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 DRAFT

Submitted To:

Project Management Unit
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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 152,000, including expenses for UXO clearance, assessment of the land acquisition and land resettlement, biodiversity management,

community outreach, and monitoring activities. However, the estimate cost for the settlement of land and assets and economic displacement are going to be included after the consideration of the final decision regarding the engineering conceptual design which will be conducted by the end of 2024. The monitoring program, which includes regular monitoring of soil, air, and water quality, is estimated to cost USD 10,500. The Executive Summary of the ESCMP will be publicly disclosed in both English and Khmer, ensuring transparency and accountability throughout the project's lifecycle.

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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 Geographical Area of the Sub–scheme

