and cultural heritage. It also considers potential indirect impacts on surrounding areas, including noise pollution, traffic patterns, and socioeconomic conditions.

Renovation of irrigation systems within the Tonle Sap Floodplains offers significant potential benefits to a wide range of stakeholders. Primarily, farmers who rely on these systems for their livelihoods will experience improved water management, increased crop yields, and reduced water wastage. Additionally, the project can contribute to broader ecological benefits by enhancing water quality, reducing soil erosion, and supporting biodiversity

conservation. Furthermore, revitalized irrigation systems can contribute to food security, rural development, and poverty reduction in the region.

1.1 Cambodia's Laws Protecting Environment and Biodiversity

Cambodia's government has made significant efforts to protect biodiversity through the establishment of a comprehensive legal framework. Key legislations include the Biodiversity Law (2009), which governs sustainable biodiversity management, and the Environmental Protection Law (1995), which sets broad principles for environmental management. Additionally, the Forest Law (1994) and Wildlife Sanctuary and Protection Law (1993) safeguard critical habitats and species, while the Fisheries Law (1991) ensures sustainable aquatic resource management. The recently introduced Environmental Code (2023) further strengthens regulations on pollution control and biodiversity conservation. Cambodia also participates in international agreements like the Nagoya Protocol, aligning its conservation efforts with global standards. Despite these advancements, effective implementation and enforcement remain essential to achieving long-term biodiversity protection. Below are short sumary of several key national legislations and international agreements:

- **Biodiversity Law (2009):** This foundational law provides a comprehensive legal structure for the sustainable management of biodiversity resources. It addresses habitat protection, species conservation, genetic resource management, and the sustainable use of biodiversity, outlining the government's responsibilities and promoting public participation.
- **Environmental Protection Law (1995):** This law sets general principles for environmental protection and outlines the government's role in environmental management, including pollution control, waste management, and natural resource conservation. It complements the Biodiversity Law by providing a broader environmental governance framework.
- **Forest Law (1994):** Regulating the management, use, protection, and restoration of Cambodia's forests, this law is crucial for balancing economic development with environmental conservation, particularly in biodiversity-rich ecosystems.
- **Wildlife Sanctuary and Protection Law (1993):** This law establishes wildlife sanctuaries and offers protection to wildlife species by prohibiting hunting, trapping, and other activities that threaten wildlife and their habitats.
- **Fisheries Law (1991):** This law governs the management of Cambodia's fisheries resources, setting rules for sustainable fishing practices, protecting aquatic habitats, and ensuring the long-term health of aquatic ecosystems.
- **Environmental Code (2023):** The newly introduced Environmental Code consolidates and updates Cambodia's environmental laws, introducing stricter regulations on pollution control, natural resource management, and biodiversity conservation. It emphasizes climate change adaptation and mitigation and enhances public participation and transparency in environmental decision-making.
- **Nagoya Protocol (2010):** As a party to the Nagoya Protocol under the Convention on Biological Diversity (CBD), Cambodia commits to the fair and equitable sharing of benefits arising from the utilization of genetic resources. This protocol supports Cambodia's efforts to protect its biodiversity while ensuring that the benefits of its genetic resources are shared with local communities and stakeholders.

1.2 Project Objectives, Components, and Activities

The project objective is to increase climate adaptation, mitigate the negative impact of extreme climate events, and improve the livelihoods of smallholder farmers and vulnerable rural communities in four provinces of Cambodia, including Pursat, Kampong Chhnang, Kampong Speu, and Kandal provinces (see map below).

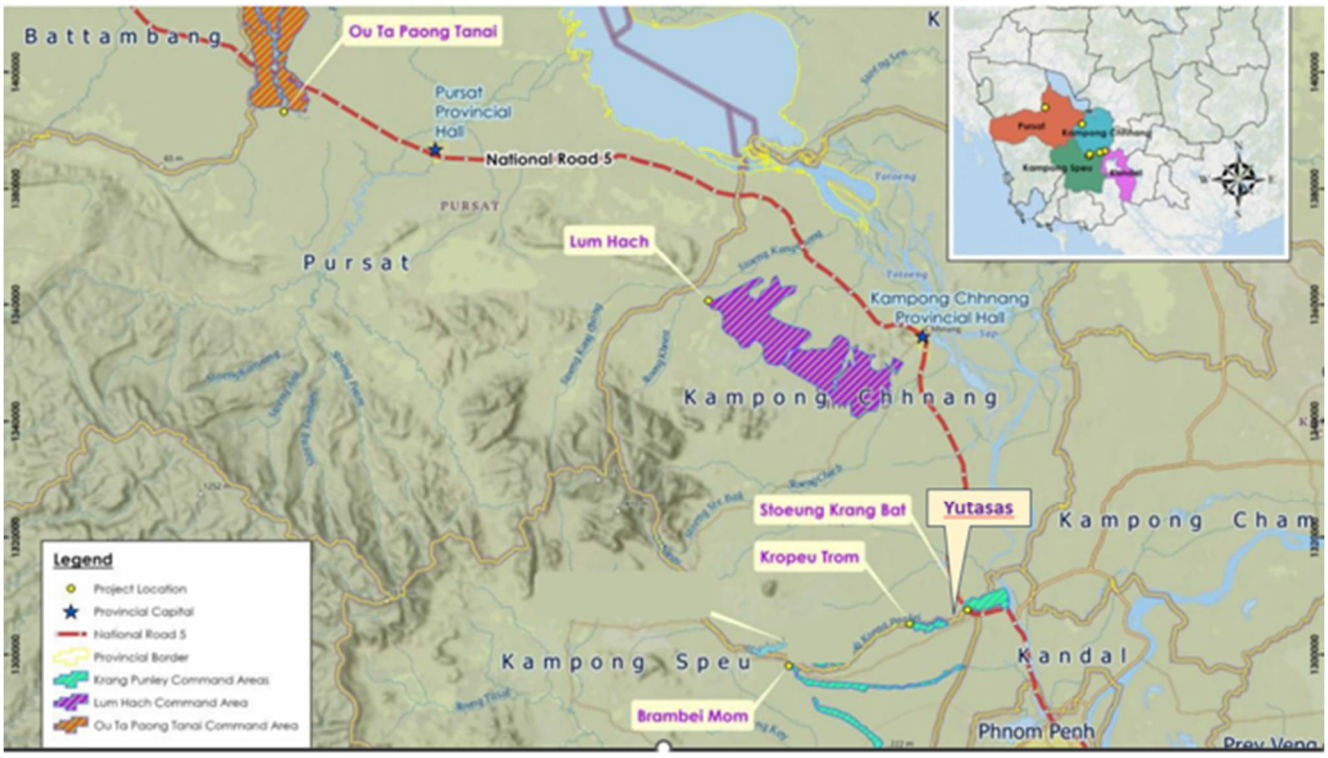


Figure 1 – Locations of six irrigation sub-schemes located in four provinces

The project will be implemented through various activities organized under the following three components:

Component 1. *Improving farm-level climate adaptation, resilience, and water use efficiency*

The objective of this component is to build climate resilience (CR) of smallholder farmers and enhance sustainable production through evidence-based planning and context-relevant climate resilient practices at the farm level. This component is designed to address the lack of knowledge and skills to deploy technologies and practices at the farm level to farmers and the lack of appropriate extension services to propagate them. It will introduce farmers to various climate-resilient technologies and practices for both rice and non-rice activities such as vegetable production, poultry and aquaculture.

Sub-component 1.1 Deployment of farm-level climate adaptation and water use efficiency measures

Output 1.1: Increased capacity of farmers to deploy climate resilient (CR) practices at farm level

This output will focus on developing farmer's capacity to deploy CR technologies and practices to transform the agricultural production system to adapt to the changing climate context. Farmers will be trained to first develop Action Plans (AP) to re-orient farmer behaviour and assist them in transforming the agriculture production system in a manner that is better adapted to factoring in the agroecological context and expected climate change impacts.

- Activity 1.1.1 Preparation of community-based action plans (AP) to transform agriculture with CR practices.
- Activity 1.1.2 Preparation of training materials to support implementation of the AP.
- Activity 1.1.3 Conduct training to create a pool of expertise to demonstrate and propagate the CR technologies and practices.

- Activity 1.1.4 Train farmers on applying CR technologies using the FFS approach.
- Activity 1.1.5 Strengthening and fostering tailored mechanization service providers for improved mechanization service delivery.
- Activity 1.1.6 community-based monitoring and evaluation (CBME) of implementation

Sub-Component 1.2 Climate-adapted, value-added, and market-led agricultural investments

Output 1.2 CR value-added, and market-led agriculture investments secured.

This output involves improving and enhancing some value chains that are key for the project area and include rice, vegetable, chicken and aquaculture value chains, through the use of Public Private Producer Partnerships (4Ps) and increased access to finance, which will improve market access, climate adaptability, and ensure increased income for smallholders in the value chains.

- Activity 1.2.1 Value chain study and planning
- Activity 1.2.2 Establish District Multi-Stakeholder Platforms (MSPs)
- Activity 1.2.3 Public Private Producer Partnership Facility (4PF)

Sub-component 1.3 Improve enabling conditions, capacities and disaster risk management strategies

Output 1.3. Increased access to and use of climate information and advisory services for climate-responsive agriculture planning

This sub-component will strengthen the production and dissemination of tailored agro-meteorological information to inform climate-responsive management and planning of agriculture in the project target areas through ICT technologies. The aim is to ensure that agro-meteorological services are accessible and useful to farmers to manage climate risks, access to and use of water and efficient cropping systems.

- Activity 1.3.1 Establish an ICT-based multi-disciplinary platform at the provincial level.
- Activity 1.3.2 Building the capacities of the platform to deliver services.
- Activity 1.3.3. Establish the agromet information systems and the outreach mechanisms.
- Activity 1.3.4 Awareness raising and capacity building of farmers and stakeholders in applying the *services.*

Sub-component 1.4 Rural roads

Output 1.4: Increased resilience of farm road infrastructure to climate change

- Activity 1.4.1 Initial planning and identification
- Activity 1.4.1 Initial planning and identification
- Activity 1.4.2 Technical survey and design considerations, preparation of cost estimation
- Activity 1.4.3 Improve 90 Kilometers of farm roads.
- Activity 1.4.4 Handing over the completed works.

Component 2: Irrigation Infrastructure for increased resilience

Component 2 is linked with Component 1 such that it facilitates the implementation of CR on-farm crop and water management practices through improved field-level water supply delivery and drainage. It will focus on rehabilitating and modernizing irrigation and flood protection/drainage infrastructure in the six sub-projects, including irrigation and drainage canals, flood control embankments, and ponds, to provide high-efficiency climate-resilient irrigated agriculture systems for adapting to both increasing flood and drought conditions.

Sub-Component 2.1: Modernization of irrigation scheme and ponds

Sub-Component 2.2: Flood-proofing and Drainage improvements

Sub-Component 2.3: Establishments and Training of Farmers Water User Communities (FWUC)

- Activity 2.3.1 Formation of institutional strengthening of the FWUC
- Activity 2.3.2 Build technical capacities of FWCU for canal structure O&M
- Activity 2.3.3 Prepare long-term financing plan for O&M of the systems including the WUAS.

Sub-Component 2.4: Water Information and Management (SCADA)

Component 3. Institutional Strengthening

Sub-Component 3.1 MOWRAM capacity Support.

Output 3.1 Strengthened MOWRAM Capacity

Sub-Component 3.2 Strengthening of NDA and NCDD.

Output 3.2 Improved capacities for climate action monitoring

- Activity 3.2.1 Preparation of Loss and Damage Strategy
- Activity 3.2.2 Strengthen national M&E process for climate action
- Activity 3.2.3 Enhancing Capacity of NDA and other stakeholders.

1.3 Environmental Risks and Impacts

Renovation of irrigation systems within the Tonle Sap Floodplains could have significant environmental consequences. Altering water flow patterns can disrupt the delicate ecological balance of the floodplain, affecting fish migration, breeding, and spawning. Increased water extraction for irrigation may lower water levels, impacting aquatic ecosystems and wetland habitats. Additionally, the use of chemical fertilizers and pesticides in agriculture can contaminate water bodies, harming biodiversity. Furthermore, construction activities associated with the renovation can lead to soil erosion, sedimentation, and habitat destruction for both aquatic and terrestrial species.

1.4 Social Risks and Impacts

The social implications of renovating irrigation systems in the Tonle Sap Floodplains are complex. While the project aims to improve agricultural productivity, it may also lead to land-use changes and displacement of local communities. Small-scale farmers may face challenges in accessing and competing for water resources, potentially exacerbating socioeconomic inequalities. Moreover, the introduction of new technologies and farming practices may require additional training and support for local communities, which could create new demands on existing resources. Conflict over water rights and access may arise, impacting social cohesion and livelihoods.

2. Objective of the Biodiversity Assessment

Based on a comprehensive biodiversity screening conducted by the E&S screening team, in conjunction with consultations with the ESCIA team, twenty-four potentially present endangered (EN) and critically endangered (CR) species were identified within the project's area of influence. To validate this initial assessment and identify additional species, a thorough literature review was conducted, and consultations were held with key government agencies and civil society organizations, including the Fisheries Administration (FiA), Wildlife Conservation Society (WCS Cambodia),

and Punleu Komar Organization (PKO). These organizations specialize in the protection of endangered and critically endangered species, empowering community-based organizations in protecting natural resources and possessing valuable knowledge of their distribution within the project's region.

The specific purpose of the Priority Biodiversity Values is to confirm the status of key wildlife species presenting in the area to ensure the protection and sustainable management of natural resources and livelihood improvement. This includes evaluating current conditions and potential impacts and developing mitigation and compensation measures. The identification and evaluation of Priority Biodiversity Values help prioritise areas with exceptional biodiversity or crucial ecological functions. These include unique habitats, key ecological processes, biodiversity hotspots, endangered species, keystone species, flagship species, cultural significance, and ecosystem services. Identifying these values involves desk-based research, field surveys, and expert consultation, considering global/regional significance, threats, vulnerability, and irreplaceability. Prioritizing conservation actions focuses on threat levels, vulnerability, irreplaceability, and cost-effectiveness to maximize impact

As part of the biodiversity assessment, the following key activities were undertaken:

1. Desk-Based Assessment: Conduct a comprehensive desk-based assessment to identify potential critical habitats and sensitive species using secondary data, and IFC PS6 criteria. Classify habitats based on ecological characteristics and sensitivity.
2. Field-Based Surveys: Conduct targeted field surveys to validate desk-based findings, assess species diversity, abundance, and habitat quality, and collect data on environmental parameters.
3. Expert consultation: Consult and verify all key findings with relevant national and international experts from key government agency, local NGOs, International NGOs, and researching institutions.
4. Critical Habitat Assessment and Mitigation: Conduct detailed assessments of potential critical habitats, develop mitigation measures to minimize impacts, and establish a monitoring program to track effectiveness.

A comprehensive biodiversity assessment, utilizing the Integrated Biodiversity Assessment Tool (IBAT) and a thorough literature review, identified a total of 25 endangered and critically endangered species across reptiles, mammals, birds, fish, amphibians, plants, and fungi. Sixteen of these species were concentrated in the Ou Tapong (OT) sub-scheme, while five were screened in Lum Hach (LC), two in Prambei Mom (BM) and Krapeu Truom (KT), and five in Yutasas (YT) and Stung Krang Bat (SKB), see Table 1.

Table 1: Second screening list of Endangered and Critically Endangered Birds, Mammals, Reptile and Fishes

No.	Local Name	English Name	Scientific Name	IUCN Category	OTP	LH	BM	KT	Yotasas	SKB
I.	Reptile spices									
1	អណ្តើកព្រេច	Elongated Tortoise	Indotestudo elongata	CR					Yes	
2	កន្ធាយក្បាលកង្កែប	Asian giant softshell turtle	Pelochelys cantorii	CR						
3	អណ្តើកភ្នែក	Black Marsh Turtle	Siebenrockiella crassicollis	EN	Yes		Yes			Yes

4	អណ្តើកសោម	Giant Asian Pond Turtle	Heosemys grandis	CR	Yes					
5	អណ្តើកបិទមុខ	Southeast Asian Box Turtle	Cuora amboinensis	EN	Yes					Yes
II.	Mammal species									
6	តេរោមច្រមុះ	Hairy-nosed Otter	Lutra sumatrana	EN	Yes					
7	ស្វាព្រាម	Indochinese Silvered Langur	Trachypithecus germaini	EN	Yes					
8	ស្វាក្តាម	Long-tailed Macaque	Macaca fascicularis	EN	Yes					
9	ឆ្កែព្រៃ	Dhole	Cuon alpinus	EN		Yes				
10	ជ្រូងធំ	Large Flying-fox	Pteropus vampyrus	EN		Yes				
III.	Fish species									
11	ត្រីត្រសក់ក្រហម	Jullien's Golden Carp	Probarbus jullieni	CR				Yes	Yes	
12	ត្រីចង្ហាស្នឹង	Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN				Yes	Yes	
13	ត្រីប្រាធំ	Striped catfish	Pangasianodon hypophthalmus	EN	Yes		Yes			Yes
14	ត្រីកាហោ/ត្រីគុលរាំង	Mekong giant barb/Giant Carp	Catlocarpio siamensis	CR					Yes	Yes
15	ត្រីកន្ត្រៃប់ខ្លា	Siamese Tiger Perch	Datnioides pulcher	CR	Yes	Yes				Yes
IV.	Bird species									
16	ត្រដក់ធំ	Greater Adjutant	Leptoptilos dubius	EN	Yes					
17	រនៀលស	Milky Stork	Mycteria cinerea	EN	Yes					
18	ចាបព្រៃវែង	Yellow-breasted Bunting	Emberiza aureola	CR	Yes					
19	ខ្សឹប ឬ ទ្រមាក់អណ្តើក	Bengal Florican	Houbaropsis bengalensi	CR	Yes					
20	ក្ងោក	Green Peafowl	Pavo muticus	EN		Yes				
21	ពពូលទឹក	Masked Finfoot	Heliopais personatus	CR	Yes					

22	ទាព្រៃស្លាបស	White-winged Duck	Asarcornis scutulata	EN	Yes				Yes	
V.	Fungi, amphibians, and aquatic plants									
23	ផ្សិតកែវ	Puffball mushrooms	Calostoma insigne	EN		Yes				
24	កញ្ជាញ់ចេកភ្នំក្រវាញ	Cardamon Shrub Frog	Philautus cardamonus	EN	Yes					
25	ស្មៅស្នឹង / ទន្លេ	River-weed	Terniopsis chanthaburiensis	EN	Yes					

The Southern Tonle Sap Floodplain (STSF), a critical component of Cambodia's biodiversity and socio-economic landscape, is a dynamic wetland ecosystem characterized by seasonal inundation. This intricate interplay of water and land supports a diverse array of flora and fauna (fish, bird, mammal, reptile, fungi, plant), contributing to significant agricultural production. However, the region faces increasing threats from development, climate change, and overexploitation.

The STSF's watershed, encompassing portions of Pursat, Kampong Chhnang, Kandal, and Kampong Speu provinces, is a complex hydrological system influenced by the Tonle Sap River, Mekong River, and their tributaries. This intricate network regulates water flow, nutrient transport, and seasonal fluctuations in water levels. The STSF catchment area, comprising diverse land cover types, directly influences water quality and quantity entering the floodplain. Factors such as topography, soil type, and land use practices within the catchment significantly impact sedimentation, nutrient loading, and overall water quality (Chua et al. 2022).

The interconnectedness of the watershed and catchment is essential for the ecological health of the STSF. The flow of water from the catchment into the floodplain through the river system drives various ecological processes. However, human activities such as deforestation, agriculture, and urbanization within the watershed and catchment pose significant threats to the STSF's biodiversity and ecosystem services. To ensure the long-term sustainability of the STSF, it is imperative to implement sustainable land use practices, prioritize forest conservation, and effectively manage water resources. These measures will help mitigate the impacts of human activities and protect the ecological integrity of this vital ecosystem (MoE; TSA).

3. Methodology

This assessment employed a comprehensive, multi-faceted approach to evaluate the potential environmental and social impacts of the CAISAR project across six sub-schemes, with a primary focus on biodiversity and ecosystem services. This methodology aligns with international best practices, including the International Finance Corporation's (IFC) Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources.

3.1 Literature review

A thorough literature review was conducted at three distinct levels to establish a robust knowledge base:

- National Level: This review aimed to establish the overarching legal and policy framework governing biodiversity management and conservation in Cambodia. It also sought to provide a comprehensive overview of the current status of biodiversity within the country, including key challenges and trends. (Relevant Cambodian environmental laws, national biodiversity strategies, reports from the Ministry of Environment, etc.)
- Regional Level: Given the project's location upstream of the Tonle Sap Lake, this review focused on the status of biodiversity and management within the Tonle Sap Floodplain. It explored the unique ecological characteristics of this region and the existing management strategies in place. (Reports from the Tonle Sap Authority, academic studies on the Tonle Sap ecosystem, regional environmental assessments, etc.)
- Sub-Scheme Level: Utilizing data from reputable sources such as the Integrated Biodiversity Assessment Tool (IBAT) and eBird, this review focused on identifying species listed as Endangered (EN) or Critically Endangered (CR) by the International Union for Conservation of Nature (IUCN). It also assessed the potential impacts of project activities on these species, as well as the cumulative impacts from other relevant projects within the project's area of influence. This review was conducted to understand the precarius state of Cambodia's endangered species, and the multiple threats that they face. (IUCN Red List, IBAT data, eBird data, relevant scientific publications, etc.)

This comprehensive review illuminated the multifaceted threats facing Cambodia's critically endangered species, including habitat degradation, illegal hunting, pollution, and other anthropogenic pressures. The diversity of taxa represented, spanning animals, birds, fish, plants, and fungi, highlights the intricate tapestry of Cambodia's ecosystems.

3.2 Baseline Data Collection

3.2.1 Data Synthesis

- Biodiversity Mapping: Spatial distribution of biodiversity was visualized by integrating field data, stakeholder interviews, and existing administrative maps (e.g., Community Forests (CF), Community Fisheries (Cfi), Key Biodiversity Areas (KBAs)).
- Species Prioritization: Focused on IUCN-listed EN/CR species with verified sightings within 1–5 years to ensure relevance for risk assessment. Historical data (>5 years) informed trend analysis relative to habitat changes.
- Critical Habitat Identification: High-value habitats were delineated using field surveys and geospatial analysis, emphasizing ecological functions and EN/CR species presence.

3.2.2 Community Engagement

- Stakeholder Consultations: Semi-structured interviews and focus group discussions (FGDs) were conducted with CF/CFi representatives, local authorities, and fishers to document wildlife presence, movement patterns, and historical population trends.
- Local Ecological Knowledge: Species data were cross-verified using morphological descriptions, behavioral traits, and habitat preferences provided by informants.

3.2.3 Aquatic Biodiversity Assessment

Endangered fish populations were evaluated through field surveys, interviews with fishers, and collaboration with government agencies. Data on migration connectivity, ecological niches, and historical catch records were analyzed to mitigate identification challenges.

3.3 Impact Assessment

3.3.1 Area of Influence (AoI)

The AoI for each sub-scheme was defined by:

1. Command Area: Geographic scope of project activities (e.g., canal rehabilitation, crop intensification).
2. Environmental Footprints: Indirect and cumulative impacts (e.g., pesticide runoff, habitat fragmentation) guided by the AIIB Environmental and Social Framework (ESF). Boundaries were iteratively refined as construction sites, logistics plans, and cultivation targets were finalized.

3.3.2 Field Surveys

Two wet-season surveys (July 25–27 and August 3–9, 2024) employed:

- Drone Surveillance: For inaccessible terrain and aerial boundary and habitat assessments.
- Transect Walks: Ground-level species and habitat monitoring.
- Hotspot Prioritization: GIS-based habitat modeling identified high-risk zones within and adjacent to the AoI for targeted data collection.

3.3.3 Risk Evaluation

Impacts were assessed against IFC Performance Standard 6 (PS6) criteria for critical habitats, emphasizing:

- Direct/Indirect Effects: Habitat loss, hydrological disruption, invasive species, and pollution.
- Cumulative Impacts: Synergistic threats from adjacent development projects.
- Ecosystem Services: Dependence of local livelihoods on biodiversity.

3.4 Adaptive Management Framework

An iterative approach was adopted to address data gaps and dynamic conditions:

- Mitigation Hierarchy: Prioritize impact avoidance, followed by minimization and restoration.
- Monitoring Protocols: Periodic evaluations to adjust mitigation measures (e.g., habitat buffers, pollution controls).
- Stakeholder Feedback: Continuous integration of community insights into conservation strategies.

3.5 Data Validation and Reporting

- Species Verification: All sightings were cross-referenced with IUCN databases and peer-reviewed literature.
- Cartographic Outputs: A3-sized maps delineated administrative boundaries, landscape features, and EN/CR species distributions.
  Expert Collaboration: Findings were validated with government agencies and research institutions to ensure methodological rigor.

3.6 Key Informant Interviews and Scope of Work

- IFC Performance Standard 6 (PS6): PS6 was applied to identify and assess critical habitats, considering irreplaceability, vulnerability, biodiversity, ecosystem services, and cultural significance.
- Key Informant Selection: 10-12 individuals per sub-scheme were selected based on local wildlife knowledge, using semi-structured and structured questionnaires with visual aids.

3.7 Methods used for Critical Habitat Assessment

IFC PS6 presented the following criteria to assess for projects in Critical Habitat. These were as follows:

- Criterion 1: Critically Endangered (CR)and Endangered (E) species;

- Criterion 2: Restricted-range/Endemic species;
- Criterion 3: Migratory/congregatory species;
- Criterion 4: Highly threatened and/or unique ecosystems; and
- Criterion 5: Key Evolutionary Processes.

In addition to the above five biological criteria, there were further circumstances in which an area might be recognised as Critical Habitat. For simplicity, there were two further criteria:

- Criterion 6: Most Legally Protected Areas (particularly IUCN Categories I-IV) and Internationally Recognised Areas (e.g., KBAs and IBAs);
- Criterion 7: Other areas of high biodiversity value, such as areas of high scientific value or areas of old growth forest.

Criteria 1-3 have quantitative thresholds which help determine whether an area is Critical Habitat. Criteria 4 and 5 are qualitatively defined at present and so require consultation with experts. Criterion 4 covers rare and threatened habitats which might not necessarily hold species triggering Criteria 1-3. Criterion 5 is particularly identified by physical landscape features promoting evolution (e.g. islands, mountains, ecotones), or by groups of species with distinct evolutionary history.

Table 1 provides the formal quantitative thresholds for species Criteria 1-3. Discreet Management Units (DMUs) may be ecologically-defined (e.g. a whole patch of a certain habitat type or a watershed) or politically-defined (e.g. a protected area, property or local political unit). This table can be reduced to five relatively simple rules to cover most eventualities. Note, however, that these alone should not be relied upon for a comprehensive Critical Habitat assessment.

- DMUs with ≥10% global population of a CR or EN species (or, generally, the equivalent in terms of known sites for that species, e.g. if the DMU is one of only 10 sites globally) = Tier 1 (Sub-criteria 1a+1b)
- DMUs with a single regularly occurring individual of a CR species = Tier 2 (Sub-criterion 1c)
- DMUs with regionally important concentrations of a EN species = Tier 2 (Sub-criterion 1c)
- DMUs with ≥95% of the global population of a restricted-range, endemic or migratory/congregatory species (effectively site endemics) = Tier 1 (Sub-criteria 2a+3a)
- DMUs with ≥1% of the global population of a restricted-range, endemic or migratory/congregatory species (this is the easiest category in which to trigger CH) = Tier 2 (Sub- criteria 2b+3b)

Table 2: Quantitative thresholds for criteria 1-3 relating to tier 1 and tier 2 critical habitat

Criteria	Tier 1	Tier 2
1. Critically Endangered (CR)/ Endangered (EN) Specie	(a) Habitat required to sustain ≥ 10 percent of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be	c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally-important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/subspecies. (d) Habitat of significant importance to CR or EN species that are wide-ranging and/or

Criteria	Tier 1	Tier 2
	considered a discrete management unit for that species. (b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. (e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.
2. Endemic/ Restricted Range Species	(a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that species (e.g., a single-site endemic).	(b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgement.
3. Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species lifecycle where that habitat could be considered a discrete management unit for that species.	b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species lifecycle and where that habitat could be considered a discrete management unit for that species, where data are available and/or based on expert judgement. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at ≥ 5 percent of the global population for both terrestrial and marine species. (e) Source sites that contribute ≥ 1 percent of the global population of recruits.

4. Assessment Results

Under this chapter, assessment will be done separately for each of the six sub-schemes under the CAISAR project. The assessment for OTP will be presented first, followed by Lum Hach, Brambei Mon, Krapeau Trom, Yutasass, and Steung Krang Bat. It is noted to ensure the assessment method is consistently applied for each sub-scheme, the presentation of each assessment will be structured around the following sub-sections:

- Proposed project activities in each sub-scheme and potential risks and impacts;
- Area of Influence of the sub-scheme;
- Analysis to prepare for determining Critical Habitat status (Steps 1 & 2);
- Determining Critical Habitat status (Step 3);
- Potential Impacts and Feasibility of net gain requirements (Step 4); and
- Mitigation measures.

5. Ou Ta Paong

5.1 Proposed project activities and potential risks and impacts

Avian species such as the Greater Adjutant, Milky Stork, and Bengal Florican have been documented in the lower section. These birds rely on seasonal wetlands, lakes, waterholes, grasslands, and rice fields for foraging. Additionally, the critically endangered Siamese Tiger Perch and Black Mash Turtle inhabit Boeung Kamsaeng Lake and Svay Daunkav River, respectively, in the upper portion of the command area.

The flooded forest habitat and natural lakes adjacent to the lower section support a diverse array of wildlife, including four critically endangered reptile species: the Black Mash Turtle, Southeast Asian Box Turtle, Giant Asian Pond Turtle, and Elongated Tortoise. These species play crucial roles in the ecosystem, contributing to nutrient cycling, seed dispersal, and maintaining ecological balance. Furthermore, the region is home to two critically endangered mammal species: the Indochinese Silvered Langur and Long-tailed Macaque. These primates are essential for forest regeneration and seed dispersal, helping to maintain the health and resilience of the forest ecosystem. This area, particularly its lower section, serves as a critical habitat for a diverse array of endangered and critically endangered species.

Given the significant ecological value of the Ou Tapaong Command Area, any irrigation system renovations must be carried out with utmost care to minimize negative impacts on biodiversity. This may involve implementing measures such as habitat restoration, creating wildlife corridors, and ensuring that water management practices are sustainable and supportive of biodiversity. By carefully considering the ecological implications of the project, it is possible to balance the needs of agriculture with the conservation of endangered species and their habitats. Under OTP, various activities will be carried out that cause the following E&S risks and impacts:

Table 3: Projection activities that may cause potential impacts on the environment and social aspects at Ou Tapaong sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes,	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing

	and water management practices	water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.
2	Increased agricultural activities, sedimentation, and pollution	**Water quality degradation** could impact aquatic ecosystems and species that rely on clean water.
3	**Hydrological changes due to m**odifications to water flows and regimes	**Altered habitat** conditions that disrupt ecological processes.
4	**Increased human activities**	**Labor influx (during project construction) and Increased** human activities (during project operations pose additional threats to biodiversity. Increased human activity within the command area which could potentially disrupt wildlife behavior (nesting/foraging), increase poaching or predation risks if not properly managed.
5	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. For example, changes in seasonal wetlands or lakes' floodplains can disrupt breeding patterns for avian. Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats.
6	Use of chemicals and nutrient loading	**If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.**
7	Species displacement and disruption of foraging and breeding habits	Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats. Additionally, alterations to the irrigation system could disrupt the foraging and breeding habits of endangered birds and other wildlife.
8	**Land Use Changes**	The changes in land use that may occur as a result of the project, such as agricultural expansion or deforestation.
9	**Biodiversity**	The potential impacts of the project on water flow, water quality, and sedimentation patterns.
10	Introduction of invasive species through irrigation canals	Irrigation canals may facilitate the introduction of invasive plant or animal species into native aquatic ecosystems like Water Hyacinth, Mimosa Pigra, Tilapia etc. These invasives can

		outcompete native species for resources such as food and habitat space

5.2 Areas of Influence

The Ou Tapaong Irrigation Sub-scheme's estimated area of influence encompasses a) the entire command area (some 14,000 hectares, including the upper, middle, and lower parts), and b) any other areas outside the command area where project activities leave an environmental footprint during project implementation and sub-scheme operations. While the first is clear in terms of the boundary, the latter needs additional information based on the final project engineering design and environment monitoring data to establish the additional area of influence that is outside of the command area (due to the project's environmental footprint).

In line with the methods set forth under Section 3.2 (above), a detailed assessment was conducted for the OTP command area (as Modified Habitat) while a preliminary assessment was carried out for the area located immediately outside and to downstream of the OTP command area. It is noted within the OTP command area, that there is a lake called Boeng Kanseang or Kanseang Lake which is home to fish and birds. Analysis to determine critical habitat (Steps 1 and 2 of the CHA method)

5.3 Analysis to prepare for determining CH status

5.3.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

5.3.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for OTP. The coordinates of OTP (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 11 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 4 reptile species, 2 mammals, 2 fishes, and 3 birds (See list of 11 EN and CR species in Table 3 below).

Description of screening for narrowing down

For Ou Ta Paong, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2025. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the OTP area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 17 EN and CR species were identified in the OTP area of influence (See Table below). In the 3rd round of screening (in August 2024), however, 11 (out of a total of 17 species) were confirmed as "potentially present" in the OTP's area of influence.

So, the assessment for Ou Ta Paong focuses on the confirmed list of **11 species** that are categorized by IUCN as EN and CR species, including 4 reptile species (Black Marsh Turtle,

Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise), 2 mammals (Indochinese Silvered Langur and Long-tailed Macaque), and 2 fishes (Striped catfish and Siamese Tiger Perch), and 3 birds (Greater Adjutant, Milky Stork, and Bengal Florican) (See Table below for the list of confirmed species and see Figure 2 for potential locations reported by key informers of these species in the project's area of influence).

Table 4: Confirmed List of endangered and critically endangered species for the Ou Tapaong sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=17)	Confirmed Species in Round 3 (Total = 11)
	I. Reptile spices					
1	អណ្តើកក្អែក	Black Marsh Turtle	*Siebenrockiella crassicollis*	EN	Yes	Yes
2	អណ្តើកសោម	Giant Asian Pond Turtle	*Heosemys grandis*	CR	Yes	Yes
3	អណ្តើកបិទមុខ	Southeast Asian Box Turtle	*Cuora amboinensis*	EN	Yes	Yes
4	អណ្តើកព្រេច	Elongated Tortoise	*Indotestudo elongata*	CR	No	Yes
	II. Mammal species					
5	តេរោមច្រមុះ	Hairy-nosed Otter	*Lutra sumatrana*	EN	Yes	No
6	ស្វាព្រាម	Indochinese Silvered Langur	*Trachypithecus germaini*	EN	Yes	Yes
7	ស្វាក្តាម	Long-tailed Macaque	*Macaca fascicularis*	EN	Yes	Yes
	III. Fish species					
8	ត្រីប្រាធំ	Striped catfish	*Pangasianodon hypophthalmus*	EN	Yes	Yes
9	ត្រីកន្ត្រៃប់ខ្លា	Siamese Tiger Perch	*Datnioides pulcher*	CR	Yes	Yes
	IV. Bird species					
10	ត្រដក់ធំ	Greater Adjutant	*Leptoptilos dubius*	EN	Yes	Yes
11	រនៀលស	Milky Stork	*Mycteria cinerea*	EN	Yes	Yes
12	ចាបព្រៃវែង	Yellow-breasted Bunting	*Emberiza aureola*	CR	Yes	No
13	ខ្សឹប ឬ	Bengal Florican	*Houbaropsis bengalensi*	CR	Yes	Yes

	ទ្រមាក់អណ្តើក					
14	ពពូលទឹក	Masked Finfoot	*Heliopais personatus*	CR	Yes	No
15	ទាព្រៃស្លាបស	White-winged Duck	*Asarcornis scutulata*	EN	Yes	No
	V. Amphibians, and aquatic plants					
16	កញ្ជាញ់ចេកភ្នំក្រវាញ	Cardamon Shrub Frog	*Philautus cardamonus*	EN	Yes	No
17	ស្មៅស្នឹង / ទន្លេ	River-weed	*Terniopsis chanthaburiensis*	EN	Yes	No

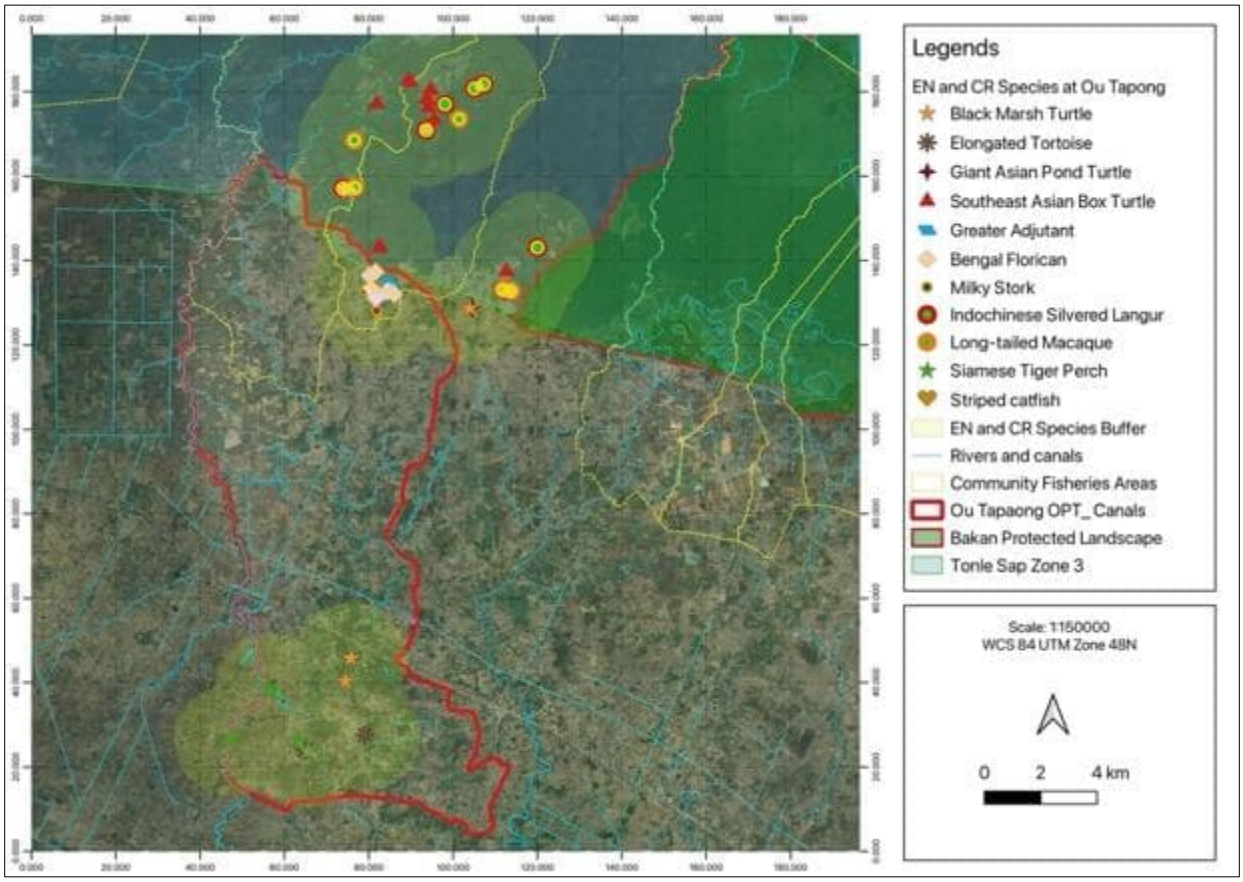


Figure 2: Map showing the observed distribution of identified EN and CR species (with the potential movement of 1-2 km within and around suitable habitats (2020 to 2024)

5.3.3 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 11 confirmed species are

presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants[1].

The OTP command area has been in existence since the 1970s. The OTP is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the OTP river, have been changed and various sections by local people to support living and farming activities. The OTP command area, therefore, the ecosystem within the OTP command area has been subject to human-induced changes over the past several decades. As such, the OTP command area is a modified habitat.

5.3.3.1 Reptiles (4 species)

The Black Mash Turtle was observed in both upper and lower sections of the command area, as well as along the main Ou Tapaong river (which is being used as a key canal feeding irrigation water for the command area). Conversely, the Elongated Tortoise was only found in the upper reaches while the Giant Asian Pond Turtle and Southeast Asian Box Turtle were found only in the lower section within Tonle Sap Zone 3 (figure 2 above). Details are below:

- **The Black Mashed Turtle *(Cuora galbinifrons)*** was confirmed to be present in the area of influence based on the accounts of four local informants. Residents from the upper reaches of Ou Tapaong reported historical sightings of this species within the past 10-20 years although recent spotting has been scarce. Key informants who live in the lower part of the command area and had livelihoods closely intertwined with the Tonle Sap Management Zone indicated that there have been ongoing efforts to bring the **Black Mashed Turtle back** to the region albeit its rarity. One informant successfully captured a Black Mashed Turtle just before the interview. This species is highly valued in the local market, particularly among middlemen, and is often used for traditional medicinal purposes. The Black Mashed Turtle is listed as Critically Endangered by the IUCN Red List, and its presence in the area of influence indicates that the habitat is essential for its survival and reproduction. Therefore, the habitat meets the criterion of being significant for a Critically Endangered species of criteria 1a of IFC PS6.
- **Elongated Tortoise:** This species wasn't initially screened for the interview, but it was identified and spotted by two key informants at the upper section of the Ou Tapaong based on the turtle images that were shown to facilitate the identification of species. No such sightings have been documented in the lower portions of the command area. One informant, a local resident near Ou Tapaong, provided a firsthand account of capturing this species. After a thorough examination of the accompanying photographs and a comparison with verified identifying features, this species is confirmed present as reported by the local informant. The Elongated Tortoise is listed as Critically Endangered by the IUCN Red List. The presence of this species within the project area indicates that the habitat is essential for its survival and reproduction, meeting the requirements of Criterion 1a.
- **Giant Asian Pond Turtle:** Three local informants who were interviewed in the lower Ou Tapaong River region confirmed the presence of the Giant Asian Pond Turtle. One informant reported spotting this species in Boeung Kum Traeng, a wetland within Tonle Sap Zone 3 while the other two informants indicated their encounters

[1] Community councils and committees, including community fisheries (CFi) and farmer water user community (FWUC), were convened on July 25 and August 4, 2024. These meetings aimed to identify potential field assessment areas and select individuals with deep local ecological knowledge and experience for interviews. A total of 13 key informants were interviewed in Ou Topaong. Five of these individuals were from the upper command area, while seven were from the lower command area. Additionally, one representative from Punleu Komar Organization, which supports the Samraong Muk Yeik Community Forest Initiative, was included. Notably, the Samraong Muk Yeik and Sdok Khlouk Community Fisheries locations overlaps with portions of the Lower Ou Tapaong Command Area.

with this species in the mountainous regions of Kravanh District. Asian Pond Turtle is listed as Critically Endangered by the IUCN Red List. The reported sightings in Boeung Kum Traeng and the mountainous regions of Kravanh District indicate that these areas may be important habitats for the survival and reproduction of this species, meeting the requirements of Criterion 1a.

- **Southeast Asian Box Turtle:** During our survey in the lower section of the Ou Tapaong, we obtained valuable information about the Southeast Asian Box Turtle. All seven informants in this area confirmed the presence of this species in nearby wetlands and flooded forest areas within Tonle Sap Zone 3, which is close to the command area boundary. While three informants reported recent encounters with this species, the remaining four mentioned that they had encountered it 10 to 20 years ago. They explained that the turtle was once abundant but has become very rare in recent years.
  Similarly, all turtle species, including the Southeast Asian Box Turtle, are threatened by ongoing illegal hunting for trading purposes. Some people were hesitant to share recent information about these species.

  Mr. Pheoun Moeun, Deputy Chief of Samraong Muk Yeik Community Fishery (SMY-CFi) is exceptionally knowledgeable about wildlife species in his Cfi area. He has been actively participating in forest patrols and community activities. He mentioned that some people who go fishing in the forest occasionally bring back one or two turtles with them but he preferred not to disclose this information.

  One key informant admitted that they captured a turtle from a nearby forest and sold it for income. Income was shared among the four individuals. While informants were willing to share their past incidents, they were reluctant to provide details about the recent events because these activities are illegal.

  the Southeast Asian Box Turtle, a Critically Endangered species, is present in the lower section of the Ou Tapaong and nearby wetlands. These unique ecosystems are highly threatened. Therefore, Criteria 1a and 4 of IFC PS6. Additionally, Criteria 1b may also apply due to the high threat level and declining population. are potentially met.

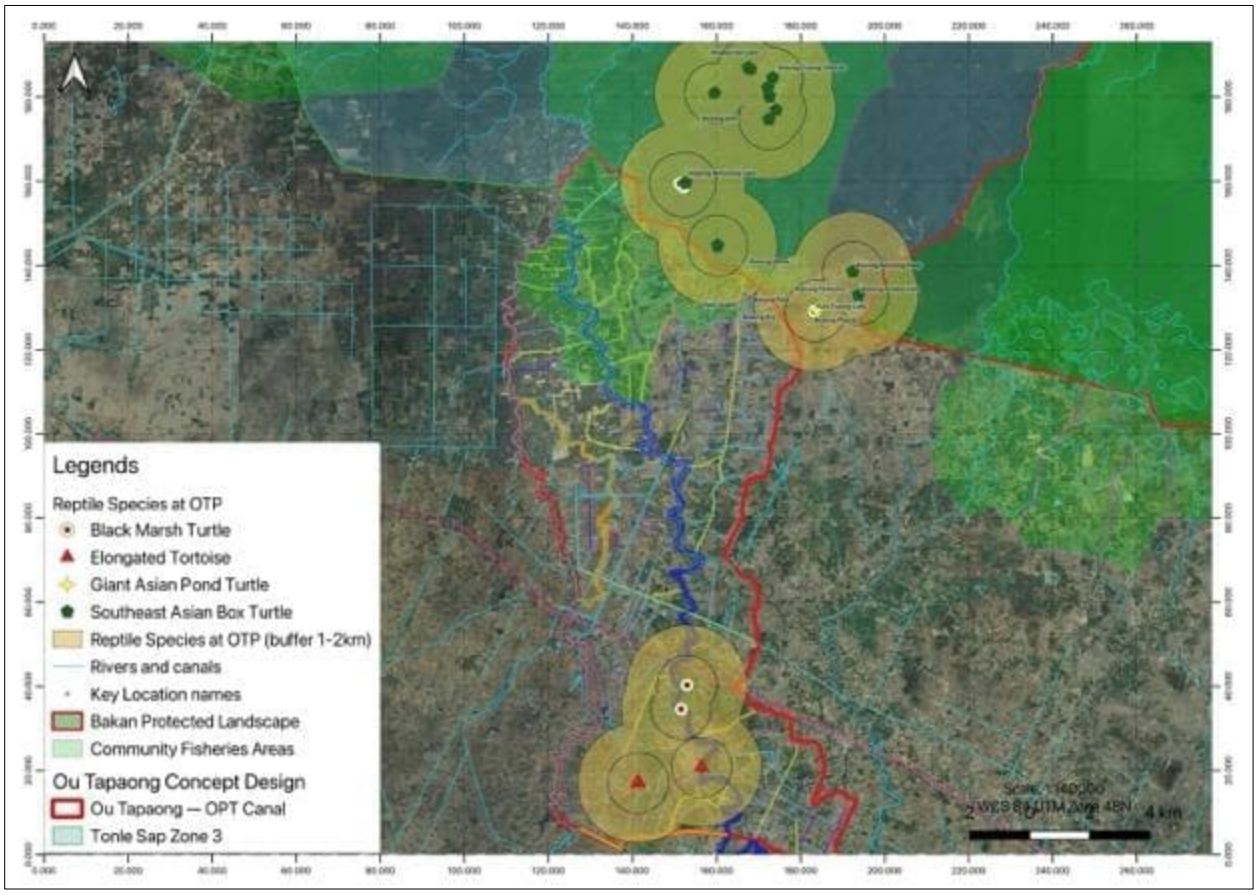


Figure 3: Distribution of identified turtle and tortoise species in and outside the OTP Command Area

5.3.3.2 Birds (3 species)

Despite extensive interviews with key informants residing in the upper reaches of Ou Tapaong, numerous endangered or critically endangered bird species were reported within their community. Conversely, only three of six bird species were confirmed by both key informants and CFi committees in the lower section. The following paragraphs summarize the primary findings and justifications for each species' presence, along with the associated level of confidence. These conclusions are based on in-depth interviews, technical expertise, and consultations with relevant units, which provided valuable assistance in verifying species of high conservation significance. Several species were initially identified by local residents.

- **Bengal Florican:** Five informants confirmed the presence of the Bengal Florican in the area of influence. Two individuals reported sightings within the past 10-20 years while three others have observed the species within the last five years and in the past. Notably, one informant witnessed a pair (male and female) as recently as March 2024 (see Figure 3). The lower reaches of Ou Tapaong exhibit a diverse mosaic of habitats, including open wetlands, grasslands, flooded forests, and minimally intensified paddy fields, creating a relatively undisturbed environment that is potentially conducive to Bengal Florican populations. Notably, the Ou Tapaong Command Area is situated only 1 kilometre from the Bakan Protected Landscape (BPL), a region characterized by similar ecological conditions (figure 3).

  Established in July 2023 through a joint effort by the Ministry of Environment and the Wildlife Conservation Society (WCS), the BPL aims to safeguard the southernmost Bengal Florican subpopulation within the Tonle Sap Great Floodplain. Moreover, the BPL serves as a critical wintering habitat for the Yellow-breasted Bunting,

Manchurian Reed-warbler, and Cambodia's unique population of the Chinese Grassbird, along with other globally threatened avian and wildlife species (WCS 2023).

The project area likely meets Criterion 1a (habitat of significant importance to Critically Endangered species) due to the presence of the Bengal Florican. Additionally, it may meet Criterion 4 (highly threatened and/or unique ecosystems) given the diverse habitat mosaic. However, a detailed ecological assessment is crucial to confirm these findings and identify any other relevant criteria.

- **Greater Adjutant:** During field assessments within the study area, multiple informants reported sightings of Greater Adjutants. While most individuals were unable to definitively distinguish between the Greater Adjutant and the similar-looking bird, which is Lesser Adjutant), one informant positively identified a Greater Adjutant within the Ou Tapaong Command area. This sighting occurred in recent years (figure 3). Unfortunately, due to the time of the observation, the Greater Adjutant had likely already migrated to its breeding grounds at Prek Toal Ramsar Site, a protected wetland area situated in Koh Chiveang community, Ek Phnom District, Battambang province (MoE 2012).

  Prek Toal Ramsar Site is the sole known breeding habitat for the greater adjutant in Southeast Asia and is recognized as the second-largest breeding colony for this species globally, following Assam, India. In December 2015, the Royal Government of Cambodia and the Ramsar Convention Secretariat designated the Prek Toal Core Area as a Wetland of International Importance due to its exceptional biological, social, and economic value. This designation solidified Prek Toal's status as Cambodia's fourth Ramsar Site (WCS 2016). Following the breeding season, greater adjutants migrate across the Tonle Sap Floodplain to their foraging habitats, with the lower section of Ou Tapaong serving as a critical foraging ground.

  Despite the challenges faced during the field observation due to the time of year, the confirmed sighting of a Greater Adjutant in the study area is a significant finding. It suggests that the species may still be present in the region and that a suitable habitat may exist for its continued survival.

  The findings indicate that the project area meets IFC PS6 Criteria 1a and 3. This is due to the presence of the Critically Endangered Greater Adjutant, a migratory species that utilizes the area as a critical foraging habitat, particularly during the non-breeding season.

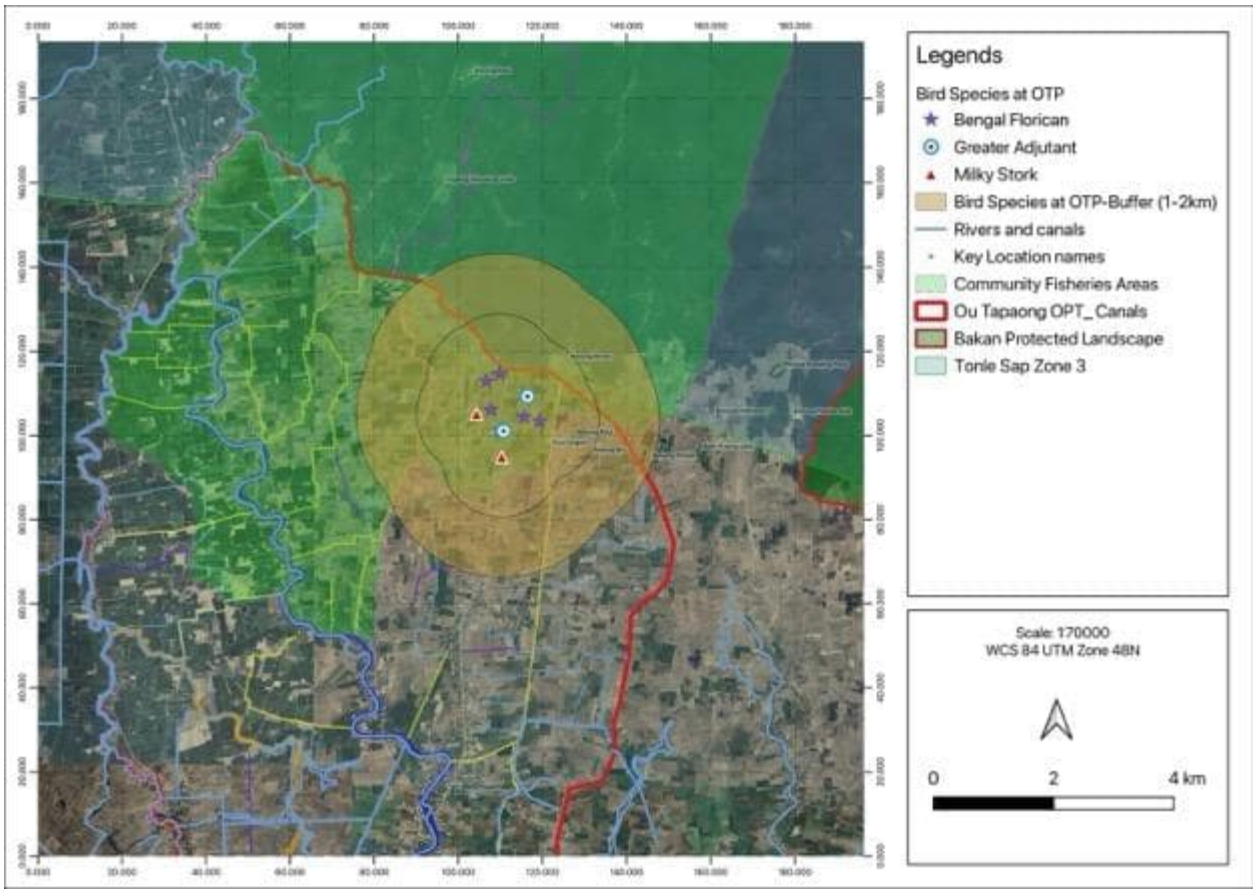


Figure 4: A spatial distribution map was generated for three bird species—the Bengal Florican, Greater Adjutant, and Milky Stork—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.

- **Milky Stork:** Despite repeated attempts to elicit accurate information, many key informants were unable to distinguish between the Painted Stork and the Milky Stork, two similar-looking bird species. This confusion is a common challenge in bird identification, especially for non-experts. While the Milky Stork is considered extremely rare in Cambodia, with sightings typically limited to 1-3 individuals, some informants claimed to have encountered larger groups. This discrepancy can be attributed to misidentification and the difficulty of accurately counting birds in the field.

  Based on my experience in bird identification and conservation, I was able to evaluate the credibility of the information provided. Two informants offered the most reliable accounts, describing sightings of 2-3 Milky Storks feeding alongside numerous Painted Storks in seasonal wetland areas near flooded forests (figure #3). These observations align with the limited available data on Milky Stork distribution and behavior in Cambodia. When the flooding season arrives, they migrate to degraded forest areas in the uplands. Milky Stork and Great Adjutant are migratory birds that move both locally and across international borders. The Prek Toal Ramsar Site serves as the only known breeding ground for Milky Stork and Greater Adjutant in Southeast Asia; after breeding, they migrate to other wetland areas throughout the country.

  The Milky Stork's situation appears to align with several IFC PS6 criteria:

  Species Level:

Endangered Species (Criterion 1a): The Milky Stork's rarity and the challenges in accurately assessing its population make it a strong candidate for this criterion. Its limited distribution and potential threats further emphasize its vulnerability.

Migratory Species (Criterion 3): The migratory nature of the Milky Stork, particularly its reliance on the Prek Toal Ramsar Site as a breeding ground and its movements to other wetland areas, highlights its dependence on various habitats throughout its range.

Ecosystem Level:

Highly Threatened and/or Unique Ecosystems (Criterion 4): The wetland habitats used by the Milky Stork, especially the flooded forests and seasonal wetlands, are often threatened by human activities like deforestation, agriculture, and pollution. These ecosystems are essential for the survival of the species and other biodiversity.

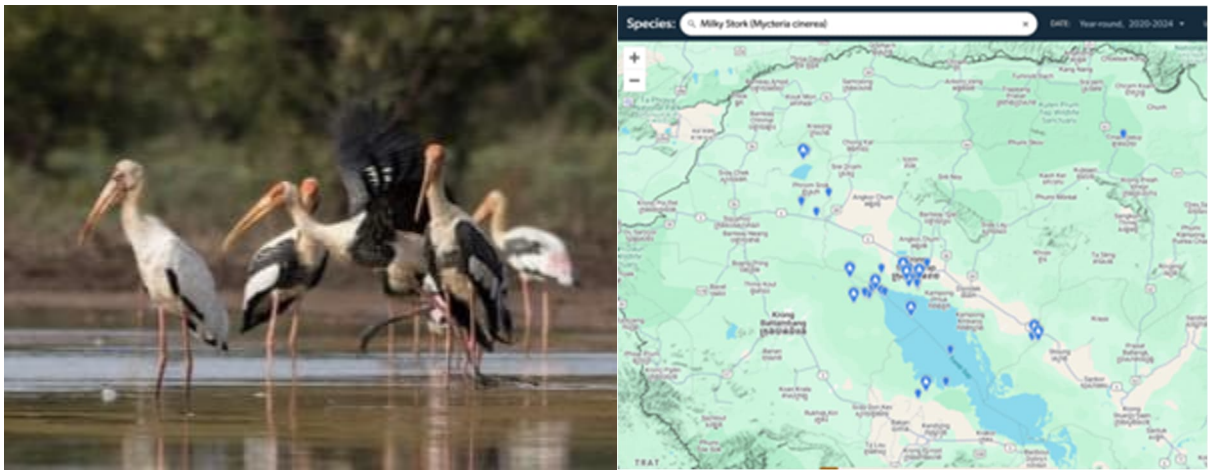


Figure 5: Photograph of a Milky Stork foraging alongside a flock of Painted Storks (credit: Sang Mony, Sam Veasna Conservation Tour), and a map illustrating the distribution of Milky Stork sightings in Cambodia from 2020 to 2024, extracted from eBird data.

- **Yellow-breasted Bunting**: The Yellow-breasted Bunting is a small, migratory songbird found in Southeast Asia, including Cambodia. It is characterized by its bright yellow breast and throat, contrasting with its olive-green upperparts. The Yellow-breasted Bunting is a winter visitor and spring passage migrant in Cambodia, often found in rice fields, scrub, grasslands, and marshes in the lowlands. In Cambodia November to May, the species has been recorded in the Tonle Sap Floodplain and the Lower Mekong Delta. Yellow-breasted Buntings are typically observed in rice fields, scrublands, grasslands, and marshes in the lowlands of Cambodia (Ly et al. 2022).

  The local population often mistakenly identifies this species as a sparrow or a weaver due to their similar size, appearance, and shared habitats. After conducting inquiries, none of the locals could confirm whether they had observed this species in the area. This highlights a common gap in local ecological knowledge regarding small bird species like this one. Identifying such species typically requires individuals with advanced birdwatching experience, who can locate them in the appropriate habitat at the right time.

Based on an overall assessment of the habitat conditions in the lower part of Ou Tapaong, we can confirm that this area has the potential to serve as a wintering habitat for this species. Additionally, the boundary of the Ou Tapaong Command Area is just 1 km away from the Bakan Protected Landscape.

The Yellow-breasted Bunting's Critically Endangered status and the Ou Tapaong area's potential as a wintering habitat potentially meet IFC PS6 Criteria 1a. Additionally, the species' restricted range and migratory behavior align with Criteria 2 and 3. The Yellow-breasted Bunting, a CR species, is known to inhabit such areas during its winter migration.

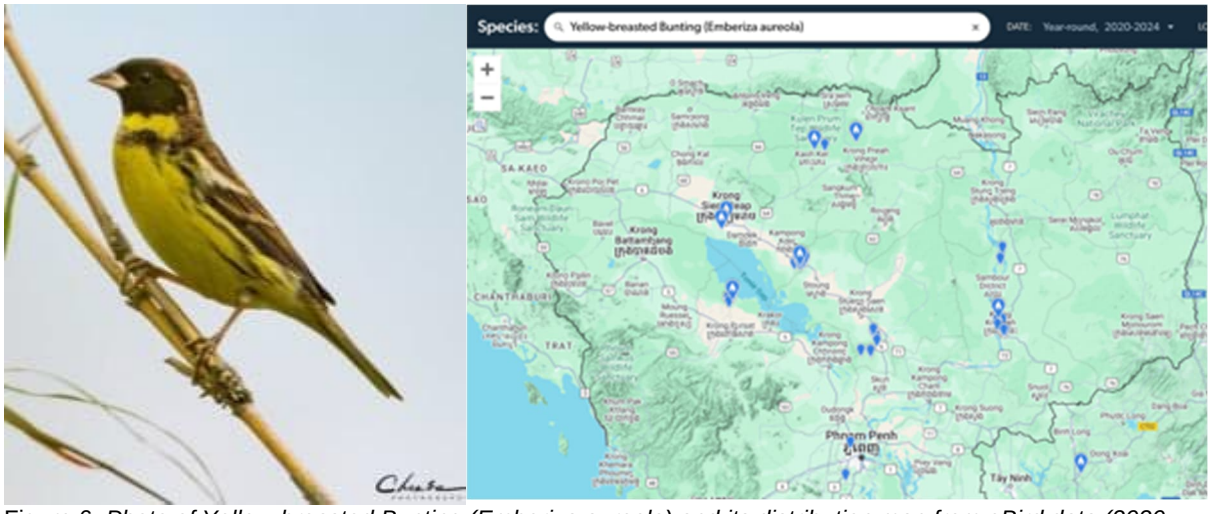


Figure 6. *Photo of Yellow-breasted Bunting (Emberiza aureola) and its distribution map from eBird data (2020-2024)recorded by birdwatcher and wildlife overserves.*

- **Wild-winged Duck:** Regarding the Wild-winged Duck, there was some confusion among informants who mistakenly identified it as the Knob-billed Duck (Sarkidiornis melanotos). However, after discussing key identification features and ecological characteristics, such as breeding and nesting habitats, we determined that none of them had actually encountered the Wild-winged Duck before. Due to it's tiny population, Wild-winged Duck is very sensitive, and live in the forest close to the lake, wetland, river and waterhold with less disturbance. Due to its limited population, the Wild-winged Duck is particularly sensitive to disturbances and prefers to reside in relatively undisturbed forests adjacent to lakes, wetlands, rivers, and watering holes. This preference for quieter, less populated areas helps to ensure the survival of this vulnerable species.

5.3.3.3 Mammals/ primates (2 species)

No suitable habitats or sightings of three mammal species were identified in the upper section of Ou Tapaong. Two primate species (Indochinese Silvered Langur and Long-tail Macaque) were confirmed at the lower section in the Flooded Forest habitat of the Tonle Sap Zone 3 and CFi Areas. Additionally, multiple reports indicated the presence of Hiary-nosed Otters in the region, particularly in the deep waters of the flooded forest near the Tonle Sap Great Lake's mouth. The following paragraphs summarize the key findings and justifications for the presence of these two primate species, along with their associated confidence levels. These conclusions are based on comprehensive interviews, technical expertise, and consultations with relevant units, which contributed to the verification of species with high conservation importance.

- **Indochinese Silvered Langur:** Six local informants (86%) reported frequent encounters with Indochinese Silvered Langurs within the flooded forests of Tonle Sap Zone 3 which is outside of the OTP command area. These sightings, primarily near natural lakes, have been confirmed by multiple individuals engaged in livelihood

activities within these areas. While the population of Indochinese Silvered Langur was once plentiful, informants noted a significant decline in recent decades, with only smaller troops now being observed. The species is known to inhabit areas near rivers and large bodies of water.

Mr. Chem Sophal from Punleu Komar Organization highlighted that his organization provides support for the Samraong Muk Yeik Community Fishery (SMY-CFi) and Sdok Khlouk Community Fishery (SK-CFi) in managing and protecting fisheries resources and flooded forests within their Community Fishery Area (figure 6). Portions of these CFi Areas overlap with the Lower section of Ou Tapaong Command Area. This effort is part of the EU “Our Tonle Sap” Project, led by the Wildlife Conservation Society and funded by the European Union. Mr Sophal emphasized the presence of numerous endangered and critically endangered species, including the Indochinese Silvered Langur, within this CFi Area. To confirm the presence of any Community Fisheries (CFIs) within the specified area, we interviewed the Chief of Pursat Fishery Administration Cantonment. Our inquiry revealed that two CFi areas overlap with the designated region, as illustrated in the accompanying map (see map below).

Based on the provided information, the following IFC PS6 criteria are potentially met regarding the Indochinese Silvered Langur and the flooded forests of Tonle Sap Zone 3:

Species Level:
Criterion 1: Critically Endangered and Endangered Species: The Indochinese Silvered Langur is an endangered species, making its habitat a potential candidate for this criterion.
Criterion 2: Highly Threatened Species: Given the observed decline in the population and potential threats to its habitat, the species could be considered highly threatened.

Ecosystem Level:
Criterion 5: Highly Threatened and Unique Ecosystems: The flooded forests of Tonle Sap Zone 3 represent a unique and threatened ecosystem, particularly due to factors such as habitat loss and degradation.

- **Long-tailed Macaque:** Indochinese Silvered Langurs and Long-tailed Macaques were commonly reported by key informants residing within the Tonle Sap Zone 3. These informants, who frequently engaged in fishing activities in the surrounding forests, encountered Long-tailed Macaques regularly. They added that these primates, known for their social nature, live in troops and communicate vocally to alert their group members of potential threats or discoveries. Some troops inhabit flooded forests situated close near the command area.

  However, informants expressed deep concern over the significant decline in the population of Long-tailed Macaques over the past several years. This alarming trend has prompted urgent action from conservation organizations. In response to the deteriorating situation, the primate specialist group upgraded the conservation status of this species from Vulnerable to Endangered in March 2022. This elevated status underscores the urgent need for increased protection measures to mitigate the species' decline, which is primarily driven by the high demand for these primates in the illegal pet trade (*Primate Conservation Alliance. 2022)*

The provided information strongly suggests that the Tonle Sap Zone 3 adjacent to the OTP meets multiple IFC PS6 criteria related to the Critically Endangered Long-tailed Macaque:

- Criteria 1a: The recent uplisting of the Long-tailed Macaque to Endangered status by the IUCN Red List underscores the habitat's critical importance for the species' survival and reproduction. The frequent sightings of these primates by local informants, especially in the flooded forests, highlight the area's significance as a key habitat.
- Criteria 4: The flooded forests of the Tonle Sap Zone 3 represent a highly threatened and unique ecosystem. They face significant threats from habitat loss, pollution, and climate change. These forests provide a crucial habitat for the Long-tailed Macaque and other potentially threatened species.

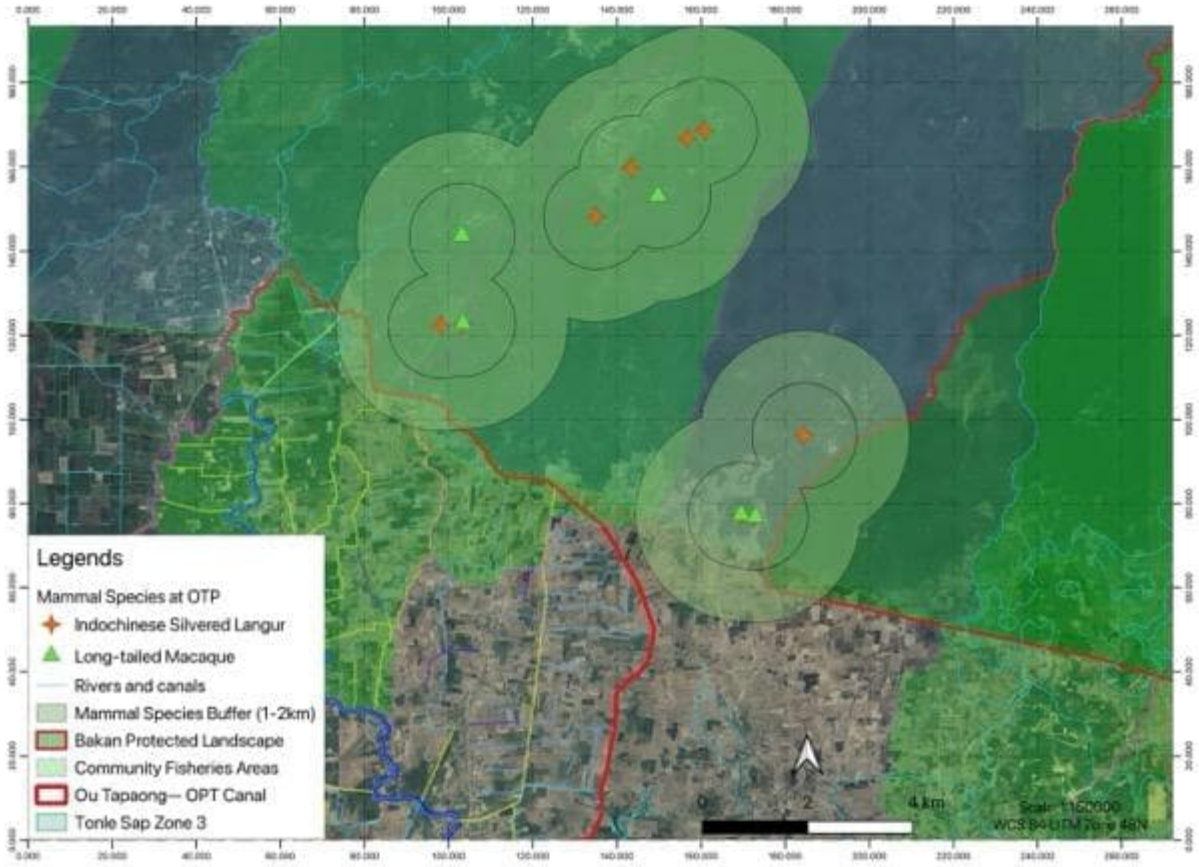


Figure 7: A spatial distribution map was generated for two primate species—the Indochinese Silvered Langur and Long-tailed Macaque—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.

5.3.3.4 Fishes (2 species)

Overall, these statements provide valuable insights into sightings and knowledge about Siamese Tiger Perch and Striped Catfish within different sections of the Ou Tapaong Command area. The following paragraphs summarize the key findings and justifications for the presence of these two fish species confirmed by key informants, along with their associated confidence levels and their ecological knowledge of fish diversity and migration.

- **Siamese Tiger Perch:** According to four key informants in the upper section of the Ou Tapaong Command area, Siamese Tiger Perch has been consistently observed in Boeng Kansaeng Lake, located in the southwest part of the Ou Tapaong Command Area. Three of them reported encountering a few individuals of this fish

species in 2023 and 2024 (figure #7), while another informant saw them about 20 years ago during the fully flooded period. This particular informant stopped fishing for many years after becoming older.

The Siamese Tiger Perch is believed to migrate from Tonle Sap Great Lake to the upstream through Svay Daun Kav River (along the western boundary of command area) and then move into Boeng Kansaeng through its tributary canal during flooding periods. Common fishing gear used includes line nets, cast nets, and small fish traps. The informants mentioned that catching this species is extremely rare, with only one to two individuals caught per season using line nets. They possess extensive knowledge about fish and make a living through fishing.

On the other hand, two key informants from the lower Ou Tapaong section stated that although they are familiar with Siamese Tiger Perch, they have never seen them in their area. One informant mentioned having seen this species in 1979 but not recently. Similarly, Mr. Chem Sophal from Punleu Komar Organization confirmed his awareness of this species but stated that it is not present in the lower Ou Tapaong Area.

The Criterion 1a of IFC Performance Standard 6 (PS6) is potentially met. The Siamese Tiger Perch, a Critically Endangered species, has been observed in Boeng Kansaeng Lake, a habitat within the Ou Tapaong Command Area. However, the frequency of sightings is low and historical, suggesting that further investigation is necessary to definitively establish the habitat's significance for the species' survival and reproduction.

- **Striped catfish**: One informant recalled seeing the Striped Catfish approximately 7 years ago in a small wetland area during the peak of flooding. This species is exceptionally rare, and it is known to migrate to this specific area when the entire region becomes submerged in floodwater.

  Based on what we know, the habitat for the Critically Endangered Striped Catfish likely meets two of the IFC PS6 criteria:
  - Criterion 1a: This habitat is super important for the survival of this super rare fish. It's like their special breeding ground during floods.
  - Criterion 3: The fish migrates to this specific area when it floods, making it a key spot for this travelling species.

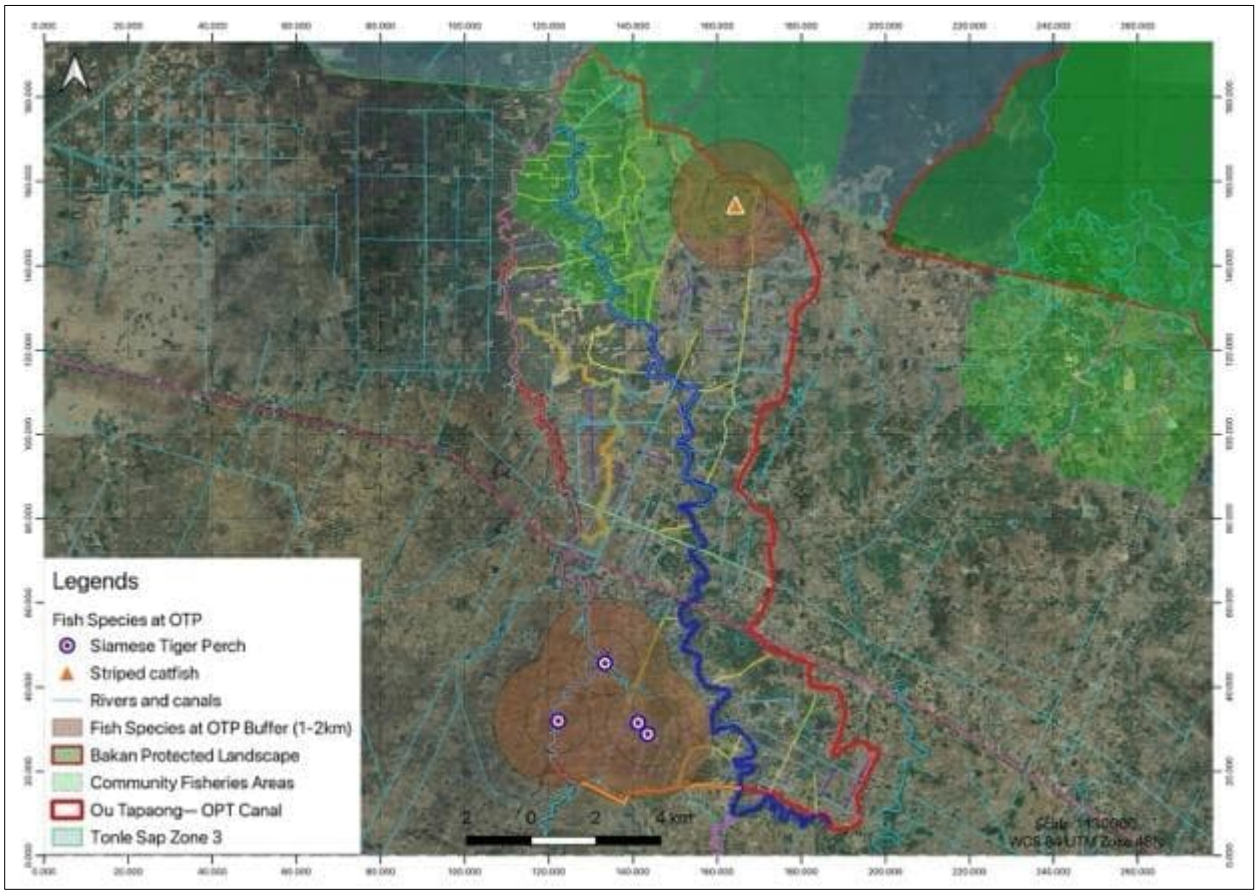


Figure 8: A spatial distribution map was generated for two fish species—the Siamese Tiger Perch, and Striped Catfish (old record-7 years ago)—within the lower Ou Tapaong Command Area. 1-2 km buffer zones were included to approximate their minimum movement range around suitable habitats.

5.3.4 Occurrence of Protected Areas near the Sub-scheme Area

A review of protected areas in the vicinity of the sub-scheme has been conducted as a preparatory step before proceeding with Step 3 of the CHA. There are four areas located near and downstream of the OTP sub-scheme (See Table below). The preliminary assessment focuses on the two that are closest to the OTB: Flood Forest Conservation, b) Bakan Grassland Protected Area[2].

No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
1	Flooded Forest Conservation	Royal Government of Cambodia: Sub-decree No. 197 dated 29 August 2011	The Tonle Sap's flooded forests are a vital part of its unique ecosystem. During the wet season, the Mekong River's waters back up into the Tonle Sap, flooding vast areas and creating a rich habitat for diverse wildlife. This dynamic ecosystem supports a multitude of fish species, waterbirds, and other wildlife. However, it faces threats like deforestation, overfishing, and pollution,	0 (share the border)

[2] Bakan grassland is a protected area for birds designated by sub-decree No. 144 in 2023.

No.	Name of Protected Area	Designated by	Main target and requirement	Distance (km) to OTP sub-scheme
			necessitating conservation efforts to protect this vital resource.	
2	Bakan Grassland protected area	Royal Government of Cambodia: Sub-decree No. 144, dated 04 July 2023	Bakan Grassland, a 38,430-hectare protected area in Cambodia, is a vital part of the Tonle Sap ecosystem. It's home to endangered bird species like the Bengal Florican and Chinese Grassbird. The Wildlife Conservation Society (WCS) and local communities are working together to protect this unique habitat.	2
3	Dei Roneat Important Bird Area (IBA)	BirdLife Internation	The IBA supports breeding colonies of important birds like the Darter, Lesser Adjutant, and Greater Adjutant. Its diverse habitat supports various bird species, but faces threats from human activities. Conservation efforts include monitoring, community engagement, habitat restoration, and policy advocacy to protect this crucial site.	12
4	Tonle Sap Biosphere Reserve (TSBR)	Royal Government of Cambodia: Royal Decree in 2001[3]	The Tonlé Sap Biosphere Reserve is a distinctive ecological region encompassing the Tonlé Sap, or Great Lake of Cambodia. The reserve was successfully designated a UNESCO Biosphere Reserve in 1997 and subsequently enshrined in the Cambodian Royal Decree in 2001.	16
5	Prek Toal Important Bird and Biodiversity Area (IBA), then designated at the core area of TSBR in 2001, and then promoted Prek Toal Ramsar Site in 2015	BirdLife Internation Royal Government of Cambodia: Royal Decree in 2001[4] Sub-decree in 2015	The area is well known as the largest waterbird breeding colonies in Southeast Asia, support a congregation of may globally threatened birds, fish and other wildlife specicis. It's the second world largest breeding habiatat for Greater Adjutant, and the only breeding habitat for Spot-billed Pelican, and Milky Stork in Southeast Asia. Prek Toal is only inland breeding population for Milky Stork in the world.	24

[3] https://www.unesco.org/en/articles/national-conference-tonle-sap-biosphere-reserve-brings-together-stakeholders-discuss-sustainable

[4] https://www.unesco.org/en/articles/national-conference-tonle-sap-biosphere-reserve-brings-together-stakeholders-discuss-sustainable

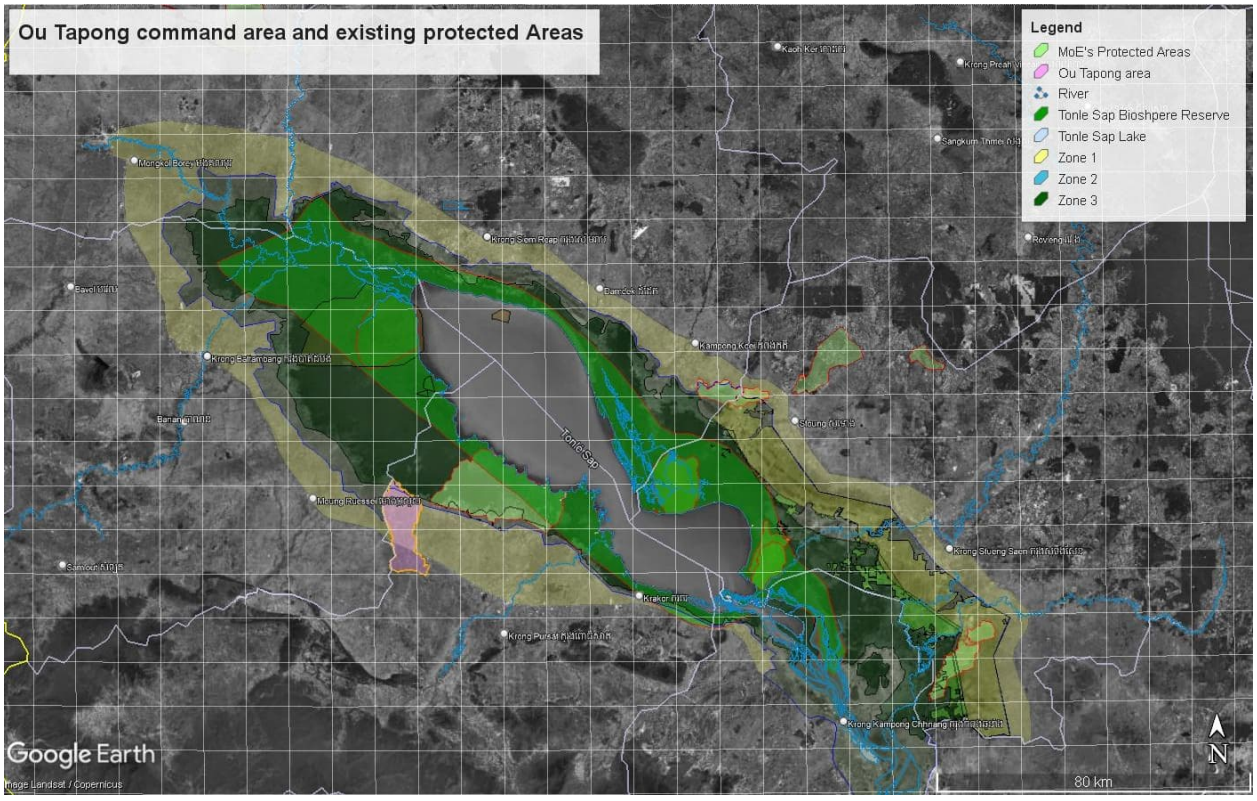


Figure 9: Map of Ou Tapong Command Area and other existing protected areas under administered of the Ministry of Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministries of Water Resources and Meteorology

5.4 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species (identified in the list of 11 EN and CR species) qualify for Critical Habitat features.

All information presented in this study report has been meticulously verified against reliable sources, including key government research institutes, national and international organizations, and expert consultations. To ensure accuracy, fish, bird, mammal, and reptile species identification at Ou Ta Paong, Lum-Hach, Brambei Mom, Kraeu Trom, and Yottasass was confirmed through consultations as below:

Table 5: list of internation and nation key expert were consulted to check and verify each all target EN and CR species

Name	Position and institution	Key Area of expertise/ consultation	Contact
Dr. Ea Chitra	Head of the Aquaculture Faculty at the Kampong Speu Institute of Technologies	Key fish species were released by his faculty at Anlong Chrey and Brambei Mum Reserviors.	+855 14 388 694
Mr. Robert Tizard	Senior Project Lead for Tonle Sap Landscape, WCS Camodia	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme	rtizard@wcs.or

Mr. Tach Sovannara	Head of the Fisheries Lab at the Inland Freshwater Research and Development Institute of the Fisheries Administration	Identification and clarification of EN and CR species of fish and reptiles across all sub-schemes	
Mr. Khim Sokha	Chief of office of the Fisheries Conservation Department	Identification and clarification of EN and CR species of fish and reptiles across all sub-schemes	+855 12 784 687
Mr. Chuem Sophal	Program Manager, Punleu Komar Organization	Confirm present of birds and key wildlife species at Ou Ta Paong Sub-scheme	
Mr. Morn Ravy	Bakan Protected Landscape Project Coordination, WCS Cambodia	Confirm present of birds and key wildlife species at Ou Ta Paong Sub-scheme	morn@wcs.org
Mr. Somony Thay	Direct of Aquaculture Department, FiA	Fish identification, key fish species releasing data, and distribution range across all schemes	+855 12 829 971
Mr. Neang Ty	Conservation Program Manager, Wild Earth Allies	Internation and national expert on reptile	+855 12 864 409
Mr. Hong Chamnan	Director of the Freshwater Wetland Conservation Department, MoE	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme, national protected area data	+855 12 922 429
Mr. Sun Visal	Deputy Director of the Freshwater Wetland Conservation Department, MoE	Confirmation and historical sighting data of Bengal Florican and other key bird species around Ou Ta Pang sub-scheme, national protected area data	+855 12 708 836

All information concerning avian and other key wildlife species, including their behavioral patterns, was corroborated through sighting data verified by relevant experts from the Wildlife Conservation Society (WCS), a long-standing partner of the Ministry of Environment (MoE), Fisheries Administration, and Forestry Administration in conservation efforts spanning over 25 years. Additionally, consultations were held with Mr. Hong Chamnan, Director of the Freshwater Wetland Conservation Department, and Mr. Sun Visal, his Deputy Director and the head of the Tonle Sap Biosphere Reserve. Both individuals possess extensive experience, ranging from 20 to 30 years, in avian ecology and protected area management within the Tonle Sap Lake region.

Finally, information related to reptiles and amphibians was validated through consultations with Mr. Neang Ty and his team from Wild Earth Allies, renowned experts who have made significant contributions to the discovery of new reptile and amphibian species in Cambodia, including the Cardamon Shrub Frog (Philautus cardamonus).

5.4.1 Overview of the current land use and land cover at OPT

The map below features the current land and use and land cover at Ou Tapaong Command Area based on the satellite image captured by Sentinel 2 with 10m resolution in late 2023. The color bands failed to distinguish between rice fields, grassland and shrubland areas. However, based on field assessment, the command area is dominated by existing rice fields and some modified habitats. There are some small and fragmented natural habitats like shrubland, and grassland along the natural streams, seasonal ponds and wetland habitat creating a mosaic habitat for many wildlife species to strive as the area is situated within the Tonle Sap Floodplain close to many protected areas and IBBAs. Residential areas are situated along the main roads, rivers, and streams.

The northern portion of the OTP Command Area is a dynamic landscape characterized by a varied mosaic of habitats. Here, agricultural lands coexist with modified habitats, wetlands,

shrublands, and remnants of grassland, seamlessly transitioning into the vast expanse of the Tonle Sap Zone 3 flooded forest.

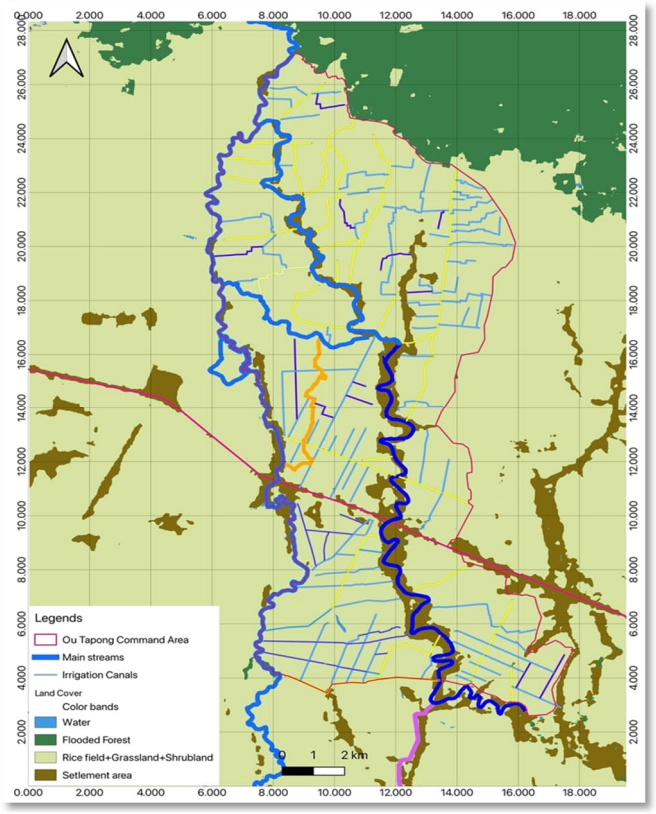


Figure SEO Figure * ARABIC 10:

This diverse ecological mosaic plays a crucial role in supporting a rich array of biodiversity. The area serves as a vital foraging ground for numerous migratory bird species, providing them with abundant food resources. Additionally, it functions as a critical refuge and breeding ground for fish during the wet season, when the flooded forests and wetlands offer ideal conditions for spawning and juvenile development.

The intricate interplay of these habitats sustains a diverse community of wildlife, including birds, mammals, fish, and reptiles. These species rely on the unique characteristics of the flooded forest and wetland ecosystems for essential life cycle activities such as breeding, nesting, and foraging. The area's significance as a biodiversity hotspot is underscored by its role in supporting a wide range of Habitat of significant importance to CE and EN species

As presented in Section 4.1.3.3 (Ecological State), species that qualify as critical habitat features include:

- **Reptile** (4 species): Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, and Elongated Tortoise,
- **Mammals** (2 species): Indochinese Silvered Langur and Long-tailed Macaque),
- **Fishes** (2 species): Striped catfish and Siamese Tiger Perch, and
- **Birds** (3 species): Greater Adjutant, Milky Stork, and Bengal Florican.

First of all, the Ou Tapaong command area was assessed as a modified habitat because the command area which is around 14,000 hectares is a mixture of paddy fields, rivers, shrubland, seasonal ponds, farmers, and houses. Rivers such as Ou Ta Paong River and Svay Donkeo River have been substantially modified at various locations of the river for water collection, storage, as well as for other living and farming purposes.

In this assessment, we divided Ou Tapaong Command Area into three parts: 1) the upper part to the south, 2) the middle part along National Road 5, and 3) the lower part to the north which is situated within the floodplain of Tonle Sap Zones 2 and adjacent to Tonle Sap Zone 3 for key informant interview and habitat assessment purposes as this command area is large and maintain different demographic and natural habitat conditions. On August 7, 2024, the Cambodian government discussed the decision to register two zones (Zone 2 and Zone

3) of the Tonle Sap Lake Basin as state land to protect the natural resources of the lake. This decision will prohibit any further requests for land concessions in these zones. The Ministry of Land Management, Urban Planning and Construction hopes that this will help to preserve the biodiversity of the lake[5]. The assessment focused on the upper and lower parts because these areas are known to have a diverse biodiversity landscape. While the survey revealed variations in knowledge about wildlife among local communities, it also highlighted the need for increased awareness and understanding across all areas.

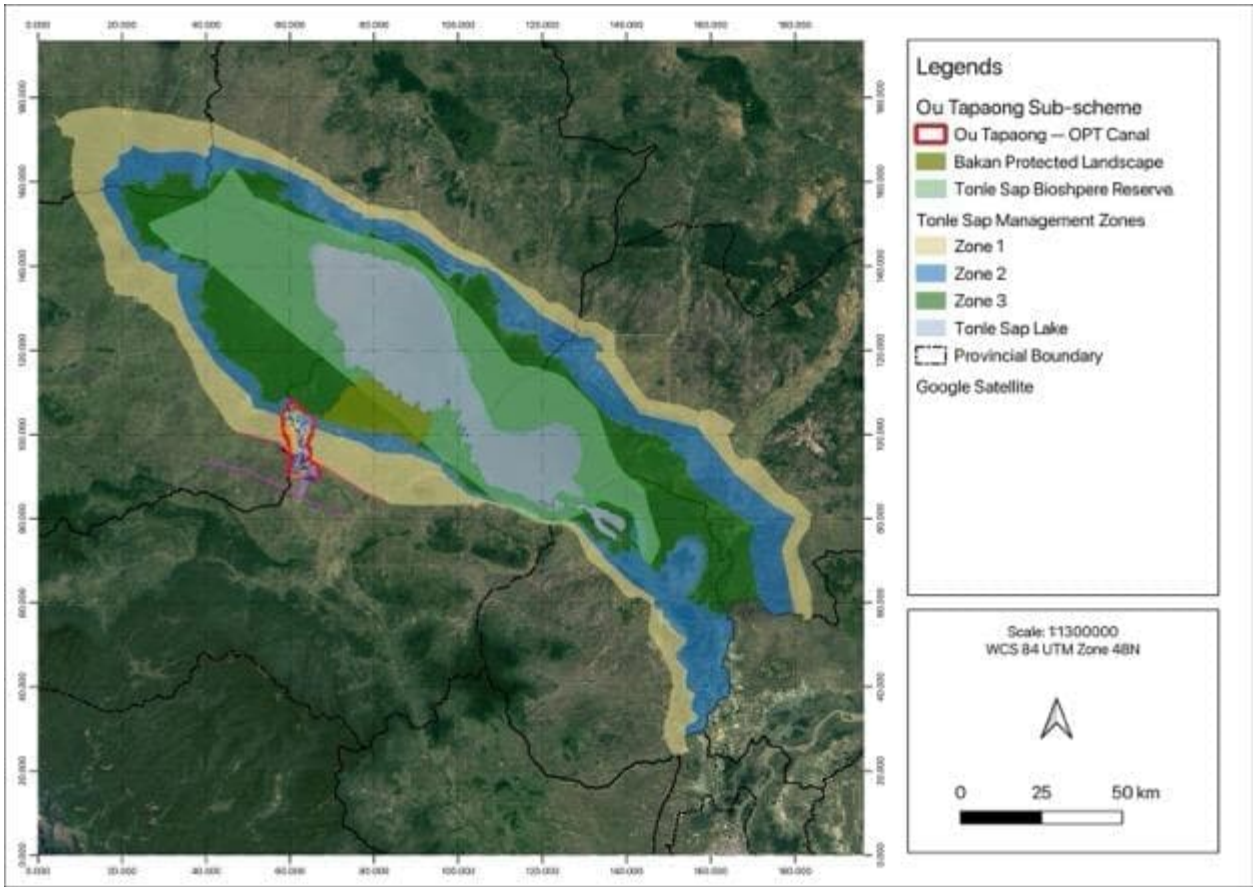


Figure 11: Map of Ou Tapaong command area and other existing protected area within the Tonle Sap Basin

The southern part of the command area is predominantly agricultural, with limited remaining natural habitats. Boeng Kansaeng, the largest seasonal wetland, faces challenges in water retention during the dry season. While the command area mostly gets water for irrigation from the Svay Daunkaev and Pursat rivers, the water volume is insufficient to maintain natural flows (e.g. Ou Tapaung River). Additionally, human interventions such as earth dams and conversion of waterways into fish ponds have fragmented the natural habitats and as such hindered the movement of aquatic species (Figures 8 and 9).

The northeastern part of the command area, though dominated by agriculture, includes a significant area of flooded forests. This diverse habitat supports a range of endangered and critically endangered species. However, the entire water system faces challenges that limit its suitability for species requiring extensive, interconnected habitats. The lowest part of this area is connected to a very healthy flooded forest habitat, consisting of many small and large waterholes, and wetland areas, creating a mosaic habitat that provides suitable ecological niches for many endangered and critical species in the area. This huge flooded forest habitat is part of the Tonle Sap Multiple Use Area, Tonle Sap Biosphere Reserve

[5] Land Management, Urban Planning and Construction, Cambodia (2024). Zones 2 and 3 of the Tonle Sap Lake will be registered as state land to preserve this precious natural resource for inheritance for all generations.

under the Ministry of Environment, and Tonle Sap Management Zone under the administration mandate of the Tonle Sap Authority, and Flooded Forest Protected Area under the Fisheries Administration. Additionally, a portion of Ou Tapaong's lower command area overlaps with two Community Fisheries (CFIs) areas.

The critical habitat for these bird species within the Ou Tapaong Irrigation sub-scheme includes flooded forests, wetlands, lakes, rivers, grassland, abandoned and fellow rice fields, and waterways. The flooded forests in Tonle Sap Zone 3 serve as crucial habitats for several endangered and critically endangered primate species like the Indochinese Silvered Langur and Long-tailed Macaque and are charaterised with lakes and wetlands inside that are crucial foraging habitats for birds. Based ont this key finding we can identify and cacharaterise critical habitats of various EN and CR species presence within and close thie command area as below:

- Flooded forests, particularly those in Tonle Sap Zone 3, are particularly significant for biodiversity. These forests provide crucial habitat for endangered primates such as the Indochinese Silvered Langur and Long-tailed Macaque. Additionally, the lakes and wetlands within these forested areas offer essential foraging grounds for various bird species including Greater Adjutant and Milky Stork.
- Wetlands, such as Boeung Kansaeng, play a vital role in supporting aquatic and terrestrial biodiversity. These areas provide essential food, shelter, and breeding grounds for a variety of species including birds, reptiles, and fish.
- Rivers and waterways, like the Svay Daun Kav River, serve as important corridors for fish migration and connectivity between different habitats. This can indirectly benefit birds by providing a healthy aquatic ecosystem.
- Grasslands and open areas, while less diverse than forested habitats, can still support certain Bengal Florican, Yellow-breasted Bunting and other bird species. Abandoned and fallow rice fields may also offer temporary refuge for many bird birds including the Florican. The Bengal Florican utilizes this habitat for nesting and feeding during the dry season. The Yellow-breasted Bunting winters in this region before returning to its breeding ground in Siberia, Russia, from May to November

Based on the biodiversity assessment conducted at Ou Tapaong Irrigation Sub-scheme, several critical habitats have been identified, and described below. These habitats support a range of endangered and critically endangered species, highlighting their ecological significance. **The critical habitat assessment activities that should be taken for the Ou Tapaong Command area, considering IFC PS 6 guidance on biodiversity conservation and sustainable management of living natural resources, are as follows:**

1. Baseline Studies: Conduct comprehensive baseline studies to identify and understand the biodiversity values in the area. This should include a literature review, stakeholder engagement and consultation, field surveys, and other relevant assessments. The focus should be on identifying key species (such as Greater Adjutant, Milky Stork, Bengal Florican), fish (Siamese Tiger Perch and Striped Catfish), reptiles (Black Marsh Turtle, Southeast Asian Box Turtle, Giant Asian Pond Turtle, Elongated Tortoise), mammals (Indochinese Silvered Langur and Long-tailed Macaque), and their habitats.
2. Habitat Mapping: Map out the different habitats present within the Ou Tapaong Command area. This should include flooded forests, lakes (such as Boeung Kamsaeng Lake), rivers (Svay Daunkav River), waterholes, grasslands, and fellowed rice fields used by bird species for foraging.
3. Threat Assessment: Assess potential threats to critical habitats identified in step 2. Consider factors such as habitat loss due to infrastructure development or land-use changes related to irrigation system renovation.

4. Stakeholder Engagement: Engage with relevant stakeholders including local communities living in or around critical habitats to gather their knowledge about biodiversity values in the area.
5. Mitigation Measures: Develop mitigation measures specific to each identified critical habitat that aligns with IFC PS 6 guidance on avoidance of impacts whenever possible; implementation of measures to minimize habitat fragmentation; restoration activities during operations or after project completion; implementation of set-asides for protection; consideration of biodiversity offsets where appropriate based on no net loss principle.
6. Environmental and Social Impact Assessment (ESIA): Conduct an ESIA that considers all potential impacts on critical habitats identified through steps 1-5 above.
7. Monitoring Plan: Develop a comprehensive monitoring plan that includes regular monitoring of key species populations within critical habitats identified in step 2 above**.**



Figure 12: *Boeung Kansaeng located in Ou Tampaong's upper reaches, offers sighted records of Siamese Tiger Parch. The area's upper part in this photo is a settlement along the Svay Daunkav River.*



Figure 13: Overview of Boeung Kansaeng, located upstream of Ou Tapaong Command Area. A canal connects to Stueng Svay Daunkav River (left) and Ou Tapaong (right), a potential fish migration route during floods.



Figure 14: Aerial photograph depicting the Ou Tapaong Stream/canal fragmented by earth dams, roads, and ponds, illustrating its diversion for non-intended purposes.



Figure 15: Aerial photograph of intake flooded forest habitat within Tonle Sap Zone 3 and the continuous land encroachment, converting forest land for rice cultivation.

5.4.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Ou Ta Paong).

5.4.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for OTP, therefore is expected to qualify as critical habitats under this criterion.

5.4.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

5.4.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

Boeung Kansaeng Lake still maintains hydrological connectivity for fish migration from Stueng Svay Daunkav River through its canals, where the Siamese Tiger Perch was confirmed. Some small wetland areas at the lower part of the OTP command area support ecological functions and connectivity for confirmed birds, reptiles and fish species for their local movement, nesting, and foraging ground. So, that is necessary to support biodiversity values that require applying biodiversity mitigation measures and protection efforts (described under the above criteria) have been identified. Pumping, drainage, and discharge of chemical inputs into that wetland can have a significant impact on the biodiversity and survival rate of EN and CR species present in that area.

5.5 Potential Impacts & Feasibility of Net Gain Requirements (Step 4)

Step 4 (as described in the above CHA method) requires a high-level assessment of the potential for critical habitat features to be affected by the investment activities of the sub-scheme (both construction and operation). This step is necessary to determine if Net Gain measures need to be demonstrated and whether the necessary measures are feasible.

In the section below, species that are assessed as “Present” or “Possible” in sub-scheme AoI (as shown in the above table) are included in the impact assessment. These include the following 8 species: 1) Four reptiles (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle, Elongated Tortoise), 2) Three birds (Greater Adjutant, Milky Stork, and Bengal Florican), and 3) One fish (Siamese Tiger Perch).

5.5.1 Potential impacts

5.5.1.1 Reptiles (Substantial risk)

All four species of reptiles are found in the upper and lower part of the OTP command area, particularly in areas near natural water courses (rivers and streams). During construction, these reptiles are potentially affected directly due to a) disturbances from noise and vibration due to increased vehicle activity and human presence, b) being hit by vehicles, equipment from increased traffic movement and river dredging/training at Ou Ta Paong river, excavating of the extended canal of Kbal Hong and other relevant canals, c) caught by workers, local people, and hunters. During project operation, these reptiles may be directly affected, including a) being caught by local people and hunters, and b) pesticide residues from intensified crop production.

5.5.1.2 Birds (Moderate risk)

Greater Adjutant, Milky Stork, and Bengal Florican are found seasonally in the command area, mainly in the lower/downstream part which is subject to annual flooding. These birds are migratory and as such are rare. Local people don't catch these birds for food. However, since these birds feed on aquatic species available from the command area, they may be affected by the feeds that are contaminated with pesticide residues.

5.5.2 Net gain assessment

Additionally, during construction activities, these birds may be indirectly affected through disturbance and habitat loss caused by increased human activity and changes in water levels. It is important to note that the Ou Tapaong Command Area serves as a critical habitat for these endangered bird species, making it crucial to minimize any potential negative impacts.

Based on the potential impacts identified above, it is evident that measures need to be implemented to achieve a net gain in biodiversity within the Ou Tapaong Command Area. These measures should focus on minimizing direct disturbances and habitat loss during construction activities, as well as implementing sustainable agricultural practices to prevent pesticide contamination of food sources for these bird species.

In conclusion, based on the assessment results, it is recommended that comprehensive actions be taken to protect critical habitats for species such as reptiles (Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle Elongated Tortoise), birds (Greater Adjutant, Milky Stork, Bengal Florican), ensuring their survival alongside irrigation system renovation projects.

Table 6: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Ou Ta Paong sub-scheme of the Project Area

English Name	Scientific Name	IUCN Status	Global population	Cambodia population	Migratory/ Congregatory	Habitat and Distribution	Likelihood of Occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Reptile									
Black Marsh Turtle	*Siebenrockiella crassicollis*	EN	Unknown (suspected to have decreased by about 80% in SEA)	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds; 5-20 masl.	Moderate - Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Giant Asian Pond Turtle	*Heosemys grandis*	CR	Unknown (suspected to have decreased by about 80%)	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds	Moderate - Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Southeast Asian Box Turtle	*Cuora amboinensis*	EN	Unknown-kept declining	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds; 5-20 masl.	Moderate - Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Elongated Tortoise	*Indotestudo elongata*	CR	Unknown-kept declining	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds; 5-20 masl.	Moderate - Confirmed in AoI in 2024	Reported at the upper part of Ou Ta Paong with possibly moving between upstream and downstream during wet season via Ou Ta Paong and Svay Daunkev rivers. While much suitable habitat, itis therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Fishes									
Striped catfish	*Pangasianodon hypophthalmus*	EN	Unknown	Unknown	Yes	This freshwater fish is native to the Mekong River Basin in Southeast Asia, including countries like Thailand, Laos, Cambodia, and Vietnam	Low	List as EN in the IUCN red list, this species migrates upstream and Tonle Sap Floodplain area during flooding season. Due to the climate change, and dam construction, there's not enough flood plus with the last several years. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**
Siamese Tiger Perch	*Datnioides pulcher*	CR	Unknown	Unknown	Yes	This freshwater fish species is native to the Mekong and Chao Phraya River basins in Southeast Asia, including	Moderate - Confirmed in AoI in 2024	List as EN in the IUCN red list, this species migrates upstream and Tonle Sap Floodplain area during flooding season. This species navigates	**IN**

						Thailand, Cambodia, Laos, and Vietnam.		through rivers and canals to upstream to reach some lake and wetland areas. It's confirmed to present in the project AoI. Likely to qualify as CH under Criterion 1& 3 threshold.	
Mammal									
Hairy-nosed Otter	*Lutra sumatrana*	EN	Unknown-kept declining	Unknown-kept declining	No	Endangered and elusive, inhabit the Tonle Sap Floodplain's diverse wetlands, including flooded forests and marshes. Their survival is threatened by habitat loss, hunting, and bycatch.	Very Low	Despite there's some habitat but the species was confirmed present around 15 to 12 km way downstream. Therefore, It's likely absent in the project AoI.	**Out**
Indochinese Silvered Langur	*Trachypithecus germaini*	EN	Unknown-kept declining	> 3,000 individuals[6]	*No*	Inhabit the diverse forests of the Tonle Sap Floodplain, including flooded areas. Habitat loss and hunting threaten their populations.	Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 6 threshold.	**IN**
Long-tailed Macaque	*Macaca fascicularis*	EN	Unknown-kept declining	Unknown-kept declining	No	Inhabit the diverse forests of the Tonle Sap Floodplain, including flooded areas. Habitat loss and hunting threaten their populations.	Moderate - Confirmed in AoI in 2024	While much suitable habitat is present downstream of the project and along the Ou Ta Paong River and is therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 6 threshold.	**IN**
Birds									
Greater Adjutant	*Leptoptilos dubius*	EN	1,000–1,200 individuals[7]	100–150 individuals	N/A	Has a very restricted range in Cambodia. Its primary stronghold is the Tonle Sap Biosphere Reserve, where it favors flooded forests and wetlands.	Moderate - Confirmed in AoI in 2024	IUCN listed as EN and although restricted range across the Tonle Sap Floodplain. It is likely to occur in Project AoI at some suitable habitats. Likely to qualify as CH under Criterion 1& 6 threshold.	**IN**
Milky Stork	*Mycteria cinerea*	EN	> 1,500 mature individuals	≥ 100 and 150 individuals	Yes	Primarily inhabit and breed around the Tonle Sap Lake, particularly its flooded forests and surrounding wetlands, shrubland, grassland making it their most crucial habitat in the country; 5-10 masl.	Low - Confirmed in AoI in 2024	The project area's lakes, rivers, and wetlands within the lower command area provide suitable habitat, although the Milky Stork population is small and local awareness of the species is limited. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**
Yellow-breasted Bunting	*Emberiza aureola*	CR	< 10,000 individuals *(80-90% decline*	Unknown	Yes	This CR species is a rare winter visitor and passage migrant in Cambodia. It prefers open	Moderate - but didn't confirm in	While much suitable habitat is present downstream of the project and along the Ou Ta Paong and the species is	**IN**

[6] https://www.phnompenhpost.com/national/silvered-langur-endangered-plentiful-kingdom

[7] BirdLife International. (2023). *Leptoptilos dubius*. The IUCN Red List of Threatened Species 2023: e.T22697721A220483715.

			since 1980s)[8]			habitats such as wetlands, grasslands, and agricultural areas like rice paddies, which provide food and shelter. It has been observed in key areas including the Tonle Sap Floodplain, Mekong River Basin, Northern Plains, and coastal regions. However, its presence is declining due to habitat loss, hunting, and degradation.	AoI in 2024 due to seasonal preference	therefore likely to occur in the project AoI. Likely to qualify as CH under Criterion 1& 3 threshold.	
Bengal Florican	*Houbaropsis bengalensi*	CR	250-1,000 individuals	150–700 individual	N/A	Primarily found in the floodplain grasslands of the Tonle Sap Floodplain, particularly in the Siem Reap, Kampong Thom, and Pursat provinces. This area provides the critical grassland habitat that the species depends on for breeding and foraging	Moderate - Confirmed in AoI in 2024	IUCN listed as CR and although restricted range with the Tonle Sap Grassland. WCS and MoE established a new protected area to conserve this species of where it's boundary is just 1km from the command area. It is likely to occur in Project AoI at some suitable habitats. Likely to qualify as CH under Criterion 1& 6 threshold.	**IN**
Masked Finfoot	*Heliopais personatus*	CR	600 - 1,700 individuals	< 100 individuals	No	Inhabits forested wetlands, slow-moving rivers, and flooded forests, especially around Tonle Sap Lake, Stung Treng Ramsar Site, and the Mekong River with dense vegetation for nesting and foraging.	Not confirmed	IUCN listed as CR and although it is a restricted-range species it is found mainly in the dense vegetation and flooded forest close the open lake and therefore it has been screened out	**Out**
White-winged Duck	*Asarcornis scutulata*	EN	250-100 individuals	< 50 individuals	No	Survives in fragmented populations within protected lowland evergreen and semi-evergreen forests, favoring forested wetlands and slow-moving rivers. With fewer than 50 mature individuals remaining, habitat loss, hunting, and human disturbance pose severe threats, making habitat protection crucial for the species' survival.	Not confirmed	IUCN listed as EN and although it is a restricted range withing dry forest and semi-evergreen habitats. There's no suitable habitat within AoI and therefore it has been screened out	**Out**
Fauna									
Cardamon Shrub Frog	*Philautus cardamonus*	EN	Unknown (very small and	Unknown (very small and	No (endemic)	This small and critically endangered frog species is	Not confirmed	IUCN listed as EN and as the Endemic to the Cardamom Mountains between	**Out**

8 **IUCN Red List**: BirdLife International. (2020). *Emberiza aureola*. The IUCN Red List of Threatened Species 2020: e.T22720966A180040113

			declining)	declining)		endemic to the Cardamom Mountains in southwestern Cambodia. Due to its restricted range and the ongoing threats of habitat loss and degradation, its population size is believed to be very small and declining		1,000 and 1,700 meters above sea level. There's no suitable habitat within AoI and therefore it has been screened out	
River-weed	*Terniopsis chanthaburiensis*	EN	Unknown	Unknown	No	Rare and poorly studied aquatic plant species endemic to Thailand, specifically found in the Chanthaburi Province.	Not confirmed	IUCN listed as EN and as the Endemic to the Thailand and therefore it has been screened out	**Out**

Table 7: Results of the prioritisation exercise to support BAP planning: priority biodiversity for BAP actions for Ou Tapong

Action Category (AC)	Group	Priority Biodiversity	Mitigation and monitoring approach
AC 1 High Priority for habitat mitigation and/or species-specific measures	Mammal	Indochinese Silvered Langur and Long-tailed Macaque	The highest priority for achieving net gain (offset targets) lies in the implementation of both species-specific and habitat-focused mitigation and offset actions.
	Reptiles	Black Marsh Turtle, Elongated Tortoise	
	Birds	Bengal Florican	
	Natural Habitats	Riverine habitat along the main canal where turtles present	
	Protected Areas and Internationally Recognized Areas	Tonle Sap Zone 3, Bakan Protected Landscape	
AC 2 Contingency planning	Birds	Greater Adjutant, Milky Stork, Yellow-breasted Bunting	While the likelihood of significant impacts is considered low, the potential consequences are substantial. Proactive mitigation measures should be implemented across the board as a matter of best practice. If impacts are observed, the situation should be escalated to the highest level of concern (Category 1) and species-specific mitigation strategies should be developed and implemented
	Reptiles	Black Marsh Turtle, Giant Asian Pond Turtle, Southeast Asian Box Turtle	
	Natural Habitat	Somraong Muk-yiek Community Fisheries and Sdok Khloak Community Fisheries	
	Freshwater fish	Siamese Tiger-perch	
	Mammal	Indochinese Silvered Langur and Long-tailed Macaque	

AC 3 General habitat mitigation measures	Freshwater fishes	Siamese Tiger Perch	To minimize anticipated impacts, implement best practices for habitat mitigation. Monitor habitat (or species-specific factors if necessary) to assess the actual impact scale. If monitoring indicates a high likelihood of significant impacts, reclassify the project to Category 1.
	Reptiles		
	Mammals	Hairy-nosed Otter,	
AC 4 Remain aware	Aquatic plant	River-weed *Terniopsis chanthaburiensis*	Potential impacts are anticipated to be minimal. Proactive mitigation measures should be implemented across the project area. Habitat monitoring can serve as an effective indicator to assess the project's actual impact scale.
	Birds	Masked Finfoot, White-winged Duck	

5.6 Biodiversity Action Plan (OTP), (if relevant, to achieve net gain)

A comprehensive Biodiversity Action Plan (BAP) should be developed to achieve net gain in biodiversity with a clear outline below:

Biodiversity Action Plan for Ou Tapaong Irrigation Sub-scheme

Executive Summary

This conservation action plan outlines strategies to mitigate potential negative impacts on biodiversity within the Ou Tapaong irrigation scheme. The plan is based on a critical habitat assessment that identified significant biodiversity values in the area, particularly for endangered and critically endangered species. The proposed actions align with the International Finance Corporation's Performance Standard 6 (PS6) on biodiversity conservation and sustainable management of living natural resources.

Key Objectives

Protect critical habitats: Identify and conserve areas crucial for biodiversity, such as flooded forests, wetlands, and rivers.

- Minimize negative impacts: Implement measures to reduce the adverse effects of irrigation scheme development on wildlife and their habitats.
- Enhance biodiversity: Promote habitat restoration and conservation activities to support species recovery.
- Engage with stakeholders: Foster collaboration with local communities and relevant government agencies to ensure effective conservation efforts.

Habitat Mapping

- Map out the different habitats present within the Ou Tapaong Command area. This should include flooded forests, lakes, rivers, waterholes, grasslands, fellows rice fields used by bird species for foraging.

Threat Assessment

- Assess potential threats to critical habitats identified in step 2. Consider factors such as habitat loss due to infrastructure development or land-use changes related to irrigation system renovation.

Mitigation Measures

- Develop mitigation measures specific to each identified critical habitat that align with IFC PS 6 guidance on avoidance of impacts whenever possible; implementation of measures to minimize habitat fragmentation; restoration activities during operations or after project completion; implementation of set-asides for protection; consideration of biodiversity offsets where appropriate based on no net loss principle.
- Carefully design project activities to avoid direct impacts on critical habitats.
- Identify alternative project locations or routes that avoid sensitive areas.
- Modify project designs to minimize the footprint and disturbance of critical habitats.
- Implement temporary measures to protect critical habitats during construction.

Minimization:

- Implement responsible construction practices to minimize adverse effects on critical habitats, such as avoiding unnecessary clearing of vegetation and minimizing soil disturbance.
- Establish effective waste management systems to prevent pollution.
- Implement erosion control measures to prevent sedimentation in aquatic habitats.
- Develop pollution prevention strategies to reduce water and air pollution.
- Habitat Protection and Restoration:

- Establish measures to protect and restore flooded forests, wetlands, and other natural habitats within and around the command area.
- Promote sustainable land use practices like agroforestry, conservation agriculture, and sustainable forest management.

Species Conservation:

- Develop species-specific conservation plans for endangered and threatened species identified in the area.
- Monitor populations of these species regularly and assess their habitat needs
- Consider implementing captive breeding programs or reintroduction efforts if necessary
- Implement habitat management measures that improve the quality and suitability of their habitats

Carbon Sequestration:

- Carbon Sequestration is the process of capturing and storing atmospheric carbon dioxide (CO2). It's a crucial strategy in mitigating climate change by reducing the amount of greenhouse gas in the atmosphere.
- Forest and wetland restoration: Re-establishing or enhancing forest and wetland areas can significantly increase carbon sequestration. These ecosystems act as carbon sinks, absorbing carbon dioxide from the atmosphere.
- Soil carbon enhancement: Implementing agricultural practices that improve soil organic matter content can increase carbon storage in the soil.
- Blue carbon: Protecting and restoring wetland and flooded forest ecosystem, can contribute to carbon sequestration.

Community Engagement:

- Involve local communities in biodiversity conservation efforts through participatory planning, monitoring, and implementation
- Educate communities about the importance of biodiversity i nthe sub-scheme area
- Foster community awareness about endangered species present within their vicinity
- Promote sustainable livelihoods that support conservation, such as community-based ecotourism, sustainable rice cultivation (eg. Sustainable Rice Flatform, and Organic Rice, and fisheries management

Research and Monitoring:

- Conduct further research assessing biodiversity and ecological processes within Ou Tapaong Irrigation Sub-Scheme
- Establish long-term monitoring programs to track changes in biodiversity and habitat conditions which will provide valuable data for evaluating the effectiveness of ongoing conservation efforts

Sustainable Water Management:

- Ensure irrigation systems and water use practices do not harm critcal haibitats. Optimise irrigation efficiency, reducing water pollution and protecting water sources.

Biodiversity Offsets:

- If significant residual impacts are expected despite avoidance and minimisation measures, biodiversity.

6. Lum Hach

6.1 Proposed project activities and potential risks and impacts

Green Peafowl have been observed year-round in all three community forests; both their offspring and adults were sighted by community patrol teams there. However, they face heightened vulnerability due to habitat degradation, fragmentation issues, land encroachment concerns, and hunting pressures from human activities. By carefully considering the ecological implications of the project, it is possible to balance the needs of agriculture with the conservation of endangered species and their habitats. Under Lum Hach, various activities will be carried out that cause the following E&S risks and impacts:

Table 8: Projection activities that may cause potential impacts on the environment and social at the Lum Hach sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes, and water management practices	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.
2	Increased agricultural activities, sedimentation, and pollution	**Water quality degradation** could impact aquatic ecosystems and species that rely on clean water.
4	**Increased human activities**	**Labor influx (during project construction) and Increased** human activities (during project operations pose additional threats to biodiversity. Increased human activity within the command area which could potentially disrupt wildlife behavior (nesting/foraging), increase poaching or predation risks if not properly managed.
5	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. For example, changes in seasonal wetlands or lakes' floodplains can disrupt breeding patterns for avian. Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats.
6	Use of chemical inputs and nutrient loading	**If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.**

7	Species displacement and disruption of foraging and breeding habits	Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats. Additionally, alterations to the irrigation system could disrupt the foraging and breeding habits of endangered birds and other wildlife.
8	**Land Use Changes**	The changes in land use that may occur as a result of the project, such as agricultural expansion or deforestation and habitat fragmentation.
9	**Biodiversity degradation, edge eddects, and soil erosion**	The potential impacts of the project on water flow, water quality, and sedimentation patterns. The changes in microclimate and increased disturbance at forest edges can negatively impact forest ecosystems and wildlife species.

6.2 Areas of Influence

The Lum Hach Irrigation Sub-scheme has a limited area of influence due to its small size and the surrounding farmland. The critical habitats identified within the area include Toul Samraong, Phnom Banon, and Chan Trak Community Forests. These areas are characterized by small, fragmented, and degraded dry deciduous forests (DDFs). However, these forests are crucial for the conservation of Green Peafowl, which have been confirmed to be present in these areas. The protection and restoration of these community forests should be a priority in the biodiversity action plan.

6.3 Analysis to prepare for determining CH status

6.3.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

6.3.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for the LH Command Area. The coordinates of this command area (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR, only one endangered bird species of Green Peafowl was confirmed see table 5 below.

Description of screening for narrowing down

For Lum Hach, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the Lum Hach area of influence, covering reptiles, mammals, fish, birds, and mushrooms. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 5 EN and CR species were identified in this area of influence (see Table below). In the 3rd round of screening (in August 2024), however, one of five species was confirmed as “potentially present” in the LH’s area of influence. So, the assessment for Lum Hach focuses on the confirmed list of **1 species** that are categorized by IUCN as Endangered species.

Table 9: Confirmed List of endangered and critically endangered species for the Lum Hach sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=5)	Confirmed Species in Round 3 (Total = 1)
I. Mammal species						
1	ឆ្កែព្រៃ	Dhole	Cuon alpinus	EN	Yes	No
2	ជ្រុំងធំ	Large Flying-fox	Pteropus vampyrus	EN	Yes	No
II. Fish species						
3	ត្រីកន្ត្រៀប់ខ្លា	Siamese Tiger Perch	*Datnioides pulcher*	CR	Yes	No
III. Bird species						
4	ក្អែក	Green Peafowl	Pavo muticus	EN	Yes	Yes
IV. Mashroom						
5	ផ្សិតកែវ	Puffball mushrooms	Calostoma insigne	EN	Yes	No

6.3.3 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the likelihood of occurrence (LoO) of Green Peafowl - as part of the CHA. For this CHA, species was classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the one confirmed species is presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The remaining forest patches within the Lum Hach Irrigation Sub-scheme are characterized by small size, fragmentation, and degradation. They are classified as very open and degraded Dry deciduous forests (DDFs), which are not suitable for many species, including Long-tailed Macaques, Large Flying-fox, and Puffball mushrooms. The limited availability of suitable habitats is a significant factor contributing to the scarcity of biodiversity in the area.

The biodiversity assessment at Lum Hach Irrigation Sub-scheme initially identified several potential endangered (EN) or critically endangered (CR) species using the Integrated Biodiversity Assessment (IBAT) and key informant interviews. However, further investigation revealed that only Green Peafowl was confirmed to be present within the Toul Samraong, Phnom Banon, and Chan Trak Community Forests (see map in Figure 14 below).

Species Distribution:

- **Green Peafowl:** Found in all three community forests, indicating their adaptability to the local environment and the importance of these habitats for their conservation.

- **Dhole:** Despite initial screenings, no confirmed sightings were made within the study area. This may be attributed to factors such as habitat fragmentation, human disturbance, or low population densities.
- **Flying-fox:** The survey result is similar to the dhole, no flying-fox was confirmed within the study area. This could be due to habitat loss, hunting pressure, or other factors affecting their survival.
- **Siamese Tiger Perch:** This species was not found within the study area, likely due to its preference for larger water bodies like the Tonle Sap Great Lake. Three KII reportd that they countered this specie when they went for fishing at Tonle Sap every year but they had never seen this species within this area (Lum Hach).
- **Puffball mushrooms:** Although not confirmed within the study area, there is potential for their presence in higher elevations of the Cardamom Mountains.

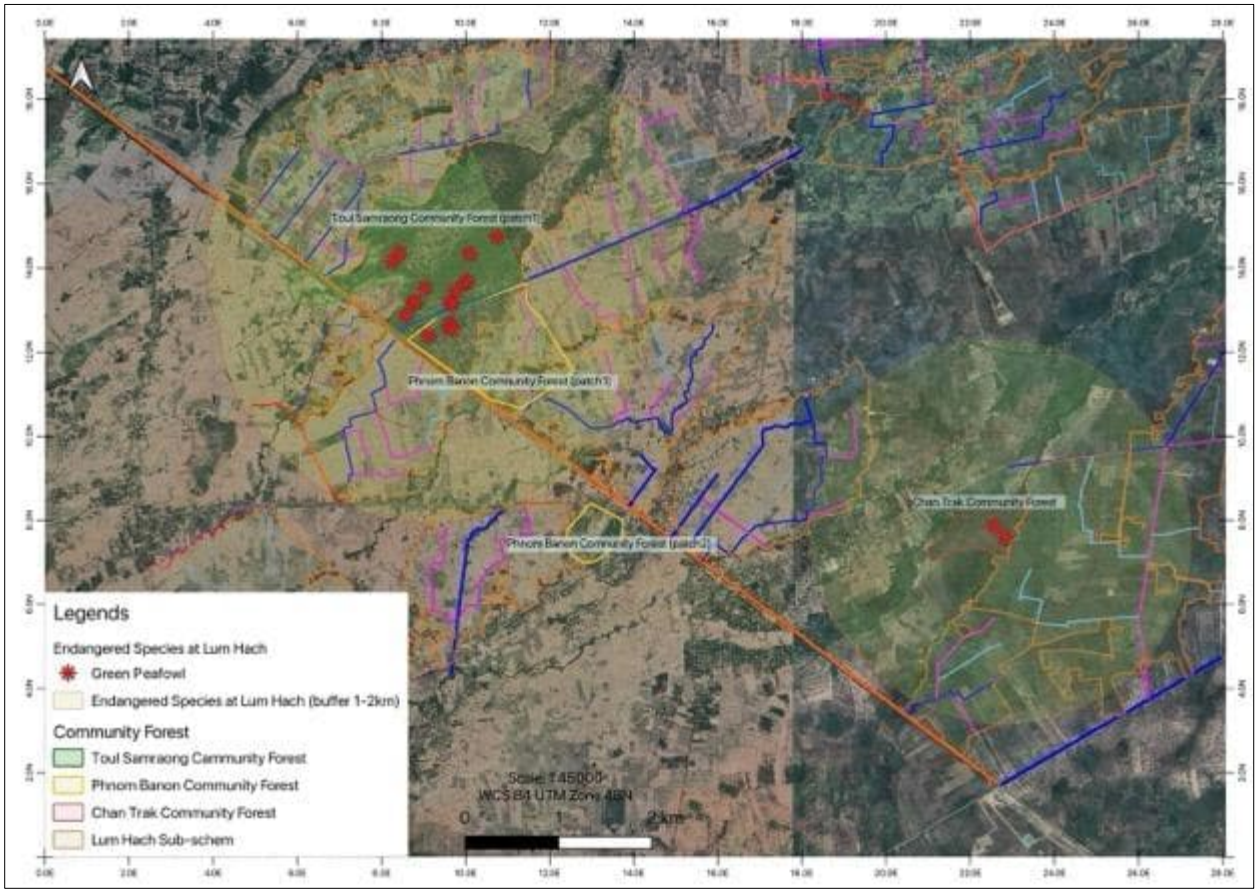


Figure 16: Green Peafowl distribution in Toul Samraong, Phnom Banon, and Chan Trak Community Forests, as confirmed by local sources from 2020 to 204.

6.4 Determination of Critical Habitat Status (Step 3)

A habitat assessment was conducted in key areas known for endangered species within the region. Interviews with local authorities, community committees, and key informants confirmed the presence of Green Peafowl in three community forest areas.

Two of these forests, Toul Samraong and Phnom Banon (a large patch), share a boundary and are primarily composed of dry, open dipterocarp forests with some closed dipterocarp areas along the natural canal. These three community forests are small, fragmented, and surrounded by farmland, with some remaining degraded forest land nearby. Despite their poor ecological connectivity, they are crucial for supporting the small remaining Green Peafowl population.

During a meeting, it was discovered that two community forest boundaries had been revised, and one had changed its name from Trapeang Mlu to Phnom Banon. All forest representatives confirmed that their areas were undergoing registration with the Ministry of Land Management, Urban Planning, and Construction (PLMUPC). However, some key informants expressed

concerns about ongoing land encroachment into their community areas. Despite previous complaints, the offenders continue to use and sell the land without any repercussions.



Figure 17: The upperpart of Hum Hack next to Boribou river catchment area



Figure 18: Overview from the above of the general condition of Toul Samroang and Phnom Banon Community Forests



Figure 19: Overview from the above of the general condition of Chan Trak Community Forest





Figure 20: An expert consulted with the Toul Samraong CF management committee to verify the identification of a canine species, ensuring it was correctly identified as either a dhole or a jackal.

6.4.1 Habitat of significant importance to CE and EN species

As presented in Section 4.2.3.3 (Ecological State), species that qualify as critical habitat features for Green Peafowl is listed as Endangered Species in the IUCN RedList. The natural dry forest habitats within the community forests of the Lum Hach Irrigation Sub-Scheme are critical for the survival of the Green Peafowl population. These forests provide essential resources for Green Peafowl, including food, shelter, and breeding sites. However, the quality and extent of these habitats can vary significantly, affecting their suitability for the species (Figures 16 and 17).

6.4.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Ou Ta Paoing).

6.4.3 Habitat supporting globally or nationally significant concentrations of migratory or congregatory species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for LH, therefore is expected to qualify as critical habitats under this criterion.

6.4.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies of there the three community forest areas are trimmed out from the command area. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion. However, the concern of illegal agriculture expansion into the community forest areas was questioned by some key informants (management committee and patrol members of community forests).

6.4.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

6.5 Potential Impacts & Feasibility of Net Gain Requirements (Step 4)

Step 4 (as described in the above CHA method) requires a high-level assessment of the potential for critical habitat features to be affected by the investment activities of the sub-scheme (both construction and operation). This step is necessary to determine if Net Gain measures need to be demonstrated and whether the necessary measures are feasible. In the section below, species that are assessed as “Present” or “Possible” in sub-scheme AoI (as shown in the above table) are included in the impact assessment on one bird (Green Peafowl).

6.5.1 Potential impacts on Green Peaflow (Substantial risk)

The Green Peafowl is found in three community forest areas located within the vicinity of Lum Hach command area. During construction, these species is potentially affected directly due to a) disturbances from noise and vibration due to increased vehicle activity and human presence, b) caught by workers, local people, and hunters.

6.5.2 Net gain assessment

Based on the assessment conducted for the Lum Hach Irrigation Sub-scheme, it has been determined that there is a net loss of biodiversity and ecological value within its area of influence. The critical habitat analysis identified only one endangered species, the Green Peafowl, with a confirmed presence in the sub-scheme's area of influence. The ecological state of habitats within this area is classified as very open and highly susceptible to human disturbances, posing potential threats to the Green Peafowl population.

It is evident that despite efforts to balance agricultural needs with conservation, there are significant risks and impacts on biodiversity within this project. Therefore, measures must be taken to mitigate these risks and minimize further loss of ecological value in order to achieve a net gain for biodiversity in the long term. This may include prioritizing protection and restoration efforts for critical habitats such as Toul Samraong, Phnom Banon, and Chan Trak Community Forests within the sub-scheme's area of influence.

Table 10: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Lum Hach sub-scheme of the Project Area

English Name	Scientific Name	IUCN Status	Global population	Cambodia population	Migratory/ Congregatory	Habitat and Distribution	Likelihood of Occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Mammal									
Dhole	Cuon alpinus	EN	< 2,500	< 200	No	Inhabits dry and semi-evergreen forests, and grasslands near water, primarily in the Eastern Plains Landscape and Cardamom Mountains, with rare sightings in the north. With fewer than 200 individuals.	Not confirmed	Listed as EN species with very restricted range. There's no suitable habitat and it's likely absent in the project AoI.	**Out**
Large Flying-fox	Pteropus vampyrus	EN	Unknown	Unknown	*No*	The Largest fox species in the world inhabits a variety of forested and coastal habitats, including primary and secondary forests, mangroves, swamps, and orchards widely distributed across Southeast Asia.	Not confirmed	Listed as EN species with very restricted range. There's no suitable habitat and it's likely absent in the project AoI.	**Out**
Birds									
Green Peafowl	Pavo muticus	EN	Btw 15,000–30,000	Btw 2,00 - 3,000[9]	N/A	Green Peafowl live in lowland forests, open woodlands, and grasslands, especially near water. They are now mostly found in protected areas of the Northern and Eastern Plains, and Cardamom. Habitat loss and hunting severely threaten their fragmented populations.	Moderate - Confirmed in AoI in 2024	IUCN listed as EN and live in the fragmented dry forest habitat in Toul Samraong and Phnom Banon, and Chan Trak Community Forests. it's present in the project AoI. Likely to qualify the Lum Harch as CH under Criterion 1& 4 threshold.	**IN**
Fish									
Siamese Tiger Perch	*Datnioides pulcher*	CR	Unknown	Unknown	Yes	This freshwater fish species is native to the Mekong and Chao Phraya River basins in Southeast Asia, including Thailand, Cambodia, Laos, and Vietnam.	Very Low – Not Confirmed in AoI in 2024	List as EN in the IUCN red list, this species migrates upstream and Tonle Sap Floodplain area during flooding season. It's likely absence in the project AoI	**Out**
Fauna									
Puffball mushrooms	Calostoma insigne	EN	Unknown	Unknown	No	It occurs in deciduous or mixed forests, particularly in moist, well-drained soils with acidic conditions. Its distribution may align with undisturbed forest regions, such as the Cardamom Mountains or Eastern Plains, where similar fungi are documented.	Not confirmed	Listed as EN species with very restricted range and health ecosystem. There's no suitable habitat and it's likely absent in the project AoI.	**Out**

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Table 11: Results of the prioritisation exercise to support BAP planning: priority biodiversity for BAP actions for Lum Hach

Action Category (AC)	Group	Priority Biodiversity	Mitigation and monitoring approach
AC 1 High Priority for habitat mitigation and/or species-specific measures	Birds	Green Peafowl	The highest priority for achieving net gain (offset targets) lies in the implementation of both species-specific and habitat-focused mitigation and offset actions.
	Protected Areas and Internationally Recognized Areas	Chan Trak Community Forest, Toul Samraong Community Forest, and Phnom Banon Community Forest	
AC 2 Contingency planning	Mammal	Dhole	While the likelihood of significant impacts is considered low, the potential consequences are substantial. Proactive mitigation measures should be implemented across the board as a matter of best practice. If impacts are observed, the situation should be escalated to the highest level of concern (Category 1) and species-specific mitigation strategies should be developed and implemented
	Freshwater fish	Siamese Tiger-perch	
AC 3 General habitat mitigation measures	N/A	N/A	
AC 4 Remain aware	Mammal	Large Flying-fox	Potential impacts are anticipated to be minimal. Proactive mitigation measures should be implemented across the project area. Habitat monitoring can serve as an effective indicator to assess the project's actual impact scale.
	Mushroom	Puffball mushrooms *Calostoma insigne*	

6.6 Biodiversity Action Plan for Lum Hach

Below is an outline of a biodiversity action plan for this sub-scheme.

Biodiversity Action Plan for Lum Hach Command Area

1. Habitat Restoration and Conservation

- **Reforestation:** Plant native tree species to restore degraded forest areas, focusing on areas with high ecological value and potential for species recovery.
- **Habitat Connectivity:** Create corridors or buffer zones between fragmented forest patches to facilitate species movement and gene flow.
- **Land Use Planning:** Develop and implement sustainable land use plans that prioritize biodiversity conservation and minimize negative impacts on habitats.

2. Species Conservation

- **Green Peafowl:**
  - Develop a specific conservation plan for Green Peafowl, including habitat management, population monitoring, and community-based conservation initiatives.
  - Implement measures to reduce human-wildlife conflict, such as habitat modification and education programs.
  - Consider establishing a captive breeding program as a last resort.
- **Other Species:**
  - Conduct surveys to determine the presence of other potential endangered or critically endangered species.
  - Develop species-specific conservation plans based on survey results.

3. Community Engagement

- **Capacity Building:** Provide training and education to local communities on biodiversity conservation and sustainable practices.
- **Community-Based Conservation:** Support community-led initiatives, such as community forestry and wildlife monitoring.
- **Sustainable Livelihoods:** Promote sustainable livelihoods that support biodiversity conservation, such as ecotourism, sustainable agriculture, or community-based enterprises.

4. Research and Monitoring

- **Biodiversity Surveys:** Conduct regular biodiversity surveys to monitor species distribution, abundance, and population trends.
- **Ecological Monitoring:** Establish long-term monitoring programs to track changes in ecosystems and species populations.

7. Brambei Mom

7.1 Proposed project activities and potential risks and impacts

By carefully considering the ecological implications of the project, it is possible to balance the needs of agriculture with the environment and ecosystem functions. Under Brambei Mom, various activities will be carried out that cause the following E&S risks and impacts:

Table 12: Projection activities that may cause potential impacts on the environment and social aspects at Brambei Mom sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes, and water management practices	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.
2	Increased agricultural activities, sedimentation, and pollution	Water quality degradation could impact aquatic ecosystems and species that rely on clean water.
3	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats.
4	Use of chemicals and nutrient loading	If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.
5	Biodiversity degradation, edge effects, and soil erosion	The potential impacts of the project on water flow, water quality, and sedimentation patterns. The changes in microclimate and increased disturbance at forest edges can negatively impact forest ecosystems and wildlife species.
6	Blockage of migration routes by dams or other structures	Dams or other structures can block migratory pathways used by fishes during specific seasons or life stages, preventing them from

		accessing their preferred habitats or breeding grounds.

7.2 Areas of Influence

The Brambei Mom Irrigation Innovation sub-scheme has an extensive area of influence that includes adjacent communities and ecosystems dependent on its water resources. The areas directly affected by the project's activities include agricultural lands within a certain radius from irrigation canals or reservoirs.

7.3 Analysis to prepare for determining CH status

7.3.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

7.3.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Brambei Mom. The coordinates of BM (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening, there's on EN and CR species confirmed.

Description of screening for narrowing down

For Brambei Mom, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the Brambei Mom area of influence, covering reptiles, mammals, fish, birds, and mushrooms. Screening was done based on the IBAT report generated and provided by the AIIB.

The four sub-schemes (Brambei Mom, Krapeu Truom, Yotasas, and Stueng Kang Bat) are integral components of the Stoeung Krang Ponley River catchment system, a tributary of the Tonle Sap. These areas share geographic connectivity and ecological functions. Semi-structured and structured interviews were conducted to collect data on species information, distribution, and fisheries ecosystems. In the first two rounds of screening, 2 EN and CR species including 1) one reptile (Black Marsh Turtle), and 2) one fish species (Striped Catfish) were identified in this area of influence. In the 3rd round of screening (in August 2024), however, none of these species was confirmed" in the Brambei Mom's area of influence.

7.3.3 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the likelihood of occurrence (LoO) of the above 2 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 11 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The four sub-schemes (Brambei Mom, Krapeu Truom, Yotasas, and Stueng Kang Bat) are integral components of the Stoeung Krang Ponley River catchment system, a tributary of the Tonle Sap. These areas share geographic connectivity and ecological functions. Semi-structured and structured interviews were conducted to collect data on species information, distribution, and fisheries ecosystems. Two National Fisheries Day ceremonies were held at Kbol and Anlong Chrey Reservoirs, during which millions of fish were released by the former prime minister. The aquaculture department of the Technology Institute of Kampong Speu also releases fish into these reservoirs. Investigations with relevant government departments confirmed that no endangered or critically endangered species were released during these events.

7.3.4 Habitat Assessment

Brambei Mom Command Area is located within the Stoeung Krang Ponley River catchment system, a tributary of the Tonle Sap. These areas are geographically and ecologically interconnected. The habitat is characterized by three large reservoirs (Anlong Chrey, Brambei Mom, and Kdol) in the upper reaches, while the lower areas consist of riverine, wetland, and agricultural landscapes. The water quality, vegetation density, and soil composition vary across these habitats. However, the hydrological functions of the system are disrupted by numerous dams and spillways along the main canal and irrigation canals, hindering fish migration from downstream to upstream. This may be one factor contributing to the absence of the targeted species in the area.

Semi-structured interviews were conducted with multiple fishermen at Anlong Chrey and Brambei Mom reservoirs. Many claimed to have seen or caught Striped Catfish, Mekong Giant Barb, and Isok barb/Jullien's Golden Carp. To verify their claims, we sent photographs of the fish to Thach Panara, head of the Inland Fisheries Research and Development Institute. It was determined that all of the fishermen had mistakenly identified Mekong Giant Barb as Rohu (Labeo rohita). Additionally, none of the fishermen reported encountering any turtles or tortoises in their fishing area. Despite consulting visual aids, we were unable to confirm the reported sightings of Jullien's Golden Carp and Striped Catfish due to a lack of clear identification evidence.

Ten key informants were interviewed with the support of commune councils. None reported encountering the targeted species within the command area. Discussions with the Chief of Brambei Mom commune revealed a history of large-scale fish farming in the area, including Pangasianodon sp. and Hypsibarbu sp. A flood event years ago led to the release of these fish into the Anlong Chrey reservoir, resulting in increased catches by local fishermen. However, it remains uncertain whether the Pangasianodon sp. was indeed Striped Catfish.



Figure 21: Interviewing and verifying Mekong Giant Barb with similar look of other fish species and their ecological niches



Figure 22: Local fishermen in Brabei Mom mistakenly identified their catch of Rohu (Labeo rohita) as Mekong Giant Barb.

7.4 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). Based on the assessment result there are no EN and CR with their critical habitat confirmed for this sub-scheme.

7.4.1 Habitat of significant importance to CE and EN species

As presented in Section 4.3.3.2 (Ecological State), no EN and CR species confirmed.

7.4.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for for Brambei Mom).

7.4.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for Brambei Mom, therefore is expected to qualify as critical habitats under this criterion.

7.4.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

7.4.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

8. Krapeu Trom

8.1 Proposed project activities and potential risks and impacts

By carefully considering the ecological implications of the project, it is possible to balance the needs of agriculture with the environment and ecosystem functions. Under Krapeu Trom, various activities will be carried out that cause the following E&S risks and impacts:

Table 13: Projection activities that may cause potential impacts on the environment and social aspects at Krapeu Trom sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes, and water management practices	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.
2	Increased agricultural activities, sedimentation, and pollution	**Water quality degradation** could impact aquatic ecosystems and species that rely on clean water.
3	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats.
4	Use of chemicals and nutrient loading	**If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.**
5	**Biodiversity degradation, and soil erosion**	The **potential** impacts of the project on water flow, water quality, and sedimentation patterns. The changes in microclimate.
6	Blockage of migration routes by dams or other structures	Irrigation structures, such as dams and weirs, can create physical barriers that prevent fish from migrating upstream or downstream. This can disrupt their reproductive cycles and reduce their survival rates.

8.2 Areas of Influence

Potential areas of influence might include:

- **Downstream areas:** The lower reaches of the Stoeung Krang Ponley River and the Tonle Sap Lake, may be affected by water quality, sediment loads, and fish migration from Krapeu Trom.

- **Upstream areas:** The upper reaches of the Stoeung Krang Ponley River and its tributaries, which may be influenced by water flow regulation and sediment transport from Krapeu Trom.
- **Adjacent ecosystems:** Forests, wetlands, and agricultural areas that are connected to Krapeu Trom through hydrological or ecological processes.

8.3 Analysis to prepare for determining CH status

8.3.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

8.3.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Krapeu Trom (KT). The coordinates of KT (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species.

Description of screening for narrowing down

For Krapeu Trom, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the OTP area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, there were two fish species (Isok barb/Jullien's Golden Carp and Leaping barb/Flying Minnow) were screened for the first two rounds. After three rounds of screening focusing on EN and CR species, only Flying Minnow is confirmed as potentially present in the sub-scheme area of influence.

8.3.3 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the one confirmed species is presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The Krapeu Trom command area has been in existence since the 1970s. The KT is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the Stueng Krang Ponlai serve as the sole ecological and hydrological connection between its upstream watershed and the Tonle Sap River basin downstream. This river is crucial for fish migration during the flooding season. However, reservoirs, spillways, and drought conditions have disrupted these essential ecological functions.

8.3.3.1 *Fish (1 species)*

Krapeu Trom, like Brambei Mom, is situated within the same river catchment area in the lower reaches, near the Tonle Sap's annual floodplain. Two fish species, the Isok barb/Jullien's Golden Carp (Probarbus jullieni) and Leaping barb/Flying Minnow (Laubuka caeruleostigmata), were targeted for interviews in this command area. Among ten key informants interviewed, only one reported encountering the Jullien's Golden Carp once in 2022, approximately 500 meters downstream of the reservoir facility during a flooding event (see map below). This individual stated that the species migrated upstream from the Tonle Sap during the flood season but became trapped in spillways. They added that if flooding is insufficient, fish populations decline, and rare species may no longer be present in the area.

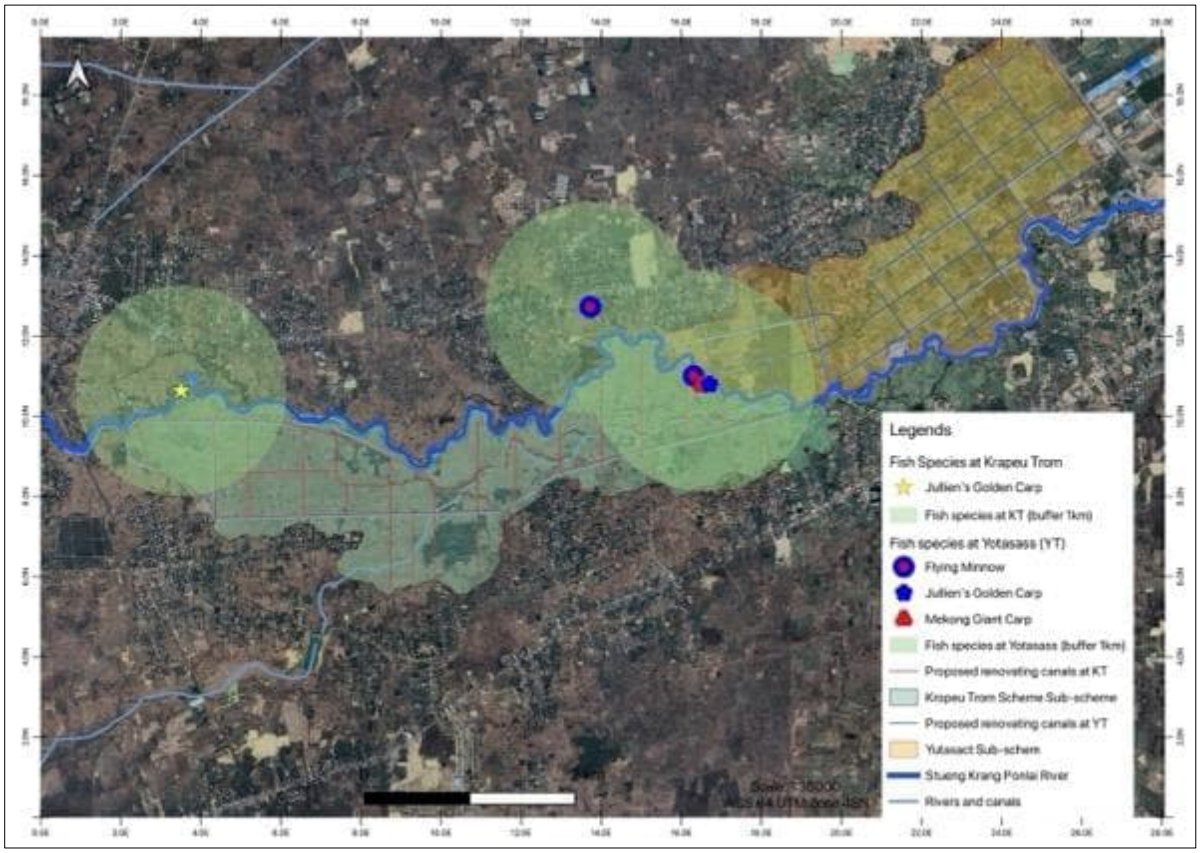


Figure 23: A spatial distribution map was generated for four fish species at Krapeu Trom and Yotasas Command Area. 1 km buffer zones were included to approximate their minimum movement range around suitable habitats.

8.4 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species qualify for Critical Habitat features.

8.4.1 Habitat of significant importance to CE and EN species

As presented in Section 4.4.3.3 (Ecological State), the species that qualifies as a critical habitat feature is the Flying Minnow. Krapeu Trom Command Area is part of Stueng Krang Ponlai River system (Tonle Sap's tributary) and situated approximately 11 km from Tonle Sap River. The area was influenced by flood-plus water from Stueng Krang Ponlai upstream and the push-up of flood water from Tonle Sap River Basic allowing fish to short distance migration for food and breeding.

Although climate change has caused dry and drought more frequently, this area still receives a good amount of flood from its upstream and downstream making a good connectivity and providing ecological function for migratory fish.

8.4.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for sub-scheme).

8.4.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for KT, therefore is expected to qualify as critical habitats under this criterion.

8.4.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

8.4.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

9. Yutasas

9.1 Proposed project activities and potential risks and impacts

Given the presence of endangered and critically endangered species and the sensitive habitat in the Yotasas Yotasas command area, the proposed irrigation renovation scheme must be implemented with careful consideration to minimize negative impacts on biodiversity. By carefully considering the ecological implications of the project, it is possible to balance the needs of agriculture with the conservation of endangered species and their habitats. Under Yutasas, various activities will be carried out that cause the following E&S risks and impacts:

Table 14: Projection activities that may cause potential impacts on the environment and social aspects at Yutasas sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes, and water management practices	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.
2	Increased agricultural activities, sedimentation, and pollution	**Water quality degradation** could impact aquatic ecosystems and species that rely on clean water.

3	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats.
4	Use of chemicals and nutrient loading	**If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.**
5	**Biodiversity degradation, and soil erosion**	The **potential** impacts of the project on water flow, water quality, and sedimentation patterns. The changes in microclimate.
6	Barriers to fish migration routs	Irrigation structures, such as dams and weirs, can obstruct fish migration, preventing them from accessing critical spawning grounds or nursery areas. This disruption of their natural life cycles can lead to reduced populations and species decline. To mitigate these negative impacts, it's essential to design and operate irrigation systems with fish-friendly considerations. Addressing this issue may includes incorporating measures like fish passage facilities[10], such as fish ladders or fish lifts, to enable safe movement upstream and downstream. Additionally, implementing effective water quality management practices and raising public awareness about the importance of protecting fish populations, particularly near fish passage areas, can contribute to the conservation of aquatic ecosystems.

9.2 Areas of Influence

The area of influence for the Yatasas Yotasas irrigation renovation scheme encompasses the direct and indirect impacts of the project. This includes:

- **Direct Impacts:** The immediate area where the irrigation infrastructure will be constructed and operated, including canals, pumping stations, and reservoirs.
- **Indirect Impacts:** The surrounding areas that may be affected by changes in water flow, land use, or other project-related activities. This includes the Stueng Krang Ponlai River, the Tonle River, and the habitats of endangered species within the Yotasas Yotasas command area.

[10] Fish passage is essential for fish to navigate water systems and access diverse habitats. Fish passage technologies, like fish ladders, help preserve fish populations and aquatic ecosystems. Fish need to migrate 10 miles or 1,000 miles to access different habitats, food, and environments that support their life cycles.

9.3 Analysis to prepare for determining CH status

9.3.1 Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

9.3.2 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Yutasas. The coordinates of Yutasas (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 6 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 3 reptile species, and 3 fishes (See list of 11 EN and CR species in Table below).

Description of screening for narrowing down

For Yutasas, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the Yutasas area of influence, covering reptiles and fish. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 5 EN and CR species were identified in the Yutasas area of influence (See Table 9 below). In the 3rd round of screening (in August 2024), however, 3 (out of a total of 5 species) were confirmed as "potentially present" in the Yutasas's area of influence.

So, the assessment for Yutasas focuses on the confirmed list of **3 species of fish** that are categorized by IUCN as EN and CR species (see map in Krapeu Trom section above).

Table 15: Confirmed List of endangered and critically endangered species for the Yutasas sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=5)	Confirmed Species in Round 3 (Total = 3)
I. Reptile species						
1	អណ្តើកព្រេច	Elongated Tortoise	Indotestudo elongata	CR	Yes	Yes
II. Fish species						
2	ត្រីត្រសក់ក្រហម	Jullien's Golden Carp	Probarbus jullieni	CR	Yes	Yes
3	ត្រីចង្វាស្នឹង	Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	Yes	Yes

4	ត្រីកាហោ /ត្រីគុលរាំង	Mekong giant barb/Giant Carp	Catlocarpio siamensis	CR	Yes	Yes
II. Bird species						
5	ទាព្រៃស្លាបស	White-winged Duck	Asarcornis scutulata	EN	Yes	No

9.3.3 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 3 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 3 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The Yutasas command area has been in existence since the 1970s. This command area is a mixture of paddy fields, farm roads, and residential areas. Natural rivers, such as the Stueng Krang Ponlai, are the sole ecological and hydrological connection between its upstream watershed and the downstream Tonle Sap River basin. This river is crucial for fish migration during the flooding season. However, reservoirs, spillways, and drought conditions have disrupted these essential ecological functions.

9.4 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species (identified in the list of 3 EN and CR species) qualify for Critical Habitat features.

9.4.1 Habitat of significant importance to CE and EN species

As presented in Section 4.1.3.3 (Ecological State), species that qualify as critical habitat features include:

Based on the interviews and habitat assessments, three of the five endangered species were confirmed to be present in the Krapeu Trom section: Jullien's Golden Carp, Flying Minnow, and Mekong Giant Barb (see map above in Krapeu Trom section).

- **Jullien's Golden Carp:** A female fisher reported encountering this rare species in the lower part of the reservoir during a flood in 2022. She caught five individuals using a fishing net. The other informants had not seen this species in several years. After careful verification, it was determined that the fishers were familiar with the species and had not mistaken it for another.
- **Flying Minnow:** Two informants reported encountering this small fish species in 2022 and 2023. One caught them in the lower part of the Yotasass reservoir, where they had migrated from a downstream area. The other found them in her natural fish pond after pumping it. Both informants were confirmed to be familiar with the species.
- **Mekong giant Barb**: A key informant reported catching five individuals of this species in July 2022 after heavy rains. The fish were small, approximately 1.5 kilograms each, and were found in the lower part of the reservoir. The informant was familiar with the species and believed that they were attempting to migrate upstream but were trapped by the reservoir..

9.4.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for Yutasas).

9.4.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

None of the IBA that are recognized for significant concentrations of migratory birds or other species are found within the vicinity of the sub-scheme. No other evidence of significant concentrations of migratory or congregatory species is available. The AoA for Yutasas, therefore is expected to qualify as critical habitats under this criterion.

9.4.4 Highly threatened or unique ecosystems

Each of the reservoirs are modified habitat and is associated with numerous rice paddies. There is no evidence that these areas are highly threatened or unique ecosystems, and no critical habitats are recognized under this criterion.

9.4.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

No ecological functions that are necessary to support biodiversity values (described under the above criteria) have been identified.

Table 16: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Yutassas sub-scheme of the Project Area

English Name	Scientific Name	IUCN Status	Global population	Cambodia population	Migratory/ Congregatory	Habitat and Distribution	Likelihood of Occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Reptile									
Elongated Tortoise	Indotestudo elongata	CR	Unknown-kept declining	Unknown-kept declining	No	Endangered and elusive, inhabit the Tonle Sap Floodplain's diverse wetlands, including flooded forests and marshes. Their survival is threatened by habitat loss, hunting, and bycatch.	Not confirmed	There's some qualified habitat but lack of permanent and deep-water body. The species was confirmed present around 15 to 12 km way downstream far from the project area. Therefore, It's likely absent in the project AoI.	**Out**
Fish									
Jullien's Golden Carp	Probarbus jullieni	CR	Unknown-kept declining	Unknown-kept declining > 80% over three generations	Yes	*Probarbus jullieni* inhabits Cambodia's Mekong tributaries and large rivers, favoring deep, flowing lowland pools. Once widespread in the Mekong and Tonle Sap systems, its range is now fragmented and drastically reduced.	Low - Confirmed in AoI in 2024	Critically endangered due to overfishing, dams, and habitat loss, it is now extremely rare in Cambodian waters. This species migrates from Tonle Sap River system into the AoI through Stueng Krang Ponlai river system (Tonle Sap tributary). Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4threshold.	**IN**
Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	Unknown-kept declining	Unknown-kept declining	Yes	This species prefers clear, forested streams and tributaries across Cambodia's river systems. While likely widespread in suitable freshwater habitats, its precise distribution remains poorly documented.	Low - Confirmed in AoI in 2024	Endangered due to overfishing, dams, and habitat loss, it is now extremely rare. This species migrates from Tonle Sap River system into the AoI through Stueng Krang Ponlai river system (Tonle Sap tributary). Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4 threshold.	**IN**
Mekong giant barb/ Giant Carp	Catlocarpio siamensis	CR	Unknown-declined over 90% in the last three generations	Unknown-kept declining	Yes	*Catlocarpio siamensis* once lived in deep Mekong pools and tributaries but are now extremely rare and restricted to isolated spots due to overfishing and habitat loss.	Very Low - Confirmed in AoI in 2024	Critically endangered, with severe population declines attributed to overfishing, dam construction, and habitat degradation, rendering it exceptionally rare. It's reported that only juvenile individuals migrate from the Tonle Sap River system into the Area of Influence (AoI) via the Stueng Krang Ponlai River, a Tonle Sap tributary. Likely to qualify the Yutasas as CH under Criterion 1, 3, and 4t hreshold.	**IN**
Bird									
White-winged Duck	Asarcornis scutulata	EN	Unknown	Unknown	No	Rare and poorly studied aquatic plant species endemic to Thailand, specifically found in the Chanthaburi Province.	Not confirmed	IUCN listed as EN and as the Endemic to the Thailand and therefore it has been screened out	**Out**

10. Stueng Krang Bat

10.1 Proposed project activities and potential risks and impacts

Many endangered and critically endangered species of fish and reptiles inhabit the Inandared area, a vital fish migration habitat within the Tonle Sap River Basin. The proposed Stueng Krang Bat irrigation sub-scheme aims to balance agricultural development with biodiversity conservation. Key components include the construction of irrigation canals, water storage facilities, and drainage systems to enhance water management. These infrastructure improvements will support increased agricultural productivity while minimizing negative impacts on the area's rich biodiversity.

Given the ecological significance of the Stueng Krang Bat irrigation sub-scheme and the presence of endangered and critically endangered species, any proposed project activities must be carefully planned and implemented to minimize negative impacts on biodiversity. Under Stueng Krang Bat, various activities will be carried out that cause the following E&S risks and impacts:

Table 17: Projection activities that may cause potential impacts on the environment and social aspects at Stueng Krang Bat sub-scheme

No.	Project activities that cause impacts	E&S Risks & Impacts
1	Construction activities (rehabilication of canal and farm roads), land use changes, and water management practices	**Habitat loss and fragmentation** could lead to habitat loss and fragmentation, affecting species' survival and connectivity. This activity may involve dredging, excavation, or modification of existing water channels and infrastructure. These activities can lead to habitat destruction, disturbance to nesting and foraging sites, disruption of natural water flow patterns, and alteration of hydrological regimes. This can directly impact both terrestrial and aquatic biodiversity.
2	Increased agricultural activities, sedimentation, and pollution	**Water quality degradation** could impact aquatic ecosystems and species that rely on clean water.
3	Dredging of waterways and Alteration of water levels	Changes in water levels within the command area due to irrigation system renovation may negatively impact wildlife dependent on specific habitats for breeding or foraging purposes. Changes in water levels and habitat quality could force endangered species to relocate, potentially leading to competition with other species or exposure to new threats.
4	Use of chemicals and nutrient loading	**If pesticides/fertilizers are used during agricultural practices within the command area as part of irrigation system renovation projects, it could lead to contamination of soil and water resources affecting both terrestrial and aquatic biodiversity.**
5	**Biodiversity degradation, and soil erosion**	The **potential** impacts of the project on water flow, water quality, and sedimentation patterns. The changes in microclimate.

6	Blockage of migration routes by dams or other structures	Irrigation structures, such as dams and weirs, can obstruct fish migration, preventing them from accessing critical spawning grounds or nursery areas. This disruption of their natural life cycles can lead to reduced populations and species decline. To mitigate these negative impacts, it's essential to design and operate irrigation systems with fish-friendly considerations. Addressing this issue may includes incorporating measures like fish passage facilities, such as fish ladders or fish lifts, to enable safe movement upstream and downstream. Additionally, implementing effective water quality management practices and raising public awareness about the importance of protecting fish populations, particularly near fish passage areas, can contribute to the conservation of aquatic ecosystems.
7	**Biodiversity**	The potential impacts of the project on water flow, water quality, and sedimentation patterns.
8	Introduction of invasive species through irrigation canals	Irrigation canals may facilitate the introduction of invasive plant or animal species into native aquatic ecosystems like Water Hyacinth, Mimosa Pigra, Tilapia etc. These invasives can outcompete native species for resources such as food and habitat space.
9	Habitat loss or degradation due to land use changes	Land use changes associated with agricultural expansion or infrastructure development can lead to habitat loss or degradation of critical areas such as wetlands or floodplain ecosystems that support diverse fish populations.

10.2 Areas of Influence

The area of influence for the Stueng Krang Bat irrigation sub-scheme encompasses both modified and natural habitats within its command area. It extends along the Tonle Sap River, encompassing floodplains, wetlands, and associated ecosystems. The project activities have the potential to directly or indirectly impact biodiversity within this region.

The area of influence for the Stueng Krang Bat irrigation sub-scheme includes both direct and indirect impacts. Direct impacts may occur within the project area itself, such as construction sites and irrigation canals. Indirect impacts may extend to surrounding areas, including the Tonle Sap River, wetlands, and adjacent ecosystems.

10.3 Analysis to prepare for determining CH status

Critical Habitat Area of Analysis

Critical habitat is defined as an Area of Analysis (AoA), and the project's command area is used as an AoA.

10.3.1 Species with Potential Occurrence within the AoA

A list of threatened species with potential occurrence was generated for Stueng Krang Bat (SKB). The coordinates of SKB (via KMZ file) are used to inform the IBAT radius of screening. Since the default radius of IBAT screening is 50km, steps were taken to narrow down to the sub-scheme's area of influence to identify only EN and CR species that are potentially present in the sub-scheme area of influence. The narrowing-down aims to

practically identify EN and CR species that could be found in the sub-scheme area of influence and to determine the Critical Habitat status of the identified species. After three rounds of screening focusing on EN and CR species, 5 EN and CR species are found as potentially present in the sub-scheme area of influence. These species include 3 reptile species, and 2 fishes (see a list of 6 EN and CR species in Table 13 below).

Description of screening for narrowing down

For Ou Ta Paong, three rounds of screening have been conducted. The first screening (Round 1) was conducted in December 2023. Round 2 was carried out in April 2024, and Round 3 in August 2024. The purpose of repeated screening is to validate the screening results (for the same area) with a wide range of local stakeholders. The screening aims to identify only EN and CR species that are potentially present in the SKB area of influence, covering reptiles, mammals, fish, birds, amphibians, and aquatic plants. Screening was done based on the IBAT report generated and provided by the AIIB.

In the first two rounds of screening, 5 EN and CR species were identified in the SKB area of influence (See Table below). In the 3rd round of screening (in August 2024), however, 6 (one additional critically endangered species) were confirmed as “potentially present” in the OTP’s area of influence.

So, the assessment for SKB focuses on the confirmed list of 6 species that are categorized by IUCN as EN and CR species including 3 reptile species (Asian giant softshell turtle, Black Marsh Turtle and Southeast Asian Box Turtle) and 3 fish species (Striped catfish, Mekong Giant Barb and Siamese Tiger Perch). See Table below for the list of confirmed species and see Figure 1 for potential locations of these species in the project’s area of influence.

Table 18: List of endangered and critically endangered species based on the IBAT Screening result vs. key informant interview at Stueng Krang Bat Sub-scheme

No.	Local Name	English Name	Scientific Name	IUCN Cat	Screened Species from Round 1&2 (Total=5)	Confirmed Species in Round 3 (Total = 3)
I.	**Reptile spices**					
1	កន្ធាយក្បាលកង្កែប	Asian giant softshell turtle	Pelochelys cantorii	CR	No	Yes
2	អណ្តើកឆ្អែក	Black Marsh Turtle	Siebenrockiella crassicollis	EN	Yes	Yes
3	អណ្តើកបិទមុខ	Southeast Asian Box Turtle	Cuora amboinensis	EN	Yes	Yes
III.	**Fish species**					
4	ត្រីប្រាធំ	Striped catfish	Pangasianodon hypophthalmus	EN	Yes	Yes

5	ត្រីកាហោ /ត្រីគុលរាំង	Mekong Giant Barb	Catlocarpio siamensis	CR	Yes	Yes
6	ត្រីកន្ត្រៃប់ខ្លា	Siamese Tiger Perch	Datnioides pulcher	CR	Yes	Yes

10.3.2 Ecological State of Habitats within the AoA

Understanding of the ecological state of habitats is necessary to assess the Likelihood of occurrence (LoO) of the above 11 screened species - as part of the CHA. For this CHA, species were classified into four LoO categories: Present, Possible, Unlikely and Not Present. Species known to be Present or with a Possible LoO are further assessed in Step 3. This understanding takes into account the classification of habitats as either modified or natural based on levels of human-induced disturbance to species composition and ecological functions. In this session, a brief assessment of the 11 confirmed species are presented. The assessment discusses historical range, distribution, habitat conditions, current status, and potential threats identified by key informants.

The SKB command area has been in existence since the 1970s. The SKB is a mixture of paddy fields, farm roads, and residential areas. The Stueng Krang Bat (SKB) irrigation sub-scheme was initially screened for a biodiversity assessment, utilizing the Integrated Biodiversity Assessment (IBAT) approach and key informant interviews. Located on the edge of the Tonle Sap River and annual floodplains of the Tonle Sap and Mekong Rivers, this area holds significant ecological importance. The initial screening identified six EN and CR of reptiles and fish species for this command area. These included the Black Marsh Turtle, Southeast Asia Box Turtle, Striped catfish, Mekong giant barb/Giant Carp, and Siamese Tiger Perch.

Upon conducting key informant interviews (KII), it was confirmed that several endangered (EN) and critically endangered (CR) species inhabit SKB. These included reptiles such as the Black Marsh Turtle, Southeast Asia Box Turtle, and Asian giant softshell turtle along with fish species like Striped catfish, Mekong giant barb/Giant Carp, and Siamese Tiger Perch. The confirmation of these vulnerable species underscores the ecological significance of SKB's command area (see map below).

This information emphasizes the importance of further biodiversity surveys in this region to comprehensively document all wildlife present. Furthermore, these findings highlight potential conservation efforts needed to protect these threatened or endangered species identified through initial screening at SKB.

Ten key informants were selected in collaboration with the commune council and village chiefs for interviews. These individuals were chosen based on their extensive local ecological knowledge and experience in fishing within their communities. The following paragraphs summarize the key information gathered from interviews regarding each confirmed species.

10.3.2.1 Reptiles (3 species)

Asian giant softshell turtle: This species was not initially screened for interviews at this sub-scheme but was confirmed during the interview process. Only one informant reported encountering the Asian Giant Softshell Turtle in 2024 at Boeung Thom. This extremely rare species was last sighted by this informant many years ago. It prefers large lakes and river systems with abundant vegetation and flooded forests. The remaining key informants had not seen this species in many years, and some had never encountered it in their lifetimes.

Black Marsh Turtle: Two key informants confirmed their familiarity with this species. One informant reported encountering the Black Marsh Turtle in the area over a decade ago but

has not seen it since then. A second informant also recalled encountering the species more than ten years ago, but not within the specific command area.

Southeast Asian Box Turtle: Five key informants confirmed their familiarity with the Southeast Asian Box Turtle. Two of these informants reported encountering the species in the Boeung Thom and Rek Trors areas in 2022. Another two informants encountered the turtle 7 years ago near the spillway close to the village and in Reahny Longvaek, which has since been converted into a real estate development project. One informant reported seeing the species in the same location for over a decade but has not observed it recently.

10.3.2.2 Fish Species

Striped Catfish: The local fishermen in the Stueng Kran Bat Command Area have consistently encountered the Striped Catfish species during the flooding season for several years. However, they have noticed a rapid decline in population size, with individuals being caught at much smaller sizes. The estimated catch by comparison to previous years is only around 30%. The fishermen report encountering these fish annually during full flooding and receding periods, with sightings randomly occurring within approximately 900m distance surrounding the village area. These fish typically migrate from the Tonle Sap Lake to the Stueng Kraing Ponlai River in August or September, depending on flood levels. Once in the Stueng Kraing Ponlai River, they disperse throughout the floodplain during the flooding season. All key informants reported consistently catching this species in the following areas for all reported fish species: Veal Braing (the floodplain area around the village), Trek Tor, Boeung Kralor Meach, Boeung Braing, Stueng Krang Ponlay River, Boeung Thom, and Boeung Toek La-ork.

Mekong Giant Barb: Local fishermen in the Stueng Kran Bat Command Area have consistently encountered the Mekong Giant Barb species during the flooding season for several years. However, they have noticed a rapid decline in population size, with individuals being caught at much smaller sizes. The fishermen do not intentionally target these fish species they are at the fingerling stage, but they often become trapped in line nets. Two of the fishermen mentioned that they had encountered this species around a decade ago but stopped going out for fishing for many years. Seven fishermen reported encountering them every year during flooding and early receding periods near the village and within the floodplain area.

The catch sizes are small during flooding season but grow significantly (2 to 3 km per individual) during receding periods. Another fisherman noted that there has been a decrease in both catch amounts and size of these fish over time, with fewer being caught with nets each year. They also mentioned that some of these fish get stuck in large lakes near the Tonle Sap River when floods occur. Overall, it is estimated that there has been a significant decline of more than 70% in catch amounts, and today's Mekong Giant Barb are much smaller compared to previous years at this time of year due to their rarity and the delay and not enough floods.

Striped Catfish: The information provided by the local fishermen regarding the Striped Catfish species in the command area is varied. Two of them reported recent sightings in 2022 and 2023 between 3 to 5 individuals per catch, while one informant mentioned their last encounter was 7 years ago, and two others stated that they haven't seen this species in over a decade. The encounters typically occurred during flooding and receding periods. The number of individuals caught has been very low, and the size of the fish has been decreasing year by year. One fisherman mentioned that he encountered this species in the Tonle Sap River but not around the village area.

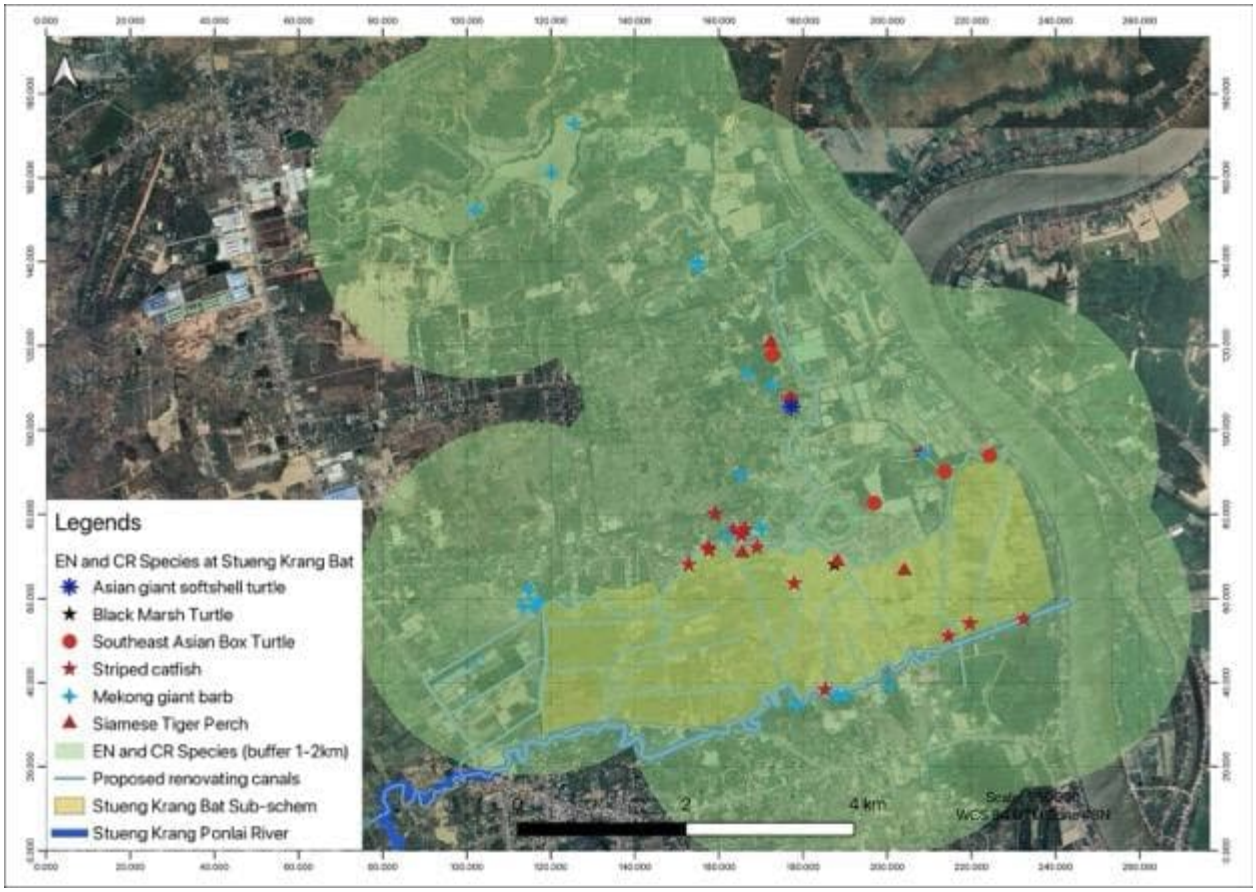


Figure 24: *Map showing the distribution of endangered (EN) and critically endangered (CR) species, with 1-2 km buffers indicating their potential movement ran ge within and around suitable habitats as identified by key informants sighted from 2020 to 2024.*

10.4 Determination of Critical Habitat Status (Step 3)

This section assesses the information (obtained from the above sub-section) vis-a-vis the criteria (presented in Section 3.4 - CH assessment method). This assessment aims to determine whether any species (identified in the list of 11 EN and CR species) qualify for Critical Habitat features.

10.4.1 Habitat of significant importance to CE and EN species

As presented in Section 4.6.3.3 (Ecological State), species that qualify as critical habitat features include:

The habitat assessment identified both modified and natural habitats within the command area. Modified habitats include areas substantially altered by human activity, such as agricultural land, natural lakes, wetlands, and river systems. Natural habitats consist of viable assemblages of native plants and animals, where primary ecological functions and species composition remain largely intact. Identifying critical habitats is essential for understanding the ecological requirements of different fish species within the project areas. The critical habitats identified in the assessment are diverse and support a range of endangered and critically endangered species. These habitats include:

- **Floodplains:** The floodplains, particularly those connected to the Tonle Sap Lake and Mekong River, provide important habitats for fish species during the flooding season. These areas are periodically inundated, creating a dynamic ecosystem that supports fish migration, spawning, and feeding.

- **Rivers and Streams:** The rivers and streams within the sub-schemes serve as crucial habitats for fish migration and spawning. The Stueng Krang Ponlai River in Krapeu Trom sub-scheme plays a vital role in connecting upstream watersheds to the Tonle Sap River basin.
- **Wetlands:** Wetlands such as marshes, swamps, lakes, and ponds are critical for supporting aquatic biodiversity. They provide breeding grounds for fish species and serve as important habitats for reptiles like Black Marsh Turtle and Southeast Asia Box Turtle.
- **Aquatic Vegetation:** Aquatic plants play a key role in providing food, shelter, and spawning sites for various fish species. They contribute to the overall health of aquatic ecosystems by improving water quality through nutrient uptake.

10.4.2 Habitat of significant importance to endemic or restricted-range species

None of the species under EN and CR classification are restricted-range species (based on IBAT report for SKB).

10.4.3 Habitat supporting globally or nationally significant concentrations of migratory or congregation species

This command area lies on the heart of Tonle Sap River Basin (TSRB) receiving annual flooding and submerging under the water seasonally. The whole floodplain area provides a signification congregation under the water during the wet season from August or September to January or February (depending on the flood situation) creating significant habitat for migratory fish, congregating downstream to upstream and vice versa..

10.4.4 Highly threatened or unique ecosystems

The Stueng Krang Bat irrigation sub-scheme is located in an area of high ecological importance within the Tonle Sap River system. The area is characterized by its proximity to the Tonle Sap Lake, the Mekong River, and their connecting channels, which provide a diverse range of habitats for fish species. This complex network of waterways supports a diverse range of fish species, making it a global hotspot for aquatic life. The confirmed presence of endangered and critically endangered species in the sub-scheme area highlights its ecological significance..

10.4.5 Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d)

Stueng Kang Ponlai or Krang Bat and its floodplain area serve as critical habitat for EN and CR species of fish and reptiles. These ecological functions are necessary to support biodiversity values (described under the above criteria). Protecting flooded forest habitats and maintaining hydrological functions and connectivity are key to securing the free movement of these rare species.

Table 19: Initial Screening of CH-qualifying Species Confirmed or Likely to Occur in the Stueng Krang Bat sub-scheme of the Project Area

English Name	Scientific Name	IUCN Status	Global population	Cambodia population	Migratory/ Congregatory	Habitat and Distribution	Likelihood of Occurrence	Rationale for Critical Habitat Screening	Screened In or Out
Reptile									
Giant Asian Pond Turtle	*Heosemys grandis*	CR	Unknown (suspected to have decreased by about 80%)	Unknown-kept declining	N/A	Thrive in the Tonle Sap Floodplain's slow-moving waters and abundant vegetation, shrubland, wetland, and ponds; 5-20 masl.	Very Low - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Black Marsh Turtle	*Siebenrockiella crassicollis*	EN	Unknown (suspected to have decreased by about 80% in SEA)	Unknown-kept declining	N/A	Inhabits slow-moving shallow wetlands (marshes, swamps, ponds) in Cambodian lowlands. Historically widespread, its range remains broad but fragmented due to habitat loss, though it persists in some degraded areas.	Moderate - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Southeast Asian Box Turtle	*Cuora amboinensis*	EN	Unknown-kept declining	Unknown-kept declining	N/A	The species inhabits lowland still-water environments such as ponds, marshes, and rice paddies. Their distribution is considered widespread across suitable wetland habitats in Cambodia, with a higher concentration likely in southern and western regions.	Moderate - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 4 threshold.	**IN**
Fish									
Striped catfish	*Pangasianodon hypophthalmus*	EN	Unknown	Unknown	Yes	This freshwater fish is native to the Mekong River Basin in Southeast Asia, including countries like Thailand, Laos, Cambodia, and Vietnam	Moderate - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**
Mekong giant barb/ Giant Carp	Catlocarpio siamensis	CR	Unknown-declined over 90% in the last three	Unknown-kept declining	Yes	*Catlocarpio siamensis* once lived in deep Mekong pools and tributaries but are now extremely rare and restricted to isolated spots due to overfishing and habitat loss.	Very Low - Confirmed in AoI in 2024	Critically endangered, with severe population declines attributed to overfishing, dam construction, and habitat degradation, rendering it	**IN**

			generations					exceptionally rare. It's reported that only juvenile individuals migrate from the Tonle Sap River system into the Area of Influence (AoI) via the Stueng Krang Ponlai River, a Tonle Sap tributary. Likely to qualify as CH under Criterion 1& 3 threshold.	
Siamese Tiger Perch	*Datnioides pulcher*	CR	Unknown	Unknown	Yes	This freshwater fish species is native to the Mekong and Chao Phraya River basins in Southeast Asia, including Thailand, Cambodia, Laos, and Vietnam.	Moderate - Confirmed in AoI in 2024	There're large proportion of suitable habitats comprise of permanent wetland, ponds, flooded forest, complex river system lie on the mouth of Tonle Sap River and receive regular season flood of the Tonle Sap Basin. It's confirmed the present of this species. Likely to qualify as CH under Criterion 1& 3 threshold.	**IN**

Table 20: Results of the prioritisation exercise to support BAP planning: priority biodiversity for BAP action for Stueng Krang Bat

Action Category (AC)	Group	Priority Biodiversity	Mitigation and monitoring approach
AC 1 High Priority for habitat mitigation and/or species-specific measures	Freshwater Fishes	Striped catfish, Mekong Giant Barb, Siamese Tiger Perch	The highest priority for achieving net gain (offset targets) lies in the implementation of both species-specific and habitat-focused mitigation and offset actions.
	Reptiles	Asian giant softshell turtle, Black Marsh Turtle, Southeast Asian Box Turtle	
	Natural Habitats	Remaining flooded forest, and natural ponds/lakes	
AC 2 Contingency planning			
AC 3 General habitat mitigation measures			
AC 4 Remain aware			

10.5 Conservation action for Stueng Krang Bat Sub-scheme

A comprehensive Biodiversity Action Plan (BAP) should be developed to achieve net gain in biodiversity with clear outline below:

Proposed Conservation Action Plan for Stueng Krang Bat Irrigation Sub-Scheme

Executive Summary

This conservation action plan outlines strategies to mitigate potential negative impacts on biodiversity within the Stueng Krang Bat irrigation sub-scheme. The plan is based on a thorough assessment of the area's biodiversity, including the identification of endangered and critically endangered species. The proposed actions align with the International Finance Corporation's Performance Standard 6 (PS6) on biodiversity conservation and sustainable management of living natural resources.

Key Objectives

Protect endangered species: Implement measures to conserve the Black Marsh Turtle, Southeast Asian Box Turtle, Striped Catfish, Mekong Giant Barb, and Siamese Tiger Perch.

Maintain habitat quality: Preserve and restore critical habitats, including floodplains, rivers, wetlands, and aquatic vegetation.

Minimize negative impacts: Reduce the adverse effects of irrigation activities on biodiversity through careful planning and implementation.

Engage with stakeholders: Foster collaboration with local communities, government agencies, and other stakeholders to ensure effective conservation efforts.

Action Plan

1. Biodiversity Assessment and Monitoring

- Conduct comprehensive biodiversity surveys: Regularly assess the distribution and abundance of endangered and critically endangered species within the sub-scheme.
- Monitor habitat conditions: Track changes in water quality, sedimentation patterns, and habitat fragmentation.
- Evaluate the effectiveness of mitigation measures: Assess the impact of conservation actions on biodiversity and adjust strategies as needed.

2. Habitat Protection and Restoration

- Identify and protect critical habitats: Delineate and conserve areas of high ecological significance, such as floodplains, wetlands, and river systems.
- Restore degraded habitats: Implement habitat restoration measures, including reforestation, wetland restoration, and removal of invasive species.
- Maintain ecological flows: Ensure that irrigation practices do not compromise the natural flow regimes of rivers and streams.
- Protect fish passage: Incorporate fish-friendly structures and practices to facilitate fish migration and connectivity.

3. Mitigation Measures

- Avoidance and minimization: During project planning and design, prioritize avoidance of sensitive habitats and minimize impacts through careful site selection and engineering.

- Habitat protection: Implement measures to protect critical habitats during construction and operation, such as establishing buffer zones and avoiding disturbance of nesting sites.
- Water quality management: Control pollution and sedimentation to maintain water quality for aquatic species.
- Invasive species control: Prevent the introduction and spread of invasive species through appropriate management practices.
- Community-based conservation: Engage local communities in conservation efforts, such as habitat restoration and monitoring.

4. Stakeholder Engagement

- Involve local communities: Collaborate with residents and stakeholders to understand their concerns and knowledge about biodiversity.
- Establish participatory platforms: Create mechanisms for ongoing dialogue and decision-making.
- Promote awareness: Raise public awareness about the importance of biodiversity conservation and the potential impacts of irrigation schemes.

5. Collaboration with Conservation Organizations:

- Collaborate with recognized conservation organizations or academic institutions specializing in reptile/fish research for technical support in monitoring activities and best practices for habitat management.

6. Environmental Education Programs:

- Implement environmental education programs targeting local communities aimed at raising awareness about the importance of protecting critical habitats and promoting sustainable agricultural practices that minimize negative impacts on wildlife.

7. Fish-friendly Infrastructure Design:

- Ensure that all infrastructure development (such as canals, weirs) is designed with fish-friendly features like fish ladders or bypass channels to allow safe fish migration upstream/downstream during different seasons.

8. Invasive Species Control Measures:

- Develop invasive species control measures specific to irrigation canals to prevent the introduction/spread of invasive plant or animal species into native aquatic ecosystems like water hyacinth or tilapia fish.

Conclusion

This conservation action plan provides a framework for protecting biodiversity within the Stueng Krang Bat irrigation sub-scheme. By implementing these strategies, the plan aims to contribute to the long-term conservation of endangered species and the maintenance of healthy ecosystems in the Tonle Sap River Basin.

11. Mitigation Measures for all sub-schemes

11.1 Overviews

Ou Ta Paong: This sub-scheme and its surrounding area, particularly the lower section and adjacent Tonle Sap Zone 3, support diverse EN and CR species: reptiles

(Black Marsh Turtle, Elongated Tortoise, Giant Asian Pond Turtle, Southeast Asian Box Turtle), mammals (Indochinese Silvered Langur, Long-tailed Macaque), fish (Siamese Tiger Perch, Striped Catfish), and birds (Greater Adjutant, Milky Stork, Bengal Florican). Construction activities, including increased worker presence and improved access, risk habitat disturbance and facilitate illegal hunting and wildlife trafficking, driven by demand for traditional medicine and pets.

Lum Hach: This sub-scheme, encompassing several community forests, has confirmed Green Peafowl sightings. Construction activities, especially worker presence, pose substantial risks to this endangered species through direct disturbance, habitat degradation, and increased access for illegal hunting and trapping, compounding existing threats of habitat loss and encroachment.

Brambei Mom: After three screening rounds, no EN or CR species were confirmed in this sub-scheme. While initial screenings suggested potential presence of some species, these were not confirmed. Despite this, construction activities require careful planning to minimize ecosystem impacts, including dust and waste control, and post-construction habitat monitoring.

Krapeu Trom: this sub-scheme confirmed the potential presence of only the endangered Flying Minnow. While another species was reported downstream, its presence within the sub-scheme was unconfirmed. Existing water infrastructure and drought have already impacted fish migration. Construction activities may further threaten the Flying Minnow and its habitat. Mitigation measures are recommended across all project phases, including habitat avoidance, buffer zones, pollution control, water quality and fish population monitoring, and public awareness.

Yutasas: This sub-scheme has confirmed sightings of the critically endangered Jullien's Golden Carp, Leaping Barb (Flying Minnow), and Mekong Giant Barb. Construction activities, particularly worker presence, risk habitat disturbance and increased access for illegal fishing and capture, threatening these vulnerable species. Mitigation measures, including sensitive area avoidance, sustainable design, fish passageways, erosion control, and community-based conservation, are essential during all project phases.

Stueng Krang Bat: This sub-scheme supports several EN and CR species: reptiles (Asian giant softshell turtle, Black Marsh Turtle, Southeast Asian Box Turtle) and fish (Striped catfish, Mekong Giant Barb, Siamese Tiger Perch). Construction activities risk habitat disturbance and increased access for illegal hunting and capture, potentially worsening existing threats to declining fish populations. The project's area of influence requires careful mitigation during all phases, including fish-friendly infrastructure, habitat restoration, erosion control, and community engagement.

11.2 Trigger of Implementation

Overall: The reports emphasize the urgent need for careful project planning and mitigation measures, including habitat restoration and sustainable water management, to minimize negative impacts on vulnerable species and their critical habitats. The project's area of influence extends beyond immediate command areas, requiring a holistic approach to conservation. Collecting and trafficking protected species are prohibited as described in the *Cambodia law/regulation:*

- Forestry Law (2002): This law provides the framework for the management and protection of forests, including wildlife. It prohibits hunting, capturing, and trading protected wildlife species without permission.
- Fisheries Law (2006): This law governs the management and protection of fisheries resources, including aquatic wildlife. It prohibits illegal fishing methods and the trade in endangered aquatic species.
- Protected Areas Law (2008): This law establishes and manages protected areas, such as national parks and wildlife sanctuaries, to conserve biodiversity, including threatened species. It restricts activities that could harm wildlife within these areas.
- Sub-decree on International Trade in Endangered Animals and Plant Species (2006): This sub-decree implements the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in Cambodia. It regulates the import, export, and re-export of CITES-listed species.
- Penal code: he Cambodian Penal Code includes provisions that criminalize wildlife trafficking, with penalties including imprisonment and fines.

11.3 P1.1. Impact: Illegal wildlife collection, possession, and trafficking by site workers/ personnel.

Mitigation Measures:

Pre-construction:

- Develop a:
  a. Code of Conduct/ethics against wildlife collection, possession, and trafficking,
  b. SOP for wildlife protection and handling, and
  c. Training and awareness materials on human-wildlife conflict management. This should include biodiversity awareness training to raise their awareness on the:
     (i) ecological sensitivity of the site, importance of forest habitats, protected and threatened plants and animals within the Project area;
     (ii) proper protocols to adopt when wildlife is encountered;
     (iii) need to be cautious when operating machinery to avoid injury/mortality to fauna; and
     (iv) zero tolerance policy to possession of wildlife and forest resources. This should be applicable to both staff and contractors. These materials will also be used for Phase 2 and Phase 3 of the Project.

Responsible for Implementation:

- The PMC-Ecologist/Biodiversity Specialist to develop a) Code of Conduct/ethics against wildlife collection, possession and trafficking, b) an SOP for wildlife protection and handling, and c) training and awareness materials on human-wildlife conflict management.
- The PMC-Ecologist/Biodiversity Specialist to coordinate with the government agencies on wildlife conservation (MoE, MoAFF) and may seek technical assistance from NGO that has strong experience in wildlife protection, collection, possession, and trafficking, such as WCS, CI, and WA in developing the Code of Conduct, SOP for wildlife protection and handling and awareness and training materials on human wildlife conflict management.

- **Provide mandatory training for Contractors management staff and site worker on:**
  a. Code of Conduct/ethics against wildlife collection, possession and trafficking,
  b. SOP for wildlife protection and handling, and

c. Human-wildlife conflict management.

Responsible for Implementation:

- The PMC is responsible in providing Training of Trainers to the CSCs and the CSCs are responsible to provide training on the Code of Conduct, SOP for wildlife protection and handling and awareness and training materials on human wildlife conflict management to all Contractors management staff and field workers prior to construction and operational Phases of the CAISAR project.
- The NGO and Cambodia conservation agency (WCS, CI, ANKO) staff can provide human resource in delivering the training.
- All management and field staff of the Construction Contractor are mandatory to attend the training on a) Code of Conduct/ethics against wildlife collection, possession and trafficking, b) SOP for wildlife protection and handling, and human-wildlife conflict management.

- Incorporate policy and associated systems and procedures inclusive of appropriate sanctions/contract termination actions that prohibit employees and/or subcontractors from possession, purchase, trade or collection of wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List, in the Project Administration Manual (PAM) and Worker's Agreement.

Responsible for Implementation:

- The PMU and PIU to incorporate the policy and associated systems and procedures in the PAM.
- The CAISAR Contractors and CAISAR Operators to incorporate the policy and associated systems and procedures in the Worker's Agreement.

Construction:

1. Minimize forest encroachment, wildlife poaching, and tree cutting due to improved access from new roads, a community-based management plan will be developed and implemented.

a. Minimize the increased potential for forest encroachment and wildlife poaching by people who could use new roads to access forest areas.
b. Avoid forest and land encroachment.
c. Minimize the intensity of poaching.
d. Tree cutting by the people, due to improved access to the area

Responsible to implement:

- Plan Development: Jointly develop a practical management plan with local communities and landowners.
- Guard Posts: Establish and maintain guard posts on temporary access and inspection roads near residential areas and priority biodiversity areas. (Include guard post construction costs in contractor agreements.)
- Surveillance: Conduct routine surveillance inspections on roads and in priority biodiversity areas (with landowner cooperation) to remove traps and deter hunting, logging, and plant removal.
- Signage**:** Install and maintain signs:
  - Banning unauthorized access on temporary roads.
  - Prohibiting hunting, snaring, and other harmful activities, especially near priority biodiversity areas and working zones.
- Reporting**:** Report observed/recorded incidents of illegal activities to FiA, FA or other authorized agencies.

2. Undertake regular monitoring of all access roads (including all quarries and the cement batching plant) to secure them from poaching activities.

Responsible to implementation.

- The Contractor is responsible in undertaking regular monitoring of all access roads (including all quarries and the cement batching plant) to secure them from poaching activity.

3. Implement the PAM and Worker's Agreement which includes policy and associated systems and procedures inclusive of appropriate sanctions/contract termination actions that prohibit employees and/or subcontractors from poaching, possession, purchase, trade or collection of wildlife or forest resources that are legally protected, CITES listed, or classed as threatened by the IUCN Red List. Corrective measures should be taken where necessary including appropriate actions against infringements.

Responsible for Implementation:

- The Contractor to implement the policy and associated systems and procedures.
- PIU should develop appropriate levels of penalisation against degree of infringement ranging from fines, suspension, and employment termination, and reporting to local authorities for prosecution (for most severe cases).

4. Check if feasible to control access road users during construction through use of security gates. If yes, security gates are to be manned by at least one (1) security officer 24 hours per day who will record the particulars (name, address, vehicle registration number, personal identification number) of all vehicles who are allowed into the access road. Visitors must also be always accompanied by a company representative. The security officers should be trained to identify behaviour associated with poachers and vehicle searches. The security gate should be equipped with 24-hour CCTV cameras. Evidence of such inspections/ vehicle searches to be recorded and available for review.

Responsible to implement:

- The CAISAR Contractor.

5. Properly handle and rescue wildlife incidentally encountered or caught during land clearing and construction Phase by to safer habitats. Handling and rescuing wild fauna will follow the SOP for wildlife protection and handling.

Responsible for Implementation:

- The is responsible handling, rescuing, and reporting encountered or caught wildlife during land clearing and construction works.
- The Contractor needs to coordinate with Cambodia conservation agency (FA, Phnom Tamao Wildlife Rescue Centre, or ACCB) in handling or rescuing the wildlife.
- Wildlife Encounter Protocols & Training: Implement protocols for wildlife encounters and train workers on appropriate responses, emphasizing non-interference and prohibiting harmful actions.
- Rapid Response Wildlife Unit: Establish a rapid response unit (potentially through a third party) to address human-wildlife conflict effectively.
- Community Information: Educate the community on local wildlife behavior, avoidance techniques, and deterrent methods.

Residual Impact: Minimal residual impact.

11.4 P1.2. Impact: Wildlife collisions with construction and quarry vehicles.

Trigger of Implementation:

The increase in vehicle movements such as trucks and excavators, particularly in quarry areas and access roads, will likely lead to increased chances of collisions with wildlife such as mammals and reptiles.

Mitigation measures:

Design/Pre-construction:

1. Conduct thorough biodiversity inspections along the access roads and at quarry sites before starting any land clearing works. The inspections should be conducted to identify any habitat and/or nesting sites of endangered/ protected species that may be affected by the clearing and identify hotspots where collisions with wildlife are likely to occur.

Responsible to implement:

- The Contractor is responsible to conduct the inspections and identify hotspots where collisions with wildlife are likely to occur.
- The CSC- Project Ecologist to provide technical assistance and guidance to the Construction Contractor in in conducting the inspections.

2. Provide general guidance to land clearance (**refer to Section 12 Below for Land Clearance SOP**):
   a. When planning for expansion, ensure land clearance is undertaken in a Phased approach such that it complements wildlife shepherding activities.
   b. All proposed clearance areas will be marked in the field prior to any vegetation being cleared. The marking can use spray paint or marking tape. A briefing is to occur with personnel to outline the area proposed for clearing.
   c. An inspection is to occur following clearing to determine if clearing has been limited to the identified clearance area. Any clearing outside of the marked area is to be reported to the HSE Manager.

Responsible to implement:

- The Project Ecologist of CSC is responsible in providing guidance.

3. Prior to wildlife shepherding activities, undertake briefing with all involved personnel so they are aware of their roles and responsibilities; measures to deal with injured wildlife; occupational health and safety requirements; and requirements regarding the prohibition of hunting/ catching/ taking of fauna and flora. This will include incident reporting measures to relevant forestry authorities and stakeholders, and the reporting of any individual suspected or caught with fauna and flora to the relevant authority. Random inspections of personnel arriving and leaving the Project area can be considered. Refresher training is to occur with new employees.

Responsible to implement:

- The CSC- Project ecologist to train field workers to recognize and avoid wildlife.
- The field workers to report to the CSC HSE Manager of any wildlife sightings or collisions.

4. Provide features such as tunnels or rope bridges along temporary roads to enable wildlife movement and to reduce potential traffic incidents.

Responsible to implement:

- Design & Engineering Team: Responsible for incorporating wildlife crossing features (tunnels, rope bridges) into temporary road designs.
- Construction Contractor: Responsible for the physical implementation and construction of these features.

Construction:

1. Install signage to alert drivers to the presence of wildlife and require them to slow down and drive with caution, especially in hotspots where collision with wildlife is likely to occur.

Responsible to implement:
- The Contractor to install the signage to alert drivers to the presence of wildlife and encourage them to slow down and drive with caution.

2. Implement speed limit (less than 40km/hour), to reduce the likelihood of collisions and give drivers more time to react to wildlife on the road.

Responsible to implement:
- The Contractor to implement the speed limit.

Residual impact: Minimal Residual Impact

11.5 P1.3. To prevent wildlife deaths and minimize disturbance to wildlife along access and inspection roads.

Management Actions: To prevent negative impacts of vehicle traffic on wildlife (animal collisions, disturbance etc.) the following actions will be implemented by Contractors:

Mitigation measures:

Design/Pre-construction:

1. Develop a system in which drivers report locations of wildlife crossing and wildlife sightings**.**

Responsible to implement:
- Project Environmental Team: Responsible for designing and implementing the wildlife sighting/crossing reporting system.
- Drivers/Transport Staff: Responsible for reporting observed wildlife crossings and sightings.
- Site Supervisors/Foremen: Responsible for collecting and relaying driver reports to the Project Environmental Team.

2. Information campaigns to explain to drivers about the biodiversity management objectives that seek to avoid wildlife collisions and disturbance, including:

Responsible to implement:
- Wildlife Awareness: Workers will receive training on frequently encountered wildlife (e.g., snakes, turtles, tortoises, nocturnal animals) and appropriate roadkill avoidance measures.
- Speed Limit Enforcement: Training will emphasize adherence to speed limits and the consequences of violations.
- Roadkill Reporting: A clear reporting system for animal collisions will be established, including reporting locations and designated recipients.

Construction:

3. Install and maintain signs in areas of frequent wildlife crossings, saying "beware of animal crossing" (complete with pictures of animals) in language understandable to all.

Responsible to implement:
- Environmental/Safeguards Team: Responsible for identifying high-risk crossing areas and designing appropriate signage.
- Construction Contractor: Responsible for the physical installation and maintenance of the signs.

Residual impact: Minimal Residual Impact

12. Standard Operating Procedures (SOP) for Land Clearing and Rehabilitation[11]

12.1 Roles and Responsibilities

This SOP applies for PMU, CSC, contractors, subcontractors, and any other associated organizations.

1. **PMU:** Oversees the implementation of this SOP, ensures compliance with environmental regulations and lender requirements, and facilitates inter-agency coordination.
2. **CSC:** Provides technical supervision and guidance to the contractor, monitors compliance with this SOP, and ensures environmental safeguards are implemented effectively.
3. **Contractor:** Responsible for executing land clearing and rehabilitation activities in accordance with this SOP and relevant contracts.
4. **Subcontractors:** Responsible for performing specific tasks as delegated by the contractor and in compliance with this SOP.
5. **CSC Project Ecologist/Biodiversity Expert:** Provides expert advice on biodiversity protection, habitat restoration, and wildlife management.
6. **Wildlife Expert:** Conducts wildlife surveys, identifies sensitive areas, and provides guidance on wildlife relocation and protection.
7. **Botanist:** Identifies and assesses plant species for potential use in rehabilitation efforts and oversees plant propagation and transplanting.

12.2 Background

This implementation procedure for land clearing and rehabilitation provides direction for avoiding and if cannot be avoided, for minimizing negative impacts on biodiversity during the construction Phase. The clearing procedures take into account the types of wildlife that exist in the project site and in surrounding areas, the key species that the project aims to protect, and the impacts anticipated from vegetation clearing. In addition, the procedures consider the features of existing vegetation in the route, specifically on key areas identified in the Biodiversity Baseline Survey (2023).

12.3 Objective

This SOP aims to:

1. Ensure that the implementation of land clearing is in accordance with the requirements of environmental management required by the Lender in accordance with Cambodian Regulations.
2. Minimize the negative impacts of land clearing on biodiversity, particularly the reduction in the number of species and number of individuals of protected wildlife (see Table 3 in section 4.2.3 of the biodiversity report).
3. Minimize the negative impact from land clearing on habitat connectivity by minimizing fragmentation where possible maintaining canopy connectivity across cleared areas.

[11] This SOP has been adapted from good international industry practices such as the *Biodiversity Management Plan (BMP) Upper Cisokan Pumped Storage Hydropower, PT PLN (Persero), Master Development Unit – UIP JBT I, April 2021*, among others.

4. Maximize the use of various types of seedlings and saplings of plants that exist in areas prior to land clearing to be planted back in areas that need to be rehabilitated (e.g., spoil banks).

12.4 Phasing of land clearing SOP

Land clearing procedures are divided into several distinct Phases:

- **Preparation Phase**: Intended for land clearing planning, notification of clearing procedures to the contractors/subcontractors, and training for contractors/subcontractors and workers to ensure SOP is fully understood. The location and management of tree nurseries also need to be determined at this stage.
- **Pre-clearing Phase**. Areas that will not be cleared are clearly demarcated on the ground to ensure that no forest areas or trees are damaged beyond what has been planned. Within the areas scheduled for clearing, any trees with endangered or protected wildlife (e.g., nesting birds) are marked, as well as underground burrows or other places currently used by wildlife. Input from the Project Management Consultant's (PMC) Ecologist/Biodiversity Expert is required to determine next steps regarding the safe relocation of these animals. At this stage, seedlings, and saplings with the potential for habitat enrichment will be collected, moved to the tree nurseries and properly maintained.
- **Clearing Phase**: Intended to ensure that the felling of trees will not damage vegetation bordering on clearing areas by careful directional felling. This coincides with PMU and contractors what refer to as the land clearing, clearing and grubbing, and excavation works.
- **Post-clearing Phase:** Seedlings and saplings that have been maintained in tree nurseries are planted back in areas designated for rehabilitation (e.g., spoil banks) or reforestation (temporary access roads, worker camps, quarry areas, etc.). Wildlife monitoring programs are implemented both in areas adjacent to land clearing sites and in rehabilitation/reforestation zones.

12.5 Preparation Phase Management Actions

PMU shall establish a land clearing project team responsible for land clearing implementation. This project team consists of environmental inspectors, wildlife experts, plant experts, ecological/conservation experts.

Task of the land clearing project team are:

1. The Contracted Service Construction (SCS)-Project Ecologists determine the priority of the clearing block (at all locations across the project site, but especially when land clearing will happen in or near the forest and natural habitat area) and determine which trees will be cleared. Also, the CSC-Project Ecologists can temporarily stop clearing activities when negative impacts on wildlife could occur. The CSC-Project Ecologists generally provides direction to the contractor regarding the rules that must be obeyed.
2. A wildlife expert is tasked to observe whether or not the clearing block is being used by wildlife. The results of these inspections are reported to the CSC-Project Ecologists.
3. A botanist is tasked to note the presence of plant seedlings and saplings which have the potential for habitat rehabilitation. The results of these observations are reported to the CSC-Project Ecologists, and decisions are then made about which plants need to be taken to the tree nursery.
4. The contractor shall prepare a local tree nursery site for keeping the seedlings and saplings of plants, hire people to maintain plants in the nursery, and provide means to water plants to maximize survival.
5. The contractor shall set up a central information center for dealing with any human-wildlife conflict issues, as well as a place for public complaints about clearing. The center should be placed in a strategic location near the closest settlement, for example

in the Village Hall, local school, health centers, etc.) and can be the same center as used for managing project grievances.

6. The contractor is responsible for preparing and installing signs on animals crossing points, and providing information to workers about a total ban on hunting or collecting. PMU, PMC, PSC will all support the contractor to do this.
7. The CSC-Project Ecologists shall conduct an evaluation to ensure that the preparation stage has been properly implemented.

12.6 Pre – Clearing Phase Management Actions

1. The wildlife expert marks all trees that are used by wildlife with yellow paint. This includes trees with hollows or ground burrows used for nesting or sleeping. Active ground burrows are marked by yellow stakes. Marked trees are not cut down before it can be ascertained with confidence that the animals have left. Similarly no clearing or soil works are allowed in a radius of five (5) meters from an active burrow until the animal has left it.
2. The contractor is responsible for the collection of seedlings and saplings of potential for habitat enrichment as identified by the botanist in the preparation Phase. Training will be given as required to ensure that there is maximum success rate with translocated plants. Seedlings and saplings will be moved in polybags with minimal disturbance of root systems. The plants are moved to a local nursery site, equipped with shade cloth and close to a permanent water source from where the plants can be easily watered. Sufficient competent workers are hired to ensure plants are kept alive until the time of planting. In the reservoir area (area to be inundated) nurseries are established close to the river to facilitate watering. Once the location of the greenbelt has been determined, seedling and saplings are planted at the start of the rainy season when survival chances are highest.
3. The contractor shall prepare the project area and physically demarcate clearing block boundaries with clear stakes at an interval of 25 meters to avoid unnecessary damage to soils and trees in the area adjacent to work sites.
4. The contractor shall install signs to ban hunting or catching of wildlife in the area.
5. Wildlife experts need to identify places where culverts, rope bridges and other structures are to be installed.
6. The CSC-Project Ecologists and wildlife expert need to ensure that all action items scheduled for the pre-clearing Phase have been carried out.

Clearing Phase Management Actions (i.e., land clearing, clearing and grubbing, and excavation)

1. The CSC-Project Ecologists must ensure that the contractor and workers (local supervisor level) have received clearance and guidance or training on clearing procedures that should be implemented.
2. Trees marked with yellow are not felled before a wildlife expert has ensured that the tree is not being used by animals. Similarly, trees or burrows that are used by animals need to be protected from clearing activities until a wildlife expert has confirmed that no animals remain.
3. Felling of trees should be directed towards the clearing area to prevent damage to trees that will remain standing.
4. Hollow tree that have been felled (and have no commercial value), should be left in the remaining forest area as these provide important microhabitats for a range of wildlife species.
5. Any animals hurt during the land clearing process (despite the above precautions) should be

handed over to the rapid response wildlife management unit (Forestry Administration, Phnom Tamao Wildlife Rescue Centre, or Angkor Centre for Biodiversity Conservation). After the animal has been brought back to health, it is released back into the area. If they are endangered or critically endangered species then the individual will be monitored.

6. After each block is completed, a wildlife expert should make a clearing report which contains:
   - The type and number of individual seedlings and saplings of plants taken to be maintained in a nursery.
   - The type and number of animals found during clearing, as well as the direction of movement of animals. Including the number of bird's nest containing eggs or young birds.
   - The type and number of animals to be treated.
   - The number of suspected hollow tree inhabited by wildlife.
   - The number of locations used by ground animals (as nests or shelter).
   - The number of damaged trees located in the area adjacent to the block clearing and embankment areas.
7. To prevent bush fires, any activities that could potentially cause a fire are prohibited including making a fire or discarding cigarette butts. The contractor is responsible for training staff regarding fire risk, and maintaining a trained firefighting squad.
8. The CSC-Project Ecologists and wildlife expert need to ensure that all action items scheduled for the clearing Phase have been carried out.

12.7 Post-clearing Phase Management Actions

1. The CSC-Project Ecologists ensures that wildlife monitoring takes place (refer to **Section 9.2.3 of the ESCIA Report**).
2. All exposed areas (roadsides, cuttings, laydown areas, spoil banks, etc.) shall be replanted as soon as practical following earthworks / construction / end of temporary use. The contractor shall follow the BMP, and seek input from wildlife and botanical experts, with respect to the types of plants that should be replanted (based on the location, slope, and long-term land use).
3. With input from wildlife and botanical experts areas for habitat enrichment planting or reforestation are selected and at the right time of the year (start of the rainy season) trees from tree nurseries are transplanted to new areas.
4. For at least the first and second year, all planted trees need to be monitored (and replaced if dead), watered (if needed) and kept free from weeds, climbers and other plants that inhibit their growth. This work is best done in collaboration with local authority, NGOs, and local communities, as needed.
5. The CSC-Project Ecologists and wildlife expert need to ensure that all action items scheduled for the post-clearing Phase have been carried out.

13. Key Considerations

The low section of this area is rich in biodiversity. Some endangered and critically endangered bird species like Greater Adjutant, Milky Stork, and Bengal Florican are confirmed at the lower section of this area, and critically endangered fish of Siamese Tiger Perch and Critically Endangered Black Mash Turtle are confirmed at the upper part of this area at Boeung Kamsaeng Lake and Svay Daunkav River. Furthermore, four other EN and CR species of reptile including the Black Mash Turtle, Southeast Asian Box Turtle, Giant Asian Pond Turtle, and Elongated tortoise and two CR mammal species including the Indochinese Silvered Langur and Long-tailed Macaque are confirmed in the flooded forest habitat and natural lack in adjacent to the lower section of this command area's boundary. Those bird species are using seasonal wetlands, lakes, waterholes, grasslands, and fellow

rice fields as their foraging habitat. Lum Hach is especially important for Green Peafowl. These species have small populations and are highly dependent on their habitats.

The fish surveys conducted in Krapeu Trom and Stueng Krang Bat irrigation sub-schemes have revealed the presence of various fish species, including endangered and critically endangered ones. The information gathered from key informant interviews provides insights into the abundance and distribution of these species within the project areas. Based on assessment results for Krapeu Trom sub-scheme at least two rare fish species have been confirmed present from 2020 to 2024 - Isok barb/Jullien's Golden Carp (Probarbus jullieni)and Leaping barb/Flying Minnow (Laubuka caeruleostigmata). On Yotasas Irrigation subscheme at least three endangered species had been confirmed present - Jullien's Golden Carp; Flying Minnow; and Mekong Giant Barb. And finally at Stueng Krang Bat Subscheme three EN/CR fish species –the Striped catfish; Mekong Giant barb; Siamese Tiger Perch

The key considerations from these findings are the importance of prioritizing ecological considerations during the design phase, implementing strict environmental safeguards during construction, and engaging in ongoing monitoring and adaptive management during the operation phase. Additionally, educating staff on biodiversity concerns, involving local communities in conservation efforts, promoting sustainable land use practices, establishing habitat protection measures, considering biodiversity offsets for significant residual impact, cultivating community-based conservation initiatives should also be prioritized. These actions are essential for mitigating potential impacts on biodiversity and maximizing the benefits of both OTP, LH and ather 4 sub-schems. Bellow are key interventions should considered and adopted for sustainable development an protection for biodivesity and ecosytem.

Habitat Conservation and Restoration:

- **Critical Habitats:** Identify and protect critical habitats, such as flooded forests, wetlands, and areas important for endangered species.
- **Habitat Restoration:** Implement measures to restore degraded habitats and improve their suitability for biodiversity.

Sustainable Resource Management:

- Fishing Practices: Promote sustainable fishing practices to prevent overfishing and protect fish populations.
- Agriculture: Encourage sustainable agricultural practices that minimize negative impacts on biodiversity and water quality.
- Water Management: Implement sustainable water management practices to ensure adequate water availability for both human needs and ecological functions.

Community Engagement and Participation:

- **Involvement:** Involve local communities in decision-making, monitoring, and conservation efforts to build ownership and support.
- **Sustainable Livelihoods:** Promote sustainable livelihoods that are compatible with biodiversity conservation.

Monitoring and Evaluation

- **Regular Monitoring:** Establish a long-term monitoring program to track changes in habitat quality, species populations, and the effectiveness of mitigation measures.
- **Adaptive Management:** Be prepared to adjust conservation strategies based on monitoring results and changing conditions.

Policy and Governance

- **Strengthened Policies:** Ensure that existing policies and regulations are adequate for protecting biodiversity and promoting sustainable resource management.
- **Enforcement:** Enforce environmental laws and regulations to prevent illegal activities that harm biodiversity.
- **Institutional Capacity:** Strengthen the capacity of government agencies and NGOs to effectively implement conservation measures.

A quick conclusion from this first assessment and observation, these healthy flooded forest and wetland ecosystem are exposed to high risk to more land encroachment and conversion for agricultural expansion when the water are available in the area. The expansion of irrigation and agricultural intensification can pose significant threats to flooded forest habitats, wetlands, and critically endangered species. Here are some of the major threats associated with these activities: anticipated

a. Habitat Loss and Fragmentation

- **Conversion of Land:** Flooded forests and wetlands may be drained or filled to create more arable land for agriculture, leading to significant loss of habitat.
- **Fragmentation:** Remaining natural habitats may become isolated patches, making it difficult for species to migrate, find mates, and maintain healthy populations.

b. Alteration of Water Regimes

- **Water Extraction:** Increased irrigation often involves the extraction of large volumes of water from rivers and aquifers, altering natural water flows and drying out wetlands.
- **Flood Control Measures:** The construction of dams and levees for irrigation can disrupt the natural flooding cycles that many species depend on for breeding and feeding.

c. Pollution

- **Nutrient Runoff:** Fertilizers used in agriculture can run off into water bodies, causing eutrophication, which leads to algal blooms and decreased oxygen levels that can harm aquatic life.
- **Pesticides and Herbicides:** These chemicals can contaminate water sources, posing risks to aquatic species and entering the food chain, affecting predators.

d. Invasive Species

- **Introduction of Non-Native Species:** Changes in land use and water management can introduce invasive plant and animal species that outcompete native species and alter ecosystem dynamics.

e. Loss of Biodiversity

- **Species Decline:** Habitat loss and degradation can lead to declines in species populations, particularly those already classified as critically endangered.

  Disruption of Ecosystem Services: The loss of biodiversity can disrupt ecosystem services such as water purification, flood control, and carbon storage.

14. Citations

Chua, S. D. X., Lu, X. X., Oeurng, C., Sok, T., and Grundy-Warr, C. (2022). Drastic decline of flood pulse in the Cambodian floodplains (Mekong River and Tonle Sap system), Hydrol. Earth Syst. Sci., 26, 609–625.

Ahmad, A.B. (2019). Probarbus jullieni. The IUCN Red List of Threatened Species 2019: e.T18182A1728224.

ASAP. (2023). Pilot reintroduction of Elongated Tortoise in Cambodia. Asian Species Action Partnership.

Auliya, M. (2007). An Identification Guide to the Tortoises and Freshwater Turtles of Brunei Darussalam, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore and Timor Leste. TRAFFIC Southeast Asia, Petaling Jaya, Malaysia. pp. 90.

Beastall, C.A. and Chng, S.C.L. (2021). Identification of Commonly Traded Wildlife in Southeast Asia. TRAFFIC, Southeast Asia Regional Office, Petaling Jaya, Selangor, Malaysia.

BirdLife International. (2016). *Green Peafowl - BirdLife Species Factsheet*. [Online]

BirdLife International. (2019). Heliopais personatus (Masked Finfoot). The IUCN Red List of Threatened Species.

BirdLife International. (2020). Species factsheet: Milky Stork Mycteria cinerea.

BirdLife *International. (2023). Asarcornis scutulata. The IUCN Red List of Threatened Species 2023: e.T22725367A193011912.*

BirdLife International. (2023). *Emberiza aureola*. The IUCN Red List of Threatened Species 2023: e.T22722631A198764946.

BirdLife International. (2023). Species factsheet: Bengal Florican Houbaropsis bengalensis.

CMS Secretariat. (2017). *International Single Species Action Plan for the Conservation of the Yellow-breasted Bunting (Emberiza aureola)*. Technical Series No. 47. Bonn, Germany: Convention on the Conservation of Migratory Species of Wild Animals.

Cota, M., Hoang, H., Horne, B.D., Kusrini, M.D., McCormack, T., Platt, K., Schoppe, S. and Shepherd, C. 2020. Cuora amboinensis. The IUCN Red List of Threatened Species 2020.

Cota, M., Horne, B.D. and Shepherd, C. 2021. Heosemys grandis. The IUCN Red List of Threatened Species 2021: e.T9943A3152603.

Cox, M.J., Van Dijk, P.P., Nabhitabhata, J. and Kumthorn, T. (2010). A Photographic Guide to Snakes and Other Reptiles of Peninsular Malaysia, Singapore and Thailand. New Holland Publishers (UK) Ltd. pp. 144.

Das, I. (2010). A Field Guide to the Reptiles of South-East Asia. New Holland Publishers (UK), England. pp. 369.

Deloya-Olvera, C., et al. (2023). Exploring the Bioactive Potential of Calostoma insigne, an Endangered Culinary Puffball Mushroom, from Northeastern Thailand. Foods, 13(1), 113.

Department of Forestry and Wildlife (2020). National Biodiversity Strategy and Action Plan for Cambodia.

Hansen, M.F., Ang, A., Trinh, T.T.H., Sy, E., Paramasivam, S., Ahmed, T., Dimalibot, J., Jones-Engel, L., Ruppert, N., Griffioen, C., Lwin, N., Phiapalath, P., Gray, R., Kite, S., Doak, N., Nijman, V., Fuentes, A. and Gumert, M.D. 2022. Macaca fascicularis (amended

version of 2022 assessment). The IUCN Red List of Threatened Species 2022: e.T12551A221666136.

Harris, R. B., Davies, V. D., Bun Keanwet, O., and Edgar, N. (2009). Distribution, status and conservation of the Bengal Florican Houbaropsis bengalensis in Cambodia. Bird Conservation International, 19(4), 371-378.

Hearn A., Ross J., Wilting A., Gray T.N.E., Kamler J.F. and Lynam A.J. (2016). Cuon alpinus (errata version published in 2019). The IUCN Red List of Threatened Species 2016: e.T5953A163903232.

Hendrie D., Timmins R.J., Nguyen T.Q., Do V.N., and Pham C.T.T (2018). Cuora amboinensis (Amboina box turtle): A new country record from northeastern Cambodia.

Hendrie D., Timmins R.J., Nguyen T.Q., Do V.N., and Pham C.T.T (2018). Cuora amboinensis (Amboina box turtle): A new country record from northeastern Cambodia.

Heng**,** et al. **(**2016). The hairy-nosed otter Lutra sumatrana in Cambodia: distribution and notes on ecology and conservation. Cambodian Journal of Natural History, 2, 1-10.

IUCN SSC Amphibian Specialist Group (2016). "Philautus cardamonus". IUCN Red List of Threatened Species. 2016: e.T58826A85539866. doi:10.2305/IUCN.UK.2016-3.RLTS.T58826A85539866.en

IUCN SSC Asia Bat Specialist Group. (2022). Pteropus vampyrus (errata version published in 2022). The IUCN Red List of Threatened Species 2021: e.T18766A167209519.

IUCN. (2019). Indotestudo elongata, 096. The IUCN Red List of Threatened Species 2019: e.T96A12017882. IUCN Tortoise and Freshwater Turtle Specialist Group.

IUCN. (2021). *Pelochelys cantorii*. The IUCN Red List of Threatened Species.

IUCN. (2023). Siebenrockiella crassicollis. The IUCN Red List of Threatened Species. Version 2023-2.

Juffe Bignoli, D. 2011. *Terniopsis chanthaburiensis*. *The IUCN Red List of Threatened Species* 2011: e.T195173A8949165.

Khmer Times (2023). Endangered hairy-nosed otters found in four provinces. https://www.khmertimeskh.com/501196138/endangered-hairy-nosed-otters-found-in-four-provinces/

Loveridge, A., Gray, D., Phan, N., and Duckworth, J. W. (2017). Abundance estimates for the endangered green peafowl Pavo muticus in Cambodia: identification of a globally important site for conservation. *Bird Conservation International*, 27(1),

Mahood, S. (2019). Catastrophic ongoing decline in Cambodia's Bengal Florican Houbaropsis bengalensis population. Bird Conservation International, 30(2), 1-15.

McGowan, G., Zhang, Z., Lei, F., and Li, Y. (2018). Status and distribution changes of the endangered Green Peafowl (Pavo muticus) in China over the past three decades (1990s–2017). *Avian Research*, *11*, 1-13.

McLeod C.R., Horne B.D., Murphy J.C., and Chea R. (2011). Current Status of Heosemys grandis (Giant Asian pond turtle) wild populations at Phnom Tamao Wildlife Rescue Centre near Phnom Penh.

Mekong River Commission (MRC). (n.d.). Mekong Fish species - Probarbus jullieni and Probarbus labeamajor. archive.iwlearn.net

MoE. (2026). National Biodiversity Status Report 2016. Ministry of Environment, Cambodia.

Ngadin, A.A. 2019. *Calostoma insigne*. *The IUCN Red List of Threatened Species* 2019: e.T125434353A125435555

Nguyen, T. T. K., Nguyen, V. H., Phan, T. V., Nguyen, T. T. H., and Nguyen, H. T. (2023). From Staple Food to Scarce Resource: The Population Status of an Endangered Striped Catfish Pangasianodon hypothalamus in the Mekong River, Cambodia. Water, 15(11), 9103.

Noor, Y. R., Umar, A., Mardiasuti, A., Gumilang, R. S., and Iqbal, M. (2020). Observation of Milky Stork Mycteria cinerea breeding on Pulau Dua, Banten, Indonesia, after 45 years. SIS Conservation, 2, 29-32.

Ohler, A., Swan, S.R., and Daltry, J.C. (2002). A recent survey of the amphibian fauna of the Cardamom Mountains, Southwest Cambodia with descriptions of three new species. Raffles Bulletin of Zoology, 50(2), 465-481.

Platt S.G., Ko W.K., Rainwater T.R., and Lee J.C.I. (2017). First record of Heosemys grandis from Siem Reap Province based on an historic specimen collected before 1912.

Platt S.G., Rainwater T.R., Bảo L.N., and Le //M.D.(2008). Cuora amboinensis (Amboina box turtle): First known occurrence from Vietnam since 1942.

Platt S.G., Rainwater T.R., Bảo L.N., and Le M.D.(2008). Cuora amboinensis (Amboina box turtle): First known occurrence from Vietnam since 1942.

Rainboth, W. J. (1996). Fishes of the Cambodian Mekong. FAO Species Identification Field Guide for Fishery Purposes. Rome: Food and Agriculture Organization of the United Nations.

Rainboth, W. J. (1996). Threatened Fishes of the World: Probarbus jullieni (Sauvage, 1880) (Cypriniformes: Cyprinidae). Environmental Biology of Fishes, 47(2), 201-201.

Primate Conservation Alliance. (2022). Primate Conservation Status Update. *Primate Conservation Alliance*. Washington, D.C.

Ly, S., et al. (2022). Emerging evidence shows the global importance of the Boeung Prek Lapouv Protected Landscape, Cambodia for yellow-breasted buntings Emberiza aureola. *Cambodian Journal of Natural History*, 2, 70-79.

WCS 2023. Bakan Grassland Officially Protected: A Major Step for Cambodia's Biodiversity and 30x30 Goals. *WCS News Release*.

Suddee, S., and Wongkamhaeng, K. (2019). New records of Terniopsis (Podostemaceae) from Thailand and Laos. *PhytoKeys*, 83080, 13-24.

Tang, D., and Kato, M. (2020). Culture of river-weed Terniopsis chanthaburiensis (Podostemaceae). *Aquatic Botany*, 161, 103228.

Tang, D., and Kato, M. (2020). Culture of river-weed Terniopsis chanthaburiensis (Podostemaceae). *Aquatic Botany*, 161, 103228.

Timmins R., Duckworth J.W., and Hedges S. (2022). Macaca fascicularis (amended version of 2015 assessment): The IUCN Red List of Threatened Species.

Tonle Sap Biosphere Reserve (2020). The Masked Finfoot: A Unique Bird of the Tonle Sap.

Vidthayanon, C. 2011. *Laubuca caeruleostigmata*. *The IUCN Red List of Threatened Species* 2011: e.T4602A11029692.

WCS Cambodia. (n.d.). Wildlife Bengal Florican. cambodia.wcs.org

WCS Cambodia (2026). Prek Toal Core Area Becomes A Ramsar Site. *Newsroom*

Zheng, G. (2015). *The ecology and conservation of Green Peafowl in Yunnan, China*. Unpublished PhD thesis, Sun Yat-sen University, Guangzhou, China.

ANNEX 2: SUMMARY OF HOUSEHOLD SURVEY RESULTS

Parameters	Ou Ta Paong		Krapeu Trom		Yutasas		Total	
	#	%	#	%	#	%	#	%
Main Occupation								
Rice and crop production	253	37.82%	81	25.08%	63	22.34%	397	31%
Animal production	2	0.30%	2	0.62%	0	0.00%	4	0%
Fishing/aquaculture	2	0.30%	0	0.00%	0	0.00%	2	0%
Forest	0	0.00%	0	0.00%	0	0.00%	-	0%
Trade	30	4.48%	12	3.72%	6	2.13%	48	4%
Service	13	1.94%	5	1.55%	10	3.55%	28	2%
Handicrafts	0	0.00%	2	0.62%	2	0.71%	4	0%
Government staff	15	2.24%	13	4.02%	14	4.96%	42	3%
Workers (full-time, private sector)	67	10.01%	75	23.22%	65	23.05%	207	16%
Workers, (seasonal, private sector)	9	1.35%	7	2.17%	10	3.55%	26	2%
Housewife	16	2.39%	6	1.86%	9	3.19%	31	2%
Student	163	24.36%	63	19.50%	54	19.15%	280	22%
Other (specify)	8	1.20%	10	3.10%	10	3.55%	28	2%
No job	91	13.60%	47	14.55%	39	13.83%	177	14%
Secondary Occupation								
Rice and crop production	150	22.42%	46	14.24%	36	12.77%	232	18%
Animal production	34	5.08%	13	4.02%	19	6.74%	66	5%
Fishing/aquaculture	5	0.75%	0	0.00%	0	0.00%	5	0%
Forest	0	0.00%	0	0.00%	0	0.00%	-	0%
Trade	26	3.89%	10	3.10%	5	1.77%	41	3%
Service	22	3.29%	6	1.86%	6	2.13%	34	3%
Handicrafts	3	0.45%	1	0.31%	2	0.71%	6	0%
Government staff	12	1.79%	12	3.72%	10	3.55%	34	3%
Workers (full-time, private sector)	66	9.87%	76	23.53%	62	21.99%	204	16%
Workers, (seasonal, private sector)	21	3.14%	7	2.17%	10	3.55%	38	3%
Housewife	21	3.14%	12	3.72%	11	3.90%	44	3%
Student	163	24.36%	63	19.50%	54	19.15%	280	22%
Other (specify)	15	2.24%	9	2.79%	8	2.84%	32	3%
No job	131	19.58%	68	21.05%	59	20.92%	258	20%
Total annual income								
Less than 2,500	20	3%	10	3%	7	2%	37	14%
2,500 - 5,000	22	3%	15	5%	19	7%	56	21%
5001 - 7,500	20	3%	12	4%	19	7%	51	19%
7,501 - 10,000	13	2%	6	2%	8	3%	27	10%
Higher than 10,000	65	10%	24	7%	12	4%	101	37%
Total annual expense								
Less than 2,500	30	21%	16	24%	27	42%	73	27%
2,500 - 5,000	63	45%	35	52%	26	40%	124	46%
5001 - 7,500	30	21%	10	15%	8	12%	48	18%
7,501 - 10,000	9	6%	4	6%	1	2%	14	5%
Higher than 10,000	8	6%	2	3%	3	5%	13	5%
Migration								
Inside the country	22	16%	9	13%	5	7.69%	36	13%
Out of the country	18	13%	0	0%	1	1.54%	19	7%
Type of House								
House built of 1 floor or more/brick wall, reinforced concrete roof	12	8.57%	8	11.94%	5	7.69%	25	9.19%
Semi-permanent	42	30.00%	33	49.25%	32	49.23%	107	39.34%
Wooden house, thatched	80	57.14%	24	35.82%	28	43.08%	132	48.53%

Parameters	Ou Ta Paong		Krapeu Trom		Yutasas		Total	
	#	%	#	%	#	%	#	%
Temporary houses	5	3.57%	2	2.99%	0	0.00%	7	2.57%
Type of Land								
Residential land	139	99%	66	99%	65	100%	270	99%
Riceland	134	96%	62	93%	60	92%	256	94%
Garden land	19	14%	15	22%	18	28%	52	19%
Other land	1	1%	1	1%	0	0%	2	1%
Land size (m^2)								
Residential land		1,539		1,342		740		1,298
Riceland		22,107		6,167		5,002		14,237
Garden land		6,849		4,239		2,842		4,709
Other land		70,000		5,000		0		37,500
Production								
Wet season								
Rice	121	86%	67	100%	60	92%	248	91%
Cash Crop	6	4%	4	6%	6	9%	16	6%
Vegetable	9	6%	1	1%	13	20%	23	8%
Industrial crop	0	0%	0	0%	0	0%	0	0%
Other	0	0%	0	0%	0	0%	0	0%
Dry season								
Rice	118	84%	2	3%	7	11%	127	47%
Cash Crop	1	1%	1	1%	3	5%	5	2%
Vegetable	7	5%	2	3%	6	9%	15	6%
Industrial crop	0	0%	0	0%	0	0%	0	0%
Other	0	0%	0	0%	0	0%	0	0%
Land size for Production (m^2)								
Wet season								
Rice		29,529		6,816		5,691		17,626
Cash Crop		2,875		3,173		1,650		2,490
Vegetable		948		150		1,039		965
Dry season								
Rice		32,945		17,000		4,157		31,122
Cash Crop		200		3,000		2,567		2,180
Vegetable		1,617		575		995		1,229
Yield (kg/year)								
Wet season								
Rice		11,517		1,838		1,478		6,453
Cash Crop		2,132		1,434		925		1,505
Vegetable		473		750		385		436
Dry season								
Rice		14,304		6,500		1,197		13,452
Cash Crop		500		15,000		1,167		3,800
Vegetable		497		10,806		477		1,864
Type of animal								
Cow	74	53%	28	42%	28	43%	130	48%
Buffalo	3	2%	0	0%	0	0%	3	1%
Pig	6	4%	1	1%	0	0%	7	3%
Chicken	69	49%	38	57%	29	45%	136	50%
Duck	20	14%	6	9%	1	2%	27	10%
Goat	0	0%	0	0%	0	0%	0	0%
Other	0	0%	1	1%	0	0%	1	0%
Water source for rice production								
Wet season								
Rainwater	116	82.86%	63	94.03%	58	89.23%	237	87.13%
Canal	94	67.14%	51	76.12%	52	80.00%	197	72.43%
River	41	29.29%	21	31.34%	11	16.92%	73	26.84%
Lake	3	2.14%	1	1.49%	0	0.00%	4	1.47%

Parameters	Ou Ta Paong		Krapeu Trom		Yutasas		Total	
	#	%	#	%	#	%	#	%
Reservoir	12	8.57%	7	10.45%	5	7.69%	24	8.82%
Well	4	2.86%	0	0.00%	0	0.00%	4	1.47%
Other	1	0.71%	0	0.00%	0	0.00%	1	0.37%
Dry Season								
Rainwater	37	26.43%	0	0.00%	0	0.00%	37	13.60%
Canal	101	72.14%	1	1.49%	6	9.23%	108	39.71%
River	32	22.86%	2	2.99%	1	1.54%	35	12.87%
Lake	5	3.57%	0	0.00%	0	0.00%	5	1.84%
Reservoir	23	16.43%	0	0.00%	0	0.00%	23	8.46%
Well	9	6.43%	0	0.00%	0	0.00%	9	3.31%
Other	2	1.43%	0	0.00%	1	1.54%	3	1.10%
Agricultural Input Using								
Wet season								
Time of using pesticide		3		0		1		2
Time of using fertilizer		2		2		2		2
Quantity of fertilizer per hectare (kg)		282		146		213		228
Dry season								
Time of using pesticide		4		3		2		4
Time for using fertilizer		3		2		2		3
Quantity of fertilizer per hectare (kg)		403		219		416		398

(Source: ESCIA Field survey data at household level 2024)

ANNEX 3: SUMMARY OF SURVEY DATA WITH VILLAGE CHIEFS

Parameters	Ou Ta Paong		Lum Hach		Krapeu Trom		Yutasas		Stueng Krang Bat		Brambei Mom		Krang Ponley		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Available of noise/vibration																
Yes	6	75%	5	56%	1	25%	3	100%	1	50%	4	80%	9	64%	20	65%
No	2	25%	4	44%	3	75%	0	0%	1	50%	1	20%	5	36%	11	35%
Level of noise/vibration																
Less annoying	1	17%	1	20%	1	100%	1	33%	1	100%	3	75%	6	43%	8	40%
Medium annoying	5	83%	2	40%	0	0%	2	67%	0	0%	1	25%	3	21%	10	50%
Very annoying	0	0%	2	40%	0	0%	0	0%	0	0%	0	0%	0	0%	2	10%
Loudest noise time																
Morning	0	0%	0	0%	0	0%	1	33%	0	0%	0	0%	1	7%	1	5%
Afternoon	2	33%	1	20%	0	0%	0	0%	0	0%	0	0%	0	0%	3	15%
Evening	3	50%	2	40%	1	100%	1	33%	1	100%	3	75%	6	43%	11	55%
Night	1	17%	2	40%	0	0%	1	33%	0	0%	1	25%	2	14%	5	25%
Causes of noise/vibration																
Traffic	3	50%	1	20%	0	0%	2	67%	0	0%	1	25%	3	21%	7	35%
Construction	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Neighbors	4	67%	4	80%	0	0%	1	33%	1	100%	3	75%	5	36%	13	65%
Other	1	17%	0	0%	1	100%	0	0%	0	0%	0	0%	1	7%	2	10%
Air quality around house																
Not good	1	13%	0	0%	1	25%	0	0%	0	0%	0	0%	1	7%	2	6%
Good	7	88%	9	100%	3	75%	3	100%	2	100%	5	100%	13	93%	29	94%
The reasons for air quality																
Burned trash/plastic	0	0%	0	0%	1	25%	0	0%	0	0%	0	0%	1	7%	1	3%
Soil dusty	1	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%
Level of air quality																
Low	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Medium	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	50%
Strong	0	0%	0	0%	1	100%	0	0%	0	0%	0	0%	1	7%	1	50%
The most polluted period																
Morning	0	0%	0	0%	1	100%	0	0%	0	0%	0	0%	1	7%	1	50%
Afternoon	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	50%

Parameters	Ou Ta Paong		Lum Hach		Krapeu Trom		Yutasas		Stueng Krang Bat		Brambei Mom		Krang Ponley		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Evening	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Night	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Water quality around in the village																
Not good	3	38%	5	56%	1	25%	0	0%	1	50%	2	40%	4	29%	12	39%
Good	5	63%	4	44%	3	75%	3	100%	1	50%	3	60%	10	71%	19	61%
Reason for water quality																
Chemical fertilizer and pesticide residue	1	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%
Animal and its manure	1	13%	0	0%	0	0%	0	0%	0	0%	1	20%	1	7%	2	6%
Erosion	0	0%	1	11%	1	25%	0	0%	0	0%	0	0%	1	7%	2	6%
Heavy mental and rusty	1	13%	1	11%	0	0%	0	0%	0	0%	0	0%	0	0%	2	6%
Groundwater is rich in lime	1	13%	3	33%	0	0%	0	0%	0	0%	0	0%	0	0%	4	13%
Trashes along the canal	1	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%
Waste water from factory	0	0%	0	0%	0	0%	0	0%	1	50%	0	0%	1	7%	1	3%
Others	0	0%	0	0%	0	0%	0	0%	0	0%	1	20%	1	7%	1	3%
Level of water quality																
Low	0	0%	1	20%	1	100%	0	0%	0	0%	1	50%	2	14%	3	25%
Medium	3	100%	4	80%	0	0%	0	0%	0	0%	1	50%	1	7%	8	67%
Strong	0	0%	0	0%	0	0%	0	0%	1	100%	0	0%	1	7%	1	8%
Availability of environment issue																
Yes	1	13%	1	11%	0	0%	0	0%	1	50%	2	40%	3	21%	5	16%
No	2	25%	4	44%	1	25%	0	0%	0	0%	0	0%	1	7%	7	23%
Type of environment issue																
Water pollution	0	0%	0	0%	0	0%	0	0%	1	100%	0	0%	1	7%	1	20%
Air pollution	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Soil pollution	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Odor problem	0	0%	1	100%	0	0%	0	0%	1	100%	0	0%	1	7%	2	40%
Solid waste problem	1	100%	0	0%	0	0%	0	0%	1	100%	2	100%	3	21%	4	80%
Others	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Problem may cause by construction																
Land impact	1	13%	6	67%	2	50%	1	33%	1	50%	3	60%	7	50%	14	45%
Noise and vibration	0	0%	0	0%	1	25%	0	0%	0	0%	0	0%	1	7%	1	3%
Damaged road in wet season	0	0%	0	0%	1	25%	0	0%	0	0%	0	0%	1	7%	1	3%

Parameters	Ou Ta Paong		Lum Hach		Krapeu Trom		Yutasas		Stueng Krang Bat		Brambei Mom		Krang Ponley		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Suggestions																
Construct the irrigation soon as possible	3	38%	3	33%	2	50%	0	0%	0	0%	1	20%	3	21%	9	29%
Provide technical on agricultural production	2	25%	1	11%	0	0%	0	0%	0	0%	0	0%	0	0%	3	10%
Restore existing main and secondary canals and make it deep with high quality	6	75%	6	67%	1	25%	1	33%	1	50%	3	60%	6	43%	18	58%
Request to have enough water for cultivation	1	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%
Request to have better road in community	1	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%
Request to restore the back of canal and dam	0	0%	0	0%	0	0%	1	33%	0	0%	0	0%	1	7%	1	3%
Request to produce sluice	2	25%	0	0%	1	25%	2	67%	0	0%	0	0%	3	21%	5	16%
Request for solar installation along the way to canal	0	0%	0	0%	0	0%	1	33%	0	0%	0	0%	1	7%	1	3%
Provide compensate to affected household	0	0%	1	11%	0	0%	0	0%	1	50%	1	20%	2	14%	3	10%
Request a study on placing rock in reservoirs which can flow into the fields by gravity	0	0%	1	11%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%

(Source: ESCIA Field survey data with village chiefs, 2024)

ANNEX 4: SUMMARY OF SUB-SCHEME COMMUNE DATA

Parameters	Ou Ta Paong		Lum Hach		Brambei Mom		Krapeu Trom		Stueng Krang Bat		Yutasas		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Population														
Total HH	8,130	-	7,958	-	1,914	-	2,430	-	1,020	-	1,339	-	22,791	
Female HH Head	1,397	17%	1,422	18%	317	17%	379	16%	179	18%	247	18%	3,941	17%
Total Population	34,189	-	30,844	-	8,237		10,535	-	4,061	-	5,330	-	93,196	
Female	17,602	-	16,019	-	4,252		5,483	-	2,104	-	2,773	-	48,233	
Age													-	
<18 years old	12,644	37%	11,200	36%	3,297	40%	3,816	36%	1,287	32%	1,962	37%	34,206	37%
18 – 35 years old	8,646	25%	8,721	28%	2,419	29%	2,830	27%	1,128	28%	1,725	32%	25,469	27%

Parameters	Ou Ta Paong		Lum Hach		Brambei Mom		Krapeu Trom		Stueng Krang Bat		Yutasas		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
36 – 60 years old	8,749	26%	7,777	25%	1,962	24%	2,585	25%	1,051	26%	1,284	24%	23,408	25%
> 60 years old	4,150	12%	3,146	10%	559	7%	1,304	12%	595	15%	359	7%	10,113	11%
Vulnerability														
Poor 1	770	9.5%	479	6.0%	122	6%	37	1.5%	31	3.0%	15	1%	1,454	6%
Poor 2	437	5.4%	158	2.0%	9	0%	10	0.4%	8	1%	-	0%	622	3%
Total	1,207	15%	637	8%	131	7%	47	2%	39	4%	15	1%	2,076	9%
Vulnerable group	-				-		-		-					
Disable person	393	1%	354	1.1%	76	1%	108	1%	96	2%	19	0.4%	1,046	1%
Old people	54	0%	72	0.2%	7	0%	6	0.1%	5	0%	7	0.1%	151	0%
Orphan	78	0%	49	0.2%	5	0%	19	0.2%	1	0%	3	0.06%	155	0%
Total	525	1.5%	475	1.5%	88	1%	133	1.3%	102	3%	29	1%	1,352	1%
Migration	-				-		-		-					
In the country	3,262	10%	1,845	6%	497	6.0%	156	1.5%	118	3%	50	1%	5,928	6%
Out of the country	1,843	5%	561	2%	39	0.5%	43	0.4%	27	1%	17	0%	2,530	3%
Total	5,105	15%	2,406	8%	536	6.5%	199	2%	145	4%	67	1%	8,458	9%
Education	-		-		-		-		-					
Kindergarten	1,952	23%	1,259	14%	348	16%	378	13%	145	10%	167	21%	4,249	17%
Primary school	1,884	22%	4,335	49%	1,144	51%	1,495	52%	218	15%	85	11%	9,161	37%
Secondary school	1,872	22%	1,849	21%	520	23%	710	25%	314	22%	336	42%	5,601	23%
High School	1,361	16%	1,099	12%	161	7%	231	8%	367	26%	170	21%	3,389	14%
College/University	514	6%	223	2.5%	32	1%	37	1%	214	15%	14	2%	1,034	4%
TVET	184	2%	70	0.8%	8	0%	-	0%	131	9%	2	0%	395	2%
Illiterate	850	10%	24	0.3%	9	0%	16	1%	35	2%	34	4%	968	4%
Occupation														
Main Occupation														
Rice and crop production	10,629	57%	12,769	67%	2,578	42%	2,887	36.6%	546	19%	1,222	30%	30,631	52%
Fishing	466	2%	-	0%	-	0%	-	0.0%	55	2%	-	0%	521	1%
Animal raising	478	3%	506	3%	13	0%	195	2.5%	162	6%	38	1%	1,392	2%
Non-Timber	-	0%	37	0%	-	0%	1	0.01%	-	0%	-	0%	38	0%
Handcraft	62	0%	39	0%	-	0%	1	0.01%	2	0%	3	0%	107	0%
Business and trade	579	3%	379	2%	104	2%	85	1.1%	124	4%	20	0%	1,291	2%
Repair	118	1%	54	0%	33	1%	19	0.2%	7	0%	8	0%	239	0%

Parameters	Ou Ta Paong		Lum Hach		Brambei Mom		Krapeu Trom		Stueng Krang Bat		Yutasas		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Transportation	303	2%	37	0%	5	0%	14	0.2%	14	0%	8	0%	381	1%
Labor sale	1,698	9%	923	5%	168	3%	321	4.1%	144	5%	122	3%	3,376	6%
Workers (full-time, private sector)	636	3%	1,104	6%	1,437	23%	1,876	23.8%	590	20%	1,199	29%	6,842	12%
Government officer	273	1%	312	2%	45	1%	90	1.1%	211	7%	79	2%	1,010	2%
Service	3,512	19%	2,809	15%	1,792	29%	2,405	30%	1,090	37%	1,436	35%	13,044	22%
Secondary Occupation														
Rice and crop production	3,971	45%	5,812	47%	486	61%	2,689	55%	305	31%	935	77%	14,198	49%
Fishing	185	2%	161	1%	-	0%	-	0%	35	4%	-	0%	381	1%
Animal raising	603	7%	2,827	23%	10	1%	671	14%	199	20%	100	8%	4,410	15%
Non-Timber	-	0%	142	1%	-	0%	-	0%	-	0%	-	0%	142	0%
Handcraft	46	1%	464	4%	-	0%	1	0%	2	0%	2	0.2%	515	2%
Business and trade	273	3%	445	4%	8	1%	100	2%	69	7%	4	0.3%	899	3%
Repair	26	0%	41	0%	1	0.1%	8	0.2%	1	0%	3	0.2%	80	0%
Transportation	83	1%	15	0%	-	0%	28	1%	10	1%	-	0%	136	0%
Labor sale	1,639	19%	815	7%	68	9%	229	5%	114	12%	33	3%	2,898	10%
Workers (full-time, private sector)	834	10%	203	2%	75	9%	385	8%	24	2%	45	4%	1,566	5%
Service	1,091	12%	1,519	12%	152	19%	750	15%	218	22%	85	7%	3,815	13%
Type of House														
Wooden house, thatched	5,445	68%	3,684	51%	757	41%	989	41%	677	72%	831	64%	12,383	57%
Semi-permanent	481	6%	150	2%	12	1%	109	5%	10	1%	24	2%	786	4%
House built of 1 floor or more/brick wall	1,879	23%	2,897	40%	1,059	57%	1,012	42%	169	18%	365	28%	7,381	34%
Apartment	210	3%	357	5%	26	1%	278	12%	46	5%	76	6%	993	5%
Villa	22	0%	99	1%	2	0%	6	0%	32	3%	1	0%	162	1%
Temporary house	64	1%	379	5%	2	0%	40	2%	1	0%	-	0%	486	2%
Source of electricity use in household														
Electricity	8,031	100%	5,862	83%	1,733	93%	2,378	98%	700	100%	1,297	100%	20,001	93%
Battery	11	0%	904	13%	11	1%	-	0%	-	0%	-	0%	926	4%
Solar	-	0%	333	5%	114	6%	47	2%	-	0%	-	0%	494	2%
Biogas	7	0%	6	0%	-	0%	-	0%	-	0%	-	0%	13	0%
Water Source														

Parameters	Ou Ta Paong		Lum Hach		Brambei Mom		Krapeu Trom		Stueng Krang Bat		Yutasas		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Tape water	1,522	19%	517	7%	252	14%	2,027	83%	935	92%	859	64%	6,112	27%
Pump well	1,055	13%	4,914	62%	426	23%	122	5%	56	5%	251	19%	6,824	30%
Wells	347	4%	1,014	13%	-	0%	56	2%	29	3%	26	2%	1,472	6%
Opened Well	274	3%	1,467	19%	-	0%	-	0%	-	0%	-	0%	1,741	8%
Pond	2,222	27%	2	0%	777	42%	53	2%	-	0%	48	4%	3,102	14%
Rain water	1,814	22%	-	0%	22	1%	133	5%	-	0%	153	11%	2,122	9%
River	896	11%	-	0%			39	2%	-	0%	32	0%	1,318	6%
Drinking Water														
Tape water	1,450	30%	26	0.3%	313	24%	763	53%	529	53%	490	39%	3,571	21%
Filtration	2,945	61%	6,204	83%	403	26%	289	20%	129	13%	499	40%	10,469	61%
Boiled	452	9%	1,218	16%	584	37%	378	26%	348	35%	261	21%	3,241	19%
Toilet Usage														
Pure Toilet	6,464	99%	4,856	99%	1,568	100%	2,132	100%	930	100%	1,246	100%	17,196	99%
Modern toilet	56	1%	61	1%	7	0%	-	0%	-	0%	-	0%	124	1%
Rice production														
Commune area	86,523	86522.5	66,233	66,233	14,925	14,925	15,854	15,854	6,832	6,832	3,440	3440	193,806	
House Land	33,274	38%	5,629	8%	3,026	20%	1,755	11%	2,110	31%	347	10%	46,141	24%
Rice land	27,905	32%	20,613	31%	3,750	25%	6,036	38%	2,781	41%	1,732	50%	62,816	32%
Orchard Land	463	1%	2,699	4%	546	4%	2,306	15%	705	10%	34	1%	6,753	3%
Other land	24,881	29%	37,293	56%	7,603	51%	5,758	36%	1,237	18%	1,327	39%	78,098	40%
Rice Land in Dry Season (ha)	10,585	38%	660	3%	-	0%	-	0%	1,281	46%	-	0%	12,526	20%
Rice Land in Wet Season (ha)	17,320	62%	19,953	97%	3,750	100%	6,036	100%	1,500	54%	1,732	100%	50,290	80%
Rice land received water from IS in dry season	8,182	77%	570	86%	-	#DIV/0!	-	0%	500	39%	-	-	9,252	74%
Rice land received water from IS in wet season	5,625	32%	2,380	12%	45	1%	1,698	28%	1,500	100%	911	53%	12,159	97%
Actual rice land in dry season (ha)	10,385	37%	570	86%	-	-	-	-	474	37%	-		11,429	91%
Actual rice land in wet season (ha)	13,952	50%	17,707	89%	3,750	100%	6,035	100%	1,500	100%	1,547	89%	44,491	88%
Yield in wet season (t/ha)	3	-	2	-	2	-	6		2	-	2	-	3	

Parameters	Ou Ta Paong		Lum Hach		Brambei Mom		Krapeu Trom		Stueng Krang Bat		Yutasas		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Yield in dry season (t/ha)	4	-	2	-	-	-	-	-	3	-	-	-	3	
Highest Price (kg)	959	-	966	-	1,059	-	1,069	-	875	-	1,000	-	5,928	
Lowest Price (kg)	761	-	788	-	880	-	795	-	700	-	780	-	4,705	
Asset														
HH with Tractor	117	1.4%	46	1%	12	1%	3	0.1%	2	0.2%	-	0%	180	1%
Walking tractor	2,065	25.4%	4,504	57%	759	40%	275	11%	71	7%	109	8%	7,783	34%
HH with Rice Harvester	66	0.8%	12	0.2%	3	0%	1	0.0%	1	0.1%	-	0%	83	0%
Threshing Machine	2	0.0%	93	1%	15	1%	6	0.2%	-	0%	1	0%	117	1%
Harvest and Threshing Machine	17	0.2%	6	0.1%	8	0.4%	-	0%	-	0%	-	0%	31	0%
Mobile rice mill	4	0.0%	4	0.1%	-	0%	6	0.2%	-	0%	-	0%	14	0%
Car	508	6.2%	261	3%	169	9%	150	6%	62	6%	112	8%	1,262	6%
Other Machinery	25	0.3%	10	0.1%	2	0%	-	0%	-	0%	-	0%	37	0%
Motorbike	4,809	59.2%	5,862	74%	1,647	86%	1,720	71%	919	90%	977	73%	15,934	70%
Tricycle	16	0.2%	27	0.3%	10	1%	18	1%	23	2%	9	1%	103	0%
Bike cycle	4,145	51.0%	6,006	75%	962	50%	948	39%	495	49%	655	49%	13,211	58%
Boat	568	7.0%	8	0.1%	-	0%	-	0%	76	7%	-	0%	652	3%
TV	6,530	80.3%	4,698	59%	1,362	71%	1,960	81%	906	89%	1,275	95%	16,731	73%
Animal Production														
HH cow raising	2,870	35%	3,714	47%	693	36%	387	16%	427	42%	551	41%	8,642	38%
HH buffalo raising	602	7%	1,351	17%	-	0%	-	0%	-	0%	-	0%	1,953	9%
HH pig raising	483	6%	1,412	18%	56	3%	13	1%	1	0.1%	10	1%	1,975	9%
HH chicken raising	5,287	65%	6,041	76%	1,421	74%	562	23%	610	60%	1,011	76%	14,932	66%
HH duck raising	326	4%	423	5%	46	2%	3	0.1%	48	5%	9	1%	855	4%
HH sheep/goat raising	2	0.0%	2	0%	-	0%	-	0%	-	0%	-	0%	4	0%
HH Crocodile	-	0.0%	1	0%	-	0%	-	0%	-	0%	-	0%	1	0%
HH of fish raising	6	0.1%	23	0%	1	0.1%	-	0%	1	0.1%	-	0%	31	0%
HH of prawn	-	0.0%	2	0.03%	-	0%	-	0%	-		-	0%	2	0%

(Source: Commune Database 2023, Ministry of Planning)

ANNEX 5: LABORATORY TESTING RESULT

Groundwater Quality Testing Result

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន លេប

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Date: 19 August 2024
Reference No: 240005

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LAB WATER ANALYTICAL RESULTS

Sample ID:	GW1	Water Source:	Well Pump
Client:	PPIC	Province:	Pursat
Date received:	11-Aug-24	District:	Bakan
Collection date:	10-Aug-24	Commune:	Ou Ta Paong
Preservation:	HNO3/Ice box	Village:	Oknha Moan

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.003	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.0004	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.01		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	345.8	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	13		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	6.4	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.3	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	14.065	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	691.4	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.4	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	1.92	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

WATER INNOVATION LAB KINGDOM OF CAMBODIA

Samrach Phan

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Date: 19 August 2024
Reference No: 240006

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LAB WATER ANALYTICAL RESULTS

Sample ID:	GW2	Water Source:	Well
Client:	PPIC	Province:	Kampong Chhnang
Date received:	11-Aug-24	District:	Rolea Bier
Collection date:	10-Aug-24	Commune:	Prasneb
Preservation:	HNO3/Ice box	Village:	Prey Sampov

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.5		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	58.12	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	5		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	3.5	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.29	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	1,600	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	116.1	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.3	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	1.45	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

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Date: 19 August 2024
Reference No: 240007

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LAB WATER ANALYTICAL RESULTS

Sample ID:	GW3	Water Source:	Well
Client:	PPIC	Province:	Kampong Speu
Date received:	11-Aug-24	District:	Odongk
Collection date:	10-Aug-24	Commune:	Veal Pung
Preservation:	HNO3/Ice box	Village:	Khnaor Ampil

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.48		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	325.5	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	3		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	21.5	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	2.2	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	1,200	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	651.6	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.5	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	1.25	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

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Surface Water Quality Testing Result

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Date: 19 August 2024
Reference No: 240008

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LAB WATER ANALYTICAL RESULTS

Sample ID:	SW1	Water Source:	River
Client:	PPIC	Province:	Pursat
Date received:	11-Aug-24	District:	Bakan
Collection date:	10-Aug-24	Commune:	Rumlech
Preservation:	HNO3/Ice box	Village:	Prasat

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.32		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	30.76	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	11		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	4.8	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.8	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	50,200	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	61.4	0.0	
11	Temperature	Electrode	°C	10-Aug-24	31.3	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.34	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

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Date: 19 August 2024
Reference No: 240009

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LAB WATER ANALYTICAL RESULTS

Sample ID:	SW2	Water Source:	Canal
Client:	PPIC	Province:	Pursat
Date received:	11-Aug-24	District:	Bakan
Collection date:	10-Aug-24	Commune:	Ou Ta Paong
Preservation:	HNO3/Ice box	Village:	Bat KoKir Thmei

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.2		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	38.07	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	29		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	3.8	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.6	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	38,750	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	76.12	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.8	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.6	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

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E-mail: lab@wil-kh.com; Tel: +855-16-668 900

Date: 19 August 2024
Reference No: 240010

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW3	Water Source:	River
Client:	PPIC	Province:	Pursat
Date received:	11-Aug-24	District:	Bakan
Collection date:	10-Aug-24	Commune:	Ou Ta Paong
Preservation:	HNO3/Ice box	Village:	Ta Nai

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.44		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	40.71	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	39		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	3.5	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.4	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	31,650	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	81.43	0.0	
11	Temperature	Electrode	°C	10-Aug-24	30.9	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.7	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

WATER INNOVATION LAB

KINGDOM OF CAMBODIA

Samrach Phan

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន ឡេប

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E-mail: lab@wil-kh.com; Tel: +855-16-668 900

Date: 19 August 2024

Reference No: 240011

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW4	Water Source:	River
Client:	PPIC	Province:	Kampong Chhnang
Date received:	11-Aug-24	District:	Rolea Bier
Collection date:	10-Aug-24	Commune:	Prasneb
Preservation:	HNO3/Ice box	Village:	Chonleav

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.42		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	14.95	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	5		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	6.8	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.6	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	19,100	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	29.91	0.0	
11	Temperature	Electrode	°C	10-Aug-24	31.7	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.21	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

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National Road 7, Ampil Krom Village, Ampil Commune, Kampong Siem District, Kampong Cham 030501, Cambodia

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Date: 19 August 2024

Reference No: 240012

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW5	Water Source:	Lake
Client:	PPIC	Province:	Kampong Chhnang
Date received:	11-Aug-24	District:	Kampong Tralach
Collection date:	10-Aug-24	Commune:	Longvek
Preservation:	HNO3/Ice box	Village:	Wat

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.78		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	71.07	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	17		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	18.1	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.3	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	85,000	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	138.7	0.0	
11	Temperature	Electrode	°C	10-Aug-24	32.8	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.62	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

Verified by

Lab Director

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Samrach Phan

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National Road 7, Ampil Krom Village, Ampil Commune, Kampong Siem District, Kampong Cham 030501, Cambodia
E-mail: lab@wil-kh.com; Tel: +855-16-668 900

Date: 19 August 2024
Reference No: 240013

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW6	Water Source:	River
Client:	PPIC	Province:	Kampong Speu
Date received:	11-Aug-24	District:	Odongk
Collection date:	10-Aug-24	Commune:	Preah Sre
Preservation:	HNO3/Ice box	Village:	Ta Cheal

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.91		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	91.58	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	43		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	17.7	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.9	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	157,500	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	183.4	0.0	
11	Temperature	Electrode	°C	10-Aug-24	33.4	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.65	0.01	

CDWQS – Cambodian Drinking Water Quality Standard, 2004
DL = Detection Limit

Kampong Cham, 19 August 2024
Verified by
Lab Director

Samrach Phan

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E-mail: lab@wil-kh.com; Tel: +855-16-668 900

Date: 19 August 2024

Reference No: 240014

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW7	Water Source:	Canal
Client:	PPIC	Province:	Kampong Speu
Date received:	11-Aug-24	District:	Odongk
Collection date:	10-Aug-24	Commune:	Veal Pung
Preservation:	HNO3/Ice box	Village:	Phkor

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.001	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	6.53		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	83.43	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	93		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	4.7	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.7	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	92,500	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	167.1	0.0	
11	Temperature	Electrode	°C	10-Aug-24	33.7	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	6.84	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

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Kampong Cham, 19 August 2024

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Lab Director

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E-mail: lab@wil-kh.com; Tel: +855-16-668 900

Date: 19 August 2024
Reference No: 240015

លទ្ធផលវិភាគទឹក

LAB WATER ANALYTICAL RESULTS

Sample ID:	SW8	Water Source:	Dam
Client:	PPIC	Province:	Kampong Speu
Date received:	11-Aug-24	District:	Thpong
Collection date:	10-Aug-24	Commune:	Prambei Mom
Preservation:	HNO3/Ice box	Village:	Tang Pou

No	Parameters	Method	Units	Date Analyzed	Results	D.L	CDWQS
1	Arsenic	Spectrophotometry	mg/L	12-Aug-24	0.005	0.01	0.05
2	Cadmium	Spectrophotometry	mg/L	15-Aug-24	0.009	0.003	0.003
3	Lead	Spectrophotometry	mg/L	13-Aug-24	0.005	0.01	0.01
4	pH	Electrometric		10-Aug-24	7.49		6.5-8.5
5	Total dissolved solids	Electrode	mg/L	10-Aug-24	99.21	0.0	800
6	Total suspended solid	USEPA METHOD #: 160.2	mg/L	12-Aug-24	21		-
7	Total Nitrogen	Spectrophotometry	mg/L	12-Aug-24	5.1	0.5	-
8	Total Phosphorus	Spectrophotometry	mg/L	13-Aug-24	0.3	0.06	-
9	Total coliform	Membrane Filtration	CFU/ 100mL	11-Aug-24	82,850	0	0
10	Electrical Conductivity	Electrode	µS/cm	10-Aug-24	197.1	0.0	
11	Temperature	Electrode	°C	10-Aug-24	38.7	0.0	
12	Dissolved Oxygen	Electrode	mg/L	10-Aug-24	5.4	0.01	

CDWQS = Cambodian Drinking Water Quality Standard, 2004

DL = Detection Limit

Kampong Cham, 19 August 2024

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Lab Director

Samrach Phan

Results of Soil Laboratory Testing

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ
អគ្គនាយកដ្ឋានកសិកម្ម

លេខ.....អ.ន.ក

ថ្ងៃ.....ខែ.....ឆ្នាំ.....ព.ស.២៥៦៧
រាជធានីភ្នំពេញ ថ្ងៃទី.....ខែ.....ឆ្នាំ២០..

លទ្ធផលវិភាគដី

Soil Analysis Results

ឈ្មោះក្រុមហ៊ុន(Company Name): **PPIC Co.,Ltd**

អាសយដ្ឋានAddress:

ថ្ងៃខែទទួលសំណាក: 14/8/24 , NAL : 574-256

Lab. ID: 61 /24		LabNo. :	1
Description Parameter		Field ID:	SS 01
			X= 355662, Y= 1399063
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		9.90
	(0.002-0.02 mm)ល្បាប់ ម៉ដ់, Fine Silt , %		37.65
	(0.02- 0.05 mm)ល្បាប់ ក្រឹម, Coase Silt , %		21.71
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ់, Fine Sand,%		30.59
	(0.2 - 2 mm) ខ្សាច់ក្រឹម, Coase Sand,%		3.22
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			1.67
កាបូន Total Carbon (Black & Walkey Method) , C %			2.22
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.19
អនុបាត C/N Ratio (Unit)			12
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.82
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.051
ផូស្វ័រសាយ Available Phosphorus (Bray II) , P (ppm)			51
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil (Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			13.00
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)	កាល់ស្យូម, Calcium Ca		3.06
	ម៉ាញ៉េស្យូម,Magnesium Mg		1.28
	សូដ្យូម,Sodium Na		1.42
	ប៉ូតាស្យូម,Potasium K		0.77
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			6.53
អត្រាចំរើនកាចុង, Bass Saturation %			50
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			20.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.20
បញ្ជូនអ.ឌីចើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			96.80
ប៊ើហាស់ទឹក, pH H2O , (1:5 Soil: water)			5.36
ប៊ើហាស់អំបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.21

អាសយដ្ឋានលេខ: ៥៤ប/៤៩ផ្លូវលេខ ៣៩៥-៦៥៦ សង្កាត់ទឹកល្អក់ ២ ខណ្ឌទួលគោក រាជធានីភ្នំពេញ ទូរស័ព្ទលេខ:(០២៣) ៨៨៣ ៤២៧ ទូរសារលេខ:(០២៣) ៨៨៣ ៤២៧
Address# 54B/49F, Street 395-656, Sangkat Toeuk Laak3, Khan Tuol Kok, Phnom Penh. Cambodia, Phone : (023) 883 427, Fax : (023) 883 427

Lab. ID: 61 /24		LabNo. :	2
Description Parameter		Field ID:	SS 02
			X= 354509, Y= 1406852
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		14.01
	(0.002-0.02 mm)ល្បាប់ មិត, Fine Silt , %		35.55
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		22.69
	(0.05- 0.2 mm) ខ្សាច់មិត, Fine Sand,%		32.75
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		2.32
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			1.73
កាបូន Total Carbon (Black & Walkey Method) , C %			1.84
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.16
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.043
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			41
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil			12.40
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)	កាល់ស្យូម, Calcium Ca		3.77
	ម៉ាញ៉េស្យូម,Magnesium Mg		1.38
	សូដ្យូម,Sodium Na		0.75
	ប៉ូតាស្យូម,Potasium K		0.27
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			6.17
អត្រាចំអែតនៃកាចុង, Bass Saturation %			50
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			15.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បណ្តាន,អ.ធ៏មើលជាតិប្រៃជី Electrode Conductivity µS/cm , (1:5 Soil: water)			36.10
ប៉េហាសំទឹក, pH H2O , (1:5 Soil: water)			5.29
ប៉េហាសំអំបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.12

Lab. ID: 61 /24		LabNo. :	3
Description Parameter		Field ID:	SS 03
			X=441471, Y=1355655
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		1.23
	(0.002-0.02 mm)ល្បាប់ ម៉ត់, Fine Silt , %		3.40
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		5.23
	(0.05- 0.2 mm) ខ្សាច់ម៉ត់, Fine Sand,%		33.52
	(0.2 - 2 mm) ខ្សាច់គ្រើម, Coase Sand,%		55.72
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			0.20
កាបូន Total Carbon (Black & Walkey Method) , C %			1.80
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.10
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.046
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			46
សមត្ថភាពដោះដូរកាថុង Cation Exchange Capacity C.E.C meq/100g Soil			10.00
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាថុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)	កាល់ស្យូម, Calcium Ca		3.56
	ម៉ាញ៉េស្យូម,Magnesium Mg		1.58
	សូដ្យូម,Sodium Na		0.30
	ប៉ូតាស្យូម,Potasium K		0.13
កាថុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			5.57
អត្រាចំរែតនៃកាថុង, Bass Saturation %			56
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			5.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.04
បញ្ជូន.អ.ន៏មើលជាតិប្រៃជី Electrode Conductivity µS/cm , (1:5 Soil: water)			99.30
ប៉េហាសំទឹក, pH H2O , (1:5 Soil: water)			7.67
ប៉េហាសំអំបិល , pH KCL , (1:5 (Soil : 1N KCL)			6.51

3

Lab. ID: 61 /24		LabNo. :	4
Description Parameter		Field ID:	SS 04
			X=465450, Y=1304887
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		14.95
	(0.002-0.02 mm)ល្បាប់ ម៉ដ្ត, Fine Silt , %		30.00
	(0.02- 0.05 mm)ល្បាប់ ក្រឹម, Coase Silt , %		19.81
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ្ត, Fine Sand,%		31.12
	(0.2 - 2 mm) ខ្សាច់ក្រឹម, Coase Sand,%		5.92
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			2.64
កាបូន Total Carbon (Black & Walkey Method) , C %			1.63
អាសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.14
អនុបាត C/N Ratio (Unit)			12
សារធាតុសរីរាង្គ Organic Matter (OM) %			2.80
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.044
ផូស្វ័រអាចយក Available Phosphorus (Bray II) , P (ppm)			29
សមត្ថភាពដោះដូរកាទ្យុង Cation Exchange Capacity C.E.C meq/100g Soil			16.50
(Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			
កាទ្យុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetatent pH =7)		កាល់ស្យូម, Calcium Ca	8.30
		ម៉ាញ៉េស្យូម,Magnesium Mg	2.37
		សូដ្យូម,Sodium Na	2.57
		ប៉ូតាស្យូម,Potasium K	0.36
កាទ្យុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			13.60
អត្រាចំអែតនៃកាទ្យុង, Bass Saturation %			70
អាស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			10.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បណ្តាន.អ.ធីមើលជាតិប្រៃជី Electrode Conductivity µS/cm , (1:5 Soil: water)			108.40
ប៉ូហាស់ទឹក, pH H2O , (1:5 Soil: water)			7.41
ប៉ូហាស់អំបិល , pH KCL , (1:5 (Soil : 1N KCL)			6.23

4

Lab. ID: 61 /24		LabNo. :	5
Description Parameter		Field ID:	SS 05
			X=469604 , Y=1306117
Particle Size (Pipette Method)	(< 0.002mm)ឥដ្ឋ, Clay %		7.30
	(0.002-0.02 mm)ល្បាប់ ម៉ដ, Fine Silt , %		21.10
	(0.02- 0.05 mm)ល្បាប់ គ្រឹម, Coase Silt , %		11.70
	(0.05- 0.2 mm) ខ្សាច់ម៉ដ, Fine Sand,%		30.29
	(0.2 - 2 mm) ខ្សាច់គ្រឹម, Coase Sand,%		28.78
សំណើម Moisture % , (Oven dry at 105 °C and 24 hours)			2.62
កាបូន Total Carbon (Black & Walkey Method) , C %			1.87
អេសូត Total Nitrogen (Kjeldal Sulfuric Method) ,N %			0.17
អនុបាត C/N Ratio (Unit)			11
សារធាតុសរីរាង្គ Organic Matter (OM) %			3.22
ផូស្វ័រសរុប Total Phosphorus (Nitric Digestion) P %			0.094
ផូស្វ័រលាយ Available Phosphorus (Bray II) , P (ppm)			37
សមត្ថភាពដោះដូរកាចុង Cation Exchange Capacity C.E.C meq/100g Soil (Method ,1M Ammonium Acetate at pH = 7 & Leach with 10 % NaCl)			16.30
កាចុងដោះដូរ ,Exchangeable Cation (meq/100g Soil), (Method, 1M Ammonium Acetateat pH =7)		កាល់ស្យូម, Calcium Ca	5.43
		ម៉ាញ៉េស្យូម,Magnesium Mg	1.48
		សូដ្យូម,Sodium Na	1.50
		ប៉ូតាស្យូម,Potasium K	0.35
កាចុងដោះដូរសរុប , Total Exchangeable Bases (meq/100g soil)			8.76
អត្រាចំអែតនៃកាចុង, Bass Saturation %			54
អេស៊ីតដោះដូរ Exchange Acidity meq/100g Soil , (1 M KCl Method)			10.00
អាលុយមីញ៉ូមដោះដូរ Exchange Al meq/100g Soil , (1 M KCl Method)			0.12
បច្ចុប្បន្ន.អ.ទឹមើលជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			63.00
ប៉ូហាស់ទឹក, pH H2O , (1:5 Soil: water)			5.66
ប៉ូហាស់អ៊ីចិល , pH KCL , (1:5 (Soil : 1N KCL)			4.47

ចំណាំ:លទ្ធផលនៃការវិភាគមានតម្លៃតែលើសំណាកដែលបានបញ្ជូនមកវិភាគតែប៉ុណ្ណោះ:(Note:Analysis result refers to the sumitted sample only).

ប្រធានមន្ទីរពិសោធន៍ជាតិកសិកម្ម

បានឃើញ និងឯកភាព
ប្រតិភូរាជរដ្ឋាភិបាលកម្ពុជាទទួលបន្ទុកជាអគ្គនាយក
នៃអគ្គនាយកដ្ឋានកសិកម្ម

ហ៊ូ ពុទ្ធា

ANNEX 6: CHANCE FIND PROCEDURE

The following *"chance find"* procedures must be included in all third-party contracts (e.g. Letters of Agreement) in instances where the contracted party is assisting with project implementation and/or construction activities.

Provincial PMUs will ensure that the bidding documents and work contracts for civil works contractors include clauses on chance find procedures. Specifically, the clause will stipulate that if the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during project implementation, the Contractor shall:

- Stop the activities in the area of the chance find.
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local or provincial authorities take over.
- Notify the supervisory Safeguards Specialist within the PMU who, in turn, will notify the responsible local and provincial authorities immediately (within 24 hours or less);
- Responsible local and/or provincial authorities would oversee protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by government approved archeologists. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values.
- Decisions on how to handle the finding shall be taken by the responsible local and provincial authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage.
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities; and
- Project activities could resume only after permission is given from the responsible local or provincial authorities concerning safeguard of the heritage.

Note that the reporting of chance finds only occurs when an item/area/etc. of cultural significance is found and is only carried out insofar as what is detailed above (i.e. reporting the find, reporting how the item/area will be treated moving forward). Reporting begins with the local level implementer (e.g. staff tasked to the implement the project within a village) notifying the Safeguards Specialist, after which, the Safeguards Specialist guides the process according to the instructions above (e.g. notifying the relevant government authorities).

ANNEX 7: LIST OF ARCHEOLOGICAL AND CULTURAL SITES

The following are the list of the archeological and cultural sites within the command areas as per the statistics given by Provincial Department of Culture and Fine Arts in 2024.

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
1	Lum Hach	ចេតិយលេកបដៃស	Bardez Stupa	Stupa	Krang Leav	Krang Leav	Rolea Bier	Kampong Chhnang	451815	1352511
2	Lum Hach	ទួលប្រាសាទ	Tuol Prasat	Archeology	Khvet	Pongro	Rolea Bier	Kampong Chhnang	456939	1355359
3	Lum Hach	វត្តក្រឡាញ់រង្សី	Kralanh Rangsei	Pagoda	Srangam Ter	Prasneb	Rolea Bier	Kampong Chhnang	448434	1361251
4	Lum Hach	វត្តត្រពាំងអំពិល	Trapang Ampil	Pagoda	Trapang Ampil	Prasneb	Rolea Bier	Kampong Chhnang	443581	1363490
5	Lum Hach	វត្តអណ្តូងព្រែង	Ondong Preng	Pagoda	Andoung Preng	Krang Leav	Rolea Bier	Kampong Chhnang	448414	1346725
6	Lum Hach	វត្តតាសុត	Ta Sout	Pagoda	Krang Leav	Krang Leav	Rolea Bier	Kampong Chhnang	451323	1353213
7	Lum Hach	វត្តនុទីពូធរាម	Noty Pocha Ram	Pagoda	Chor	Prasneb	Rolea Bier	Kampong Chhnang	435927	1356091
8	Lum Hach	វត្តចំបក់ប្រាសាទ	Chambak Prasath	Pagoda	Chambak Prasath	Krang Skear	Tuek Phos	Kampong Chhnang	435418	1351279
9	Lum Hach	វត្តក្រាំងស្គារ	Krang Skear	Pagoda	Lum Harch	Krang Skear	Tuek Phos	Kampong Chhnang	441163	1350893
10	Lum Hach	វត្តគិរីរុក្ខារាម	Kirirukharam	Pagoda	Phnum Ta Sam	Krang Skear	Tuek Phos	Kampong Chhnang	439315	1345397
11	Lum Hach	វត្តស្ទឹង	Stueng	Pagoda	Ou Leach	Banteay Preal	Rolea Bier	Kampong Chhnang	451345	1356445
12	Lum Hach	វត្តភ្នំខ្លា	Phnom Khla	Pagoda	ou Roung	Chrey Bak	Rolea Bier	Kampong Chhnang	455819	1348500
13	Lum Hach	វត្តព្រះរាម	Preah Ream	Pagoda	Preah Ream Reangsei	Chrey Bak	Rolea Bier	Kampong Chhnang	456242	1346839
14	Lum Hach	វត្តបង្ហ័ល្ង	Balang	Pagoda	Prambei Chhaom	Pongro	Rolea Bier	Kampong Chhnang	455213	1356241
15	Lum Hach	វត្តអាឡែង	Alaeng	Pagoda	Aleng	Chrey Bak	Rolea Bier	Kampong Chhnang	458921	1345407
16	Lum Hach	វត្តចាស់	Wat Chas	Pagoda	Prachak	Prey Mlu	Rolea Bier	Kampong Chhnang	458524	1344578

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
17	Lum Hach	វត្តថ្មកែវ	Thmor Keo	Pagoda	Thmor Keo	Svay Chrum	Rolea Bier	Kampong Chhnang	453515	1361941
18	Lum Hach	វត្តអង្គមេត្រី	Angmetrei	Pagoda	Trea	Svay Chrum	Rolea Bier	Kampong Chhnang	458911	1357975
19	Lum Hach	វត្តគោល	Koul	Pagoda	Selang	Svay Chrum	Rolea Bier	Kampong Chhnang	458026	1358349
20	Lum Hach	ត្រពាំងឈូក	Trapang Chhouk	Shrine	srah kev	Melum	Baribour	Kampong Chhnang	450354	1365102
21	Lum Hach	ត្រពាំងលាងជាវ	Trapang Leangdav	Shrine	srah kev	Melum	Baribour	Kampong Chhnang	450023	1365675
22	Lum Hach	ត្រពាំងដើមពោធិ៍	Trapang Derm Por	Shrine	Tuol Thlok	Melum	Baribour	Kampong Chhnang	448732	1366465
23	Lum Hach	វត្តស្រះកែវ	Srah Kaev	Pagoda	Srah Kaev	Melum	Baribour	Kampong Chhnang	449337	1365583
24	Lum Hach	វត្តរាំងចោម	Roveang Chum	Pagoda	Andoung Rovieng	Anhchanh Rung	Baribour	Kampong Chhnang	440010	1367419
25	Lum Hach	វត្តក្រពុំឈូក	Kra Pum Chhouk	Pagoda	Anhchanh Rung	Anhchanh Rung	Baribour	Kampong Chhnang	437065	1365784
26	Lum Hach	វត្តត្រពាំងប្រាសាទ	Tra Peng Brasat	Pagoda	Tang Trapeang	Pech Chongvar	Baribour	Kampong Chhnang	434115	1367224
27	Lum Hach	វត្តអូររលុះ	O Rolus	Pagoda	Krang Skear	Krang Skear	Tuek Phos	Kampong Chhnang	428812	1364716
28	Lum Hach	វត្តកែវសុវណ្ណគិរីសេនជ័យសុខរម	Keo Sovankirisenchey Sokharam	Pagoda	Kdol	Krang Skear	Tuek Phos	Kampong Chhnang	428861	1358537
29	Lum Hach	វត្តចន្ទរង្សី (ត្រពាំម្លូ)	Chan Rainsy (Trapeam Mlou)	Pagoda	Trapeang Mlu	Krang Skear	Tuek Phos	Kampong Chhnang	441163	1350893
30	Lum Hach	វត្តគង្គា	Kongkea	Pagoda	Tang Krasang	Tang Krasang	Tuek Phos	Kampong Chhnang	455817	1339324
31	Lum Hach	វត្តព្រាល	Preal	Pagoda	Preal	Banteay Preal	Rolea Bier	Kampong Chhnang	452189	1357714
32	Ou Ta Paong	ទួលបន្លាស្អិត	Tuol banlea saet	Archeology	Roung	Beong Khna	Bakan	Pursat	361785	1400642
33	Ou Ta Paong	ទួលគរ១	Tuol Kor 1	Archeology	Roung	Beong Khna	Bakan	Pursat	359524	14044333
34	Ou Ta Paong	ទួលថ្នាន់ខាងលិច	Tuol Thnang Lech	Archeology	Roung	Beong Khna	Bakan	Pursat	359594	1404389

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
35	Ou Ta Paong	ទួលសំរែង	Tuol Samrong	Archeology	Roung	Beong Khna	Bakan	Pursat	359685	1405010
36	Ou Ta Paong	ទួលម៉	Tuol Mor	Archeology	Roung	Beong Khna	Bakan	Pursat	359816	1405388
37	Ou Ta Paong	ទួលតផន	Tuol Taphan	Archeology	Roung	Beong Khna	Bakan	Pursat	359674	1404051
38	Ou Ta Paong	ទួលអំពិល	Tuol Ampil	Archeology	Roung	Beong Khna	Bakan	Pursat	359940	1404042
39	Ou Ta Paong	ទួលល្វា	Tuol Lvea	Archeology	Roung	Beong Khna	Bakan	Pursat	359974	1404132
40	Ou Ta Paong	ទួលតកិល១	Tuol Takil 1	Archeology	Roung	Beong Khna	Bakan	Pursat	359856	1404091
41	Ou Ta Paong	ទួលថ្នាន់ខាងកើត	Tuol Thnang Kaeut	Archeology	Roung	Beong Khna	Bakan	Pursat	359733	1404138
42	Ou Ta Paong	ទួលតកិល២	Tuol Takil 2	Archeology	Roung	Beong Khna	Bakan	Pursat	360102	1404229
43	Ou Ta Paong	ទួលតគៀត	Tuol Ta Keat	Archeology	Roung	Beong Khna	Bakan	Pursat	361926	1400522
44	Ou Ta Paong	ទួលខ្ពស់	Tuol Khpuos	Archeology	Roung	Beong Khna	Bakan	Pursat	361714	1400746
45	Ou Ta Paong	ទួលអូរវល្លិប្រេង	Tuol O Va Breng	Archeology	Roung	Beong Khna	Bakan	Pursat	361882	1399835
46	Ou Ta Paong	ទួលតាវ៉ែន	Tuol Tavan	Archeology	Roung	Beong Khna	Bakan	Pursat	361680	1400196
47	Ou Ta Paong	ទួលគរ២	Tuol Kor 2	Archeology	Trach Krol	Beong Khna	Bakan	Pursat	359492	1404044
48	Ou Ta Paong	ទួលគរ៣	Tuol Kor 3	Archeology	Trach Krol	Beong Khna	Bakan	Pursat	359245	1404005
49	Ou Ta Paong	ទួលគរ៤	Tuol Kor 4	Archeology	Trach Krol	Beong Khna	Bakan	Pursat	359470	14044139
50	Ou Ta Paong	ទួលគរ៥	Tuol Kor 5	Archeology	Trach Krol	Beong Khna	Bakan	Pursat	359306	1404189
51	Ou Ta Paong	ទួលតមុំ	Tuol Ta Mom	Archeology	Bat Kokir Chas	Ou Ta Paong	Bakan	Pursat	357802	1403082
52	Ou Ta Paong	ទួលភ្នៅ	Tuol Phnov	Archeology	Bat Kokir Chas	Ou Ta Paong	Bakan	Pursat	359306	1404189
53	Ou Ta Paong	ទួលពង្រួញ	Tuol Proung	Archeology	Bat Kokir Chas	Ou Ta Paong	Bakan	Pursat	357886	1404335

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
54	Ou Ta Paong	ទួលអ្នកតាឧកញ៉ាមាន់	Tuol Neak Ta Oknha Moan	Archeology	Oknha Moan	Ou Ta Paong	Bakan	Pursat	356855	1406103
55	Ou Ta Paong	ទួលតស៊ុក	Tuol Ta Suk	Archeology	Oknha Moan	Ou Ta Paong	Bakan	Pursat	356817	1406136
56	Ou Ta Paong	ទួលវត្តចាស់	Tuol Wat Chas	Archeology	Ou Bat	Ou Ta Paong	Bakan	Pursat	355370	1406864
57	Ou Ta Paong	ទួលស្រះម្កាក់	Tuol Srah Mkak	Archeology	Srah Mkak	Ou Ta Paong	Bakan	Pursat	356525	1404675
58	Ou Ta Paong	ទួលស្រះរុន	Tuol Srah Run	Archeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353855	1409227
59	Ou Ta Paong	ទួលរជ	Tuol Reach	Archeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353565	1408310
60	Ou Ta Paong	ទួលអំពិល២	Tuol Ampil 2	Archeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353408	1408957
61	Ou Ta Paong	ទួលអំពិល១	Tuol Ampil 1	Archeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353364	1408699
62	Ou Ta Paong	ទួលតទុយ	Tuol Ta Tuy	Archeology	Srah Run	Ou Ta Paong	Bakan	Pursat	353980	1408730
63	Ou Ta Paong	ទួលអំពិល	Tuol Ampil	Archeology	Srah Run	Ou Ta Paong	Bakan	Pursat	354218	1408735
64	Ou Ta Paong	ទួលរគំង	Tuol Rokeang	Archeology	Tuol Rokeang	Ou Ta Paong	Bakan	Pursat	357407	1408650
65	Ou Ta Paong	ទួលវិហា (ថ្មគ្រែ)	Tuol Vihea (Thmo Krae)	Archeology	Chrob	Svay Don Kev	Bakan	Pursat	350967	1407679
66	Ou Ta Paong	ទួលគុក	Tuol Kuk	Archeology	Chrob	Svay Don Kev	Bakan	Pursat	352252	1408072
67	Ou Ta Paong	ទួលកំពែតអង	Tuol Kampot Ang	Archeology	Kampout ang	Svay Don Kev	Bakan	Pursat	352770	1407290
68	Ou Ta Paong	ទួលតកែ	Tuol Takor	Archeology	Kampout ang	Svay Don Kev	Bakan	Pursat	352433	1407902
69	Ou Ta Paong	ទួលប្រត្រាញ់	Tuol Pratranh	Archeology	Svay Don Kev	Svay Don Kev	Bakan	Pursat	353801	1402072
70	Ou Ta Paong	ទួលវែង	Tuol Veng	Archeology	Tuol Samraong	Svay Don Kev	Bakan	Pursat	352115	1400412
71	Ou Ta Paong	វត្តចន្ទគន្ធរាម	Chan Khutaram	Pagoda	Ta Nai	Ou Ta Paong	Bakan	Pursat	352341	1413104

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
72	Ou Ta Paong	វត្តស្តុកឃ្លោក	Stok Khlok	Pagoda	Sdok Khlouk	Ou Ta Paong	Bakan	Pursat	353133	1410316
73	Ou Ta Paong	វត្តកំប៉ាង	Kampang	Pagoda	Kampout	Svay Don Kev	Bakan	Pursat	351865	1405613
74	Ou Ta Paong	វត្តទួលអ្នកគ្រូ	Toul Neak Kru	Pagoda	Nikom Leu	Svay Don Kev	Bakan	Pursat	350902	1402270
75	Ou Ta Paong	វត្តចន្ទរង្សីរំលេច	Chan Rainsy Romlech	Pagoda	Rumlech	Rumlech	Bakan	Pursat	358428	1393346
76	Ou Ta Paong	វត្តស្មឹឈូកស	Raksmey Chhouk Sar	Pagoda	Boeng Chhuk	Khnar Totoeng	Bakan	Pursat	361370	1392685
77	Ou Ta Paong	វត្ត(មង្គលវនវាសី) ហេ (វត្តបឹងគល់)	Mongkul One Veasey (Wat Boeung Koul)	Pagoda	Sakar	Boeung Khnar	Bakan	Pursat	359747	1399031
78	Ou Ta Paong	វត្តប្រាសាទដូនអន	Prasat Wat Don Orn	Pagoda	Prasat	Rumlech	Bakan	Pursat	357137	1396275
79	Ou Ta Paong	វត្តបឹងខ្នារ	Boeng Khna	Pagoda	Prey Svay	Boeung Khnar	Bakan	Pursat	358563	1398259
80	Ou Ta Paong	វត្តត្រាង	Trang	Pagoda	Trang	Me Tuek	Bakan	Pursat	361654	1407561
81	Ou Ta Paong	វត្តនន្ទូណារាម (វត្តកោះខ្សាច់)	Noun Thonaram (Koh Khsach)	Pagoda	Koh Khsach	Me Tuek	Bakan	Pursat	366350	1405804
82	Ou Ta Paong	វត្តព្រៃដំរី	Prey Domrei	Pagoda	Prey Phdua	Boeung Khnar	Bakan	Pursat	364443	1395900
83	Ou Ta Paong	វត្តពូសីរីវង្ស	Pou Serei Vong	Pagoda	Kruo	Boeung Khnar	Bakan	Pursat	362889	1396697
84	Ou Ta Paong	វត្តសុវណ្ណជល្លសាខ្នារអណ្តែត ហៅវត្តទន្សាយអើត	Sovanchul Sakhnar Andet (Tonsay Eth)	Pagoda	Krasang	Boeung Khnar	Bakan	Pursat	361791	1396360
85	Ou Ta Paong	វត្តកូនឆ្នោត	Kon Thnot	Pagoda	Kon Thnot	Rumlech	Bakan	Pursat	356619	1393584
86	Ou Ta Paong	វត្តវេឡុវនតំណាក់ត្រាច	Velovan Tamnak Trach	Pagoda	Tamnak Trach	Rumlech	Bakan	Pursat	357044	1392516
87	Ou Ta Paong	ប្រាសាទវត្តបាកាន	Prasat Wat Bakan	Pagoda	Bakan	Trapeang Chong	Bakan	Pursat	365943	1390522

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
88	Ou Ta Paong	វត្តដូងជ្រុំ	Doung Chrum	Pagoda	Doung Chrum	Boeung Bat Kandaol	Bakan	Pursat	369173	1401120
89	Ou Ta Paong	វត្តអ្នកតាទ្វារ	Neak Ta Thvear	Pagoda	Neak Ta Thvear	Ou Ta Paong	Bakan	Pursat	351859	1415913
90	Stung Krang Bat	ទួលតឹម	Tuol Ta Khem	Archeology	Tropeang Chambok	Longvek	Kampong Tralach	Kampong Chhnang	472155	1311719
91	Stung Krang Bat	ទួលវិហារបក់ក (បត់កង)	Toul Vihear Bak Kor (Bat Kong)	Archeology	Tropeang Chambok	Longvek	Kampong Tralach	Kampong Chhnang	472653	1312071
92	Stung Krang Bat	ទួលវិហារតុក	Tuol Vihear Tok	Archeology	Wat	Longvek	Kampong Tralach	Kampong Chhnang	474677	1311029
93	Stung Krang Bat	ទួលតយូ	Tuol Tayu	Vihear	Wat	Longvek	Kampong Tralach	Kampong Chhnang	474156	1311730
94	Stung Krang Bat	ទួលវិហារបរយុក	Tuol Vihear Bor Youk	Vihear	Wat	Longvek	Kampong Tralach	Kampong Chhnang	473982	1311839
95	Stung Krang Bat	ទួលប្រាសាទរាជា	Tuol Prasat Reachea	Temple	Wat	Longvek	Kampong Tralach	Kampong Chhnang	473775	1312183
96	Stung Krang Bat	ទួលក្រពើណេនធន់	Toul Krapeu Nen Thorn	Archeology	Wat	Longvek	Kampong Tralach	Kampong Chhnang	474855	1311948
97	Stung Krang Bat	ទួលប្រាសាទកាន់ណេកកត់	Tuol Prasat Kan Neak Kot	Temple	Wat	Longvek	Kampong Tralach	Kampong Chhnang	474723	1311592
98	Stung Krang Bat	ទួលនាងសក់ក្រអូប	Tuol Neang Sok Kra Aoub	Temple Foundation	Wat	Longvek	Kampong Tralach	Kampong Chhnang	474262	1310739
99	Stung Krang Bat	ទួលតអុក	Toul Ta Ok	Archeology	Wat	Longvek	Kampong Tralach	Kampong Chhnang	473771	1310352
100	Stung Krang Bat	ទួលតាប្រាក់ (តាព្រាក)	Toul Ta Brakk (Ta Prak)	Archeology	Wat	Longvek	Kampong Tralach	Kampong Chhnang	472905	1310211
101	Stung Krang Bat	ទួលតឈីន (លួងឈីង)	Toul Ta Chhin (Luong Chhing)	Archeology	Wat	Longvek	Kampong Tralach	Kampong Chhnang	473550	1312197
102	Stung Krang Bat	ទួលតប៉ូវ	Tuol Tapao	Archeology	Wat	Longvek	Kampong Tralach	Kampong Chhnang	473286	1311780
103	Stung Krang Bat	វត្តត្រឡែងកែង	Tralaeng Kaeng	Pagoda	Wat	Longvek	Kampong Tralach	Kampong Chhnang	473896	1311731
104	Stung Krang Bat	វត្តប្រាំបីជុំ	Brambei Chhom	Pagoda	Peam Chumnik	KampongLuong	Ponhea Lueu	Kandal	477972	1310163

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
105	Stung Krang Bat	វត្តដងទង់	Dangtong	Pagoda	Peam Chumnik	KampongLuong	Ponhea Lueu	Kandal	478032	1309643
106	Stung Krang Bat	វត្តពាមជំនីក	Peam Chumnik	Pagoda	Peam Chumnik	KampongLuong	Ponhea Lueu	Kandal	477781	1309221
107	Stung Krang Bat	វត្តសង្វារ	Sangvor	Pagoda	Sangvar	KampongLuong	Ponhea Lueu	Kandal	478110	1308715
108	Stung Krang Bat	ប្រាសាទយាយទាវ	Yeay Tey	Temple	Sangvar	KampongLuong	Ponhea Lueu	Kandal	476870	1308902
109	Stung Krang Bat	លេកយយជំទវម៉ៅ	LokYeay Chumteav Mao	Shrine	Peam Chumnik	KampongLuong	Ponhea Lueu	Kandal	477386	1311208
110	Stung Krang Bat	វត្តពោធិ៍កំបោរ	PoKomBoar	Pagoda	PoKomBoar	Vihear Luong	Ponhea Lueu	Kandal	475831	1307970
111	Stung Krang Bat	វត្តវិហារសំណរ	Wat Vihear Samnor	Pagoda	Sala Kat Sak	Vihear Luong	Ponhea Lueu	Kandal	474341	1307690
112	Stung Krang Bat	ប្រាសាទនាងកែវណាម៉	Neang Keo Nama	Temple	Sala Kat Sak	Vihear Luong	Ponhea Lueu	Kandal	474305	1307602
113	Stung Krang Bat	វត្តសាលាគូ	Sala Kou	Pagoda	Malu Meun	Phsar Dek	Ponhea Lueu	Kandal	473527	1306754
114	Stung Krang Bat	វត្តព្រះវិហារហ្លួង	Preah Vihear Luong	Pagoda	Thnak	Vihear Luong	Ponhea Lueu	Kandal	474956	1306685
115	Stung Krang Bat	វត្តប្រក់ក្តារ	Prok Kdar (Wooden Roof Pagoda)	Pagoda	Prok Kda	Vihear Luong	Ponhea Lueu	Kandal	472332	1307676
146	Stung Krang Bat	ប្រាសាទ តុលរករ	PrasatTolaka	Shrine	Wat	Longvek	Kampong Tralach	Kampong Chhnang	474730	1311895
131	Stung Krang Bat	វត្តព្រះអង្គទេព	Prah En Tep	Pagoda	Wat	Longvek	Kampong Tralach	Kampong Chhnang	474564	1311155
132	Stung Krang Bat	វត្តសសរ ១២០	Sorsor moi roi mapei	Pagoda	Wat	Longvek	Kampong Tralach	Kampong Chhnang	474742	1311775
133	Stung Krang Bat	វត្តសុភីរង្សី	Sophy Raingsei	Pagoda	Srah Chak	Longvek	Kampong Tralach	Kampong Chhnang	474142	1312485
134	Stung Krang Bat	វត្តទួលបាយក្តែក	Toul Bay K'aek	Pagoda	Peam Longvek	Vihear Luong	Ponhea Lueu	Kandal	475333	1311372
135	Stung Krang Bat	វត្តសង្គមមានជ័យបុរីមានរិទ្ធ	Sangkum Meanchey, Borey Mean Rith	Pagoda	Tropeang Chambok	Longvek	Kampong Tralach	Kampong Chhnang	472318	1311158

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
130	Krapeu Truom	វត្តប្រាជុំខ្ពស់	Brachum Kpous	Pagoda	Voat Sedthei	Svay	Sameakki Meanchey	Kampong Chhnang	465424	1309984
117	Krapeu Truom	វត្តវិហារខ្ពស់	Vihear Kpos	Pagoda	Vihear Kpos	Veang Chas	Odongk	Kampong Speu	471628	1305730
120	Krapeu Truom	វត្តទេពសុវណ្ណ	Tep Sovann	Pagoda	Phdor	Veal Pung	Odongk	Kampong Speu	465704	1304524
121	Krapeu Truom	វត្តខ្សាច់ពូន	Khsach Poun	Pagoda	Khsach Puon	Veal Pung	Odongk	Kampong Speu	464355	1303193
122	Krapeu Truom	វត្តធ្លាចាស់	Thleachas	Pagoda	Thleachas	Veal Pung	Odongk	Kampong Speu	463631	1304247
123	Krapeu Truom	វត្តព្រះនរាយណ៍	Preah Noreay	Pagoda	Kngaok Pong	Svay Chuk	Sameakki Meanchey	Kampong Chhnang	458790	1305619
124	Krapeu Truom	វត្តក្តីបុរីរម្យ	Kdei Borey Rom	Pagoda	Boureirom	Veal Pung	Odongk	Kampong Speu	460699	1304686
125	Krapeu Truom	វត្តត្បែងខ្ពស់	Tbaeng Khpos	Pagoda	Tbaeng Khpos	Tbaeng Khpos	Sameakki Meanchey	Kampong Chhnang	461089	1306547
138	Krapeu Truom	វត្តត្រពាំងម្នេស	Tra Peang Mor Tes Monastery	Pagoda	Trapeang Mtes	Svay Chuk	Sameakki Meanchey	Kampong Chhnang	455362	1304172
126	Krapeu Truom	វត្តហង្សឈូក	Hang Chhouk	Pagoda	Hangs Chhuk	Svay	Sameakki Meanchey	Kampong Chhnang	464938	1305996
127	Yutasas	វត្តទន្លាប់	Tonlab	Pagoda	Khyang Cheung	Svay	Sameakki Meanchey	Kampong Chhnang	468243	1307222
128	Yutasas	វត្តខ្យាង	Khyang	Pagoda	Khyang Tbuong	Svay	Sameakki Meanchey	Kampong Chhnang	468275	1307412
116	Yutasas	វត្តវាំងចាស់	Vaing Chas	Pagoda	Knong Veang	Veang Chas	Odongk	Kampong Speu	472311	1306273
118	Yutasas	វត្តព្រៃច្រាប	Prey Chrab	Pagoda	Prey Chrab Lech	Veal Pung	Odongk	Kampong Speu	467805	1304487
119	Yutasas	វត្តអង្គសណ្តាន់	Ang Sandan	Pagoda	Angk Sandan	Preah Sre	Odongk	Kampong Speu	468585	1304611
129	Yutasas	វត្តវិហារចាមសាមគ្គី	Vihear Cham Samaki	Pagoda	Thmei	Svay	Sameakki Meanchey	Kampong Chhnang	468475	1309425
136	Brambei Mom	វត្តអង្គទន្លេស្ងួត	Aug Tonlea Sngout	Pagoda	Boeng Va	Trach Tong	Odongk	Kampong Speu	457039	1295585
137	Brambei Mom	វត្តអង្គក្រាំងក្តឹប	Ang Krang Kdeb	Pagoda	Sdok	Mean Chey	Odongk	Kampong Speu	455611	1294336
139	Brambei Mom	វត្តស្រះទាល់	Srah Thul	Pagoda	Trapeang Thum	Yuth Sameakki	Odongk	Kampong Speu	451001	1290590

No.	Sub-Scheme	Name Khmer	Name English	Type	Village	Commune	District	Province	X	Y
140	Brambei Mom	វត្តទឹកលង	Toek Lorng	Pagoda	Tuek Long Ti Pir	Rung Roeang	Tpong	Kampong Speu	445408	1291996
141	Brambei Mom	វត្តសុវណ្ណគីរី	Sovankiri	Pagoda	Trapeang Kraeun	Prambei Mom	Tpong	Kampong Speu	437228	1294353
142	Brambei Mom	វត្តជុតិវន្ត	Chotivoan	Pagoda	Chambak Sa	Rung Roeang	Tpong	Kampong Speu	447065	1296838
143	Brambei Mom	វត្តច្រកស្តេច	Chrak Sdach	Pagoda	Chrak Sdach	Peam	Sameakki Meanchey	Kampong Chhnang	447157	1304159
144	Brambei Mom	វត្តភ្នំព្រះធាតុ	Phnom Preah Theat	Pagoda	Chrak Kov	Peam	Sameakki Meanchey	Kampong Chhnang	441487	1306834
145	Brambei Mom	វត្តឧត្តមគីរីព្រឹក្សា	Utdomkiri Proeksa	Pagoda	Trapeang Kraeun	Prambei Mom	Tpong	Kampong Speu	433367	1293210

(Source: Pursat, Kampong Chhnang and Kampong Speu Provincial Department of Culture, and Fine Arts, 2024).

Figure 1: Maps of archeological and cultural sites in and near Ou Ta Paong Sub-scheme

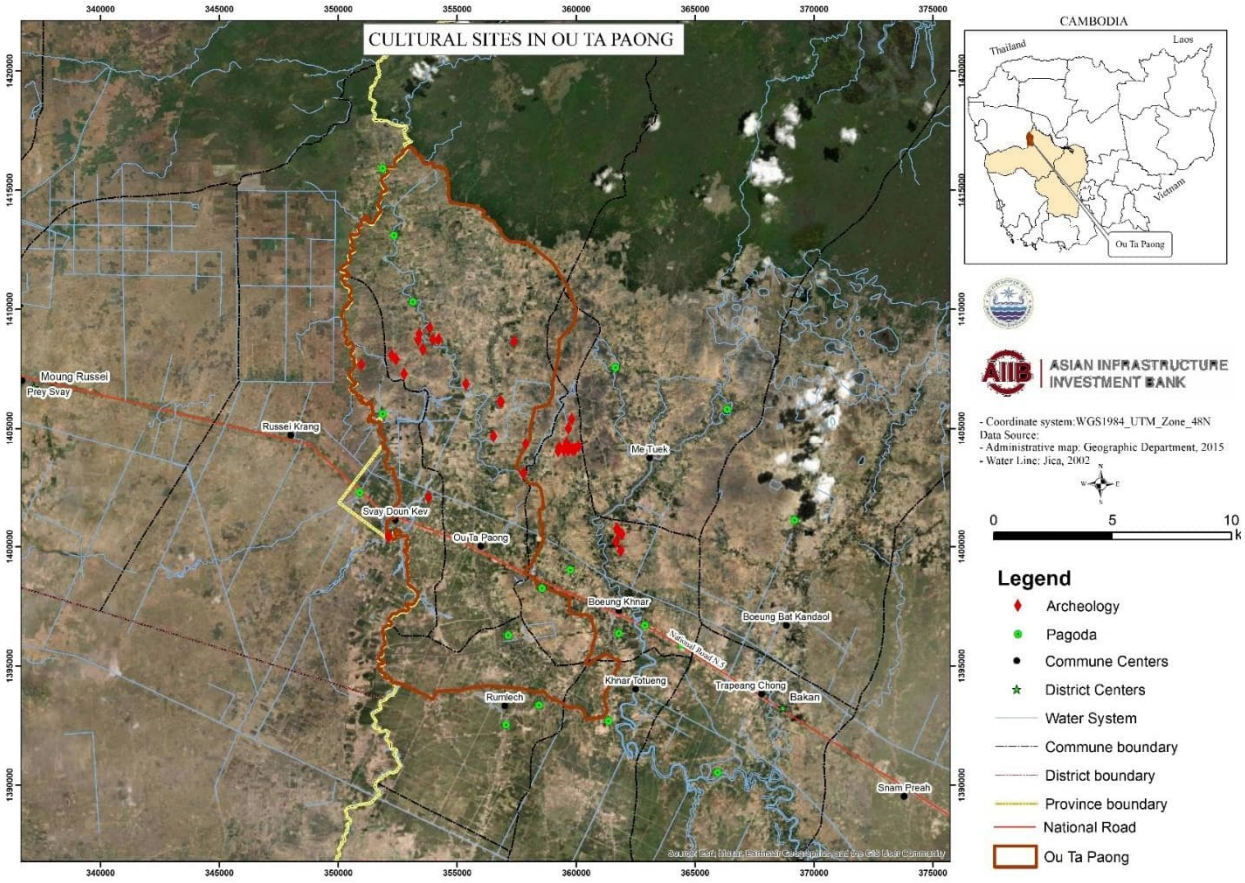


Figure 2: Maps of archeological and cultural sites in and near Lum Hach Sub-scheme

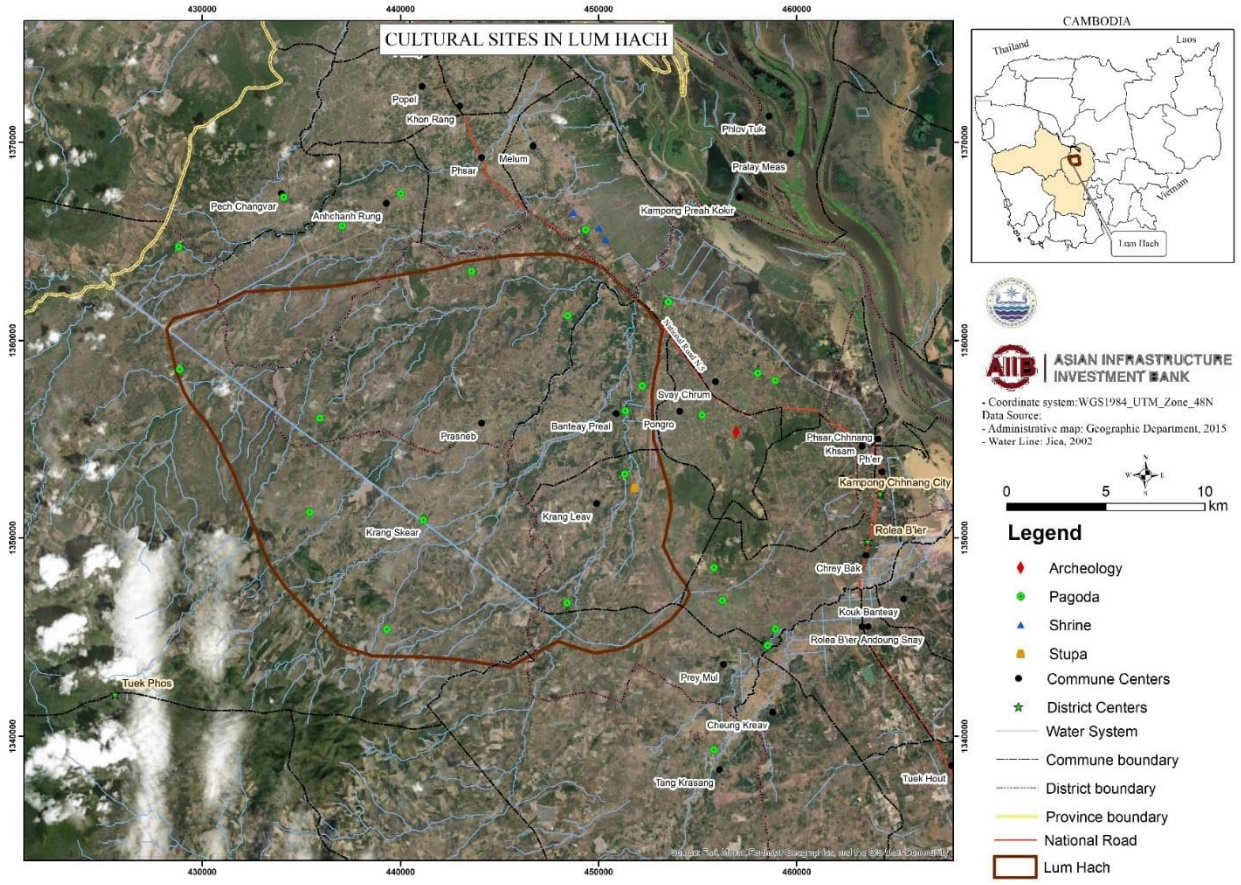
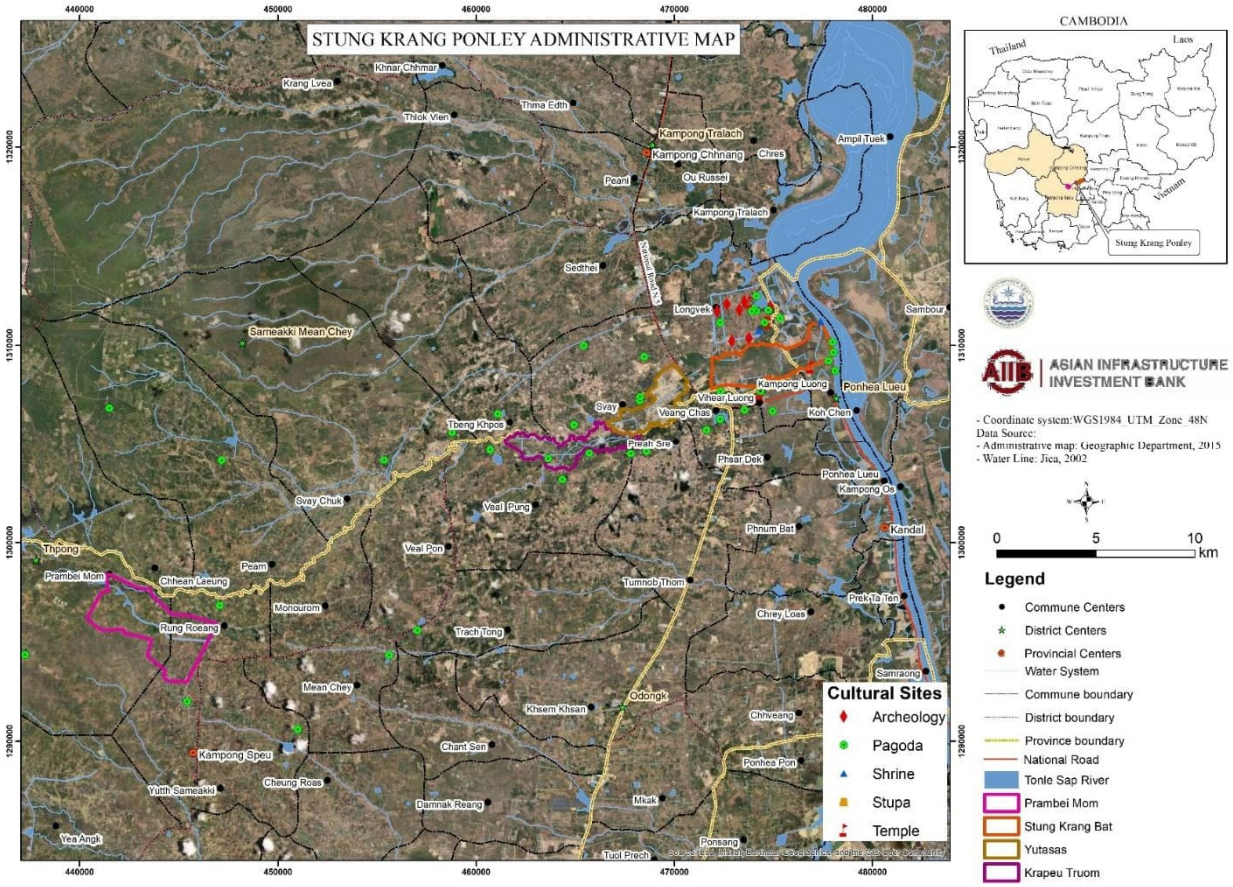


Figure 3: Maps of archeological and cultural sites in Stung Krang Ponley Sub-scheme



ANNEX 8.1: RESULTS OF THE CONSULTATIONS IN PURSAT PROVINCE

Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Pursat Provincial Hall
Participants	Mr. Lay Viseth
Moderator	1. Mr. Chun Nimul 2. Miss Tuon Somphorsdavin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The sectors with potential for development in the province include agriculture (rice, cassava, corn, and oranges) and mining (stone and sand). Notably, reservoirs No. 1, No. 3, and No. 5 are supplying the province, while Reservoir No. 2 is under construction. - In the agricultural sector, 78% of the province's population are farmers, which emphasizes the importance of agriculture in development plans. - Challenges in implementing the CAISAR project include difficulties in sourcing water from Dam Ampeul due to its distance from O Ta Pong and its potential impact on the population. Conversely, sourcing water from Kbal Hong, which is closer and has existing canals, would avoid population displacement. - The environmental and biodiversity impacts in the area are minimal. Regarding the livelihoods of residents, the project benefits farmers by providing irrigation during the dry season, creating agricultural jobs, and addressing poverty in priority areas 1, 2, and 3, though these areas still require significant attention. - There are no major issues with resettlement in the province due to the existence of clear policies and active participation from relevant institutions, including departments, communes, and villages, along with scheduled compensation from the government. - The General Department responsible for mitigating impacts is working to secure land for project implementation by coordinating meetings with affected residents, officials, and banks to collectively resolve disputes. -
Requests	- Strengthen livelihood capacities - The project should be implemented quickly - Prepare to participate in project work, cooperate, and implement - Work together to face and resolve challenges

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Photo	

Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Department of Agriculture Forestry and Fisheries, Pursat province
Participants	1. Mr. Hun Sovan 2. Mr. Meas Set
Moderator	Mr. Keo Sony
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Each household owns an average of 3 hectares of farmland. - Farmers use an average of 250 kg of seeds per hectare during the dry season and 300 kg per hectare during the wet season. - Seeds are purchased from companies (OM seeds from Vietnam and local varieties) and saved for 2–3 generations. Seeds for mung beans and cucumbers are also purchased. - Fertilizer is applied to rice twice per season and to other crops three times. - Insecticides are applied to rice five times per season and to other crops 5–6 times per season. - Farmers hire labor for plowing, harvesting, and spraying pesticides. - Rice is sold directly in the fields, while other crops are sold at home. - Challenging of farming are flooding, water shortages, and climate change (currently facing water scarcity). - Farmers purchase seeds and also save their own. - Chemical fertilizers are currently suitable for the area. - Pesticide: While not ideal, there are no better options.

	- Insufficient water availability due to poor water management and lack of infrastructure. - There are no fees as there is no community-based water management system. - Rice is harvested by machine, and other crops are harvested manually. - Production Cost: Include plowing, fertilizers, pesticides, seeds, harvesting, and transportation. - Quick-harvesting crops like mung beans, cucumbers, and cabbages are grown popularity in the area. - Along the Ou Ta Pong stream is suitable areas for vegetable cultivation. - Vegetable Crop Benefits: Quick harvest time and broad market opportunities. - The Department organizes meetings between buyers and farmers to secure markets. - Fish Species Recommended: Catfish, silver barb, and tilapia. - Fish Farming Areas: Along the O Ta Pong stream near households. - Market Opportunities for Fish: Expected to thrive quickly, with the Department facilitating market access for farmers. - Challenges in Fish Farming: Insufficient water availability. - Training Provided: The Department conducts 20 training sessions per year for rice farmers (twice annually in the O Ta Pong area) on cultivation techniques and awareness. - 2023 Training Topics: Focused on rice production and the promotion of other crops. - Average Rice Cultivation: Farmers cultivate rice twice per year on average. - Additional Training Sources: Farmers receive training from partner organizations and fertilizer and pesticide companies. - Support from the Department: Committed to supporting projects by providing training, technical guidance on water conservation, and promoting solar-powered systems. - Water Availability and Management: Improved water accessibility enhances agricultural productivity, mitigates natural disasters (floods and droughts), and ensures water availability when needed. - Areas for Improvement: Establish agricultural technical officers at the commune level to train farmers, address challenges, find markets for agricultural products, and provide training on seed selection.
Requests	- Study technical methods for constructing irrigation systems properly to avoid water shortages or flooding in nearby areas. - Canals must have a consistent water supply. - Ensure stable water distribution and avoid conflicts over water usage. - Raise awareness among the population and stakeholders about the existence and benefits of the project.

	- Solutions: Adjust planting schedules and adopt intercropping methods; build reservoirs, ponds, and wells; educate and train people on water conservation; and encourage farming practices that do not exceed the area's available water resources.
Photo	

Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Department of Water Resources and Meteorology, Pursat province
Participants	1. Mr. Kit Phal 2. Mr. Lao Sokha 3. Mr. Ra Sovanret 4. Mr. Mao Mina
Moderator	Miss Sek Liny
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The current water sources are sufficient for the rainy season but inadequate for the dry season. This is because the agricultural land spans 110,000 hectares, while water can only supply 20,000 hectares. Presently, farmers cultivate 70,000 hectares, with a water shortage affecting about 10%. (Farmers use water reserved for livestock for their fields, leaving no water in ponds or other reservoirs.) Farmers exceed recommended cultivation levels due to the high market value of rice and observing others doing the same. - The rainy season’s water supply is generally sufficient for rice farming, making water shortages uncommon. However, the dry season still faces water scarcity issues. - Developing water resources in the province presents challenges and obstacles that impact farmland and residents' settlements, though the impact is minimal if development occurs using existing systems.

	- In the Ou Ta Paong area, there is a water users' community with a committee, but it is nonfunctional due to insufficient water supply for farmers. - The CAISAR Project aims to improve water access for farmers, establish efficient community operations, provide technical knowledge, and train communities on conflict resolution since many residents do not follow instructions or announcements from authorities. - Other challenges in water management include: ● Providing inaccurate data on cultivation areas (underreporting actual numbers). ● Water shortages due to farmers cultivating more fields than recommended (ignoring guidelines and the water department's supply limitations). ● Insufficient water sources for rice farming. ● Conflicts in water allocation caused by noncompliance with distribution rules. ● Farmers neglecting field maintenance and not participating in water distribution or monitoring. ● Farmers leaving water gates open, causing water loss (with insufficient community representatives monitoring usage). ● Unauthorized water usage during off-hours by individuals while community representatives are unavailable (e.g., stealing water between 10 p.m. and midnight). - The state of water resources and management in target areas involves discussions on water allocation. However, cases of water theft persist, and some residents refuse to adhere to recommended water levels (reluctant to share with downstream users). Water is sourced from key areas, such as the Stung Thom (Promaoy), Stung Areng (Dams #3 and #5), and Stung Prek Khlong (via Stung Pursat). - Management: Contract officers manage water sources upstream, while local authorities oversee water usage at the village, commune, and district levels. Annual meetings are held to plan water use and allocation. - Importance of irrigation systems in the livelihoods of citizens: ● Provide water for farming (rice fields, vegetable cultivation, and livestock). ● Reduce migration by encouraging farmers to increase rice farming. ● Maintain a higher population in villages (limiting migration). ● Enable more local business activities due to increased buyers and consumers in the area. ● Boost water-related businesses (e.g., purified water production).
Requests	- Provide additional training on water management and technical skills to the water user communities.

	- Supply modern equipment and new technologies to the officials within the department. - A farmer in Romlech commune expressed happiness about the establishment of the irrigation system but dissatisfaction with the construction company. The issue stems from uneven land excavation, leaving deep pits that make the remaining land near the canal unusable for farming. (The farmer has also demanded $200 in compensation from the company.)
Photo	

Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Department of Labour and Vocational Training, Pursat province
Participants	Kol Buntheuorn
Moderator	1. Mr. Chun Nimul 2. Miss Tuon Somphorsdavin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The employment and vocational training in the project area focus on agriculture, tourism, industry, and agro-industry. - The department's role in managing and monitoring project activities includes providing guidance to workers in the area, collaborating with company owners, and ensuring worker safety. - The department provides vocational skills training to farmers in the community, focusing on crop cultivation and livestock rearing. - Female migration does not significantly impact the labor force needed for rice production, as farming activities are partially automated. - The CAISAR project has minimal impacts on the community and work environment, as it is located downstream, in areas previously prone to seasonal flooding.

	- Migration occurs mainly after agricultural and household work, contributing to increased household economic stability. - In terms of health, the project has no significant adverse effects since the irrigation system does not involve chemical usage. Minor disturbances include occasional noise or vibrations.
Requests	- Support the project because it is in Zone 2.
Photo	

Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Department of Women's Affairs, Pursat province
Participants	1. Mr. Morn Kimsoeurn 2. Ms. Teou Sonary 3. Ms. Kruoch Bunly
Moderator	1. Mr. Chun Nimul 2. Miss Tuon Somphorsdavin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The participation of women in agricultural work has declined due to low market prices for agricultural products (e.g., vegetables), high input costs, limited water availability for irrigation during the dry season, and low participation in community meetings. - Incidents of violence have decreased in both mild and moderate cases. - Mild cases: Victims report to the commune-level officials.

	- Moderate cases: Complaints are filed with the local police or judiciary, potentially leading to mediation, separation orders, or arrests. - The department collaborates with local authorities at all levels to monitor, identify pro bono lawyers, and report cases to the National Council and Ministry of Women's Affairs. - Resolutions are coordinated with local authorities at the commune and district levels. - Support is provided to help victims find pro bono legal representation. - Reports are prepared and submitted to the National Council and Ministry of Women's Affairs. - Resolutions for minor cases are handled at the village, commune, and district levels through education, mediation, and agreements. Moderate cases may involve separation orders, arrests, divorce petitions, or formal mediation. - Government mechanisms, including the six-point Neary Rattanak Policy and plans for women, are effective. Relevant departments collaborate with the Department of Social Affairs and Women's Affairs to track victims and arrest or detain perpetrators. - There is concern about gender-based violence (GBV) risks linked to the presence of project staff in the area. - Projects aimed at reducing GBV risks must enforce policies, ensure worker discipline, and hold companies accountable for staff conduct. - GBV risks in the area depend on individual behavior and interpersonal relationships. - Construction companies must coordinate and implement measures to protect the community from sexual exploitation and abuse/sexual harassment (SEA/SH). - All project staff operating in the area must participate in awareness campaigns, receive guidance, and adhere to strict discipline. Strengthening judicial systems and providing training on legal issues related to complaints are also necessary.
Requests	- The department's staff lacks financial support, relying only on the department's own mission budget. - It is necessary to consider deploying specialists to educate and raise awareness about issues of violence. - Expedite the construction and restoration of this irrigation system project.

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Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Department of Environment, Pursat province
Participants	1. Mr. Dang Rady 2. Mr. Lay Vannak
Moderator	Miss Sek Liny
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The general situation in the province includes areas with multi-use nature conservation zones (Tonle Sap region) and national parks. - The department is responsible for monitoring and inspecting various locations, with some locations requiring daily inspections. - The department's role involves regular project monitoring in three phases: pre-project, operational, and post-completion (managing waste and construction debris). It also raises public awareness about hygiene among the affected population and the general public, although hygiene issues persist. The department will continue its awareness campaigns. - Major challenges include insufficient public participation, requiring regular monitoring. Approximately 40% of urban residents have not yet participated in sanitation efforts (previously, more residents were involved in municipal waste disposal, but participation has declined due to economic issues, as residents must pay monthly waste collection fees). The ministry has a campaign to reduce plastic usage, with factories participating more actively and improving management compared to before. However, there is a lack of technical staff, and a

	significant portion of the population continues to dump waste indiscriminately rather than using designated bins. - The department has contributed materials to the project but has not yet established other forms of collaboration. - Key biodiversity areas/species/habitats are not affected by the project but have been improved instead. Biodiversity areas are primarily located in the Tonle Sap region, which could face impacts if construction workers improperly dispose of waste. - Positive environmental and biodiversity impacts: The project improves fish habitats, allowing aquatic species to migrate and increasing fish production due to larger waterways. Residents benefit from higher fish catches, reduced costs, expanded agricultural production, and livestock farming. The project also helps clean the environment by reducing unauthorized constructions and indiscriminate waste dumping by the community. - Negative environmental and biodiversity impacts: Construction and project activities may cause water and air pollution, soil erosion, waste from workers and machinery, noise pollution, and impacts on residential and commercial lands. Wastewater and debris could enter conservation zones and multi-use areas (Tonle Sap), polluting water and affecting fish in the Tonle Sap area. - Solutions: o Provide compensation or alternative arrangements for affected families regarding land issues. o Schedule construction to avoid noise pollution during residents' rest times. o Offer temporary business locations for those affected by partial loss of commercial land. o Restrict the use of outdated machinery, allowing them only in rural areas. o Promote clean living practices, reduce plastic usage, and improve waste management. o Conduct air quality tests to prevent water pollution.
Requests	- Request to conduct water and air quality tests before starting construction in order to compare the conditions during and after construction. - The construction company must regularly monitor the workers' living conditions, waste management, and ensure there are proper sanitation facilities and adequate housing for the workers. - The company provides education and guidance on maintaining cleanliness and hygiene for the workers (such as proper waste disposal and handling of oil) and prohibits activities like fish poaching and hunting.

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Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Department of Land Management, Urban Planning and Construction, Pursat province
Participants	Mr. Suong Se
Moderator	1. Mr. Chun Nimul 2. Miss Tuon Somphorsdavin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The land use and land ownership registration in the Ou Ta Paong area are fully documented in the system. - The general issues related to land use are that conflicts may arise on an individual basis. - The system's land certificates is existing, but there have been difficulties in issuing certificates for citizens concerning land cultivation. - The impact of the CAISAR project on the community and land use is not a concern, as there is a registered irrigation plan in place. - There are no concerns about the restoration of the irrigation system, as it benefits the local population.
Requests	- Conduct a study on the impacts on the irrigation system. - Request shapefiles to clearly define boundaries and prevent opportunistic individuals from causing issues with land value or exploiting profits through speculation.

	- Request proper land parcel delineation or ensure that all citizens with land ownership certificates are accounted for.
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Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Department of Culture and Fine Arts, Pursat province
Participants	1. Mr. Ut Raksa 2. Mr. Chea Sophea 3. Mr. Teng Phearum
Moderator	Miss Sek Liny
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- In the province, there are no complete temple structures, only the foundations and ancient mounds that were once inhabited. There are 9 temple foundations, 91 ancient mounds, 15 small mounds, 11 ponds, and 34 other features. - The status and characteristics of the temples in the CAISAR project area are as follows: in Bakan District, there are 6 temple foundations, 50 ancient mounds, 1 pond; in Ou Ta Paong Commune, there is 1 temple foundation and 16 mounds. - The role and activities of the department include the preservation, protection, and promotion of the value of national cultural heritage, organizing conservation, registration of ancient objects to prevent loss, registering the inventory of ancient buildings and historical sites, collaborating with authorities to prevent crimes related to cultural

	heritage assets, conducting archaeological surveys and determining ancient locations, and promoting the awareness of historical sites. - Potential impacts and changes to the heritage site area due to the project may affect the water channels and the base of the ancient temple, Phnom An.
Requests	- Request that the project be relocated or diverted away from the temple site. - If the project cannot be avoided, request project funding for mitigation efforts and preservation activities to protect the cultural heritage.
Photo	

Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Sustainable Cambodia Organization, Pursat province
Participants	1. Phang Polin 2. Ok Seab
Moderator	Mr. Nhoeb Phearun
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Involvement with clean water and sanitation for poor households, providing rainwater collection tanks with a capacity of 400 liters. If possible, also provide small portions of help such as digging latrines, building sanitary latrines, teaching vegetable gardening, creating compost, community ponds for animal farming to increase income, and forming groups of 10-15 people per group. Additionally, provide sewing lessons to make souvenirs (bags, phone cases, washable sanitary pads, etc.) and maintain sanitation for women.

	- Concerns and challenges include high migration rates, and group formation is often influenced by political affiliation, with the village chief selecting members based on their political party alignment.
Requests	- If the project affects citizens' land, please provide them with appropriate compensation. - If possible, preserve large trees.
Photo	

Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Lutheran Hope Cambodia Organization, Pursat province
Participants	Ms. Ruon Phorn
Moderator	Mr. Nhoeb Phearun
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Activities related to clean water, sanitation, agriculture (vegetable farming, animal husbandry), drip irrigation systems, and greenhouses for vegetable farming, strengthening community activities with committees to promote awareness among youth. - Providing sanitation training to communities and schools, resolving disputes outside the judicial system with the community, and raising awareness about migration. - The project has been progressing well, with enough funds to implement the plan, but the main difficulty is finding money for continued project implementation. This has led to reducing staff, and community participation has been slow due to high migration rates.

	Many people are in debt and are focused on earning money, leaving no time to participate in the project. - Concerns and challenges include potential impacts on agricultural land around the irrigation systems and disputes between project implementers and beneficiaries, causing delays in farming. - Impact, benefits, and changes from the CAISAR project: After completion, the irrigation system was sufficient, leading to increased production. Migration was reduced as people worked on farms four times a year, and animal husbandry and fish farming were incorporated to create a more sustainable environment. - People with less land may lose their land, and there is a lack of farming land. Children are not able to attend school because they must follow their mothers to work in distant areas.
Requests	- Provide appropriate compensation when construction takes place, or allow them to exchange land where they can farm.
Photo	

Consultation Level	Provincial
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	HEKS - EPER Cambodia Organization, Pursat province
Participants	Ms. Khorn Sokluk
Moderator	Mr. Nhoeb Phearun
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project

Perceptions and concerns	- The registered land is limited; the project will assist in improving the living conditions of the people. - The needs of the people have been addressed, and they can participate in the responsibility of maintaining and using water. - Organized discussions with agents to encourage them to be operators. - The relationship between the CAISAR project and organizations can help address household or farming needs and ensure the sustainability of water irrigation for a long time. - Study the necessary requirements to ensure farming can be done in both seasons with adequate water supply. - Concerns and challenges include land affected by construction near irrigation systems or the placement of construction projects, with some areas of land that people are using being close to harvest time and potentially rendered unusable. - Reduce migration by strengthening capabilities in farming and livestock management (government should allocate leadership and manage water distribution). - Reduce impacts and conduct more studies; the risks and benefits of water flooding in villages should be shared. - Minimize negative effects and discuss with people whether irrigation restoration is indeed a need. - Establish teams for maintaining irrigation systems and water gates, and add trees when preparing the irrigation areas.
Requests	- Set a specific deadline to prevent negatively affecting the people's increased productivity. - Minimize the impact on both people and the environment as much as possible. - Trees along the irrigation channels should be preserved and not cut down. Irrigation workers should be instructed to love and protect the environment. - Study the needs of the people before making decisions and ensure clarity. - The irrigation system should be capable of storing a large amount of water. - The community level should be small, from 10 to 20 hectares. - The community should own the irrigation systems and not consider them as state property. - Implement a water usage fee model to fund maintenance and further improvements. - Villages or districts should collaborate with the irrigation system or help maintain it.

	- A village-level management committee should be established to manage water resources, especially for areas with 100 or 80 hectares of land.

Consultation Level	District
Date	August 21st, 2024
Sub-Scheme	Ou Ta Paong
Organization	Bakan District Hall, Pursat province
Participants	1. Ms. Khiev Raning 2. Mr. Chea Heng 3. Ms. Sam Sophun 4. Ms. Vann Sokhon 5. Ms. Him Makara
Moderator	Mr. Keo Sony
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The sectors with potential and priority for rural development are agriculture and handicrafts (bricks and tiles). - The project will create water storage sites and infrastructure systems. - The impact on wildlife habitats during construction. - Create wildlife habitats and corridors. - Local people have migrated to work in Thailand, South Korea, Japan, and Phnom Penh. - The role of local authorities is to enforce clear policies on water resource management, and the government has already measured and registered land. As a result, the working team has also preserved land near water sources. - Key issues and challenges may arise from land-related problems, but the local population is aware of the project and its presence. - The capacity and human resources of local authorities include a district administrative committee to resolve conflicts outside the judicial system. - The biggest challenge for farmers is the lack of irrigation water, insufficient infrastructure systems, and competition for water resources among migrants. - The solution is that local authorities distribute water from sources (such as wells) to each village, and the people contribute funds for irrigation and water distribution in cooperation with local authorities. - Seeds: In the first year, people buy seeds from the market; in subsequent years, they keep their own seeds (seeds can be kept for only 2-3 years). The types of seeds include OM51, OM54, Cambodian varieties, and Sarang.

	- Fertilizer: Fertilizers must be used for agriculture (types include urea, granular fertilizer, and DAB fertilizer). - Pesticides: Use herbicides, insecticides, and fungicides. - Infrastructure systems: There is insufficient water for farming due to a lack of infrastructure, water storage ponds, and over-farming during the dry season. - Post-harvest: Harvesting is done using machines. - Production costs: Preparing the land, buying seeds, fertilizers, pesticides, and harvesting. - Government initiatives should be efficient to reduce and address gender-based violence through awareness campaigns on reducing violence at the grassroots level and collaborating with educational organizations on gender issues. - To prevent and respond to gender-based violence, gender education should be integrated into local programs. - Concerns about the risks of gender-based violence due to an increase in the number of workers in the CAISAR project, which may lead to violence within workers' families, as well as sexual assault from male workers on women and children living near the project sites. - To reduce the risk of gender-based violence that may arise from the project, the company should collaborate with local authorities to provide gender training for workers. - Risks in the area include traffic accidents and substance abuse. - The company should cooperate with local authorities to provide gender education for workers.
Requests	- The company collaborates with local authorities. - The company informs local authorities and the community about the project's presence. - The project development is requested to proceed as quickly as possible.

Photo	

ANNEX 8.2: RESULTS OF THE CONSULTATIONS WITH COMMUNE COUNCILS IN PURSAT PROVINCE

Consultation Level	Commune
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Organization	Svay Doun Keo Commune Hall, Bakan District, Pursat Province
Participants	1. Mr. Deuk Kimhean 2. Mr. Un Samart 3. Mr. Moung Moeun 4. Mr. Sok Chanthy 5. Mr. Long Tang
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune has developed concrete and dirt roads in each village. About 95% of the population engages in agriculture, with a total of 2,550 hectares of farmland, 60% of which is dedicated to rice cultivation. - Residents practice rice farming, grow vegetables at the household level, and raise livestock, relying on wells as a water source. The commune also has a poultry farm. Other livelihood activities include trading, handicrafts, and small businesses. - Farmers near the Svay Doun Keo stream use water from the reservoir for irrigating rice fields, raising livestock, and fishing. - Drinking Water: Residents use tap water and purified bottled water. However, those living in villages along dirt roads rely on well water, which is filtered using household filtration systems. - Most farmers cultivate rice twice a year, while some do so once annually. Common rice varieties include OM, Somaly, and Sra Ngae. - The wet-season rice is cultivated from June to December, while dry-season rice is planted from January to March. Average yields range from 4 to 5 tons per hectare. - Most households grow vegetables on small plots of land around their homes, primarily cultivating leafy greens and fruiting vegetables. - Family-based livestock farming includes raising chickens, ducks, pigs, cows, and buffaloes. - Two villages, Kampout Ang and Svay Doun Keo, benefit from the restoration of the Ou Ta Pong sub-scheme. - The commune coordinates and consults with families affected by land issues, aiming to explain the project's benefits and gain their understanding.

	- The commune will assist in facilitating and collaborating with the project to address any issues and obstacles that may arise. - The project will provide water for rice farming, household use, and livestock rearing, benefiting approximately 90% of the population. It will also enhance the local aquatic ecosystem, especially increasing fish populations. - There are no cultural heritage sites in the project area that would be affected. - The project will affect land owned by some residents. - The commune also plans to restore the Domnak Ampil Canal, Svay Doun Keo Stream, and Ou Boeng Krapeu in certain areas.
Requests	- Restore secondary irrigation canals, install box culverts to facilitate water flow and drainage. - Repair and reinforce embankments, improve canals and streams, and install water gates. - Compensation should be considered if the irrigation project significantly impacts the land of any farmer.
Photo	

Consultation Level	Commune
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Organization	Rumlech Commune Hall, Bakan District, Pursat Province
Participants	Ms. Chhum Phally
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune has constructed canals, roads, rubber-paved roads, concrete roads, and internal village roads. - Rumlech Commune has a total land area of 6,000 hectares, of which 4,650 hectares are used for agriculture. - Most residents engage in rice farming, vegetable cultivation, and livestock rearing at the household level. The commune also has one poultry farm. - Residents living near canals, streams, and rivers use water for household needs, rice farming, livestock rearing, and fishing. - Rice farming and vegetable cultivation rely heavily on water from the canals. However, water is insufficient during the dry season. - Each household uses tap water and well water, which is filtered through individual household filtration systems. - Most farmers cultivate rice three times a year. The common rice varieties grown are OM and light rice varieties.

	- Most residents grow vegetables on household plots and land surrounding their homes, often planting mixed crops. - Family-based livestock farming includes raising chickens, ducks, pigs, cows, and buffaloes. - The canal restoration benefits two villages include Rumlech and Kampong Kdei. - The commune has informed the population about the benefits and potential impacts of the project. - The commune will cooperate with the project team to resolve issues with affected residents if assistance from the commune is required. - The project will provide water for rice farming, household use, and support diverse crop cultivation, livestock rearing, and fishing. This will increase agricultural productivity, creating more job opportunities and boosting household incomes. Additionally, the aquatic ecosystem will thrive, with an increase in fish populations. - The project does not impact cultural heritage sites but may affect land owned by residents. - The commune plans to restore Rumlech Canal and 107 secondary canals, including: 4 branch canals, 3 drainage canals, 3 water gates, 100 small irrigation canals, and 52 main canals.
Requests	- Please restore and repair shallow canals within the commune to improve water management and accessibility. - Accelerate the construction process to ensure timely completion and minimize disruption to local livelihoods. - Before commencing the irrigation system restoration, the Ministry is requested to organize public forums in collaboration with the commune to gather feedback from the local population, especially from residents who may be affected by the project.

Photo	

Consultation Level	Commune
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Organization	Boeng Khnar Commune Hall, Bakan District, Pursat Province
Participants	Ms. Tang Rebanglay
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune has developed concrete roads and dirt roads in each village, improving connectivity and access. - The commune has constructed drainage channels to manage water flow from canals. Additionally, key infrastructure has been built, including a temple, commune office, hospital, schools, and two community centers. - Most of the population engages in rice farming, vegetable cultivation, and family-based livestock farming, including chickens, ducks, pigs, and cattle. However, large-scale farms are not yet established. - Residents living near rivers use water for household consumption, farming, livestock, and fishing. Farming and vegetable growing depend on rainfall and river water, but during the dry season, water availability is insufficient. - For drinking, the population uses tap water and collects river water for irrigation. Each household has a water storage tank for individual use. - Farmers typically cultivate rice three times a year. The favoured rice varieties are OM and lowland rice. In the first two seasons, the

	average yield is 4-5 tons per hectare, while the third season yields about 1 ton per hectare. - The villages benefiting from the canal restoration project include Srakar, Chamkar Leu, Voat Chreae, and Trach Kraol. - The commune will actively raise awareness among residents about the benefits and impacts of the project. It will collaborate with the project to resolve any issues faced by affected individuals, especially if assistance is needed from the commune. - The commune has a limited capacity to contribute to the project but is committed to providing support where possible. - The project will provide water for agricultural activities, household use, livestock farming, and fishing, contributing to improved public health. It will help diversify crops, improve livelihoods, and increase agricultural employment. With sufficient water access, farmers will spend less and earn more, boosting income. Additionally, aquatic animals, particularly fish, will thrive in the restored water systems. - The project will not affect cultural heritage sites but will have an impact on land owned by local citizens. - The commune currently lacks the technical knowledge and sufficient budget to implement a large-scale restoration project. If restoration occurs, it will be on a smaller scale. - If the project proves feasible, the commune plans to learn from it and, with increased funding, will include such projects in future investment plans for subsequent locations.
Requests	- Please restore and repair Ou in the commune to improve water management and accessibility. - The project should organize training sessions for the commune to help them understand the project's processes, including the size of the infrastructure systems and the standards for excavation and construction. This will ensure that the commune is well-informed about the project. - Before the restoration begins, the Ministry should organize public consultations and work with the commune to gather feedback from the local population, especially those directly affected by the project. This will ensure transparency and community involvement. - In cases where the project disrupts residents living along the waterway, the project should offer compensation to those affected. This will address the impact on their livelihoods and property.
Photo	

Consultation Level	Commune

Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Organization	Ou Ta Paong Commune Hall, Bakan District, Pursat Province
Participants	1. Ms. Meng Chhorn 2. Ms. Hul Sereyvathana
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune of Ota Pong consists of 18 villages, with 14 villages being served by the irrigation system. - Villages along National Road 5 primarily engage in business activities, while those located along the secondary roads depend largely on agriculture. These farming households typically cultivate rice once or twice a year, depending on soil conditions and proximity to water sources. - Some farmers plant vegetables after harvesting their rice, while others maintain vegetable gardens around their homes. Common vegetables grown include squash, beans, and cucumbers. - Livestock farming is common across the commune, with most households raising animals such as cattle, pigs, ducks, and chickens. One family, located near the river mouth, raises over 500 ducks for eggs. - Many young people, seeking work, migrate to other provinces or to Thailand for employment opportunities. - Water for rice cultivation comes from the Ota Pong canal and the feeder canals connected to it. - Water for irrigating vegetables and for livestock is sourced from local ponds and the water reservoirs around the homes of farming households. - For households along the main road, drinking water is supplied via a tap water system. However, people living along secondary roads in rural villages rely on water from channels filtered through household water containers. - While crop damage from pests is minimal, water scarcity remains a significant issue for farmers, especially during the dry season. - Watermelons are typically grown on rice fields near water sources after the rice has been harvested. - Due to the low market prices for cattle, many farmers in the area have reduced cattle farming. However, they continue to raise smaller numbers of pigs, chickens, and ducks for household consumption. - It is important to educate and raise awareness about the potential impacts of the project and prevent people from encroaching on irrigation land.

	- There should be public campaigns to prevent pollution in the water systems, including both the Ota Pong canal and the smaller feeder canals. - The project will ensure a sufficient water supply for both rice farming and vegetable cultivation. If farming production increases, it may reduce migration, improve fish stock levels, and boost local fishing activities. - With the project, fish populations will grow, and local farmers will have the opportunity to engage in fishing, providing additional income for their families. - Families will have sufficient food through access to fish, vegetables, and meat, which they can either cultivate or raise themselves. - The project will affect the land ownership of the local community. - This project aligns with the village's development plans. The village regularly submits proposals for investment projects, but due to limited funding and more urgent infrastructure needs, funding has been redirected to road development. - Currently, the village only has a plan for maintaining and protecting the irrigation system.
Requests	- Requesting the ministry's assistance to restore the Ou Ta Pong and side drainage channels to ensure water availability for farmers during the dry season. - Requesting support to restore three Boeng include, Boeng Konseng, Boeng Peak Dong, and Boeng Chouk to serve as water reservoirs for the local population in the surrounding areas. - Requesting the construction of water gates and dams along the irrigation channels and side drains, ensuring precise water level measurements to prevent both flooding and water shortages. - Compensation for Affected Landowners: If any farmland is severely impacted, requesting the ministry to study the possibility of compensation for the affected farmers.

Photo	

ANNEX 8.3: RESULTS OF THE CONSULTATIONS WITH VILLAGE CHEFS IN PURSAT PROVINCE

Consultation Level	Village Chef
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Svay Doun Keo Village, Svay Doun Keo Commune, Bakan District, Pursat Province
Participants	Mr. Chhut Vandy
Moderator	Miss Tuon Somphorsdavin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent diseases in the village are caused by chemicals in food, consumption of canned beverages, and the use of chemical pesticides. - 30 households receive water from the irrigation system. - The main issue is water scarcity during the dry season and the distance from large water sources. - The commune chief manages the irrigation system in the village. - The water quality in the irrigation system is poor due to chemicals and pesticides flowing in, and livestock farming is commonly done in water ponds. - This project will not impact the farmland of the farmers. - The project will help farmers have water for three growing seasons, which can be used for livestock farming, helping to increase additional income.
Requests	- Request to construct a pond with adequate water storage. - Request to help build proper roads in the village.
Photo	

Consultation Level	Village Chef
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Kampang Village, Svay Doun Keo Commune, Bakan District, Pursat Province
Participants	Mr. Vann Sorng
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project

Perceptions and concerns	- The factors contributing to frequent diseases in the village are due to the dense forests and the abundance of mosquitoes, which lead to malaria. - 223 households receive water from the irrigation system. - The main issue is water scarcity during the dry season. - The sub-district is the manager of the irrigation system in the village. - The water quality in the irrigation system is poor due to waste clogging the mouths of the ponds. - This project will not impact the farmland of the farmers. - The project will help farmers have water for both the dry and rainy seasons, increasing household income and reducing the number of family members who migrate abroad or to distant provinces for work.
Requests	- Assist in restoring water drainage ponds. - Please expedite the implementation of this irrigation system restoration project.
Photo	

Consultation Level	Village Chef
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Prasat Village, Rumlech Commune, Bakan District, Pursat Province
Participants	Mr. Hach Pat
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent diseases in the village are due to - The factors contributing to frequent diseases in the village are due to poor hygiene practices, consumption of food rich in chemicals, and climate change. - 150 households receive water from the irrigation system. - The main issue is the water being too distant, and there is insufficient water during the dry season. - There is currently no manager for the irrigation system in the village. - The water quality in the irrigation system is good for about 50% of the supply. - This project will not impact the farmland of the farmers. - The project will help provide water for the entire community.
Requests	- Please help restore the ponds to a deeper level. - Kindly provide technical support for growing rice and vegetables to the farmers, as their knowledge is still at a basic level.

Photo	

Consultation Level	Village Chef
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Voat Chreae Village, Boeng Khnar Commune, Bakan District, Pursat Province
Participants	Mr. Kae Vanna
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent diseases in the village are due to the abundance of mosquitoes during the rainy season, chemicals from pesticide use in agriculture, and dietary factors. - 254 households receive water from the irrigation system. - The main issue is the lack of sufficient water for farming during the dry season, as well as conflicts between the upper and lower villagers over water sources. - The village water resource group plays a role in coordinating water usage for the community during times of water scarcity. - The water quality in the irrigation system is good. - This project will not affect the farmers' land, as the land has been planned and cleared for expanding or restoring the irrigation system. - The project will help farmers grow crops year-round, provide additional water for livestock, and reduce migration.
Requests	- Request to restore the main pond and build secondary ponds in the village. - Help construct water gates to control the water flow from the irrigation system's five-phase ponds.
Photo	

Consultation Level	Village Chef
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Srah Run Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	Mr. Yaet Horn
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project

Perceptions and concerns	- The factors contributing to frequent diseases in the village are due to climate change, poor hygiene in food preparation, and the consumption of food containing chemicals. - 186 households receive water from the irrigation system. - The main issue is that the large irrigation system cannot reach the village due to its distance, and the residents only use pond and irrigation water. - The village chief, sub-chief, and community members play a role in coordinating the use of water. - The water quality in the irrigation system is poor. - This project will not impact the farmers' land. - The project will help farmers have an irrigation system that reaches all farmers in the village, allowing them to fully engage in agriculture. Farmers will be able to grow crops in both the rainy and dry seasons, helping to improve household economies.
Requests	- Request that the Ministry of Agriculture help restore the pond, dig additional ponds, and expand irrigation canals.
Photo	

Consultation Level	Village Chef
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Ou Ta Paong Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	Mr. Voa Saren
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent diseases in the village are due to climate change. - 253 households receive water from the irrigation system. - The main issue is water scarcity. - The village chief plays a role in coordinating the irrigation system in the village. - The water quality in the irrigation system is good. - This project will impact the farmland of about 35 households living near the mouths of the irrigation canals. - The affected households feel sad about losing their land. - The project will help farmers create livelihoods, such as engaging in fishing to support family needs, and allow them to grow crops in both

	the dry and rainy seasons, increasing household income and reducing migration to foreign countries or distant provinces for work.
Requests	- Request that the community have sufficient water for use during the rainy season.
Photo	

Consultation Level	Village Chef
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Bat Kokir Chas Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	Mr. Tol Nhib
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent diseases in the village are due to the consumption of food without considering its nutritional value and climate change. - 80% of households in the village receive water from the irrigation system, while 20% work outside the village. - The main issues are the distance to the water source, difficulties in managing water, water scarcity, and conflicts over water use with neighbouring villages along the water stream. - The village chief plays a role in coordinating the irrigation system in the village and ensuring adequate water distribution to the community. - The water quality in the irrigation system is good. - The project will impact some farmers' land, but this is not considered a problem, as farmers understand that expanding the irrigation canals benefits agriculture. The affected land has already been planned and cleared for the canals and roads. - The project will ensure sufficient water for the community to increase rice production and provide clean, accessible roads for easy entry and exit.
Requests	- Request the restoration of the main pond and construction of additional secondary ponds in the irrigation system. - Encourage the restoration and construction process to be completed as quickly as possible.
Photo	

Consultation Level	Village Chef
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Oknha Moan Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	Mr. Doung Savy
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent diseases in the village are due to - The factors contributing to frequent diseases in the village are due to climate change (Flu) and poor hygiene (diarrhea, dysentery). - 251 households receive water from the irrigation system. - The main issues are the lack of irrigation canals, canals being too far from the farmland, and the canals being shallow. - The village authorities and community members are involved in maintaining the irrigation system in the village. - The water in the irrigation system is usable, but the groundwater contains a lot of salt and clay. - The project will affect the farmland of about 7 households, but they are willing because they will have water for vegetable farming. - The project will help the community have sufficient water for irrigation, improve roads within the village, and provide more housing.
Requests	- Request to restore the main irrigation canal and deepen the secondary canals. - It is recommended to construct water gates at the outlet of the irrigation system to control water flow.
Photo	

ANNEX 9.1: RESULT OF CONSULTATION: KAMPONG CHHNANG PROVINCE

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Kampong Chhnang Province Hall
Participants	1. Mr. Pich Keomony 2. Mr. Un Sotha 3. Mr. Kim Vanny
Coordinators	1. Mr. Chun Nimul 2. Ms. Toun Samphorsdavin
Topic	CAISAR
Perception and Concern	- The agricultural sector holds significant development potential in the province, and the project plays a critical role in ensuring water storage during the dry season. - The primary goal of provincial development is to enhance family livelihoods, boost the national economy, and improve the transportation system supporting agriculture. - Risks include insufficient water supplies from existing projects, failure to study abundant river sources, potential water loss, and flooding during the rainy season, which could lead to financial losses. - Negative impacts may involve disruptions to water access and encroachments on private land. - Positive impacts include benefits to farming activities, particularly for both wet and dry rice cultivation and mixed crops. - The project should prioritize vulnerable populations, clearly identify beneficiary families, and conduct thorough studies on water usage. - The provincial administration possesses the legal authority to collaborate with the judiciary. - Budget-related challenges need to be addressed by the working group. - The sub-committee is responsible for addressing project impacts and ensuring effective communication with the public. - Experience required includes expertise in land area assessment, land valuation, construction planning, cost estimation, and crop studies. - Challenges may include space constraints, concerns over water distribution, impacts on private land, and non-compliance by companies with local authorities and communities. - The action plan for resolution emphasizes avoiding private land impacts, preparing adequate materials and signage, determining

	usage boundaries, informing the public beforehand, and setting clear policies and timelines. - Most problems arise from external instigators rather than directly from affected communities.
Request	- Strengthen livelihood skills - The project should be implemented promptly - Prepare to participate in project activities, collaborate, and implement - Work together to face challenges and find solutions
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	DAFF
Participants	1. Mrs. Heng Kimsreang 2. Mr. Chum Maochandara 3. Mr. Mech Phearom
Coordinators	Mr. Keo Sony
Topic	CAISAR
Perceptions and Concerns	- Farmland owned by farmers typically ranges from 3 to 5 hectares. - Average seed usage is 200kg during the dry season and 500kg during the rainy season. - Most farmers in the region purchase seeds in the first year and use self-produced seeds in the second and third years. - Fertilizers are applied 2 to 3 times per growing cycle, using 4 to 6 sacks. - Pesticides are used 1 to 2 times per growing cycle to protect crops. - Farmers generally do not hire labor but instead rely on machinery. - Farmers in the area usually sell their harvested crops directly from the fields.

	Challenges: - The most common issue is the lack of irrigation systems and insufficient water for farming. Solutions: - Restore and build additional irrigation systems. - Perform land preparation 1 to 2 times per season. - Practice farming during rainy seasons. - Purchase seeds in the first year and select seeds in subsequent years. - - Use fertilizers to enhance productivity (e.g., urea, DAP, 20-20-15). - Apply pesticides to safeguard crops against threats. - Address irrigation shortages by establishing reservoirs and canals. - Post-harvest, farmers use machinery for harvesting. - Production costs include land preparation, fertilizer, water pumping, pesticides, and harvesting. Recommended vegetable crops for sub-systems: - Sugarcane, watermelon, beans, cucumbers. - Suitable areas for cultivation span the district, especially during the dry season. - These crops meet market demands. - The department will partner with stakeholders to establish markets for farmers. Challenges in vegetable production: - Low prices and limited markets (often restricted to local sales). Recommended fish species for sub-systems: - Catfish, tilapia, snakehead fish, and carp. - Areas suitable for fish farming include locations near rivers. - There is significant market demand, making fish farming potentially successful. - The department will collaborate with partners and markets to support market access. Challenges in promoting fish farming under CAISAR: - Lack of infrastructure, inadequate locations, limited technical expertise, and restricted market access. - Farmer training initiatives: - Farmers have received training on rice production five times per year. - Key training topics in 2023 focused on climate change and rice production. - On average, farmers cultivate rice twice a year. Training support and collaboration: - - Farmers have been trained on rice production by various service providers, including civil society organizations (VSU, LWD, World Vision, WSP) and pesticide companies. Current agricultural support:

	- Support is being provided through the construction of irrigation systems and water reservoirs. To improve agricultural productivity: - Modernized community projects (e.g., cooperative land use, coordinated production, and marketing). - Training on production planning to prevent crop overlap.
Request	- Construct additional small canals (tributary canals). - Build irrigation systems to ensure a consistent water supply.
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	WORAM
Participants	Mr. Oeur Samreun
Coordinators	1. Mr. Chun Nimul 2. Ms. Toun Samphorsdavin
Topic	CAISAR
Perceptions and Concerns	- The current water sources for agricultural supply are insufficient, with only 60% availability. - The development of water resources in the province faces challenges and obstacles due to limited funding, traditional water usage practices by local communities, and market dependence on private traders. - In the lowland areas, there are farmer communities utilizing water, but these systems are not operational due to a lack of cooperation in paying contributions. - In the lowland regions, soil erosion is prevalent, and rice yields decrease annually due to rising temperatures and water shortages.

	- The importance of irrigation systems is critical to the livelihoods of the population, providing water for agriculture and enabling multi-season rice cultivation.
Request	- A water user community should be organized prior to construction to participate in identifying key locations and ensure there are caretakers in place.
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Department of Labor and Vocational Training
Participants	1. Mrs. Yim Nimul 2. Mr. Rim SamAng 3. Mr. Reun Channa
Coordinators	Ms. Sek Liny
Topic	CAISAR
Perceptions and Concerns	- The employment situation and vocational training in the project area benefit from the presence of numerous factories, which help reduce migration. - Common issues in factories and enterprises include air pollution, factory heat, technical problems (electric shocks), personal disputes within factories, and conflicts between workers and employers (related to wages, working hours, health and poor workplace safety). - The role of the provincial department includes disseminating labor laws to factories and workers, assisting in resolving disputes, conducting regular inspections to prevent concentration of violations, and promoting laws prohibiting the use of child labor under 18 years old.

	- Job training opportunities for farmers are lacking because the department focuses on non-agricultural skills (e.g., auto and motorcycle mechanics). - The department can contribute to providing training and job creation for the CAISAR project in non-agricultural fields (e.g., auto and motorcycle mechanics) and offer training in food processing (e.g., tamarind processing, pickling vegetables). The deputy provincial governor has suggested training in fish farming as well. - Women's migration for work has a minor impact due to the reduced labor force for farming. However, modern farming methods currently require less labor. - The employment framework and agriculture in the province and target areas are mainly centered on factory work and farming. - The industrial sector has greater potential than agriculture due to its geographic proximity to urban areas, the availability of labor, and strong relationships between the department and employers. - The agricultural sector requires further strengthening and significant technical support. - The department can help mitigate negative impacts and improve the agricultural sector by providing more agricultural jobs. - Factory workers with social security schemes (NSSF) have benefited from reduced health burdens, though health issues persist frequently.
Request	- Help promote sufficient irrigation systems and water availability for farmers to cultivate their fields.
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024

Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Department of Women's Affairs
Participants	1. Mrs. Pich Sophea 2. Mrs. Phin Phalla
Coordinators	Ms. Sek Liny
Topic	CAISAR
Perceptions and Concerns	- There is not complete agreement with the idea, as most women work in factories in the area but still assist with family farming tasks during their days off. Men and women contribute equally to agriculture, with men participating during the initial stages, and women helping with tasks like fertilizer application. - Violence incidents occur at a rate of 1-2 cases per month, and sexual assaults happen every 1-2 months, often linked to media influence, mobile phone use, alcohol, or drug abuse. - Reports of violence have increased as women have become more courageous, confident, and financially independent. - Psychological violence is more prevalent than physical violence. - Some victims remain hesitant and embarrassed, unable to speak out immediately. Counselors recommend employing specific techniques for probing and providing victims with a supportive and compassionate environment. - The role of the Women's Affairs Department includes providing advice for decision-making, assisting with filing complaints to the court, offering temporary shelter and some material and food support to victims during the resolution or litigation process, educating and promoting information on gender equality, attending court sessions when requested by victims, and coordinating with volunteer lawyers for legal representation (for the victims). - The department assists in resolving, mediating, and referring cases to relevant institutions. - The department provides minimal financial assistance, temporary shelter, and works to find centers for child victims of violence and sexual assault. - Immediate reports are made to the deputy provincial governor responsible, with daily updates provided. - The department resolves and closes cases by filing them in court, at the provincial office, or preparing documentation for referral to centers and the judiciary. - Government mechanisms include the Ratanak VI Women's Plan, the Legal Protection Office, and collaboration with the police, the Department of Social Affairs, the Department of Health, and the judiciary. - To improve the prevention and response to gender-based violence, efforts focus on promoting and educating about gender equality, punishing offenders, imposing penalties, and reducing drug trafficking.

	- The increase in personnel under the CAISAR project is not a concern, as there have been no prior issues with site workers, and local communities and companies are attentive to preventing problems. - Risks in the area include violence and sexual assault. - Construction companies should prioritize hiring local workers to provide employment opportunities, reduce concerns about newcomers, and create opportunities for the Women's Affairs Department to contribute additional recommendations on gender and women's issues, as well as increasing job opportunities for women capable of working in construction.
Request	- The provincial level provides minimal opportunities for women in construction work. - Some men working at the provincial level still undervalue women's contributions in the workplace.
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Department of Environment
Participants	1. Mr. Leng Sameth 2. Mrs. Meas Sovanna 3. Mr. Khoun Chantheng
Coordinators	Mr. Keo Sony
Topic	CAISAR
Perceptions and Concerns	- The general situation regarding environmental management involves project owners collaborating with the department and being encouraged to comply with legal requirements.

	- The role of the department includes conducting inspections of project activities twice a year. - Major challenges include project owners failing to comply with laws, such as discharging liquid waste, a lack of cooperation from project owners, and shortages of funds and materials for enforcement. - The work of the Environmental Department related to the CAISAR project's environmental management program includes resolving land impact issues with local communities, watering dirt roads to reduce dust, monitoring the transport of soil, ensuring legal compliance, and managing fuel and oil waste to prevent contamination of water sources. - Negative impacts: Changes in biodiversity, loss of habitats, and feeding grounds. - Positive impacts: Access to water is ensured throughout all seasons. - Solutions: Restore degraded reservoirs or canals and preserve areas that serve as feeding grounds for wildlife.
Request	- Minimize environmental impacts from project activities. - Address impacts through peaceful methods. - Collaborate with the Environmental Department.
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Department of Land Management Urban Planning & Construction

Participants	Mr. Chhun Sokongpheak
Coordinators	1. Mr. Chun Nimul 2. Ms. Toun Samphordavin
Topic	CAISAR
Perceptions and Concerns	- Areas with registered land systems are already listed. - For land disputes involving registered land, resolution must follow legal procedures through the courts and applicable laws, ensuring fair and just compensation. - For land disputes involving unregistered land, resolutions are to be pursued through collaboration under provincial administration, supported by reports from residents highlighting common reasons for disagreement, such as the complete demolition of homes, refusal to accept compensation, or increased land values. - Technical work involves measuring and delineating land plots, waterways, and property boundaries of residents. - There are no concerns regarding land that has already been systematically registered.
Request	- Pre-study is beneficial for solving land issues. - Supporting the restoration of old irrigation systems is good for agricultural work.
Photo	

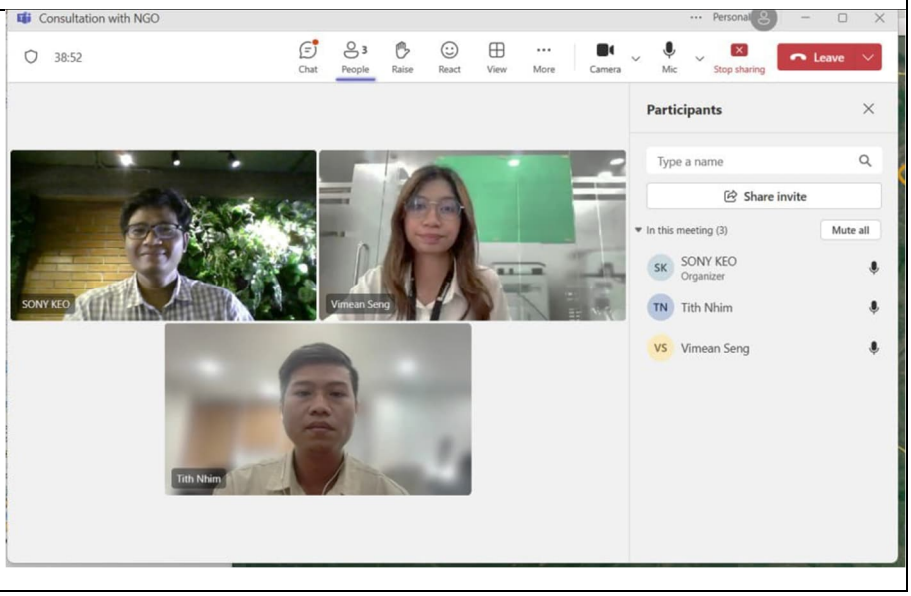
Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Department of Culture & Fine Arts
Participants	Mrs. Oun Yada

Coordinators	1. Mr. Chun Nimul 2. Ms. Toun Samphordavin
Topic	CAISAR
Perceptions and Concerns	- The province has 110 registered locations of ancient sites, including temples, monuments, historical sites, ponds, and ancient reservoirs. - The land system includes one temple mound in Pongro Village, Rolabear District. - The project area does not affect any temples or temple mounds. - The department's role is to protect and maintain these sites, provide information, and report to the Ministry. - There are no indigenous ethnic minorities, distinct cultures, religions, or special areas in the project area, as most of the land consists of old irrigation systems. - There are no temple mounds located within the project area. If any impact occurs, it will be reported to the Ministry of Culture and Fine Arts, which is the decision-making authority.
Request	- Request for set up irrigation system quickly
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Community Hope Organization
Participants	1. Mr. Rech Panha 2. Mrs. Munh LangHeang
Coordinators	Mr. Nheb Phirun

Topic	CAISAR
Perceptions and Concerns	- The key roles and activities of the organization in the province include mental health, education through the construction of schools, development, installation of solar panels along the roads, sanitation facilities, installation of water wells in villages, teaching sewing and coffee-making (open to anyone interested, without discrimination), covering all 8 districts of the province. - Awareness and perceptions about the project indicate difficulties in reaching the community, especially along water routes. There are high costs for the community to participate in training without fees (such as coffee-making and sewing), and those living near the schools are either unwilling to learn or do not value the training. The community has provided scholarships to 21 students from grades 6 to 12, with amounts ranging from $25 to $35, and one student is receiving $100 per month for studies at a university. - Concerns and potential challenges include the risk of animals or people falling into water and drowning after flooding, loss of farmland, and the destruction of residents' homes. - The impact on aquatic biodiversity may result in the loss or extinction of species, and residents may lose land for farming. If there is an impact, compensation should be addressed properly, including for lost trees. If farmland is lost, people may migrate, making them vulnerable to exploitation, and their children may have to abandon their education.
Request	- Provide appropriate compensation, protect biodiversity and the environment well
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat

Organization	Rural Water Supply and Sanitation Organization
Participants	1. Mr. Vann Sambath 2. Ms. Seng Vimean 3. Mr. Nhem Tith
Coordinators	Mr. Keo Sony
Topic	CAISAR
- Perceptions and Concerns	- The key roles and activities of the organization in the province include providing clean water and sanitation systems to rural populations and implementing projects that help communities adapt to climate change. - The project will help the population increase agricultural production several times a year. - The relationship between the CAISAR project and the organization ensures that the population receives sufficient water and is resilient to climate change. - Concerns and potential challenges include impacts on infrastructure. - The benefits of increasing agricultural production help reduce migration.
Request	- The project should cooperate with local authorities and partner organizations - Educate people's attitudes about using water sparingly - Establish a water management committee for this irrigation system.
Photo	

Focus Group Discussion	Provincial Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	World Vision Cambodia

Participants	Mrs. Lay Lineang
Coordinators	Ms. Sek Liny
Topic	CAISAR
Perceptions and Concerns	- The key roles and activities of the organization in the province include education (primary school), health, nutrition, clean water, sanitation, food security, child protection (youth), Sponsor Child, social accounting (in collaboration with partners), and family welfare activities. These efforts include promoting gender awareness in the project and engaging with people with disabilities. The organization has also worked on irrigation systems and roads, and generally, there have been no issues, as everything has been properly planned and cleared. - The implementation of previous projects has not encountered any problems, as all activities adhered to established guidelines. - The organization and authorities consistently participate in child protection and legal age regulations. - Families without land face fewer issues if their needs are not land-related. - The project has helped improve biodiversity, with more livestock farming, increased water availability, more trees planted, reduced costs, water storage facilities, and an increased number of crop planting cycles.
Request	- All sectors must be involved technically - Can not help reduce migration completely until there is a market

Focus Group Discussion	District Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Rolea Bier District Hall, Kampong Chhnang province
Participants	1. Mr. Mey Sophally 2. Ms. Chan Sokly
Coordinators	Mr. Keo Sony
Topic	CAISAR
Perceptions and Concerns	- The sector with potential and a priority for rural development is the agricultural sector. - Awareness and perceptions about the project indicate that the local administration of Rolabear District has previously participated in meetings about the watershed system project at the district and provincial levels. - The benefits of the project include the creation of habitats and corridors for biodiversity, and ensuring the population has sufficient water for agricultural production. - The role of the district administration is to collaborate with specialized institutions to identify potential issues and address them.

	- The main challenges include populations dependent on agricultural resources along waterways or water systems located within the project area. - The district's capacity and human resources include a committee for resolving land disputes outside the judicial system. - The general challenge for farmers is the lack of irrigation water during the dry season and the absence of water infrastructure and reservoirs. - Solutions from the district administration involve restoring irrigation systems and pumping water from sources (watershed areas), constructing systems funded by the district's budget, and involving community participation. - Seedlings: In the first year, people buy seeds from the market, and in the following years, they use their own seeds (seeds can only be saved for 2-3 years). - Fertilizer: Farming requires the use of chemical fertilizers (such as urea and phosphate fertilizers) and compost. - Pesticides: The use of herbicides, insecticides, and fungicides. - Water systems: There is a lack of water for irrigation in agricultural areas due to the absence of infrastructure and water storage reservoirs. - Post-harvest: Farmers harvest using machinery. - Production costs: Preparing the land, buying seeds, fertilizer, pesticides, and harvesting. - The situation regarding domestic violence: Domestic violence incidents occur within families. - Victims of violence have filed complaints with village and commune authorities. - The government operates a committee related to violence at the commune and district levels. - To prevent and respond to gender-based violence, awareness campaigns and educational programs on gender are organized at the commune and village levels. - There is concern about the potential for sexual violence against women and children in the area due to the increase in staff for the CAISAR project. - To reduce the risks of gender-based violence potentially caused by the project, project owners must educate and train staff about gender knowledge and rights. - Risks in the area include land disputes and drug use. - Construction companies should prioritize hiring local workers from the area.
Request	- Please ensure the project operates as quickly as possible. - The company collaborates with local authorities. - The project provides significant benefits to the local population in the agricultural sector. - The company is requested to hire local staff and workers for the project.

Photo	

Focus Group Discussion	District Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Teuk Phos District Hall, Kampong Chhnang Province
Participants	1. Mr. Mot Novavi 2. Mrs. Chim Chot 3. Mrs. Ung Sophy 4. Mr. Bit Sary
Coordinators	Ms Sek Liny
Topic	CAISAR
Perceptions and Concerns	- The sectors with potential and priority for local development are agriculture and tourism. - The district is aware of the project to restore and expand the existing irrigation system, which will help provide water for agricultural land. - The benefits of the project include enhancing biodiversity due to more water availability, creating a tourism area, allowing farmers to cultivate year-round (2 to 4 times per year), reducing migration, reducing poverty, and offering labor for sale. - The role of the district level is to assist in coordinating the project activities, help resolve issues with affected stakeholders, request solutions from higher levels for the population, ensure affected people receive compensation, and monitor air pollution (informing the company to manage water spray). - There are no more land issues, as the land has already been registered.

	- The district's human resource capacity is sufficient to address issues according to land law. - The main challenges for farmers in this irrigation system are water shortages during the dry season, market access, pests, and conflicts due to water scarcity. - The causes of these challenges are a lack of water sources and climate change, leading to longer dry seasons. Farmers are losing some irrigation water due to management constraints, and markets are not functioning well because of excessive heat. - Solutions include creating water sources, providing water usage techniques, promoting water conservation, and establishing water resources while helping with coordination. - Seeds: Farmers save 80% of seeds and buy 20%. - Fertilizers: Farmers use chemical fertilizers, organic fertilizers, and natural fertilizers. The use is not ideal yet, and they want regulations or training on fertilizer use according to soil types. - Pesticides: The use of herbicides is considered effective since they kill the grass quickly, and there are only a few pest problems. - Irrigation system: During the dry season, water availability is insufficient. - Post-harvest: 95% of harvesting is done by machine, and 5% is done manually. - The situation of domestic violence in families is about 2%, mainly due to alcohol and gambling, but it has decreased significantly, and drug abuse is about 1%. - The victims of violence are not well-known because issues are being resolved at the commune level. The district has not yet participated, as most land-related issues are being resolved at the commune level. - Government actions include laws related to solving violence issues, promoting gender awareness, and ensuring safety in villages and communes. - To prevent and respond to gender-based violence, efforts are being made to involve more men in training programs, as most problems are caused by men. Continued gender awareness campaigns, reducing drug and alcohol abuse, and addressing social media-related issues are also part of the approach. - The increase in personnel in the CAISAR project has not raised concerns about gender-based violence risks, as there have been no incidents involving construction workers in the past. - To reduce the risks of gender-based violence that may arise from the project, relevant parties will conduct site inspections, separate accommodation for men and women, and continue public awareness and gender campaigns. - The risks in this area include violence and drug use. - The company must verify the names, identification numbers, and contact details of workers, inform workers about laws and penalties for wrongdoers, promote gender equality, and ensure that the company has someone responsible for reporting issues to local authorities.

Request	- When construction is taking place, the company or relevant parties must notify the local authorities. - Upon completion of the construction project, notification must be given, and there must be a formal handover, avoiding any secrecy. - Clear work distribution and assignment of responsibilities must be made. - Compensation should be provided to the local population, and the company must cooperate with local authorities. - Provide water storage facilities and ensure an adequate water supply for agricultural purposes.
Photo	

Focus Group Discussion	District Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Samaki Meanchey District Hall, Kampong Chhnang Province
Participants	1. Mrs. Se Kem 2. Mrs. Hem Saveth
Coordinators	Mr. Nheb Phirun
Topic	CAISAR
Perceptions and Concerns	- The sectors with potential and priority for rural development are agriculture, the garment industry, seasonal farming, and paddy cultivation. - Awareness and perception of the project include community participation, especially during the dry season, encouraging local communities to grow vegetables in rotation. During the rainy season, there is no issue with water, but during the dry season, sufficient water is available to grow crops throughout the year. The village and commune areas have access to irrigation systems.

	- The impacts and benefits of the project should be studied and minimized, especially when expanding the planting area, dealing with the death of livestock due to irrigation, or contamination of fish and aquatic animals. The community benefits from improved livelihoods due to employment opportunities, which helps vulnerable and indigenous populations without any significant issues. - The role of local authorities is to cooperate with citizens regularly and ensure the protection of the community once the project is operational. - Key challenges in land acquisition for the project include finding ways to balance the benefits to the community, ensuring they can continue to benefit from irrigation activities in the future. - The capacity and human resources at the local level need to be used extensively and persistently, with the district governor playing a key role by being regularly involved in overseeing the project. - The main challenges for farmers in the irrigation system include a lack of rainfall, limited water in some irrigation systems, or excessive water that may flood crops and cause conflicts. - Solutions include better water conservation practices, effective water distribution, and ensuring water is not wasted. - Seed varieties: Farmers purchase seed varieties and also store some of their own seeds as a habit, particularly those for flooding-prone rice strains. - Pest control: Farmers use pesticides as recommended for pest management. - Irrigation systems: The irrigation systems can be used based on their availability and how they were studied in the harvested areas. - Production costs: The cost of buying seed varieties. - The situation regarding domestic violence is still a concern, with an occurrence rate of about 3% in the last three years, involving domestic disputes, violence, and economic instability, which leaves victims fearful for their future. - Government interventions include annual action plans to raise awareness among the public, particularly during crises, imposing penalties when necessary, and supporting coordination with organizations to address violence and provide appropriate solutions. - To prevent and address gender-based violence more effectively, efforts should be made to encourage male participation in awareness programs, with perpetrators of violence directly involved in public campaigns. These should be organized at least once a year in 9 communes. - If there is an increase in the number of project personnel, the project should not proceed if there are concerns about gender-based violence. - To reduce the risks of gender-based violence arising from the project, efforts should focus on ensuring proper communication and understanding about the project and fostering family unity. - The risks in this area must be addressed promptly to prevent violence from recurring.

	- Local leadership in villages and communes must meet to address challenges and resolve issues impacting those directly affected or opposed to the project.
Request	- Help provide crop seeds to families in the community.
Photo	

Focus Group Discussion	District Level
Date	August, 22 2024
Sub-scheme	1. Lum Hach 2. Yutasas 3. Stueng Krang Bat
Organization	Kampong Tralach District Hall, Kampong Chhnang Province
Participants	1. Mr. Ker Mat 2. Mrs. Nuon Hong 3. Mr. Kao Viriya 4. Mrs. Nem Chanthea
Coordinators	Mr. Nheb Phirun
Topic	CAISAR
Perceptions and Concerns	- The sectors with potential and priority for rural development are agriculture (72.2%), handicrafts (0.6%), and factories (27.2%). - The project could enable our population to produce rice two to three times a year. If we can connect the irrigation systems from the deep reservoirs, we may have the potential to grow more vegetables. If there is enough water, we can plant rice three times a year, and some farmers may even use the land for industrial crops like chili cultivation. When private individuals restore the area, they must consider the environmental impacts as they rebuild reservoirs and irrigation systems. - Potential impacts may include the loss of fish habitats and environmental degradation, such as soil erosion.

	- The benefits of the project include reducing rural migration by allowing farmers to cultivate rice two to three times per year. - Land loss due to the project can be minimized by reducing negative impacts through proper boundary demarcation. - The role of local authorities is to facilitate multiple meetings (ideally two or three) to ensure smooth implementation and, if necessary, resolve any conflicts by achieving consensus with at least 70% participation from local stakeholders. - If consensus is not reached, additional meetings should be organized to find common ground. If there are only a few opponents, the project should still proceed. - The local authorities have strong capacity and resources, with district or deputy district governors directly addressing issues. - Challenges include farmers who rely on agriculture but face water shortages for rice cultivation and chili farming. - Solutions include restoring irrigation systems and building reservoirs. - Seeds: Rice seeds are purchased with 90% used for the dry season and 40% for the rainy season. - Fertilizer: The use of organic fertilizers is encouraged, with training on how to use them in local villages, as well as the use of chemical fertilizers such as DAP and Urea. - Irrigation system: The current irrigation system is insufficient, as the amount of agricultural land exceeds the available water resources. - Harvesting: A rice harvester machine is used for harvesting. - The situation regarding violence is unclear, but regular meetings are held in the communes, ensuring safety for all participants. - Authorities help facilitate and educate citizens on their rights, encouraging participation through legal and procedural methods. - Government actions include disseminating 13 key points through regular community-based meetings, spreading information directly to local populations through commune councils. - To prevent and respond to gender-based violence, efforts should be made to raise awareness in communes by holding multiple sessions and directly addressing areas where violence is occurring. - Public meetings should be organized three times to ensure appropriate compensation and government authorities should remain engaged with the local stakeholders. - To reduce the risks of gender-based violence arising from the project, authorities should maintain consistent communication with local groups to address concerns. - Communication efforts should include three awareness campaigns, ensuring that the involved individuals participate directly in the process.
Request	- Should not catch the machine when he digs a pond to dry rice - If affected, should move to another place that is not affected or compensate appropriately.

Photo	

ANNEX 9.2: RESULTS OF THE CONSULTATIONS WITH COMMUNE COUNCILS IN KAMPONG CHHNANG PROVINCE

Consultation Level	Commune
Date	August 16th, 2024
Sub-Scheme	1. Lum Hach 2. Stoeung Krang Bat 3. Yutasas
Organization	Krang Leav Commune Hall, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Mr. Pho Sok 2. Ms. Kae Hoeurn 3. Ms. Men Chenda
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune has developed key achievements such as roads, bridges, and reservoirs. However, agricultural development has not progressed well due to a lack of water. - Growing rice, cultivating vegetables, and raising livestock are very challenging for farmers in the commune because of water scarcity. They are willing to cultivate, but without water, their agricultural activities rely solely on rainfall. - The commune's role is to help coordinate and manage project activities. - The residents are pleased with the project because, in the future, the entire commune will have sufficient water for cultivation and livestock, enabling them to expand production and improve their livelihoods, which will reduce migration to other areas. - The project also contributes to environmental protection and will create biodiversity, potentially turning the area into a recreational site for residents. - Negative impacts include the displacement of residents affected by land loss, as they previously grew more rice, but now their production has decreased. - This project aligns with the commune's development plan, as the commune had planned to restore the canals but lacked sufficient funding.
Requests	- They want the project to help restore the canals and additional reservoirs.

	- They request to expedite the project implementation to quickly provide water for the residents, enabling them to increase agricultural productivity. - They wish for the ministry to frequently visit, study, and monitor the project closely.
Photo	

Consultation Level	Commune
Date	August 15th, 2024
Sub-Scheme	1. Lum Hach 2. Stoeung Krang Bat 3. Yutasas
Organization	Banteay Preal Commune Hall, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Mr. Prum Thorn 2. Mr. Khoem Chham 3. Mr. Suos Saret
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune has a total agricultural land area of 5,313 hectares, including more than 2,587 hectares of rice fields. Other areas consist of mixed-crop land and forest land that has not yet been allocated to the residents. - Most of the farmers are over 50 years old, while younger, able-bodied individuals have migrated to work in Thailand. - Livelihoods in the commune include agriculture, collecting forest products, handicrafts (such as making baskets and mats), trading, and labour work. - Key agricultural activities include rice farming, home gardening of vegetables, and raising chickens, ducks, cattle, buffaloes, and pigs at

	the household level. There is also one farmer in the commune who raises ducks for egg production on a farm. - Rice farming depends entirely on seasonal rainfall (from June to December). Water flows into the Lum Hach irrigation system and eventually drains into local canals in the village only when it rains. - Vegetable farmers use well water for irrigation. Some farmers living near reservoirs can irrigate their crops using reservoir water, but during the dry season, severe drought can lead to water shortages in the reservoirs. - For drinking water, most farmers rely on well water. Some households have filtration tanks, while others use the water directly. However, the water quality is poor due to arsenic contamination. - A portion of the population living in urbanized areas uses clean water from 20-litter containers, but even this water has limited quality. - Most farmers can only grow rice once a year due to water shortages during the dry season. - Vegetable cultivation is done at the household level on land surrounding their homes, and the produce is sold only within the village. No companies have yet established large-scale purchase contracts. - Livestock farming is still limited and small-scale. - Of the 10 villages, 4 receive water from the irrigation system: Trapeang Phkoam, Toap Srov, and Ou Leach. - The commune will collaborate with the project to assess its impacts and mediate with residents whose land is affected by the project. - The benefits of the project include enabling farmers to cultivate rice 2 to 3 times a year, having sufficient water for vegetable farming, and increasing biodiversity with fish and other aquatic animals. Additionally, it will boost household income through integrated farming. - There are no heritage sites within the commune. - The project may impact agricultural land and pose a risk of drowning for children. - The project aligns with the commune's three-year rolling development plan. Although the commune has submitted a proposal, there has been no response regarding the restoration of the irrigation system. The three-year rolling plan also includes a request to construct check dams (water gates) in Ruessei Duoch, Trapeang Phkoamg, and Toap Srov villages.
Requests	- Before implementing the restoration of the irrigation system, the ministry should organize a public forum to gather feedback from residents, especially those directly affected by the project. - The restoration and reconstruction of the Ou Koal should be prioritized. - The irrigation system should be constructed using durable structures (concrete) to prevent soil erosion, canal narrowing, and unauthorized access by the community in the future.

	- Build check dams along damaged or deteriorated canals and streams, as well as new ones in locations where they are currently lacking. Check dams regulate water levels, allowing excess water to overflow into canals or streams situated at lower elevations.
Photo	

Consultation Level	Commune
Date	August 15th, 2024
Sub-Scheme	1. Lum Hach 2. Stoeung Krang Bat 3. Yutasas
Organization	Krang Skear Commune Hall, Teuk Phos District, Kampong Chhnang Province
Participants	1. Ms. Keo Yan 2. Ms. Phan Sophalla 3. Mr. Bearn Porn
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune has constructed gravel roads connecting each village, and some village roads have been paved with concrete. - Most of the able-bodied youth have migrated to work in Thailand, in factories across various provinces, or as labourers on plantations. - Krang Skear Commune is a remote rural area, with 99% of the population engaged in agriculture, primarily rice farming and small-scale vegetable gardening at the household level.

	- There is a growing trend of cultivating fruit trees (such as mangoes, coconuts, and longans) as plantations. - Livestock farming is conducted on a household scale, including cattle, buffaloes, pigs, chickens, and ducks. - Irrigation water comes from reservoirs and rainwater that flows into dug canals (such as Prek 1 Makara, a canal from the Pol Pot era) and streams. However, during the dry season, water is insufficient for rice farming. - In some areas, wells must be dug to support rice farming and vegetable gardening around homes, with depths ranging from 10 to 50 meters. - For domestic use, residents rely on filtered water from shallow wells and tube wells. - Many farmers in Krang Skear Commune cultivate rice once a year, specifically during the wet season, which spans up to six months. - Vegetable cultivation, primarily leafy greens, remains a household-level activity, typically grown on land surrounding homes. - Livestock rearing is still predominantly practiced at the family level, including cattle, buffaloes, pigs, chickens, and ducks. - In addition, the commune has small-scale livestock farms for pigs, chickens, and ducks, which have their own established markets. - Five villages stand to benefit from the canal restoration project: Chan Trak, Trapeang Mlu, Tuol Samraong, Krang Skear, Chambak Prasat. - The project aims to provide: Adequate water for rice cultivation and other crops. Sufficient water for household use. Water resources for livestock farming, particularly for cattle, buffaloes, and pigs. Enhanced aquatic biodiversity, especially fish, in the area. - The project will impact land owned by residents, especially agricultural land. - There are no cultural heritage sites within the commune that will be affected. - The commune has proposed plans to restore the Prek Chi and the small canal tributary in specific locations to enhance water distribution. - The commune is ready to assist and collaborate in implementing the irrigation system restoration project. This includes: - Facilitating communication between project stakeholders and affected farmers. - Coordinating with residents to address concerns and ensure smooth project implementation.
Requests	- Before construction, it is necessary to collect data on the land of farmers affected by the project, consult with the residents for their opinions, disseminate information, and notify the community. Coordination with farmers is essential during the project implementation process.

	- We request the Ministry to urgently assist in raising the dam and restoring the Prek Chi and small canal tributary as soon as possible, to enable farmers to increase rice production for a full year. - Compensation should be considered if the implementation of the irrigation project severely impacts the land of any farmer.
Photo	

Consultation Level	Commune
Date	August 14th, 2024
Sub-Scheme	1. Lum Hach 2. Stoeung Krang Bat 3. Yutasas
Organization	Longveak Commune Hall, Kompong Tralach District, Kampong Chhnang Province
Participants	1. Mr. Ou Chanmony 2. Mr. Thim Thouern 3. Mr. Srey Saret 4. Mr. Choem Bunthoeurn 5. Mr. Uch Virak 6. Mr. Tok Bunna 7. Miss Sot Tonsreypov 8. Mr. Chhoem Chhoan
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project

Perceptions and concerns	- Some of the agricultural land owned by the villagers has been sold to companies. - Most of the working-age population works as factory workers or migrates to Phnom Penh for employment. - The commune has paved roads, and some villages are currently constructing concrete roads as part of the commune's development budget, with additional dirt roads providing access to farmers' fields. - Within the commune, there are textile factories, shoe factories, and beer factories, among others, which discharge wastewater into the streams and canals. - Regarding agricultural potential, all eight villages have 90% of the population engaged in dry-season rice cultivation, which is done only once per year, starting in November when the water recedes, with harvesting in April. - As for vegetable cultivation and livestock raising, these activities are mostly on a household scale, but only a small number of households grow vegetables. They rely on water from wells, ponds, or canals. There are no commercial farms in the commune. - Dry-season rice farming depends on the remaining water in the canals after the river water recedes. - In some villages near the canals that receive wastewater from factories, farmers pump water from the canals for a second cycle of dry-season rice cultivation. - For household use, they rely on clean water from authority. - During the water recession season, farmers begin dry-season rice cultivation. Some farmers grow heavy rice varieties (cultivated only once a year), while others grow light rice varieties to harvest twice a year. - Livestock raised at the household level includes cattle, chickens, ducks, and pigs. - The commune will participate in studying, promoting, and facilitating project activities. - The benefits of the project include helping residents increase their income through double cropping per year, growing vegetables for additional income, fishing to sell fish, increasing fish populations, and ensuring sufficient water for agriculture. - There are no cultural heritage sites in the area. - The project may impact small remaining forested areas along the canal banks and result in the loss of some agricultural land. - The commune’s development plan highlights the restoration of canals and ponds to support the agricultural sector. In 2024, the commune requested district authorities to restore a pond (Boeng Tuek La’k), but the restoration project was not completed as the company awarded the contract withdrew from the agreement.

Requests	- If the canal restoration is carried out, we request the Ministry to create water gates along the remaining canals to store water for use. - For the Pol Pot-era irrigation system, we ask to maintain its original size and deepen it more than before. - We request that the canal banks be raised to create a two-lane road, approximately 5 meters wide, to allow farmers to drive vehicles to their fields and to provide access for rice buyers. - We request that the Ministry conduct an inspection and address the issue of wastewater discharge from certain factories in the commune. - We request the installation of solar lamps on bridges crossing the canals (such as Krang Punlai Bridge, Ta Hor Bridge, and Kampong Chamlor Bridge) to ensure safety for night travel and to assist residents transporting harvested rice. - We request the construction of a new gate at the Ou-Sleng dam because the old gate is difficult to open and close.
Photo	

Consultation Level	Commune
Date	August 13rd, 2024
Sub-Scheme	1. Lum Hach 2. Stoeung Krang Bat 3. Yutasas
Organization	Svay Commune Hall, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	Mr. Chum Sam Ol

Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- People living along the road have shifted to business activities. - Most of the youth with working age leave the village to work in factories or move to Phnom Penh. - Most of the population engages in wet-season rice farming, while dry-season rice farming is done only in small areas near the river or on land with its own water resources. - Regarding livestock farming, nearly all households in the commune raise cattle, chickens, and ducks on a household scale, selling only within the village. There are also agricultural farms cooperating with CP Company, with two farms raising broiler chickens and one farm raising pigs. Additionally, there is a private farm raising about 200 to 300 ducks. - The water used for wet-season irrigation comes from the river, while dry-season irrigation uses water from canals and ponds. Household water comes from clean water supplied by the authorities. - In the past, people would thresh rice by hand, but now there is a shortage of local labour, so mechanized methods are used, which leads to a higher need for agricultural inputs. - There are two vegetable farms in the commune, and in addition, vegetable cultivation is carried out on a household level. - Six villages benefit from the project, including Chamkar Village, Ang Chhuk Village, Trapeang Boun Village, Trapeang Thma Village, Tuol Pongro Village, and Svay Pok Village. - The commune will participate in promoting and facilitating the restoration project. Currently, the commune has its own fund to support the maintenance of the dam. - The benefits of the project include providing farmers with sufficient water for irrigation, reducing fuel costs, enabling vegetable cultivation, and supporting the raising of ducks, fish, and crabs. It will also reduce the need to buy water and improve the health of both animals and people, as well as provide food and fish breeding grounds that people can fish from. - The commune does not have any cultural heritage sites. - The potential impact could affect some of the agricultural land. - The commune has a plan for the project, but no funding has been secured for the restoration yet. Currently, there is a development plan for the irrigation infrastructure, but it has not been implemented due to the priority need to construct concrete roads into the village and repair existing dirt roads first.
Requests	- For the irrigation system restoration project, if it impacts agricultural land that is severely affected, please consider appropriate

	compensation measures to prevent discouragement among the local population. - Please study methods to preserve or store more water during the dry season in each area and expedite the implementation of the project, as the local population is currently facing water shortages. - Please collaborate with agricultural experts if the water distribution project is implemented. - We request the Ministry to assist in constructing a handrail on the side of the water gate dam, as this area is frequently crossed by residents daily.
Photo	

Consultation Level	Commune
Date	August 14th, 2024
Sub-Scheme	1. Lum Hach 2. Stoeung Krang Bat 3. Yutasas
Organization	Kampong Luong Commune Hall, Ponhea Lueu District, Kandal Province
Participants	1. Mr. Nhem Punleur 2. Mr. Chim Chhen 3. Mr. Prak Pao
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune has developed concrete roads and dirt roads to each village. - Most of the agricultural land in this area has already been sold to companies, with only about 20% of the land remaining under the ownership of the local population. This land requires water from the Stoeung Krang Punlei for irrigation, while the rest is located farther from the river mouth. - In terms of agriculture, the population engages in rice farming, vegetable cultivation on a household scale, and raising ducks, cattle, chickens, and ducks. One household also raises fish in their own pond. - Farmers near the Stoeung Krang Punlei use its water for irrigation on their fields. - The clean water system has been extended along the national roads for residents, while those living in villages farther from the roads rely on well water.

	- For consumption, the population uses purified water (from 20-litter containers), water from hand-dug wells that is filtered with a mesh, and piped water from pumps, which is filtered before consumption. - Most farmers in the area manage to cultivate two rice crops per year, specifically light rice. The first crop is from January to March, and the second crop is from April to June. - Some farmers grow only one crop per year, but after harvesting the rice, they plant vegetables on the same land, using well water for irrigation. - Livestock farming requires minimal resources in the area. - To address issues, the commune will collaborate with the Ministry to coordinate the project, communicate updates to the public, and raise awareness about the environmental impact, especially water pollution in the area. - The benefits of the project include providing water for some farmers, allowing drainage for flooded areas during the rainy season, supporting local fisheries, and offering habitats for fish to thrive and reproduce. - The Rajanilongvek Eco-tourism site might benefit from additional views of the river mouth. - Over 500 farming households live along the river mouth and rely on river water for irrigation. - There is potential to cultivate mixed vegetables for additional household income. - The project could affect some farmland, particularly for families with land along the river mouth. - It might also impact some trees growing along the river mouth. - The project would affect the farmland of over 100 farming households and land owned by companies near the river mouth. Notably, it severely impacts the land of one household who built their home right on the river mouth (in Kla Tram village). - The commune has previously requested the Ministry of Water Resources to restore this river. - The commune does not have sufficient budget plans for this project now.
Requests	- A request is made to deepen the river to improve water drainage for areas affected by flooding during the rainy season. - A request is made to repair a water gate at the intersection of Prek Chrov and Lao Khav, as the current gate is too small and cannot adequately release water during the rainy season. - A request is made to study the situation at the Rajani Bridge, located near the Ta Chan dam, because there is a small gap for water flow that needs to be addressed.

	- A request is made to construct a head dam in the Peam Chinik village to help retain water for agricultural use.
Photo	

ANNEX 9.3: RESULTS OF THE CONSULTATIONS WITH VILLAGE CHEFS IN KAMPONG CHHNANG PROVINCE

Consultation Level	Village Chef
Date	August 13rd, 2024
Sub-Scheme	Yutasas
Farmer Group	Svay Pok Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	Nhem Non
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The villagers face issues with poor-quality animal feed, unhygienic conditions, and food that is overly chemically processed. - Some villagers are struggling with limited access to water and lack the means to buy water pumps. Renting water pumps is expensive, making it difficult for them to meet their needs. - The village has 223 households that rely on the irrigation system for their water supply. - There are community officials managing the water distribution system, such as the dam gatekeeper. - The quality of water in the irrigation area is good. - The construction of the irrigation system has not caused any harm to the people's assets or cultural sites. - The project will provide water for both agricultural work during the rainy and dry seasons, as well as for animal husbandry. It is expected to boost the local economy and could help create a tourism area, providing additional income for villagers.
Requests	- Request assistance from the Ministry of Public Works to repair the dam embankment. - Ask the Ministry to install metal gates for the water dam (Ta Pring) and the embankment (Ta Nang). - Help to repair the embankment (Pou Sim), which is currently at risk of damage. - Request to install solar panels for lighting the road to the Yutasas dam
Photo	

Consultation Level	Village Chef
Date	August 13rd, 2024
Sub-Scheme	Yutasas
Farmer Group	Svay Pok Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	Mr. Dik Hakk
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent illnesses in the village include climate change (extreme heat) and mosquito bites, which cause diseases such as malaria and dengue fever, with higher occurrences during the rainy season. - Approximately 70% of the villagers use water from the irrigation system, while the remaining 30% rely on river water. - There is a shortage of water, especially during the rice reproductive stage, as there is no water supply to the fields, causing crop damage. Farmers must wait for water from Svay Pok, which only flows to them after farmers in that area have sufficient water. - The Water User Community is responsible for managing the irrigation system. - The current canals are shallow, storing only a limited amount of water. - The project will provide sufficient water for agricultural activities, increase water storage capacity, allow for additional rice cultivation during the dry season, and support vegetable farming.
Requests	- Compensation will be provided to the affected households for the farmland impacted by the construction. - A water reservoir and gates will be constructed to retain water.
Photo	

Consultation Level	Village Chef
Date	August 13rd, 2024
Sub-Scheme	Yutasas
Farmer Group	Krasang Pul Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	Mr. Chea Sary
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent illnesses in the village include a lack of water for daily use and pollution from factory emissions. - Approximately 310 households in the village rely on water from the irrigation system. - During the dry season, the canals do not have enough water, and villagers must take turns pumping water, which is time-consuming. - There is currently no designated authority managing the irrigation system; instead, everyone in the village has equal access to it. However, those with land adjacent to the irrigation system participate in its maintenance. - The water quality in the irrigation system is poor, characterized by a murky and heavily turbid appearance. - The project will help villagers increase productivity and access water for irrigation beyond rice farming, such as growing vegetables and raising livestock. - Approximately 50 households will be affected by the project. They feel concerned and regretful about losing their farmland, but they acknowledge that the project must proceed, and the land has already been excavated.
Requests	- The project will restore and improve the irrigation system within the village.
Photo	

Consultation Level	Village Chef
Date	August 13rd, 2024
Sub-Scheme	Stoeung Krang Bat
Farmer Group	Oknha Pang Village, Longveak Commune, Kompong Tralach District, Kampong Chhnang Province
Participants	Mr. Chhoem Chhorn
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project

Perceptions and concerns	- The factors contributing to frequent illnesses in the village include mosquito bites causing dengue fever among children and dietary habits leading to diseases like diabetes and hypertension. - The canal lacks water during the dry season, and if there is no rainfall at the beginning of the wet season, the canal remains dry. - Villagers with land adjacent to the canal are responsible for maintaining it. - The water quality in the canal is poor due to polluted wastewater discharged from a nearby bag manufacturing factory. - Approximately 50 households in the village rely on water from the irrigation system. - The construction project on this canal will affect approximately 100 plots of land belonging to the villagers. - The villagers will not agree to the restoration of the irrigation system unless appropriate compensation is provided. - The project will help address the water shortage for dry-season rice farming and crop cultivation.
Requests	- The ministry should consider providing fair compensation for the land affected by the project.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Chan Trak Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	Mr. Pon Bunly
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The factors contributing to frequent illnesses in the village include poor sanitation, lack of access to clean water, limited knowledge, and food containing excessive chemicals. - If the irrigation system reaches the village, 90 households will benefit from it. - The main challenge faced by farmers is the lack of water, as the current irrigation system has not yet reached the village. - Villagers will have access to water for irrigating their agricultural fields.
Requests	- They request the department to conduct technical training sessions on agricultural practices.

	- They also wish for the canal to be deepened and for the construction of branch canals to reach the village.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Trapeang Mlu Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	Ms. Chey Puthy
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The main factor contributing to frequent illnesses in the village is climate change. - Approximately 50 households in the village rely on water from the irrigation system. - A major challenge is the insufficient water supply during the dry season. - The canal in the village currently has no designated management authority; all farmers share the responsibility for its maintenance. - The water quality in the irrigation system is good. - The project will impact the land of around 50 households living near the canal. - Affected households initially feel upset, but the commune has organized outreach sessions to explain the project's benefits. Since they have land within the village for resettlement, they can relocate if necessary. - The project will provide sufficient water for crop cultivation and rice farming in both the dry and wet seasons. It will also enable villagers to engage in fishing, supporting their livelihoods and increasing household income. - The project will help reduce the number of family members migrating to work abroad or in distant provinces.
Requests	- Request the restoration project to be completed as quickly as possible.
Photo	

Consultation Level	Village Chef

Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Krang Skear Khang Tboung Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	Mr. Soam Sary
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The primary factor causing frequent illnesses in the village is frequent climate change, which affects the health of the population. - Only 7 households in the village rely on water from the irrigation system, while the rest use their own wells and ponds. - A key challenge is the insufficient water supply for pumping, as the water in the stream often runs out after each pump cycle. - The canal in the village currently has no management authority. - The water quality in the canal is poor, as fallen leaves contaminate the stream, making the water muddy and suitable only for livestock consumption. - The project will not affect cultural heritage sites but will impact farmland and plantations near the stream. - Affected households feel disappointed about losing some of their land near the canal and will demand compensation if their land is excavated. - The project will provide the community with a reliable irrigation system, ensuring sufficient water for various needs, including rice field irrigation, vegetable cultivation, and farming. - Additionally, the villagers will be able to fish in the water system, enhancing food security and income.
Requests	- Requests the restoration of the old stream within the village.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Andoung Preng Village, Krang Leav Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	Mr. Keo Heng
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project

Perceptions and concerns	- The main factors causing frequent illnesses in the village are poor nutrition, climate change, and an increase in mosquitoes during the rainy season. - Currently, there is no irrigation system in the village. - The quality of the water (from wells) is poor due to the presence of heavy metals. - The project will impact the land of villagers, and affected households are demanding compensation. - Once completed, the project will provide water for household use, support additional livestock farming, and enable rice cultivation in both the wet and dry seasons. - The villagers support the construction of the irrigation system.
Requests	- They request the immediate construction of the irrigation system and the restoration of the canal.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Krang Leav Village, Krang Leav Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	Mr. Hem Sarom
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The primary factor contributing to frequent illnesses in the village is climate change, which often causes flu outbreaks. - Approximately 222 households in the village rely on water from the irrigation system. - The main challenge is the insufficient water supply during both the dry and wet seasons. - Currently, the irrigation system is managed by the abbot of the local pagoda. - The quality of the canal water is suboptimal, while the groundwater contains a high level of minerals, particularly lime. - Regarding land impacts, the commune has already allocated land for canal restoration. - Affected households, around 10 to 15 families, feel regretful about losing their land. - The project will provide sufficient water for crop cultivation and rice farming in both the dry and wet seasons, helping to increase household income.

	- Villagers will also be able to fish, contributing to their family's food security. - The project is expected to reduce the need for family members to migrate for work to other provinces or abroad.
Requests	- The restoration of the irrigation system to be completed as soon as possible.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Srae Veal Village, Krang Leav Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	Ms. Phen Chanthorn
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent illnesses in the village are caused by the consumption of chemically treated vegetables and climate change. - Only 5 households in the village use water from the irrigation system, while others rely on groundwater and rainwater for farming. - The main challenge is the lack of sufficient water to increase crop yields and rice production. - There is no management authority overseeing the village's irrigation system. - The quality of canal water is poor, and the groundwater contains a high level of contaminants. - The project will have minimal impact on the land of households near the irrigation system, and no significant problems are expected when restoring the system. - Affected families have no objections to the construction or restoration of the irrigation system, and they are satisfied with the project. - The project will help provide adequate water for expanding rice cultivation and increasing other crop production.
Requests	- Requests assistance in restoring or constructing the irrigation system.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024

Sub-Scheme	Lumhach
Farmer Group	Preal Village, Banteay Preal Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	Ms. Nim Sarith
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent illnesses in the village are caused by many mosquitoes during the rainy season, leading to an increase in malaria cases, as well as climate change factors. - Only 16 households in the village use water from the irrigation system; the rest rely solely on rainwater for farming. - The main challenge is the lack of sufficient water for irrigation. - There is no management authority overseeing the village's irrigation system. - The quality of canal water is poor, and the groundwater is contaminated with a lot of salts. - The project will impact the land of about 25 households, but it is not expected to cause significant issues. - Affected households are requesting compensation for the loss of land. - The project will help ensure sufficient water for irrigation, enabling multiple cropping seasons and providing more water for better rice yields and crop production. - The community can also fish from the irrigation system.
Requests	- Compensation is requested for the households affected by the land loss. - The project aims to restore and improve the quality of the irrigation canals.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Sdok Kabbas Village, Banteay Preal Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	Ms. Nov Saoky
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The cause of the frequent illnesses in the village is unclear.

	- Only 4 households in the village use water from the irrigation system, sourced from canals, ponds, and rainwater. Other households do not have land for farming. - The villagers do not engage in dry season (winter) rice cultivation. - The main problem is that the canals are dry during the dry season, and both the pond and stream lack sufficient water. - There is no management authority overseeing the village's irrigation system. - The project will not affect the cultural areas of the village, but it will impact the agricultural land of the villagers. - Affected households are disappointed about losing their land, but they still support the project. - The project will help the villagers by providing a functional irrigation system, allowing them to cultivate crops and irrigate fields during both the rainy and dry seasons.
Requests	- There is a request to restore the pond and canal systems to meet the village's irrigation needs.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Sdok Kabbas Village, Banteay Preal Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	Ms. Nov Saoky
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent illnesses in the village are caused by a lack of sanitation (Diarrhea, fever, stomach diseases), climate change leading to epidemics, and mosquito bites causing malaria. - Only 20 households in the village use water from the irrigation system. - The villagers do not practice dry-season rice farming. - The main issue is the absence of water storage ponds for agricultural use during the dry season. - The government manages three large reservoirs (0.35 hectares) and a cattle pond (2 hectares), while farmers manage other smaller ponds. - The water quality from the irrigation system is not good, and the underground water contains many pollutants. - The project will not affect cultural areas or the agricultural land of the villagers.

	- The project will provide a water storage pond that can support the villagers' fishing activities.
Requests	- A study is requested to examine the possibility of placing water sediment in the streams to allow the water to flow into the fields. - The project will include the restoration of a new irrigation canal from the water sediment storage area. - The construction of the new canal will involve using the land to form an irrigation canal entrance.
Photo	

Consultation Level	Village Chef
Date	August 15th, 2024
Sub-Scheme	Stoeung Krang Bat
Farmer Group	Trapeang Chambak Village, Longveak Commune, Kompong Tralach District, Kampong Chhnang Province
Participants	Ms. Kong Samut
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent illnesses in the village are caused by the lack of proper sleep for the population, and parents do not have time to properly care for their young children. Elderly people often suffer from diabetes due to consuming excessive amounts of sweet foods. - Only 60 households in the village use water from the irrigation system. - The main issue is the inability to grow crops in the dry season due to a lack of rain and insufficient water in the irrigation canals. In addition, fishers in the area have blocked the water gates, preventing water from flowing into the village's irrigation systems. - The village irrigation system does not have any management. - The water quality is poor, as it is polluted by waste runoff from factories, and it can only be used for farming and livestock purposes. - The project will not affect cultural areas but will impact the land of villagers living near the irrigation canals. - Families whose land is affected feel disappointed about losing their land and will demand compensation if their land is damaged during construction. - Once the project restores the old canal in the village, it will allow water from the surrounding irrigation systems to flow in, providing enough water for farming and crop cultivation.

Requests	- The project will help restore the irrigation canals in the village, making it easier to receive water and connect the main canal to the village's irrigation systems.
Photo	

ANNEX 10.1: RESULTS OF THE CONSULTATIONS IN KAMPONG SPEU PROVINCE

Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	1. Krapeu Truom 2. Brambei Mom
Organization	Kampong Speu Provincial Hall
Participants	1. Mr. Chet Dom 2. Ms. Prak Leakkhina
Moderator	3. Mr. Chun Nimul 4. Miss Tuon Somphorsdavin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The agricultural sector in both regions has fertile land suitable for growing rice and other crops. - There are no major concerns as the local population is willing to cooperate, though there may be issues with land disputes. - Negative impacts mostly occur during construction (such as difficult terrain and challenging travel) and land impact. - Positive outcomes post-construction includes better roads, water distribution systems, and access to water in the area. - There are no environmental or natural impacts, and biodiversity can improve once the project is completed. - The living conditions of the local population have improved overall, benefiting both landowners involved in agriculture and non-landowners through wage labor, offering jobs to the poor in manual labor roles (wage labor and physical work). - The general situation of resettlement issues and management solutions in the province largely involves conflicts between private land project companies and local populations, with some grassroots movements opposing regional development. - Technical issues arise in various aspects of resolution, and there are financial resource challenges.
Requests	- Request to construct a concrete system for long-term use (with a focus on quality) for both the irrigation channels and the main canal. - Request to improve and enhance the quality of the water reservoirs, drainage ditches, making them more efficient and modern, as well as to repair the current water gates due to flooding issues. - Consideration for the local population during the construction phase and after the completion of the project.

	- Request for the project to proceed quickly.
Photo	

Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	3. Krapeu Truom 4. Brambei Mom
Organization	Department of Agriculture Forestry and Fisheries, Kampong Speu province
Participants	Mr. Chea Hokly
Moderator	1. Mr. Chun Nimul 2. Miss Tuon Somphorsdavin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The use of medium-sized rice seeds for the dry season (150kg-200kg for male and 20kg-30kg for female) and wet season (150kg-200kg for male and 20kg-30kg for female). - Five communes have rice farming areas: 1860ha for the wet season and 30-50ha for the dry season. - Most farmers in this region purchase rice seeds from companies and community seed producers. Local land beans are saved by the farmers, and vegetable seeds are bought from companies.

	- Fertilizer usage: 70%-80% of farmers use fertilizer twice, and 20%-30% use fertilizer three times. - Most farmers do not use pesticide; they only use herbicides and insecticides. - Labor hiring is rare; most work is done manually or with machines. - Farmers here sell rice depending on the type. For fragrant rice (e.g., jasmine), they sell it immediately at a high price (wet 1100 Riel), while for regular rice, they store it at home until it dries, then sell it at a higher price (wet 800-900 Riel, dry 1500 Riel). - Issues faced include water scarcity, agricultural inputs, and the lack of livestock to produce fertilizer. - Pesticide use is minimal, and bans on usage are not enforced. - Irrigation systems are inadequate; storage reservoirs are limited to upper sections such as the Tasal, Talong dam, and the Tonle Prek river. The province has areas that are flooded or dry. - Harvesting is done using machines. - Production costs: Fertilizers, pesticides, and fuel are expensive. - Vegetable production that should be promoted focuses on the market, depending on farmers and farming communities. - The region is suitable for farming, especially when farmers gather according to community plans. - The vegetable market relies on the community's connection to traders and other local networks. - Fish species are unclear, and farmers often lack time, as most work in factories. - Labor issues include a shortage of workers and irregular income. - There are 31 training courses in 31 communes, equal to 31 villages. - Training topics include vegetable and rice farming techniques. - Farmers typically cultivate rice three times a year. - Besides the ministry, farmers receive training on rice production through some programs from World Vision and government projects.
Requests	- Assist in properly organizing the irrigation system.

Photo	

Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	1. Krapeu Truom 2. Brambei Mom
Organization	Department of Water Resources and Meteorology, Kampong Speu province
Participants	Mr. Huong Eksamnang
Moderator	1. Mr. Chun Nimul 2. Miss Tuon Somphorsdavin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The current water sources are insufficient due to most of the dams in the province being small dams. - The development of water resources in the province faces issues and obstacles, particularly a lack of financial resources. - The 35 communes have farming communities using water, but the systems are not yet operational. There are human resources, but no materials available. - The management of the department is the best coordinator for connecting with the communities. - However, most of the farming communities using water have failed due to the entry of industrial investment companies into the region. - The total irrigated area in the province is 65,000ha for both dry and wet seasons, with 75% of the irrigation systems being in poor condition (most systems are damaged). - The importance of irrigation systems in improving living conditions is that they reduce poverty and improve the lives of the people in the

	region, helping landowners with farming and providing work opportunities for landless individuals.
Requests	- Do not take too long to conduct the study for the project. - Request for the project to proceed quickly.
Photo	

Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	1. Krapeu Truom 2. Brambei Mom
Organization	Department of Women's Affairs, Kampong Speu province
Participants	Ms. Phun Phin
Moderator	Mr. Keo Sony
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Industrial development has led to female family members working in garment factories, resulting in a lack of water for agricultural use. - There is violence within families and cases of sexual assault. - Victims are concerned about personal safety and fear that pursuing legal action could result in retaliation from the perpetrator's family. - The Women's Affairs Department works with institutions and partner organizations to provide legal services and vocational training for victims. - The department has addressed incidents through public awareness programs on gender in collaboration with local authorities and communes, working with partner organizations such as CSC (legal aid organization), CWCC (organization helping women in crisis), and LWD (Life with Dignity).

	- The department provides support to victims through legal and social services. - The department prepares monthly gender reports for submission to the Ministry. - The department resolves cases by preparing complaints for the court and providing psychological and legal counseling. - Government initiatives include the "Rattanak Women's Strategy Plan," the "National Action Plan to Combat Violence Against Women and Children," and collaboration with partner organizations. - To prevent and better respond to gender-based violence, efforts include increasing public awareness of gender issues and legal challenges faced by offenders, creating gender-related community networks at the grassroots level, and ensuring regular gender report collection at local levels (district, commune, village). - The increasing number of personnel in the CAISAR project has raised concerns about company workers engaging in violence against people (sexual assault). - To mitigate the risk of gender-based violence associated with the project, the company must train staff on gender issues and collaborate with local authorities and relevant institutions to provide personnel data. - The primary risk in this area is sexual assault. - Construction companies involved in coordinating and providing living and restroom facilities must separate accommodations and restrooms for men and women. They must also provide gender training to staff and workers, collaborate, and report incidents at project sites, ensuring public awareness of the project's presence to local authorities and the community.
Requests	- The project will reduce migration. - The project will increase agricultural production. - It is requested that women be included in the management committee of the irrigation system.

Photo	

Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	1. Krapeu Truom 2. Brambei Mom
Organization	Department of Environment, Kampong Speu province
Participants	Mr. Koy Sonin
Moderator	1. Mr. Keo Sony 2. Mr. Nhoeb Phirun
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The general situation of environmental management by the Department of Environment for development projects in the province involves coordinating with local authorities and communities to ensure the smooth implementation of the project and encouraging companies to comply with the law. - The role of the Department of Environment includes preparing agreements (for areas under one hectare) and collaborating with ministries. - The work of the Department of Environment related to the environmental management program for the CAISAR project involves preparing the Environmental Impact Assessment (EIA) in collaboration with the Ministry of Environment. For any project funded by ADB, World Bank, or similar organizations, an EIA must be prepared.

	- There are no significant areas of biodiversity resources, only agricultural land. - The project provides benefits to biodiversity resources by providing habitats and relocation opportunities for species. - Solutions include placing hazard signs and water irrigation along transportation routes. The company collaborates with local authorities to address the impacts of project activities on land use.
Requests	- The company implements its own plan. - Collaborates with local authorities. - Prepares a report to monitor project activities every 3 months.
Photo	

Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	1. Krapeu Truom 2. Brambei Mom
Organization	Svay Kravan Disabled People's Federation Organization, Kampong Speu province
Participants	Mr. Vann Sambath
Moderator	Mr. Keo Sony
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The role and key activities of the organization in the province involve advocating for persons with disabilities, protecting the rights of persons with disabilities, promoting disability rights to private partners, and providing assistance to persons with disabilities.

	- The project will help the population increase agricultural production multiple times per year. - The relationship between the CAISAR project and the organization is to improve agricultural production. - The impacts, benefits, and changes brought by the CAISAR project include creating shelter and pathways for biodiversity resources, providing opportunities for the population to increase agricultural production or participate in reducing migration.
Requests	- Provides opportunities for farmers to engage in agriculture multiple times per year. - Reduces the risks of floods and droughts.

Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	1. Krapeu Truom 2. Brambei Mom
Organization	Kong Pisei Integrated Agricultural Community, Kampong Speu province
Participants	Mr. Chea Ratha
Moderator	Mr. Nhoeb Phirun
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The community has participated in the election process and the declaration of the provincial district council. A training session for the community has been organized, covering livestock farming, fish farming, and vegetable cultivation for all districts throughout Kampong Spue province. - Farmers are knowledgeable about fish farming, livestock farming, and vegetable cultivation, but currently, these projects have been discontinued. - There is limited communication due to the farming-related issues they are involved in. - There are no impacts as long as the project starts quickly; the benefits and environmental improvements will continue to improve. - Living conditions and migration are not an issue if land measurement and planning are carried out correctly. - Vulnerable groups, including women, children, ethnic minorities, and communities with cultural backgrounds, face no issues if the impacts have already been addressed or if land exchange has been completed.
Requests	- Accelerate construction to ensure it is completed in time for the planting season of the population.

	- Establish a community to protect water usage or pay fees for construction and repairs.
Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	1. Krapeu Truom 2. Brambei Mom
Organization	Oudong Me Chey Town Hall, Kampong Speu province
Participants	1. Mr. Kong Sophannak 2. Mr. Keo Borey 3. Mr. Yoeng Soyen 4. Mr. Mak Samoeurn 5. Mr. Sok Khanit 6. Mr. Um Vann
Moderator	Miss Sek Liny
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The sector with potential and a priority for rural development is agriculture (75%) (rice, vegetables, groundnuts, watermelons, Chinese broccoli, and cabbage), followed by handicrafts (10-20%), tourism, and industry (factories). - The district is aware of the project to restore and expand the existing irrigation system, which helps facilitate water delivery to agricultural land. Once land prices drop, farmers return to farming. - The impact is the dry season causing water shortages. - The benefits of the project include providing water for livestock and fish, reducing migration, improving the livelihoods of the population, increasing agricultural production, providing additional jobs for landless people through selling labor, and starting small businesses because there are many people in the district (reducing migration). - The role of the district is to facilitate project activities and advise the company on how to reduce pollution (water and air pollution). - There are no more land issues because the land has already been registered. - Meetings are held to find solutions and provide compensation to those affected. - The district's capacity and human resources for those with land titles: resolve through legal channels; for those without land titles: assist in facilitating solutions. - The main challenges for farmers are water shortages, lack of water storage, pests, crop diseases, lack of capital, lack of labor, and poor crop growth due to climate change and flooding.

	- Challenges include insufficient irrigation systems (water has to be taken from dikes and reservoirs). The dry season lasts too long, and the water level of dams is too high, preventing the flow of water. In the plan, there is no land allocation for rice cultivation, but farmers have cultivated 20 hectares. When there is heavy rain and high water, they open the dam, which causes water to overflow and damage fields. - Solutions include using chemical and organic pesticides, borrowing money from banks, planting vegetables in small greenhouses, providing agricultural training to farmers, and issuing emergency alerts when water exceeds 3 meters. - Seed retention: keep 90% and buy 10%. - Fertilizer: use chemical fertilizers, which are required annually, and compost (chicken, pig, and duck manure). Some farmers use both, but sometimes only chemical fertilizers. - Pest control: No use of insecticides, only weed killers. - Irrigation system: There is enough water in the rainy season; some years, about 500 hectares of rice land may be flooded for 3-7 days. The dry season does not have enough water, and there is a shortage of water storage. - Service fees for the irrigation system: The community pays 40,000 KHR/ha for water in the village area, 20,000 KHR/ha for drained land, and 10,000 KHR/ha for pumped land. - Harvesting: 90% is machine harvested, and 10% is hand-harvested (for seed selection). - The situation regarding violence includes 2 cases of sexual abuse and 1 case of physical violence. - Victims, particularly women, may still be hesitant to speak out but have become braver in reporting and filing complaints. - Government operations include existing laws for resolving and publicizing gender issues. - To prevent and respond to gender-based violence, efforts include continued gender awareness campaigns, strict punishment for perpetrators, and efforts to reduce the spread of drugs. - The increase in the number of staff in the CAISAR project poses no problems, as no issues have been caused by construction workers so far. - To reduce the risk of gender-based violence, the project involves allocating separate accommodation for men and women, advising workers on laws and punishments for violations, and promoting gender equality. - Risks in the area include violence and sexual harassment. - The construction company facilitates and completes work by allocating separate accommodation for men and women, advising workers about laws and punishments for violators, and promoting gender equality.

Requests	- Increase water sources to help reduce migration, which in turn helps reduce sexual violence through living together with family. - Request the water resources department to expedite construction. - Provide water storage facilities and ensure sufficient water for agricultural activities.
Photo	

Consultation Level	Provincial
Date	August 23rd, 2024
Sub-Scheme	1. Krapeu Truom 2. Brambei Mom
Organization	Thpong District Hall, Kampong Speu province
Participants	1. Ms. Say Sean 2. Ms. Seng Samrong 3. Mr. Sao Vat 4. Mr. Sem Chea 5. Mr. Long kakada
Moderator	Miss Sek Liny
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The sector with the potential and priority for rural development includes agriculture, agro-industry, industries (such as garment factories and sugar factories), and tourism. - It is known that there are plans to restore and expand existing irrigation systems, helping to facilitate water supply to agricultural land. - Areas with high biodiversity, habitats for various species, and a conducive environment help increase fish flow if developed in stages, without negatively impacting the environment, while also creating tourist destinations in the region.

	- The living conditions of the population and migration could impact some lands, but it can increase yields through the availability of water, and farmers need agricultural techniques and good market access. - Vulnerable groups and indigenous peoples can sell their labor. - The role of the district is to assist in coordinating the project activities, resolving issues with affected populations who are beneficiaries, and promoting participation in water system conservation. - There are no further issues as land titles have already been registered. - The district's capacity and human resources can resolve some issues at the local level through legal land rights and requests for additional support from the provincial level in case of more serious problems. - The main challenges for farmers include flooding, water scarcity (during the dry season), pests, labor shortages, animal diseases, and unstable markets. - The reasons for the issues stem from heavy rains, dam construction, the draining of some ponds, climate change leading to longer dry seasons, water management issues, pest outbreaks due to drought, cross-border movement, increased factory operations, and declining livestock breeding and trust in the population. - Solutions include emergency relief movements, establishing water storage facilities, promoting water usage, collaboration with relevant ministries and agencies to educate on water conservation, and introducing modern agricultural methods. - Seedstock: 90% are kept by farmers (who select seeds for planting) and 10% are purchased. - Fertilizers: 50% chemical fertilizers and 50% organic fertilizers (from poultry, pigs, and ducks), used according to vendor advice. - Irrigation system: Insufficient water during the dry season. - Irrigation service fees: No fees have been collected yet due to insufficient water supply to meet demand, and the infrastructure is not yet adequately organized. - Harvesting: 90% is done by machine, and 10% by hand (for seed selection or when machinery is not available). - Violence situation: Cases of sexual assault and violence. - Vulnerable families have filed complaints, and more people are coming forward to file complaints than before. - Government interventions include the Ratanak Women's Book, which provides legal resolutions, public awareness campaigns, and gender education to the public, with a GBV team to assist in resolving issues. The team provides confidential assistance, including counseling, without exposing the identities of victims, and consultation groups are formed to resolve and offer psychological support. - To prevent and respond to gender-based violence, continued awareness campaigns on gender are needed, along with strong

	penalties for perpetrators, efforts to reduce drug use and alcohol, and addressing social media issues. There should also be campaigns promoting safe communities in rural areas. - There has been no issue with the increased number of staff in the CAISAR project because there have been no issues caused by construction workers in the past. - To reduce the risk of gender-based violence that could arise from the project, related parties should conduct site checks, separate accommodations for men and women, provide legal guidance to workers, and impose penalties for offenders. - Risks include issues related to violence and sexual assault. - Construction companies coordinating and completing their work should provide workers with information on laws, penalties for offenders, and promote gender equality.
Requests	- Request for the construction project to hire workers from the local area. - Accelerate construction. - Provide water storage facilities and ensure there is enough water for agriculture.
Photo	

ANNEX 10.2: RESULTS OF THE CONSULTATIONS WITH COMMUNE COUNCILS IN KAMPONG SPEU PROVINCE

Consultation Level	Commune
Date	August 12th, 2024
Sub-Scheme	1. Brambei Mom 2. Krapeu Truom
Organization	Sangkat Preah Sre Hall, Oudong Me Chey District, Kampong Speu Province
Participants	1. Mr. Tim Sanou 2. Mr. Chhay Aem 3. Mr. In Thy 4. Mr. Huy Seng
Moderator	1. Mr. Chun Nimul 2. Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Most of the development in the district focuses on the construction of road infrastructure. - The district's population mainly consists of farmers, with some individuals along the roads engaged in businesses, and youth migrating for employment. - Agricultural activities mainly involve rice cultivation, vegetable farming, and livestock raising. - For the wet season irrigation, water is sourced from the reservoir and canals connected to it. However, during the dry season, there is a shortage of water, and irrigation for crops is unavailable. Household water use is dependent on tap water. - Farmers typically cultivate rice once a year during the wet season. - Vegetables are grown around homes, utilizing canal or pond water. In some areas, after rice harvesting, melon farming is practiced. There is also one farmer cultivating cucumbers in a well-organized setup with a market in Phnom Penh. - Livestock farming includes raising cattle, chickens, and ducks for household consumption. Additionally, there are two farms for chicken and two for pigs currently operational in the district, with some farmers also raising ducks on farmland after harvesting crops. - There are four villages that benefit from this irrigation system: Angk Sandan, Pou Kaong, Ta Chiel, and Chhuk Sar. - The commune will facilitate resolving conflicts related to impacts and cooperate during project implementation.

	- The benefits of the project include a sufficient water supply for rice farming and vegetable cultivation, a habitat for fish, irrigation for crops, and the potential for integrated vegetable farming to generate additional household income. - There are no heritage sites within this commune. - The potential impact includes affecting some parts of the rice fields. - The restoration of this canal aligns with the commune's implementation plan, but the commune currently lacks sufficient funding to carry it out.
Requests	- Please implement the restoration project according to the system plan. If the restoration deviates from the designated system plan provided by the land surveyor and affects private land, appropriate compensation should be provided to the landowners. - A water gate should be constructed at the stream to divert water into the secondary canals, as the stream level is lower than the canal. - Please conduct a thorough impact assessment and public consultation before implementing the project. - The project will help establish a road along the canal, which will increase the land value in the area after construction is completed.
Photo	

Consultation Level	Commune
Date	August 14th, 2024
Sub-Scheme	1. Brambei Mom 2. Krapeu Truom

Organization	Sangkat Veal Pong Hall, Oudong Me Chey District, Kampong Speu Province
Participants	3. Mao Mon 4. Sorn Sem
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune consists of 16 villages, all of which use water from the irrigation system, which supports farmers in growing rice and vegetables during the rainy season. However, this year, there was a shortage of water during the dry season. - The irrigation system covers three communes, providing water from the lower Krapeu Irrigation System for use in these areas. Water for irrigation and domestic use within the communes is generally sufficient. - If water is available during both the dry and rainy seasons, it will greatly assist farmers in cultivating rice, growing vegetables, and raising livestock (which typically requires adequate water for farming). - The entire community benefits from the Krapeu Truom Irrigation System, supporting rice cultivation and various crops. Migration also contributes to improving livelihoods. - The construction of the irrigation system does not harm the environment. On the contrary, it increases fish diversity, and the local population can fish and enjoy recreational activities on weekends. - During the dry season, the economic situation of the community is challenging due to insufficient water, leading to some residents migrating. - If the irrigation project is implemented but fish are scarce in the canals, it may affect the landscape negatively, which could discourage residents from visiting. - The project is in line with the commune's 5-year plan and a 3-year investment plan, which includes necessary repairs as part of the implementation.
Requests	- Request for the department to assist in repairing the automated water gate that has been damaged, to restore its functionality as before. - Request to help repair the water intake pipes for both the main and secondary canals. - If possible, request assistance in constructing concrete structures in the canals.

Photo	

Consultation Level	Commune
Date	August 14th, 2024
Sub-Scheme	1. Brambei Mom 2. Krapeu Truom
Organization	Brambei Mom Commune Hall, Thpong District, Kampong Speu Province
Participants	Ms. Kao Sokea
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Key developments in the commune include the construction of concrete roads and earthen roads in each village. - Agricultural land in the area, owned by residents, requires water from the Five-Mum dam for irrigation, and some residents also use clean water from the Anlong Chrey reservoir. - In terms of agriculture, people in the commune grow rice and vegetables at a family level, and raise cattle, chickens, and ducks. One family even practice aquaculture in a pond. - Farmers near the Brambei Mom dam use water from the dam for irrigation. Some farmers also grow vegetables near the dam's mouth to conveniently access water for use. - Drinking water is sourced from tap water, well water filtered with a strainer, and machine-filtered water, with a proper cleaning process before consumption. - Most farmers cultivate rice once a year, growing light rice and OM rice varieties, from May to November. They plant vegetables on the same land after harvesting. Most farming relies on rainwater, while livestock farming requires minimal water usage. - To address the issues that arise, the commune will collaborate with the Ministry to coordinate the project activities and disseminate information to the public about potential impacts, particularly environmental concerns such as water pollution in the region.

	- The benefits of constructing the irrigation system include providing water to farmers, helping to mitigate flooding during the rainy season, enabling farmers to cultivate crops year-round, and supporting fishery activities. This will also allow farmers to grow mixed vegetables for additional family income and reduce rural-urban migration. - Over 600 families living along the riverbanks will have access to river water for irrigation. - The project will impact agricultural land owned by farmers, land held by companies, and some trees along the Brambei Mom dam's embankment. - The commune has previously submitted a request to the Ministry of Water Resources to restore the Brambei Mom dam. - Currently, the commune does not have sufficient funds to implement the project, but it will participate in disseminating information to the local population.
Requests	- A request is made to assist in restoring the dam to its original depth to effectively drain the rainwater and alleviate flooding.

Consultation Level	Commune
Date	August 14th, 2024
Sub-Scheme	1. Brambei Mom 2. Krapeu Truom
Organization	Roung Roeang Commune Hall, Thpong District, Kampong Speu Province
Participants	Ms. Soun Sarith
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The commune is crossed by a paved road and is developing various village roads by constructing concrete roads, which are part of the commune's budgeted projects. - Most of the working-age population migrates to work in factories outside the district or in Phnom Penh. - Farmers can only cultivate rice during the rainy season due to the availability of water from community reservoirs or ponds within the commune. The canal located east of the Brambei Mom irrigation system also provides sufficient water, but during the dry season, there is not enough water for agricultural activities. - Farmers engage in small-scale livestock raising, such as cattle, buffaloes, chickens, and ducks. Pig farming is less common. - Rice farming relies on rainwater collected in reservoirs, ponds, and canals connected to the Brambei Mom irrigation system. From January to July, water for agriculture is no longer available.

	- Water usage at the household level varies: rural farmers use water from community reservoirs, ponds, and hand-dug wells, while those in urban areas use clean water (tap water). For drinking water, some residents consume purified water, while others boil or filter water from taps and wells. - Farmers typically grow rice, but only during the rainy season. - Vegetable cultivation is limited to small-scale gardening around households. For larger-scale farming, it is only feasible on land along the banks of Krang Punley Stream during the dry season. - Livestock is raised at the household level, with well water used during the dry season and water from reservoirs and ponds during the rainy season. - The commune will assist in disseminating information about the canal restoration, inspecting and maintaining the restored canal, and coordinating with the ministry during project implementation. - The project will provide water to enhance rice and vegetable production, increasing household income, and boosting the aquatic ecosystem. - The project may negatively impact privately-owned land. - There are no heritage sites within the commune. - The commune had proposed a development plan related to dam restoration, but due to high costs, the budget was redirected to road construction instead. - The commune has plans to restore small canals in the area and install culverts to prevent water from flowing across roads.
Requests	- Restore Krang Punley Stream and the canals connected to the Brambei Mom irrigation dam to provide water for residents during the dry season. - Reconstruct the Brambei Mom dam to its original height, as it has deteriorated and can now only store a limited amount of water. - Improve the irrigation system in the commune by elevating and deepening the Lorng Dam and Lang Dam to increase water storage capacity, ensuring sufficient water supply for residents around both dams during the dry season.

Photo	

ANNEX 10.3: RESULTS OF THE CONSULTATIONS WITH VILLAGE CHEFS IN KAMPONG SPEU PROVINCE

Consultation Level	Village Chef
Date	August 12th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Angk Sandan Village, Preah Srae Commune, Oudong Me Chey District, Kampong Speu Province
Participants	Mr. Kuy Cheun
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent occurrence of diseases in the village is caused by the abundance of forests and heavy rainfall, which create conditions for a large mosquito population. Villagers work hard during their youth, which leads to deteriorating health as they age. - A total of 196 families receive water from the irrigation system. However, the remaining families face water shortages because when others pump water first, the water source runs dry before they can access it. - The main challenges include a lack of water, failed well drilling, and competition among villagers for limited water, especially during the dry season when water is scarce. - The village chief, deputy village chief, and other community members are responsible for managing and regulating the use of the irrigation system. - Air quality in the village is poor due to residents burning waste, resulting in harmful smoke. - The water quality is excellent, suitable for drinking and supporting both human consumption and livestock farming. - The project will not impact cultural heritage sites but may affect approximately 20 families whose farmland is located near streams, rivers, and canals, causing some discontent among the affected residents. - Some villagers who own land near streams, rivers, and canals do not have official land titles, meaning they lack legal ownership of the land. - The project aims to establish an irrigation system for the community, providing sufficient water for various uses such as rice farming, vegetable cultivation, livestock rearing, fish farming, and extending the growing season.
Requests	- Request the government issue land titles for their properties near streams, rivers, and canals.

	- Propose the construction of water reservoirs and gates within the village to collect and store water from the Krapeu Trom area.
Photo	

Consultation Level	Village Chef
Date	August 13th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Khchas Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	Mr. Thoy Voan
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent occurrence of diseases in the village is caused by improper food consumption, leading to diarrhea, and by the abundance of forests, which creates a large mosquito population, resulting in dengue fever. - A total of 24 families receive water from the irrigation system. - The primary challenge is the lack of sufficient water for use. - The village has selected a leader to manage the irrigation system. - The water in the irrigation system is of good quality. - The project will have a minor impact on the farmland of approximately 30-40 families. - The families affected by the loss of their farmland initially felt upset, but the village and commune authorities have worked to communicate and mediate with them. - The project will provide sufficient water for crop cultivation and rice farming during both the dry and rainy seasons, helping to increase household income.
Requests	- There is a desire for the irrigation system to be restored quickly and constructed according to the geographical conditions of the area.
Photo	

Consultation Level	Village Chef
Date	August 14th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Souvongs Leu Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	Mr. Oam Phorn

Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent occurrence of diseases in the village is caused by climate change, leading to an increase in cases of the common cold. - A total of 134 families receive water from the irrigation system. - The main challenge is the difficulty in pumping water for use, which requires a significant financial cost. - The village chief and members of the water user community are responsible for managing the irrigation system. - The water quality in the irrigation system is not very good, and the groundwater is also not very clear. - During the construction period, there may be noise disturbances from heavy machinery and road damage during the rainy season. - The project will not impact farmers' rice fields. - The project will help ensure sufficient water for crop cultivation and rice farming during both the dry and rainy seasons, contributing to increased household income.
Requests	- Request to restore the irrigation system as soon as possible to facilitate easier water access for the villagers.
Photo	

Consultation Level	Village Chef
Date	August 14th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Thlea Chas Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	Mr. Kroun Thiem
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent occurrence of diseases in the village is caused by poor hygiene in food consumption, children eating unhealthy food, and climate change, leading to illnesses such as the common cold and skin diseases. - A total of 133 families, accounting for 100% of the households in the village, receive water from the irrigation system. - The main challenges are water shortages, lack of a water storage system, and difficulties in coordinating with upstream villages to request water when needed. - The village chief, deputy village chief, and the head of the water user group are responsible for maintaining the water gates and

	coordinating with other villages to provide water for agriculture during shortages. - The water quality in the irrigation system is good. - The construction of the irrigation system does not pose any issues for the community, as the affected landowners have supported the project and prepared the necessary land plans. Twenty families are directly affected by the project. - The project will help store sufficient water to allow rice farming two to three times per year and expand crop cultivation, reducing concerns about water shortages.
Requests	- The project will assist in restoring the irrigation system to increase water storage capacity. - It will also address and restore parts of the system that lack adequate water supply.
Photo	

Consultation Level	Village Chef
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Lar Village, Brambei Mom Commune, Thpong District, Kampong Speu Province
Participants	Mr. Bun Samnang
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent occurrence of diseases in the village is caused by consuming unhygienic food containing chemical substances and by climate change. - A total of 87 families receive water from the irrigation system. - The main challenge is insufficient water, and the irrigation system is not yet operational. - Farmers in the village have never used water from the Brambei Mom irrigation system. - The project will have a minor impact on the farmland of approximately 20 families. - The families affected by the loss of farmland are generally indifferent, as their main concern is having sufficient water for use. - The project will help provide water for irrigation during both the rainy and dry seasons, supporting rice farming, crop cultivation, and other agricultural activities.

Requests	- There is a request to expedite the construction of the Brambei Mom irrigation system so that the villagers can benefit from it as soon as possible.
Photo	

Consultation Level	Village Chef
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Prey Veng Village, Brambei Mom Commune, Thpong District, Kampong Speu Province
Participants	Mr. Khoen Sou
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent occurrence of diseases in the village is caused by climate-related factors. - A total of 75 families receive water from the irrigation system. - The main challenge is the lack of sufficient water for use. - The village's irrigation system currently has no designated management. - The water in the irrigation system is of good quality and suitable for use. - The project will have some impact on farmers' rice fields. - The project will help ensure sufficient water for crop cultivation and rice farming during both the dry and rainy seasons, contributing to increased household income.
Requests	- There is a request to construct secondary canals branching from the Brambei Mom irrigation system.
Photo	

Consultation Level	Village Chef
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Tang Pou Village, Brambei Mom Commune, Thpong District, Kampong Speu Province
Participants	Mr. Hun Dara
Moderator	Miss Hak Leakhina

Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent occurrence of diseases in the village is caused by climate-related factors. - A total of 263 families receive water from the irrigation system. - The main challenge is the lack of sufficient water, especially during the dry season when the canals have no water supply. - The village's irrigation system currently has no designated management. - The water quality in the irrigation system is poor due to heavy sedimentation. - There are no impacts on cultural heritage sites; however, approximately 10 families with farmland near the canal will be affected. - The affected families feel some distress but continue to support the project. - The project will ensure sufficient water for crop irrigation, fish farming, livestock rearing, and extended rice farming seasons. For the families affected by the loss of farmland, they will be able to cultivate their crops once the project is completed.
Requests	- There is a request to restore the reservoir. - In case of reservoir excavation, roads should be constructed around the area to facilitate transportation.
Photo	

Consultation Level	Village Chef
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Tuek Long Ti Muoy Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	Mr. Touch Yan
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The frequent occurrence of diseases in the village is caused by poor hygiene and mosquito bites, which lead to diseases such as malaria or dengue fever. - A total of 290 families receive water from the irrigation system. - The village has a community pond, but water cannot be pumped into the rice fields because, during the dry season, the pond has a small capacity and stores limited water.

	- The main challenge is that during the dry season, both the Loleng reservoir and the community pond do not have enough water for agricultural activities, and there is no secondary canal connecting the reservoir to the village. - The village chief is responsible for managing the water in the community pond. - The water quality in the irrigation system is poor. - Construction will impact the farmland of local farmers. In cases of minor impacts, the affected families will be understanding. - The project will help villagers access water for dry-season rice farming, grow vegetables, and improve road access to the fields.
Requests	- Requests the ministry to assist in deepening and expanding the Loleng reservoir, as the surrounding land belongs to the government. - Requests the creation of secondary canals from the Lorng reservoir. - Additionally, there is a request for a canal connection from the Brambei Mom reservoir to the Loleng reservoir.
Photo	

Consultation Level	Village Chef
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Chambak Sar Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	Ms. Koh Phirum
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The primary cause of frequent diseases in the village is mosquito bites, which lead to dengue fever. - A total of 200 families receive water from the irrigation system. - The main challenge is that the canal in the southern part of the village (connected to Anlong Chrey) does not have water and does not flow back into the Brambei Mom reservoir. - The local authorities manage the village's irrigation system. - The water quality in the irrigation system is poor because the upstream stream in a neighbouring village is contaminated by pig farming, with waste discharged into the stream. - Construction will affect approximately 50 families whose farmland is located along the banks of the stream and canal. - Some affected farmers with small plots of land are unwilling to participate in the project.

	- The project will help villagers access water for dry-season rice farming and vegetable cultivation during the dry season.
Requests	- It is requested that compensation be provided to the families whose farmland is affected by the project.
Photo	

ANNEX 11: RESULTS OF THE CONSULTATIONS WITH RICE FARMERS

Results of the Consultations with Rice Farmer Group in Kampong Chhnang Province

Consultation Level	Rice Farmer Group
Date	August 13th, 2024
Sub-Scheme	Yutasas
Farmer Group	Krasang Teab Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Mr. Iem An 2. Mr. Van Sarun 3. Ms. Aor Sat 4. Ms. Paok Raksmey 5. Ms. Sun Sreypov 6. Ms. Uoch Saren
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Challenges include brown planthopper, invasion of stem borers during the tillering stage, and high production costs. - Farmers in the village have received training on rice cultivation techniques, including land preparation, seed selection, and fertilizer application. - After canal restoration, rice cultivation could be extended to up to three growing seasons per year.
Requests	- Establish a new irrigation system in the village and restore the old canals.
Photo	

Consultation Level	Rice Farmer Group
Date	August 13th, 2024
Sub-Scheme	Yutasas
Farmer Group	Svay Pok Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Ms. Tum Siem 2. Ms. Mao Koeurng 3. Mr. Khut Vorng 4. Mr. Bel Soy 5. Ms. Sam Phorn 6. Mr. Poul Nhoeb

	7. Mr. Phal Pheap
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Challenges include insufficient water in the canals. - The rising cost of fertilizers and pesticides. - Rice cultivation heavily relies on chemical fertilizers, while pesticide usage is minimal. - High expenses for labour, land preparation, and harvesting. - Farmers in the village have never received training specifically on rice cultivation.
Requests	- We request the ministry to increase the height of the strategic water gate by 30 centimetres to ensure sufficient water storage for year-round rice farming. Additionally, please help install water gates at the Ta Pring and Ta Nang dams to store water for the dry season. - Kindly assist in restoring the "Yay Soy" canal from the Ta Pring dam to the mouth of the stream. Also, please help repair the damaged Ta Sim dam. - We request assistance in addressing the cost of agricultural fertilizers and maintaining favourable rice prices. - Please arrange for solar-powered lighting along the embankment roads to improve accessibility for farmers during rice cultivation and sales.
Photo	

Consultation Level	Rice Farmer Group
Date	August 13th, 2024
Sub-Scheme	Yutasas
Farmer Group	Kyang Khang Tboung Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Ms. Prak Bopha 2. Ms. Pak Maly 3. Ms. Chea Thy 4. Ms. Phorn Samley 5. Ms. Phoung Kroem 6. Ms. Seng Chanthy 7. Ms. Dum Korng
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project

Perceptions and concerns	- There is a shortage of water for rice farming and crop cultivation due to insufficient water in the canals. - There is a high infestation of pests that damage rice, requiring the use of many pesticides to control them. - The cost of production is increasing, especially for land preparation, pesticide application, and harvesting. - In general, farmers use organic manure mixed with chemical fertilizers, and all pest control is done using chemical pesticides. - Farmers have received training on rice cultivation techniques only once a year from agricultural cooperatives.
Requests	- There is a desire to have an adequate irrigation system for rice farming. - Build a central reservoir dam for agricultural use and water storage. - Construct water gates for the canals to facilitate water storage.
Photo	

Consultation Level	Rice Farmer Group
Date	August 13th, 2024
Sub-Scheme	Stoeung Krang Bat
Farmer Group	Oknha Pang Village, Longveak Commune, Kompong Tralach District, Kampong Chhnang Province
Participants	1. Mr. Rith Sarath 2. Ms. Chab Nem 3. Ms. Chab Niem 4. Ms. oun Chanry 5. Mr. Kol Vannak
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Lack of an irrigation system and flooding issues caused by runoff from nearby hills. - The price of fertilizers continues to rise. - High costs for labour, land preparation, and harvesting. - Rice cultivation relies almost entirely on chemical fertilizers, but insecticides are rarely used. - Farmers in the village have never received any training on rice cultivation.
Requests	- It is necessary to construct secondary canals to supply water to the village's rice fields, ensuring at least two cropping seasons and potentially enabling dry-season rice cultivation.

Photo	

Consultation Level	Rice Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Chan Trak Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	1. Ms. Ma Chantha 2. Ms. Nuy Sina 3. Ms. Sem Mao 4. Ms. Sim Sarom 5. Ms. Kai Eang 6. Mr. Prak Heurn 7. Ms. Nhean Sarat 8. Ms. Seng Da
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The main challenge is water scarcity, which limits farmers to cultivating only one rice crop during the rainy season, relying entirely on rainwater. - A lack of capital to purchase inputs forces them to borrow money or buy on credit, which further reduces their profit margins. - Farmers primarily use chemical fertilizers rather than combining them with compost fertilizers, and pest management is mostly done with chemical pesticides. - The costs for labour, land preparation, pesticide application, and harvesting are increasingly high. - Farmers have never received any training on rice cultivation.
Requests	- Please provide training on rice cultivation techniques to the farmers in the village. - Assist in establishing an irrigation system, as the area is currently facing severe water shortages.
Photo	

Consultation Level	Rice Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach

Farmer Group	Krang Skear Khang Tboung Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	1. Ms. Chhum Neang 2. Ms. Ros Chhum 3. Ms. Dul Sophal 4. Mr. Sem Chek 5. Ms. Chann Sopheak
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The village canals have no water because there is no main canal to supply them. - The farmers have never received any training on rice cultivation. - The costs for labour, land preparation, pesticide application, and harvesting are significantly high.
Requests	- Restore the old canals in the village to ensure sufficient water supply for rice production and potentially increase the cropping seasons to up to three per year. - Propose the construction of a community reservoir in the village.
Photo	

Consultation Level	Rice Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Trapeang Mlu Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	1. Mr. Kim Huot 2. Ms. Hem Nary 3. Ms. Lang Mom 4. Ms. Em Sophearath 5. Mr. Pon Thouch 6. Mr. Yim Chea 7. Mr. Seb Oeurn
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The village canals currently have sufficient water. - Production costs, including land preparation, fertilizers, pesticide application, and harvesting, remain high.

	- Farmers in the village have never received any training on rice cultivation.
Requests	- Assist in urgently restoring the irrigation system to maintain water availability. - Organize training programs focused on rice cultivation techniques for the farmers.
Photo	

Consultation Level	Rice Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Sdok Kabbas Village, Banteay Preal Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Mr. Satt Thet 2. Ms. Non Noa 3. Mr. Chum Vuthy 4. Mr. Oeur Savry
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The village canals have no water because there is no main canal to supply them, limiting farmers to cultivating rice only during the rainy season, relying solely on rainwater. - The fields face severe weed problems, and the soil has low fertility. - Most farmers in the village grow rice primarily for household consumption. - The costs for labour, land preparation, and harvesting remain high. - Farmers have previously received training on single-seedling rice transplanting techniques.
Requests	- Restore the old canals in the village and develop additional irrigation systems to ensure sufficient water supply for rice production, potentially increasing the cropping seasons to up to three per year. - If implemented, the community is likely to provide additional support and participation.
Photo	

Consultation Level	Rice Farmer Group
Date	August 15th, 2024

Sub-Scheme	Lum Hach
Farmer Group	Andoung Preng Village, Krang Leav Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Mr. Phoem Sarun 2. Mr. Horn Sambol 3. Ms. Hong Chanthorn 4. Ms. Om Sam 5. Mr. Sok Ratha
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- There is a water shortage, and an irrigation system is needed to store and manage water for agricultural use. - Farmers face a lack of capital. - Rice cultivation relies on chemical fertilizers and animal manure, but very few farmers use chemical pesticides. - The costs for labour, land preparation, pesticide application, and harvesting are high. - Farmers in the village have never received training on rice cultivation.
Requests	- An irrigation system is essential in the village to increase rice and vegetable production. - Urgent action is needed to build or restore the irrigation system as soon as possible.
Photo	

Consultation Level	Rice Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Krang Leav Village, Krang Leav Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Ms. Chhun Channa 2. Mr. Sao Hong 3. Ms. Soam Youn 4. Ms. Meas Sruoy
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The village canals have sufficient water supply. - There is an issue with weeds affecting rice crops. - Production costs include land preparation, fertilizers, and harvesting.

	- Farmers in the village have received training on land preparation for rice fields.
Requests	- Request assistance in restoring the irrigation system in the village. - Increase training programs and techniques for vegetable cultivation. - Seek support for acquiring quality seeds.
Photo	

Consultation Level	Rice Farmer Group
Date	August 18th, 2024
Sub-Scheme	Stoeung Krang Bat
Farmer Group	Trapeang Chambak Village, Longveak Commune, Kompong Tralach District, Kampong Chhnang Province
Participants	1. Mr. Kong Sinat 2. Ms. Phen Sony 3. Ms. Phorn Rath 4. Mr. Hin Samart 5. Mr. Sok Chamreun
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- There is a lack of irrigation water for rice fields and crops. - Production costs include land preparation, fertilizers, pesticides, and harvesting. - Farmers in the village have never received training on rice cultivation.
Requests	- There is a need to restore the irrigation system and build a new secondary canal in the village to ensure a reliable water supply.
Photo	

Results of the Consultations with Rice Farmer Group in Kampong Speu Province

Consultation Level	Rice Farmer Group
Date	August 12th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Angk Sandan Village, Preah Srae Commune, Oudong Me Chey District, Kampong Speu Province
Participants	1. Ms. Youn Pao 2. Ms. Phan Sary

	3. Ms. Sin Sophanny 4. Ms. Sieng Chanthol 5. Ms. Chan Orn 6. Ms. Chan Ngorn 7. Ms. Oun Srey 8. Mr. Uong Muon
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The main challenge is the lack of water and the absence of a dam for water storage. - There is a shortage of water pumps, and farmers must rent them from others, but there are not enough pumps available and often not in time. - Farmers have previously received training from the APSARA company on the use of seeds, fertilizers, and pesticides.
Requests	- There is a desire to build a water reservoir to capture water from the runoff, which could help ensure farmers have water for rice cultivation during the dry season.
Photo	

Consultation Level	Rice Farmer Group
Date	August 14th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Thlea Chas Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	1. Ms. Thiem Lida 2. Ms. Soung Lang 3. Ms. Nom Sarorn 4. Mr. Khut Chou 5. Mr. Mith Rien 6. Mr. Kroun Theam 7. Mr. Soung Som 8. Ms. Soung Sophal
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The issue of water scarcity during the rainy season is caused by damaged gates in the irrigation system, along with climate change affecting the timing of the rainy season. - The community must pay for water usage to pump into the rice fields.

	- Farmers have previously received training on the use of rice seeds.
Requests	- Request assistance in restoring the irrigation system to a deeper level and constructing water storage structures to ensure sufficient water for rice cultivation during the dry season as well.
Photo	

Consultation Level	Rice Farmer Group
Date	August 14th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Souvongs Leu Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	1. Ms. Phat Rorn 2. Ms. Soy Chandy 3. Ms. Rin Channeang 4. Mr. Soy Ny 5. Ms. Khem Yeun
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The irrigation system is too deep, making it difficult to pump water into the rice fields. - Invasion of stem borers during the tillering stage - Farmers in the village have never received any training.
Requests	- Request assistance to make the canals deeper and more manageable for easier water pumping into the rice fields. - Propose constructing a water storage reservoir to store water for use during both the rainy and dry seasons.
Photo	

Consultation Level	Rice Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Chambak Sar Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	1. Ms. Vann Ry 2. Ms. Soun Leang 3. Ms. Kong Sophal

	4. Ms. Soth Kol 5. Ms. Phoung Pet 6. Ms. Ngam Torn
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- There is no water in the canals during the dry season (February). - The cost of labour for land preparation, fertilizers, and pesticides is increasing. - Farmers have never received any training on rice. - Rebuilding the canals could negatively impact the farmers' land, and they may not agree with the plan.
Requests	- It would be better to restore the old canals from the nearby swamp area that are already in place, rather than constructing new ones.
Photo	

Consultation Level	Rice Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Tuek Long Ti Muoy Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	1. Ms. Lach Heang 2. Ms. Dul Lean 3. Mr. Sem Rem 4. Mr. Thai Bunthorn 5. Ms. Ma Sok 6. Ms. Kaorm Phal
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- There is a water shortage, and no irrigation system is in place. - Farmers have never received any training on rice.
Requests	- Request assistance in setting up an irrigation system by creating water channels from the existing reservoir and a new water storage dam, allowing farmers to have sufficient water for dry season rice cultivation.
Photo	

Consultation Level	Rice Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Chambak Thum Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	1. Ms. Taem Na 2. Ms. Tak Saroun 3. Ms. Nov Vorn 4. Mr. Phlaok Vorn 5. Ms. Ouk Sarorn
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- There is a water shortage for rice cultivation. - Climate change issues are affecting crop production. - Invasion of fall armyworm on rice - Farmers have never received any training on rice.
Requests	- Request assistance in constructing secondary canals from the main irrigation system to ensure farmers have enough water for their crops.
Photo	

Consultation Level	Rice Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Prey Veng Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	1. Mr. Sem Chhum 2. Mr. Loa Tob 3. Mr. Kim Song 4. Mr. Soun Yoeurn 5. Mr. Troeng Choek 6. Mr. Sorn Moy 7. Mr. Young Han
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- There is a water shortage for rice cultivation; although there are canals, they do not provide sufficient water. - Farmers have never received any training on rice.

Requests	- Request assistance in creating a canal system connected to the main reservoir to supply water to the village, as the village currently has no usable irrigation system.
Photo	

Results of the Consultations with Rice Farmer Group in Pursat Province

Consultation Level	Rice Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Prasat Village, Rumlech Commune, Bakan District, Pursat Province
Participants	1. Ms. Soeurng Soeurn 2. Mr. Boem Hil 3. Ms. Soeurng Seng 4. Mr. Kon Chantha 5. Mr. Kann Noeurn 6. Mr. Sien Hean
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- There is a shortage of water for rice cultivation during the dry season due to irrigation issues. - Seeds and fertilizers have become more expensive, and counterfeit pesticides are widespread in the market. - There is a lack of capital. - Famers have previously received many training sessions.
Requests	- Request additional technical training on planting techniques. - Request assistance in restoring irrigation to ensure sufficient water during the dry season. - Ask for help in solving the issue of fluctuating rice prices and how to stabilize them. - Request that the Ministry conducts inspections of fertilizers and pesticides in the market to address counterfeit products.
Photo	

Consultation Level	Rice Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong

Farmer Group	Svay Doun Keo Village, Svay Doun Keo Commune, Bakan District, Pursat Province
Participants	1. Mr. Em Kong 2. Mr. Chhut Bunchhai 3. Mr. Kov Keo 4. Ms. Uk Chenda
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The irrigation channels are dry and there is no water because the gate to the water source from the Svay Doun Keo irrigation system is not opened to allow water to flow into the village's irrigation system. - Famers have never received training on rice cultivation.
Requests	- Reviving the old irrigation system in the village would provide sufficient water for rice production, enabling up to three planting seasons per year. - Request the construction of a water gate connecting to the Svay Doun Keo irrigation system to ensure sufficient water for the village.
Photo	

Consultation Level	Rice Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Bat Kokir Thmey Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	1. Mr. Kim Sophal 2. Ms. Tuy Savoeurn 3. Mr. Kim Sak Sakhorn 4. Mr. Khim Soeurn 5. Mr. Net Borey 6. Mr. Meng Chhaoet
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The main issue is the lack of water because the village irrigation system has low water storage, and during the dry season, we must rely on water flowing from the upstream village.

	- There is a lack of capital, as we must purchase seeds and fertilizers on credit, with repayment made after harvest, including an additional 10% interest, which reduces the profit margins. - I have never received training on rice cultivation.
Requests	- To establish a proper water entry and exit system in the village, restore the main irrigation system, and develop a secondary irrigation system to support rice cultivation.
Photo	

Consultation Level	Rice Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Voat Chreae Village, Boeng Khnar Commune, Bakan District, Pursat Province
Participants	1. Mr. Em Pa 2. Mr. Nhim Sophal 3. Mr. Kae Sophal
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The issue is the lack of water because the village's irrigation system has shallow water storage that is insufficient. - There is a lack of capital, as we must purchase seeds and fertilizers on credit, with repayment made after harvest along with interest, which reduces profit margins. - Farmers in the village have never received training on rice cultivation.
Requests	- Restore the old irrigation system from the upper region down to the village and to construct a water dam.
Photo	

Consultation Level	Rice Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Kampang Village, Svay Doun Keo Commune, Bakan District, Pursat Province
Participants	1. Mr. Mai Phorn 2. Mr. Sorng Kimsoeurn

	3. Mr. Long Phalla
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The issue is the lack of water because the village's irrigation system has shallow water storage. - I have previously received training in agriculture and industry. - Farmers support the restoration of the irrigation system in the village.
Requests	- Request that water channels be established along the irrigation system. - Also request the creation of technical agricultural training programs.
Photo	

Consultation Level	Rice Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Ou Ta Paong Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	1. Ms. Ly Neang 2. Mr. Von Morng 3. Mr. Sieng Sokchea 4. Mr. Men Leang 5. Mr. An Roun
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The issue is the lack of water for rice and crop cultivation due to the shallow water storage in the village's irrigation system. - The price of chemical fertilizers continues to rise. - I have never received training on rice cultivation. - Farmers support the restoration of the irrigation system in the village.
Requests	- To request urgent assistance in restoring the irrigation system and water infrastructure.
Photo	

ANNEX 12: RESULTS OF THE CONSULTATIONS WITH VEGETABLE FARMERS

Results of the Consultations with the Vegetable Farmer Group in Kampong Chhnang Province

Consultation Level	Vegetable Farmer Group
Date	August 13rd, 2024
Sub-Scheme	Yutasas
Farmer Group	Svay Pok Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Ms. Sieng Kunthy 2. Ms. Phorn Sron 3. Ms. Sea Lakk 4. Ms. Sim Kun 5. Ms. Hin Yeurn
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Challenges include insufficient rainfall, fungal diseases affecting vegetables, and various pests. - The soil in the village is low in nutrients because it is sandy loam. - The water quality is average, but the irrigation water supply is insufficient during the dry season. - Farmers have received training on vegetable cultivation techniques and composting from the district agricultural office, while some have also learned from online sources. - If water were available in the canal, farmers could pump it into reservoirs, allowing for more cultivation cycles and enabling them to grow a wider variety of vegetables.
Requests	- Please study the height of the Yutasas dam. If it is raised by an additional 30 centimetres, it could ensure an adequate water supply to the canal. - We request the ministry to install metal water gates along canals AB, such as Ta Pring Canal, Ta Nang Canal, and Svay Commune Canal. - Please assist in repairing the roads along both sides of the dam. - If the project implementation affects privately owned land, we request the ministry to consider appropriate compensation. - We also request training on modern agricultural techniques and assistance in finding markets for farmers.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 13rd, 2024
Sub-Scheme	Yutasas
Farmer Group	Kyang Tboung Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Ms. Ek Sokhoeurn 2. Ms. Yem Pol 3. Ms. Pon Sok 4. Ms. Seng Soth 5. Ms. Khim Ry 6. Ms. Tob Bopha 7. Ms. Chhim Khon
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Leafy vegetables are significantly affected by diseases, while fruiting vegetables are impacted by pests and climate variability, with diseases spreading from one farm to another. - The soil quality is good, allowing for high yields, as farmers regularly use cow manure to enrich the soil's nutrients. - The producer group is not heavily impacted by water shortages and can manage the situation effectively. - Market information for agricultural products is provided by vegetable-buying communities. - Previously, the village had a community that collected vegetables from farmers and sold them to supermarkets under clear contractual agreements. However, this was discontinued because farmers believed the prices were too low, and supermarkets required only high-quality vegetables. Now, ordinary traders purchase these vegetables instead. - Farmers have received training on vegetable cultivation techniques, the use of pesticides and fertilizers, drip irrigation systems, composting, and the implementation of good agricultural practices (GAP). - Farmers in the village have substantial knowledge of smart agriculture but practice it to a limited extent. - If additional water systems are available, the producer group plans to expand cultivation areas and grow a wider variety of vegetables.
Requests	- Please restore additional canals and construct water gates to retain water for agricultural use.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Chan Trak Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	9. Ms. Ma Chantha 10. Ms. Nuy Sina 11. Ms. Sem Mao 12. Ms. Sim Sarom 13. Ms. Kai Eang 14. Mr. Prak Heurn 15. Ms. Nhean Sarat 8. Ms. Seng Da
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Challenges include insect pests, low market prices, and climate change issues. - Insufficient water for irrigating vegetable fields, as the irrigation system only reaches about 20% of the village. - Lack of access to modern agricultural techniques due to limited participation in training programs. - If sufficient water is available, farmers are willing to expand their vegetable cultivation area.
Requests	- Request for more wells to be dug or ponds to be constructed, as water scarcity is a significant issue, with most vegetable farming relying on rainwater. - Request to restore canals for water storage.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Trapeang Phkoam Village, Banteay Preal Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Ms. Doung Net 2. Mr. Chhoem Sambath 3. Ms. Leng Sopha 4. Mr. Lach Tong 5. Ms. Neang Soeurn

Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The main challenge is the various worm that damage vegetables. - The quality of well water is acceptable, but the quantity may be insufficient in particularly hot months, especially during May and June. - Farmers have previously participated in training on vegetable cultivation techniques, such as seedling production and crop care. However, they have not received any training on smart agriculture. - If sufficient water is available, it would encourage farmers to grow more vegetables during the dry season and enable year-round cultivation.
Requests	- Request the ministry to restore the canal and conduct a study on how to maintain a consistent water supply in the canal throughout all seasons, as currently, during the dry season, there is no more runoff from the upland areas. - If excavation or construction affects privately owned land, it is requested to consider appropriate compensation for the affected landowners.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Srae Veal Village, Krang Leav Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Ms. Phen Saoroeurng 2. Ms. Sen Sreymom 3. Ms. Phen Vanna 4. Ms. Hun Von 5. Mr. Hun Kear 6. Mr. Hong Thong 7. Ms. Sao Thon
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The main challenges in cultivation are the presence of fall armyworms and some diseases, but these can be managed using self-made organic pesticides. - Water scarcity during the dry season is a significant issue, and the well water used for irrigation contains high levels of sediment.

	- The soil in the area is fertile, leading to good crop growth and high yields. - Farmers have never participated in any formal training programs. - The project could help farmers expand vegetable cultivation from a subsistence level to a commercial scale, thereby increasing agricultural activities and reducing migration to work abroad. - If sufficient water is available, farmers plan to grow new types of vegetables that meet market demands and practice year-round crop rotation.
Requests	- Request the construction of a secondary canal extending into the village, connected to the main canal from the upland area, to provide a shared water resource for the community.
Photo	

Results of the Consultations with the Vegetable Farmer Group in Kampong Speu Province

Consultation Level	Vegetable Farmer Group
Date	August 12nd, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Angk Sandan Village, Preah Srae Commune, Oudong Me Chey District, Kampong Speu Province
Participants	9. Ms. Youn Pao 10. Ms. Phan Sary 11. Ms. Sin Sophanny 12. Ms. Sieng Chanthol 13. Ms. Chan Orn 14. Ms. Chan Ngorn 15. Ms. Oun Srey 16. Mr. Uong Muon
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include insect pests damaging vegetables, low market prices, lack of buyers, and climate change issues. - There is a lack of irrigation water, and water sources are far away. - Farmers have received market information. - The project will help farmers grow vegetables in both the dry and rainy seasons.

	- If sufficient water is available, they plan to farm during the dry season, as it offers quick yields, higher income, and opportunities to expand vegetable cultivation.
Requests	- Construct a water gate from the Krapeu Truom irrigation system - Offer additional training programs related to agriculture.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 13rd, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Khchas Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	1. Ms. Soun Sokny 2. Ms. Muth Chanthoeurn 3. Ms. Khloeng Sophann 4. Ms. Khon Soeurn 5. Ms. Penh Sary
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include insects damaging vegetables and climate change. - Farmers grow a small quantity of vegetables, mostly using organic fertilizers. - There is no issue with irrigation water, as they use clean water from the nearby Krapeu Truom dam. - The government has previously distributed vegetable seeds to famers for cultivation. - If the irrigation system is restored and sufficient water is available, farmers in the village currently have no plans to expand vegetable cultivation but prefer to focus on rice farming during both the dry and rainy seasons due to higher income from rice compared to vegetables.
Requests	- There is a request for the construction of a secondary canal connected to the swamp irrigation system to reach their village.
Photo	

Consultation Level	Vegetable Farmer Group

Date	August 14th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Thlea Chas Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	9. Ms. Thiem Lida 10. Ms. Soung Lang 11. Ms. Nom Sarorn 12. Mr. Khut Chou 13. Mr. Mith Rien 14. Mr. Kroun Theam 15. Mr. Soung Som 6. Ms. Soung Sophal
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include pests, diseases, mealy bugs, extreme heat, lack of farming techniques, and insufficient planting materials. - The soil is generally good, but some areas have poor soil quality due to excessive use of chemical fertilizers. - This year, there is a water shortage during the dry season, whereas in previous years, water was sufficient, and the quality improved when the water level rose. - The provincial department has visited to promote and distribute seeds. - If the Krapeu Truom irrigation system is restored and water is available, farmers may expand vegetable cultivation.
Requests	- A request is made to restore the Krapeu Truom irrigation system and improve the water gate to prevent water leakage. - A request for technical support on farming practices and the proper use of chemical fertilizers.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Lar Village, Brambei Mom Commune, Thpong District, Kampong Speu Province
Participants	1. Ms. Ngin Phan 2. Ms. Ek Hoeurng 3. Mr. Chhit Tonh 4. Mr. Samrit Yem

	5. Mr. Kry Treang
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include an abundance of pests and diseases, extreme heat, and poor soil quality for cultivation. - Water is scarce both during the rainy and dry seasons, and there is high sediment content in the available water. - Vegetable production in the village has limited potential due to the lack of resources, but if sufficient water is available, farmers will expand their production areas.
Requests	- Request for technical training and the provision of seeds. - Request for the provision of organic fertilizers to the community.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Chambak Thum Village, Brambei Mom Commune, Thpong District, Kampong Speu Province
Participants	1. Mr. Rith Sovan 2. Ms. Sang Sokhim
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include extreme hot weather, diseases affecting vegetables, especially cucumbers, and pest problems during certain months, which have not been solved. - The soil used for vegetable cultivation in the village is rich in nutrients. - There is no issue with water scarcity because the farmland of the production group is adjacent to an irrigation canal that flows from the main canal. - Information about popular and high-value vegetables is obtained through traders who purchase them. - The production group has previously participated in study tours on various crops in other provinces. They have also received training related to smart agriculture, which is now being widely implemented. - The farmers do not yet have plans for expanding the cultivated land area.

Requests	- Encouragement is needed for the quick restoration of irrigation canals.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Tuek Long Ti Muoy Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	1. Mr. Sorn Chhean 2. Mr. Lach Lounh 3. Ms. Lach Soeurn 4. Ms. Sorn Keanf 5. Mr. Yang Leng 6. Ms. Chheng Na
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include leaf curl disease and pests, and the soil is not very fertile. - The quality of the water used is good, but the amount of irrigation water is insufficient during the dry season, from February to May. - Farmers learn techniques from other farmers in the village and nearby villages. Additionally, they have received training in poultry farming and vegetable cultivation four times from the Life with Dignity (LWD) organization several years ago. - If there is sufficient water, farmers can grow more vegetables in multiple cycles, expand the cultivated land during the dry season, and attract other farmers from the village to cultivate as well.
Requests	- Help is needed to establish a water storage system in the region to ensure adequate irrigation water during the dry season.
Photo	

Results of the Consultations with the Vegetable Farmer Group in Pursat Province

Consultation Level	Vegetable Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong

Farmer Group	Srah Run Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	1. Ms. Nhim Roeurn 2. Ms. Vann Sary 3. Ms. Phin Siem 4. Ms. Huy Soy 5. Mr. Nhen Sol 6. Ms. Chum Khorn 7. Ms. Chhean Sang 8. Ms. Soun Sitha
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include hot weather, pest disturbances, and fluctuating market prices depending on the traders. - Water scarcity occurs during the dry season. - The farmers' vegetable cultivation land is fertile. - They have never received agricultural information or training on various topics. - If there is sufficient water, the farmers plan to expand their vegetable cultivation.
Requests	- A request is made for the project to provide training on vegetable cultivation techniques, natural pest control methods, and to supply vegetable seeds. Additionally, they are requesting capital if possible.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Prasat Village, Rumlech Commune, Bakan District, Pursat Province
Participants	1. Ms. Sean Soeurn 2. Ms. Bo Sokban 3. Ms. Lorn thy 4. Mr. Kann Noeurn 5. Ms. Chhin Rou
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include fungal diseases, pests, irregular market prices, and climate change. - Water scarcity occurs during the dry season.

	- The farmers' vegetable cultivation land is fertile. - The agricultural information they have received includes seedling propagation, crop care, and irrigation techniques. - The farmers have previously received one training session on vegetable cultivation techniques. - If there is sufficient water, the farmers will expand their cultivation during both the rainy and dry seasons.
Requests	- Provide training in cultivation techniques. - A proposal is made for the project to deepen the water channels to store more water for irrigation. - A request is made for the project to help find markets with reasonable prices.
Photo	

Consultation Level	Vegetable Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Voat Chreae Village, Boeng Khnar Commune, Bakan District, Pursat Province
Participants	1. Mr. Moung Touch 2. Ms. Chou Rath
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The challenges include diseases that cannot be treated, causing total crop failure, fluctuating vegetable market prices, and climate change leading to vegetable diseases. - In the dry season, there is insufficient water for irrigating the vegetables. - The soil quality is not very good, and growing crops requires a lot of fertilizer. However, the soil can be improved by using cow manure. - They have received information about using fertilizers, pesticides, and seeds, but have never participated in any training sessions. - If there is sufficient water, the farmers will expand their cultivation, especially during the dry season.
Requests	- Assistance is needed to restore the main canal and build a water reservoir to store water from the headwaters to ensure water availability throughout the year.

Photo	

ANNEX 13: RESULTS OF THE CONSULTATIONS WITH CHICKEN FARMERS

Results of the Consultations with Chicken Farmer Group in

Kampong Chhnang Province

Consultation Level	Chicken Farmer Group
Date	August 13th, 2024
Sub-Scheme	Yutasas
Farmer Group	Krasang Pul Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Mr. Reun Rith 2. Mr. Chan Sothei
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Poultry farming has been successful because it follows proper techniques and has never failed. - Farmers in the village have a reasonable understanding of poultry health care and can mix natural feed on their own. - Farmers are very satisfied with this type of poultry farming because it is easy and there is ample space for raising chickens. Currently, around 100 households in the village are engaged in poultry farming. - Poultry farming contributes approximately 600,000 riels per month to household income, and farmers intend to continue this activity in the future. - Challenges include extreme heat, occasional chicken illnesses, and missing chickens when left free-range. - It is difficult to find and purchase feed, and feed prices are rising. - The market price for chicken meat is low and depends heavily on middlemen.
Requests	- Farmers request the project to provide poultry farming equipment and materials. - They also request additional technical training. - Farmers would like to have access to high-quality chicken breeds.
Photo	

Consultation Level	Chicken Farmer Group
Date	August 13th, 2024
Sub-Scheme	Yutasas
Farmer Group	Svay Pok Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Mr. Im Van 2. Mr. Meng Dara 3. Mr. Tom Nan 4. Mr. Sam Nim 5. Ms. Nim Ro 6. Mr. Pov Kroeurn 7. Ms. Sam Tha 8. Mr. Hin Voeurn
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The reasons for raising chickens are that it is easy to manage, they are disease-resistant, and they grow quickly, making them ready for sale in a short time. - The types of chicken breeds being raised are Sampov and Skouy chicken varieties. - Poultry farming can contribute approximately 1 million riels per month to household income. - Farmers in the village are satisfied with this poultry farming, with 219 households currently engaged in it, and they intend to continue in the future. - The challenges include a lack of technical knowledge in poultry farming. - Extreme heat causes the chickens to scratch the ground excessively and fall ill. - Sometimes it is difficult to find markets, and the price of chickens heavily depends on middlemen.
Requests	- A request is made for the department to conduct more frequent technical training, provide vaccines, poultry farming equipment, and high-quality chicken breeds for raising.
Photo	

Consultation Level	Chicken Farmer Group
Date	August 13th, 2024
Sub-Scheme	Stoeung Krang Bat

Farmer Group	Oknha Pang Village, Longveak Commune, Kompong Tralach District, Kampong Chhnang Province
Participants	1. Mr. Korng Kearn 2. Ms. Chhun Sreythum
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Poultry farming is going well because it is easy to manage, the breeds are readily available, they grow quickly, and the breeds are reasonably priced. - Poultry farming contributes approximately 600,000 to 800,000 riels per month to household income and helps support children's education. - Poultry farming is not very popular among farmers in the village, with only about 10 households currently engaged in it. The main reason for its low popularity is the perception that chickens often get sick and die quickly, the selling price is low, and there is limited market demand, except during festive seasons. - Challenges include frequent illnesses and high mortality rates among chickens, a lack of high-value chicken breeds, and the absence of a poultry farming community in the area.
Requests	- A request is made for the government to help establish a poultry farming community in the region. - They also request training in poultry farming techniques, the provision of farming materials and supplies, and access to high-value chicken breeds for better market opportunities.
Photo	

Consultation Level	Chicken Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Trapeang Mlu Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	1. Mr. Kim Huot 2. Ms. Hem Nary 3. Ms. Lang Mom 4. Ms. Em Sophearath 5. Mr. Pon Thouch 6. Mr. Yim Chea 7. Mr. Seb Oeurn
Moderator	Mr. Ly Visoth

Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Poultry farming is successful because it is easy to manage, can be done within the household premises, requires minimal labour, and provides both food for the family and an income from sales. - Poultry farming contributes about 30% to household income. - Poultry farming is not very popular among villagers, with only about 10 to 15 households currently engaged in it. - Most villagers are not interested in poultry farming because large-scale farming requires close supervision, and those who raise chickens are mostly elderly people with limited physical capacity. - The main challenge is chicken diseases.
Requests	- They request the CAISAR project to be established to ensure sufficient water supply for rice cultivation and for raising ducks and chickens by the farmers.
Photo	

Consultation Level	Chicken Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lum Hach
Farmer Group	Trapeang Phkoam Village, Banteay Preal Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Ms. Leas Vean 2. Ms. Kaoet Sae 3. Ms. Thuch Sarin 4. Mr. Phann Sarath 5. Mr. Boeur Sinat
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Most of the poultry farming in the village is free-range, with chickens raised both for sale and for household consumption. - Poultry farming contributes only a small amount to household income. - Almost all households in the village raise chickens, but the majority do so mainly for their own consumption. - Challenges include chickens catching colds and dying in large numbers during the rainy season, and extreme heat causing illness and mortality as well.
Requests	- A request is made for additional technical training and access to better chicken breeds.

Photo	

Results of the Consultations with Chicken Farmer Group in Kampong Speu Province

Consultation Level	Chicken Farmer Group
Date	August 13th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Khchas Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	1. Ms. Roeurn Siem 2. Mr. Khen Sokha 3. Ms. Son Saoly 4. Ms. Kann Tonglim
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The reasons for raising chickens include ease of care, low susceptibility to diseases, minimal maintenance requirements, and convenience in feeding. - Raising chickens can somewhat improve household livelihoods by supporting children's education and providing food. However, villagers are not fully satisfied with the income generated. - Farmers in the village are not keen on raising chickens due to a lack of labour force, as most chicken raisers are elderly. - Challenges include chicken diseases, lack of technical knowledge, and limited market access.
Requests	- Request for technical training programs on chicken raising in the village. - Restore the Krapeu Truom irrigation system to ensure sufficient water supply.
Photo	

Consultation Level	Chicken Farmer Group
Date	August 14th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Thlea Chas Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	1. Mr. Phorn Sophal 2. Mr. Sorn Siengly

	3. Mr. Dong Duy 4. Mr. Hai Venghong 5. Ms. Chey Say
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Most villagers raise chickens naturally, with minimal care, primarily for consumption and occasional sales. - Income from chicken raising is modest, and there are no clear future for expanding this activity. - Only about 50 households in the village are currently raising chickens. - Challenges include limited market access, low selling prices, and the absence of buyers. Additionally, when raising many chickens, the lack of technical knowledge leads to high mortality rates. - Climate change has caused chickens to become sick and die. - The chicken breeds being raised are slow growing, have low body weight, and are prone to diseases.
Requests	- There is a need for technical training on chicken farming and breeds that are more resilient to climate change. - Reduce water costs from the Krapeu Truom irrigation system.
Photo	

Consultation Level	Chicken Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Chambak Thum Village, Brambei Mom Commune, Thpong District, Kampong Speu Province
Participants	1. Ms. Sorn Sreymom 2. Ms. Hon Davy 3. Ms. Muong Vansorn 4. Ms. Vann Sreymom 5. Ms. Huon Hai
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Raising chickens contributes to the household economy by helping pay for utilities, covering some school expenses for children, and purchasing feed for the chickens. - However, villagers are not satisfied with the income because of low selling prices and a lack of buyers, leading to unclear plans for expanding chicken farming in the future.

	- Approximately 100 households in the village engage in chicken farming due to its ease of management, with chickens raised for both consumption and sale. - During the dry season, chicken farming faces fewer challenges, but in the rainy season, issues arise such as outbreaks of avian influenza and increased mortality due to heavy rains.
Requests	- Additional technical training on chicken farming is requested.
Photo	

Consultation Level	Chicken Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Lar Village, Brambei Mom Commune, Thpong District, Kampong Speu Province
Participants	1. Mr. Ya Yan 2. Mr. Pin Nak 3. Ms. Ek Hun 4. Mr. Ek Horn 5. Mr. Soeng
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The reasons for raising chickens include ease of care, non-selective feeding, fast growth for quicker sales, disease resistance, easy access to breeds, and abundant market opportunities. - Chicken farming can significantly improve household livelihoods and occasionally provides food for the family. Farmers plan to continue raising chickens in the future. - The average income from chicken farming is around 200,000 riels per month. - Approximately 150 households in the village engage in chicken farming. - Challenges include a lack of capital to purchase additional chicken breeds, insufficient technical knowledge, and difficulty in sourcing necessary farming materials.
Requests	- The villagers request the relevant department to conduct technical training on chicken farming in the village. - They also seek project support for providing feed, vaccines, quality chicken breeds, coops, and other essential farming materials.
Photo	

Results of the Consultations with Chicken Farmer Group in Pursat Province

Consultation Level	Chicken Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Srah Run Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	9. Ms. Nhim Roeurn 10. Ms. Vann Sary 11. Ms. Phin Siem 12. Ms. Huy Soy 13. Mr. Nhen Sol 14. Ms. Chum Khorn 15. Ms. Chhean Sang 16. Ms. Soun Sitha
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- The reasons for raising chickens include ease of care, fast growth, non-selective feeding, and abundant market opportunities. - Chicken farming has contributed to household income, and farmers plan to continue it in the future to improve their livelihoods. - Approximately 150 households in the village are engaged in chicken farming. - Challenges include extreme heat, which causes high chicken mortality. - The market price is unstable, and farmers lack the capital to buy chicken breeds and have limited technical knowledge.
Requests	- Additional technical training on chicken farming is requested. - Support is needed in the form of capital, farming materials, and quality chicken breeds.
Photo	

Consultation Level	Chicken Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Oknha Moan Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	1. Ms. Hun Chan

	2. Ms. Voeurn Phal 3. Ms. Thy Channa 4. Ms. Khin Niem 5. Mr. Thoeng Chantha
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Chicken farming in the village follows a family-based, traditional approach, with insufficient feed, no vaccinations, and occasional outbreaks of disease (in December-January and June). - Chicken farming is easy to manage, leads to fast growth, has high demand, requires low initial investment, and minimal maintenance. - Almost every household in the village raises chickens, as it contributes to household income and provides food. - Challenges include chicken diseases, extreme weather (both hot and cold), which cause high mortality rates. - There is a lack of technical knowledge and experience, which discourages farmers from raising larger numbers of chickens. - Farmers face a shortage of capital to expand their poultry farming. - If the Ou Ta Paong irrigation system is implemented and sufficient water is available, farmers could pump water into ponds at home to ensure a steady supply of drinking water for chickens and other animals.
Requests	- Assistance is requested to provide more training in chicken farming techniques and to supply quality chicken breeds.
Photo	

ANNEX 14: RESULTS OF THE CONSULTATIONS WITH DUCK FARMERS

Results of the Consultations with Duck Farmer Group in Kampong Chhnang Province

Consultation Level	Duck Farmer Group
Date	August 13th, 2024
Sub-Scheme	Yutasas
Farmer Group	Krasang Pul Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Mr. Vann Chhai 2. Mr. Pou Art 3. Mr. Chann Sothei
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is easy to manage, with ducks eating almost any feed, being resistant to diseases, growing quickly for sale, having a short production cycle, and being easier to raise than chickens. - Farmers are satisfied with duck farming as it helps solve some livelihood issues in the present, and they plan to continue if there is access to better markets with higher prices in the future. - The average monthly income from duck farming is 500,000 riels. - Only 4 households in the village are currently raising ducks. - Challenges include falling market prices, difficulty in receiving payment from buyers, and a lack of capital.
Requests	- Farmers request the project to help find better markets for their products. - The project is also requested to provide additional technical training on duck farming.
Photo	

Consultation Level	Duck Farmer Group
Date	August 18th, 2024
Sub-Scheme	Yutasas
Farmer Group	Svay Pok Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Mr. Norn Thoeurn 2. Mr. Norn Kroun

Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming operates well and is easy to sell the products. - Duck farming helps address some livelihood issues in the present, and farmers plan to continue raising ducks in the future. - The average monthly income from duck farming is 300,000 riels. - There are not many farmers in the village engaged in duck farming, with only 5 households involved. - Challenges include high mortality rates and a lack of technical knowledge on duck farming. - Farmers face a shortage of capital and lack the means to purchase more ducks for farming. - Market prices are low, and traders set the prices.
Requests	- Provide technical training on duck farming, as the farmers' knowledge is still limited.
Photo	

Consultation Level	Duck Farmer Group
Date	August 13th, 2024
Sub-Scheme	Yutasas
Farmer Group	Kyang Khang Tboung Village, Svay Commune, Sameakki Mean Chey District, Kampong Chhnang Province
Participants	1. Ms. Pak Maly 2. Ms. Ek Yiem
Moderator	Miss Yeab Dalin
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming operates well with low disease incidence, is easy to manage, and produces heavy ducks. It requires fewer vaccinations and low feed costs. - Duck farming helps improve livelihoods to some extent, but in the future, farmers may stop raising ducks due to a lack of labor to care for them. - There are only 9 households in the village raising ducks, as most farmers are busy with crop farming, and some families face a shortage of labour. - Challenges include the lack of market access and traders defaulting on payments.

	- When diseases affect the ducks, they are hard to treat, and the disease spreads quickly, leading to high mortality rates. However, outbreaks are not frequent.
Requests	- Restoration of the main canal connected to the irrigation system is needed. - Restoration the irrigation system as soon as possible.
Photo	

Consultation Level	Duck Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Krang Leav Village, Krang Leav Commune, Rolea B'ier District, Kampong Chhnang Province
Participants	1. Ms. Prak Borany 2. Ms. Um Theary 3. Ms. Ing Thy 4. Ms. Min Siphoan 5. Ms. Soam Youn
Moderator	Miss Chhim Sreytouch
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is easy to manage and sell. - Farmers are satisfied with duck farming as it helps solve some livelihood issues in the present, and they plan to continue in the future. - Only 37 households in the village are raising ducks. - Challenges include a shortage of water sources, limited market prices, lack of technical knowledge, and low levels of expertise. - Ducks are prone to diseases and high mortality rates due to extreme heat. - Efforts to care for ducks are challenging, especially during the rainy season. - Traditional medicines can be used to treat sick ducks.
Requests	- Farmers request the restoration of irrigation ponds to provide water for agriculture and animal husbandry. - They also ask the Ministry to help find markets and increase stable prices. - Farmers request technical assistance for duck farming, vaccines, and quality duck breeds.
Photo	

Consultation Level	Duck Farmer Group
Date	August 15th, 2024
Sub-Scheme	Lumhach
Farmer Group	Krang Skear Khang Tboung Village, Krang Skear Commune, Teuk Phos District, Kampong Chhnang Province
Participants	1. Ms. Chann Ngorn 2. Ms. Ul Chanthoeurn 3. Mr. Seng Hak
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming operates well, is easy to manage, and ducks grow quickly, making them easy to sell. - Villagers raise ducks on a family basis, which allows them to earn about 25% of their household income compared to other livelihoods. - Duck farming in the village is considered a supplementary activity. - Most farmers in the village do not prefer raising many ducks due to the need for more breeds, large fields, and daily care. Currently, young people tend to work in factories or other jobs, leaving only women and elderly people to manage farming activities like vegetable cultivation and family-based duck farming. - Challenges include a lack of market access, with buyers taking a long time to purchase, especially during the holiday season. - Ducks are sold at very low prices. - There is a lack of technical knowledge in duck farming.
Requests	- Training on duck disease treatment methods and providing farming materials such as pens, nets, and assistance in finding markets for selling ducks is needed.
Photo	

Consultation Level	Duck Farmer Group
Date	August 18th, 2024
Sub-Scheme	Stoeung Krang Bat
Farmer Group	Trapeang Chambak Village, Longveak Commune, Kompong Tralach District, Kampong Chhnang Province
Participants	1. Mr. Korng Sarin 2. Ms. Soun Sopheap 3. Mr. Hit Sophin

	4. Mr. Khoem Savuth
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is successful, easy to manage, and can be done around the household. It requires little labour, is easy to raise, and the ducks eat a variety of food with low expenses. - Villagers raise ducks on a family basis, for both consumption and sale, with about 25% of their household income coming from this activity compared to other livelihoods. - Duck farming in the village is considered a supplementary activity. - Most farmers in the village do not prefer raising many ducks due to the need for large areas of land and intensive care. Nowadays, the younger generation tends to work in factories, while only women and the elderly remain at home for farming and family-based duck farming. - Challenges include the high temperatures causing diseases in ducks and a lack of technical knowledge on duck farming and disease treatment methods.
Requests	- The community hopes that the CAISAR project will be implemented to provide sufficient water for irrigation and duck farming, benefiting farmers in the area.
Photo	

Results of the Consultations with Duck Farmer Group in Kampong Speu Province

Consultation Level	Duck Farmer Group
Date	August 13th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Khchas Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	1. Ms. Loeurn Samhak 2. Mr. Tut Chanthoeurn 3. Mr. Khon Sroeun 4. Ms. Khloeng Sophan 5. Ms. Penh Sary 6. Ms. Soun Sokny
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is successful with no significant problems, as it is easy to manage and can be done in the backyard with minimal labour.

	Ducks are resistant to diseases, and feed costs are low because they do not require selective feeding. - Villagers raise ducks on a family basis, for both consumption and sale. They can generate about 15% of their household income from duck farming compared to other livelihoods. - Villagers are satisfied with duck farming because it requires minimal expenditure, and the ducks can be sold for a decent profit. - Duck farming in the village is seen as a supplementary activity for villagers. - Currently, only 10 households in the village raise ducks out of more than 200 farming households. Most villagers prefer to work in factories, and only women and the elderly stay at home to engage in farming and duck raising. - Challenges include heat causing diseases like avian cholera, as well as a lack of technical knowledge in duck farming and disease treatment methods.
Requests	- Provide more training on duck farming techniques in the village to improve knowledge and skills.
Photo	

Consultation Level	Duck Farmer Group
Date	August 14th, 2024
Sub-Scheme	Krapeu Truom
Farmer Group	Souvongs Leu Village, Veal Pong Commune, Oudong Me Chey District, Kampong Speu Province
Participants	1. Ms. Phat Rorn 2. Ms. Soy Chandy 3. Ms. Rin Channeang 4. Mr. Soy Ny 5. Ms. Khem Yeun
Moderator	Miss Hak Leakhina
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is not very successful due to the lack of a market; it is difficult to sell ducks, and the buying process takes a long time. - Villagers are not satisfied with the income from duck farming because they are not making much profit. - Duck farming is done on a family basis in the village for both consumption and sale, generating about 5% of household income compared to other livelihoods.

	- Most villagers are not interested in raising ducks because it requires large space, multiple breeds, and daily care. Currently, younger adults work in factories or other jobs, while only elderly people and women stay at home to engage in farming and raising ducks. - Challenges include ducks getting sick (such as avian cholera) and a lack of technical knowledge on duck farming and treatment methods.
Requests	- Provide training on duck farming techniques in the village to improve knowledge and skills.
Photo	

Consultation Level	Duck Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Chambak Sar Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	1. Ms. Yun Savoeurn 2. Mr. Von Sambath 3. Mr. Mom Pov 4. Ms. Soth Korn 5. Mr. Hem So 6. Mr. Phon Soth
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is going well, easy to manage, and can be done in a small space such as a backyard. It requires minimal labour, is disease-resistant, and has low feed costs since ducks are not picky eaters. The ducks are raised both for consumption and sale. - Villagers practice small-scale family-based duck farming, keeping some for-home consumption and selling the rest, which contributes around 10% of household income compared to other sources. - However, they are not fully satisfied with the income from duck farming as it provides limited profit. - Most farmers in the village are not interested in large-scale duck farming, as it requires a lot of space, daily care, and is challenging to manage disease outbreaks when they occur. Farmers prefer clean areas for gardening, and they don't want to mix livestock farming with crop cultivation. - Currently, younger adults work in factories, while elderly people and housewives are mainly responsible for farming and duck raising at home.

	- The challenges include frequent disease outbreaks, especially during hot and rainy seasons, and a lack of technical knowledge on duck farming and treatment methods.
Requests	- A request is made for training on duck farming techniques to help improve skills and manage diseases more effectively.
Photo	

Consultation Level	Duck Farmer Group
Date	August 14th, 2024
Sub-Scheme	Brambei Mom
Farmer Group	Tuek Long Ti Muoy Village, Roung Roeang Commune, Thpong District, Kampong Speu Province
Participants	1. Ms. Sok Sarom 2. Mr. Thai Siem 3. Mr. Soy Lang 4. Mr. Mes Thoeurn
Moderator	Mr. Ly Visoth
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is going well, easy to manage, grows quickly, ducks are not picky eaters, and are disease resistant. Ducks can be sold regularly, and it requires minimal time for care. - There are few villagers interested in raising ducks, with only 6 families doing so. This is mainly because duck farming requires large spaces for them to roam, so farmers with small plots of land do not engage in it. - The farmers are not fully satisfied with the income from duck farming, as it still provides limited returns. - The main challenges are the lack of a consistent market and no buyers willing to guarantee purchases. - When disease outbreaks occur, they result in the loss of all ducks. - There is a lack of technical knowledge on duck farming and treatment methods.
Requests	- Provide more training on duck farming techniques to improve knowledge and address disease management.
Photo	

Results of the Consultations with the Duck Farmer Group in Pursat Province

Consultation Level	Duck Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Kampang Village, Svay Doun Keo Commune, Bakan District, Pursat Province
Participants	1. Mr. Pat Pov 2. Ms. Chin Voeurn 3. Ms. Loat Phung
Moderator	Miss Sothy Chantana
Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is going well, it is easy to manage, grows quickly, ducks are not picky eaters, and are disease resistant. It is possible to raise them in the backyard. - However, the income is not satisfying because of high expenses and low selling prices. Duck farming contributes only 5% to the household income. - There are few villagers involved in duck farming, with only 4 families participating. - Most farmers in the village are not interested in raising ducks because it requires a large area of land and daily care. - Currently, most of the young people with strength are working in factories, while only housewives and the elderly stay at home for farming and raising ducks on a family scale. - The main challenge is that diseases arise during the hot months. - There is no treatment method, and ducks that fall ill often die. - There is a shortage of funds to buy feed.
Requests	- Provide more additional training on duck farming techniques.
Photo	

Consultation Level	Duck Farmer Group
Date	August 16th, 2024
Sub-Scheme	Ou Ta Paong
Farmer Group	Ou Ta Paong Village, Ou Ta Paong Commune, Bakan District, Pursat Province
Participants	1. Mr. Nhim Nhenh 2. Ms. Chorn Nan 3. Ms. Nhenh Channy 4. Mr. Sao Bunthoeurn
Moderator	Miss Sothy Chantana

Consultation Topics	The Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) project
Perceptions and concerns	- Duck farming is going well, it is easy to manage, ducks are not picky eaters, disease-resistant, and can be raised in the backyard with minimal labour. Ducks are raised both for consumption and for sale. - However, the income from duck farming is not satisfactory due to high expenses, low selling prices, and the income only contributing about 15% to the household. - There are not many villagers involved in duck farming, with only 12 families participating. This is because raising more ducks requires a lot of care, and most of those who farm ducks are elderly and do not have much strength. - The main challenges include diseases (such as duck plague) occurring during the hot and rainy months, as well as the ducks' damaging crops in the yard. - There is no treatment method available, and sick ducks often die.
Requests	- The villagers would like the CAISAR project to be implemented to ensure sufficient water for agriculture and duck farming.
Photo	

ANNEX 15: STANDARD OPERATION PROCEDURE (SOP) FOR LAND CLEARING AND REHABILITATION

Standard Operating Procedures (SOP) for Land Clearing and Rehabilitation[12]

Roles and Responsibilities

This SOP applies for PMU, CSC, contractors, subcontractors, and any other associated organizations.

8. **PMU:** Oversees the implementation of this SOP, ensures compliance with environmental regulations and lender requirements, and facilitates inter-agency coordination.
9. **CSC:** Provides technical supervision and guidance to the contractor, monitors compliance with this SOP, and ensures environmental safeguards are implemented effectively.
10. **Contractor:** Responsible for executing land clearing and rehabilitation activities in accordance with this SOP and relevant contracts.

[12] This SOP has been adapted from good international industry practices such as the *Biodiversity Management Plan (BMP) Upper Cisokan Pumped Storage Hydropower, PT PLN (Persero), Master Development Unit – UIP JBT I, April 2021*, among others.

11. **Subcontractors:** Responsible for performing specific tasks as delegated by the contractor and in compliance with this SOP.
12. **CSC Project Ecologist/Biodiversity Expert:** Provides expert advice on biodiversity protection, habitat restoration, and wildlife management.
13. **Wildlife Expert:** Conducts wildlife surveys, identifies sensitive areas, and provides guidance on wildlife relocation and protection.
14. **Botanist:** Identifies and assesses plant species for potential use in rehabilitation efforts and oversees plant propagation and transplanting.

Background

This implementation procedure for land clearing and rehabilitation provides direction for avoiding and if cannot be avoided, for minimizing negative impacts on biodiversity during the construction Phase. The clearing procedures take into account the types of wildlife that exist in the project site and in surrounding areas, the key species that the project aims to protect, and the impacts anticipated from vegetation clearing. In addition, the procedures consider the features of existing vegetation in the route, specifically on key areas identified in the Biodiversity Baseline Survey (2023).

Objective

This SOP aims to:

5. Ensure that the implementation of land clearing is in accordance with the requirements of environmental management required by the Lender in accordance with Cambodian Regulations.
6. Minimize the negative impacts of land clearing on biodiversity, particularly the reduction in the number of species and number of individuals of protected wildlife (see Table 3 in section 4.2.3 of the biodiversity report).
7. Minimize the negative impact from land clearing on habitat connectivity by minimizing fragmentation where possible maintaining canopy connectivity across cleared areas.
8. Maximize the use of various types of seedlings and saplings of plants that exist in areas prior to land clearing to be planted back in areas that need to be rehabilitated (e.g., spoil banks).

Phasing of land clearing SOP

Land clearing procedures are divided into several distinct Phases:

- **Preparation Phase**: Intended for land clearing planning, notification of clearing procedures to the contractors/subcontractors, and training for contractors/subcontractors and workers to ensure SOP is fully understood. The location and management of tree nurseries also need to be determined at this stage.
- **Pre-clearing Phase**. Areas that will not be cleared are clearly demarcated on the ground to ensure that no forest areas or trees are damaged beyond what has been planned. Within the areas scheduled for clearing, any trees with endangered or protected wildlife (e.g., nesting birds) are marked, as well as underground burrows or other places currently used by wildlife. Input from the Project Management Consultant's (PMC) Ecologist/Biodiversity Expert is required to determine next steps regarding the safe relocation of these animals. At this stage, seedlings, and saplings with the potential for habitat enrichment will be collected, moved to the tree nurseries and properly maintained.

- **Clearing Phase**: Intended to ensure that the felling of trees will not damage vegetation bordering on clearing areas by careful directional felling. This coincides with PMU and contractors what refer to as the land clearing, clearing and grubbing, and excavation works.
- **Post-clearing Phase:** Seedlings and saplings that have been maintained in tree nurseries are planted back in areas designated for rehabilitation (e.g., spoil banks) or reforestation (temporary access roads, worker camps, quarry areas, etc.). Wildlife monitoring programs are implemented both in areas adjacent to land clearing sites and in rehabilitation/reforestation zones.

Preparation Phase Management Actions

PMU shall establish a land clearing project team responsible for land clearing implementation. This project team consists of environmental inspectors, wildlife experts, plant experts, ecological/conservation experts.

Task of the land clearing project team are:

8. The Contracted Service Construction (SCS)-Project Ecologists determine the priority of the clearing block (at all locations across the project site, but especially when land clearing will happen in or near the forest and natural habitat area) and determine which trees will be cleared. Also, the CSC-Project Ecologists can temporarily stop clearing activities when negative impacts on wildlife could occur. The CSC-Project Ecologists generally provides direction to the contractor regarding the rules that must be obeyed.
9. A wildlife expert is tasked to observe whether or not the clearing block is being used by wildlife. The results of these inspections are reported to the CSC-Project Ecologists.
10. A botanist is tasked to note the presence of plant seedlings and saplings which have the potential for habitat rehabilitation. The results of these observations are reported to the CSC-Project Ecologists, and decisions are then made about which plants need to be taken to the tree nursery.
11. The contractor shall prepare a local tree nursery site for keeping the seedlings and saplings of plants, hire people to maintain plants in the nursery, and provide means to water plants to maximize survival.
12. The contractor shall set up a central information center for dealing with any human-wildlife conflict issues, as well as a place for public complaints about clearing. The center should be placed in a strategic location near the closest settlement, for example in the Village Hall, local school, health centers, etc.) and can be the same center as used for managing project grievances.
13. The contractor is responsible for preparing and installing signs on animals crossing points and providing information to workers about a total ban on hunting or collecting. PMU, PMC, PSC will all support the contractor to do this.
14. The CSC-Project Ecologists shall conduct an evaluation to ensure that the preparation stage has been properly implemented.

Pre – Clearing Phase Management Actions

7. The wildlife expert marks all trees that are used by wildlife with yellow paint. This includes trees with hollows or ground burrows used for nesting or sleeping. Active ground burrows are marked by yellow stakes. Marked trees are not cut down before it can be ascertained with confidence that the animals have left. Similarly no clearing or

soil works are allowed in a radius of five (5) meters from an active burrow until the animal has left it.

8. The contractor is responsible for the collection of seedlings and saplings of potential for habitat enrichment as identified by the botanist in the preparation Phase. Training will be given as required to ensure that there is maximum success rate with translocated plants. Seedlings and saplings will be moved in polybags with minimal disturbance of root systems. The plants are moved to a local nursery site, equipped with shade cloth and close to a permanent water source from where the plants can be easily watered. Sufficient competent workers are hired to ensure plants are kept alive until the time of planting. In the reservoir area (area to be inundated) nurseries are established close to the river to facilitate watering. Once the location of the greenbelt has been determined, seedling and saplings are planted at the start of the rainy season when survival chances are highest.
9. The contractor shall prepare the project area and physically demarcate clearing block boundaries with clear stakes at an interval of 25 meters to avoid unnecessary damage to soils and trees in the area adjacent to work sites.
10. The contractor shall install signs to ban hunting or catching of wildlife in the area.
11. Wildlife experts need to identify places where culverts, rope bridges and other structures are to be installed.
12. The CSC-Project Ecologists and wildlife expert need to ensure that all action items scheduled for the pre-clearing Phase have been carried out.

Clearing Phase Management Actions (i.e., land clearing, clearing and grubbing, and excavation)

9. The CSC-Project Ecologists must ensure that the contractor and workers (local supervisor level) have received clearance and guidance or training on clearing procedures that should be implemented.
10. Trees marked with yellow are not felled before a wildlife expert has ensured that the tree is not being used by animals. Similarly, trees or burrows that are used by animals need to be protected from clearing activities until a wildlife expert has confirmed that no animals remain.
11. Felling of trees should be directed towards the clearing area to prevent damage to trees that will remain standing.
12. Hollow tree that have been felled (and have no commercial value), should be left in the remaining forest area as these provide important microhabitats for a range of wildlife species.
13. Any animals hurt during the land clearing process (despite the above precautions) should be
    handed over to the rapid response wildlife management unit (Forestry Administration, Phnom Tamao Wildlife Rescue Centre, or Angkor Centre for Biodiversity Conservation). After the animal has been brought back to health, it is released back into the area. If they are endangered or critically endangered species then the individual will be monitored.
14. After each block is completed, a wildlife expert should make a clearing report which contains:
    - The type and number of individual seedlings and saplings of plants taken to be maintained in a nursery.
    - The type and number of animals found during clearing, as well as the direction of movement of animals. Including the number of bird's nest containing eggs or young birds.
    - The type and number of animals to be treated.
    - The number of suspected hollow tree inhabited by wildlife.
    - The number of locations used by ground animals (as nests or shelter).

- The number of damaged trees located in the area adjacent to the block clearing and embankment areas.

15. To prevent bush fires, any activities that could potentially cause a fire are prohibited including making a fire or discarding cigarette butts. The contractor is responsible for training staff regarding fire risk, and maintaining a trained firefighting squad.
16. The CSC-Project Ecologists and wildlife expert need to ensure that all action items scheduled for the clearing Phase have been carried out.

Post-clearing Phase Management Actions

6. The CSC-Project Ecologists ensures that wildlife monitoring takes place (refer to **Section 9.2.3 of the ESCIA Report**).
7. All exposed areas (roadsides, cuttings, laydown areas, spoil banks, etc.) shall be replanted as soon as practical following earthworks / construction / end of temporary use. The contractor shall follow the BMP, and seek input from wildlife and botanical experts, with respect to the types of plants that should be replanted (based on the location, slope, and long-term land use).
8. With input from wildlife and botanical experts areas for habitat enrichment planting or reforestation are selected and at the right time of the year (start of the rainy season) trees from tree nurseries are transplanted to new areas.
9. For at least the first and second year, all planted trees need to be monitored (and replaced if dead), watered (if needed) and kept free from weeds, climbers and other plants that inhibit their growth. This work is best done in collaboration with local authority, NGOs, and local communities, as needed.
10. The CSC-Project Ecologists and wildlife expert need to ensure that all action items scheduled for the post-clearing Phase have been carried out.

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 21 A. Annex 13 Cofinancing Letter Aiib Caisar 23012025

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

ASIAN INFRASTRUCTURE INVESTMENT BANK

Beijing, January 23, 2025

To:

International Fund for Agricultural Development (IFAD)
Via Paolo di Dono, 44, 00142 Roma
Italy

and

The Green Climate Fund (GCF)
175, Art Center-daero
Yeonsu-gu, Incheon 22004
Republic of Korea

Re: Climate Adaptive Irrigation and Sustainable Agriculture for Resilience Project (CAISAR) in Cambodia

To whom it may concern:

The Asian Infrastructure Investment Bank (AIIB) understands that the International Fund for Agricultural Development (IFAD) is currently contemplating the CAISAR Project in Cambodia (the "Project") that was proposed to the Green Climate Fund (GCF) for funding.

The Asian Infrastructure Investment Bank ("we" or "AIIB") is pleased to confirm its interest in participating in the financing of the Project in an amount of up to one hundred million United States Dollars (USD 100,000,000).

This letter does not constitute a promise to finance, including without limitation, an offer or commitment to provide financing to the Project, and does not create (and it shall not be deemed to have created) any binding or enforceable obligations of AIIB. Any financing to be provided by AIIB remains conditional on the findings of the project appraisal and satisfactory due diligence, and subject to review and approval processes of AIIB, and arrangements or agreement to be concluded with the Kingdom of Cambodia (the Borrower).

The disclosure of the information with respect to the Project contemplated herein will be made in accordance with AIIB's policies on access to information.

Nothing in this letter shall be construed as a waiver, renunciation or other modification of any privileges, immunities or exemptions of AIIB accorded under the Articles of Agreement of AIIB, the Headquarters Agreement between the Government of the People's Republic of China and AIIB, international convention or any applicable law.

ASIAN INFRASTRUCTURE INVESTMENT BANK

Sincerely yours,



Acting Chief Investment Officer

Public Sector (Region 1) and Financial Institutions and Funds (Global) Clients

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 21 B. Annex 13 Cofinancing Letter Rgc Caisar 1702025

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

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ជាតិ សាសនា ព្រះមហាក្សត្រ
KINGDOM OF CAMBODIA
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ក្រសួងសេដ្ឋកិច្ច និង ហិរញ្ញវត្ថុ
MINISTRY OF ECONOMY AND FINANCE
N°.1293...MEF/..GDICDM

Phnom Penh, 17 February 2025

Ms. Reehana Rifat Raza
Regional Director, Asia and the Pacific Division
International Fund for Agriculture Development (IFAD)
Via Paolo di Dono, 44, 00142 Roma, Italy

and

Green Climate Fund (GCF)
G-Tower, Songdo Business District,
175, Art Center-daero, Yeonsu-gu, Incheon 22004, Republic of Korea

Subject: Co-financing Commitment Letter for the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project in Cambodia

Dear Ms. Reehana Rifat Raza and the Green Climate Fund,

The Ministry of Economy and Finance is pleased to express our commitment to support the CAISAR Project in Cambodia that has been proposed to the GCF for funding.

With this, we hereby confirm the in-kind contribution of USD 15,000,000.00 to co-finance the CAISAR Project, should the proposal be approved by the Asian Infrastructure Investment Bank, IFAD, and the GCF.

Nonetheless, this letter does not constitute a legally binding commitment of any kind, as the final approval of the co-financing is subject to the Government of the Kingdom of Cambodia's legal, budgetary and policy considerations, as per applicable procedures.

Please accept, Ms. Reehana Rifat Raza and the GCF, the assurances of our consideration.

Sincerely yours,

Dr. Aun Pornmoniroth
Deputy Prime Minister
Minister of Economy and Finance

ផ្លូវលេខ ៩២ សង្កាត់វត្តភ្នំ ខណ្ឌដូនពេញ រាជធានីភ្នំពេញ កម្ពុជា
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ទូរស័ព្ទ: (+៨៥៥) ២៣ ៨៩០ ៦៦៦
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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: 21 C. Annex 13 Commitment Letter Ifad Caisar 2 Signed

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

IFAD
Investing in rural people

06 January 2025

Re: Co-financing Commitment Letter for the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project

Excellency and Representative of the Green Climate Fund,

I am writing to you to express our commitment to support the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) Project that was proposed to the Green Climate Fund (GCF) for funding.

This is to confirm the loan contribution of the International Fund for Agricultural Development (IFAD) to co-finance the Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR), will be approved, with a total value of 45 million USD (forty-five million US Dollars).

Kindly note that this letter does not constitute a legally binding commitment of any kind, as the final approval of the co-financing is subject to IFAD's legal, budgetary and policy considerations, including that of IFAD's Executive Board or President, as per applicable procedures.

Accept, Excellency, the assurances of my highest consideration.

Reehana Raza
Regional Director
Asia and Pacific Region

H.E Eang Sophalleth
Minister
Ministry of Environment
of the Kingdom of Cambodia
Phnom Penh

Director Division of Mitigation and Adaptation
Green Climate Fund
175, Art Center-daero, Yeonsu-gu,
Incheon 22004
Republic of Korea

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06 January 2025

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Climate Adaptive Irrigation and Sustainable Agriculture for Resilience

Project Design Report

Annex: Caisar Steps In Rights

Document Date:	28/07/2025
Project No.	2000003926
Report No.	7034-KH

Asia and the Pacific Division
Programme Management Department

IFAD
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15 July 2025

Excellency,

The International Fund for Agricultural Development (IFAD) is very pleased to inform you about the ongoing negotiation on the term sheet for the Project ***Climate Adaptive Irrigation and Sustainable Agriculture for Resilience (CAISAR) in Cambodia*** with the Green Climate Fund (GCF) for the forty-second meeting of the Board (B.42).

As part of this negotiation, it was agreed between the GCF and IFAD that the Project will not be subjected to step-in rights from the GCF. Under this arrangement, in case IFAD decides not to continue the project implementation, the GCF will not have recourse to take over the Project, and the only alternative would be its cancellation. However, we assure you that IFAD does not envisage this scenario.

IFAD would like to reiterate its full support and continuous collaboration to the Royal Government of Cambodia and its sustainable development agenda.

Accept, Excellency, the assurances of my highest consideration.

Frew Behabtu
Country Director
Asia and Pacific Division

H.E. Eang Sophalleth
National Designated Authority (NDA)
Minister
Ministry of Environment
of the Kingdom of Cambodia
Phnom Penh

Copies for information:

H.E. Ros Seilava
Secretary of State
Ministry of Economy and Finance

H.E Chan Sinath
Secretary of State
Ministry of Water Resources and Meteorology

H.E Chan Sothea
Head of NCDDS
Secretary of State
Ministry of Interior

H.E Coup Paris
Secretary of State
Ministry of Environment

H.E Sum Thy
Director General
General Directorate of Policy and Strategy
Ministry of Environment

Mr. Meas Sam An
Deputy Director General
General Department of International Cooperation
and Debt Management
Ministry of Economy and Finance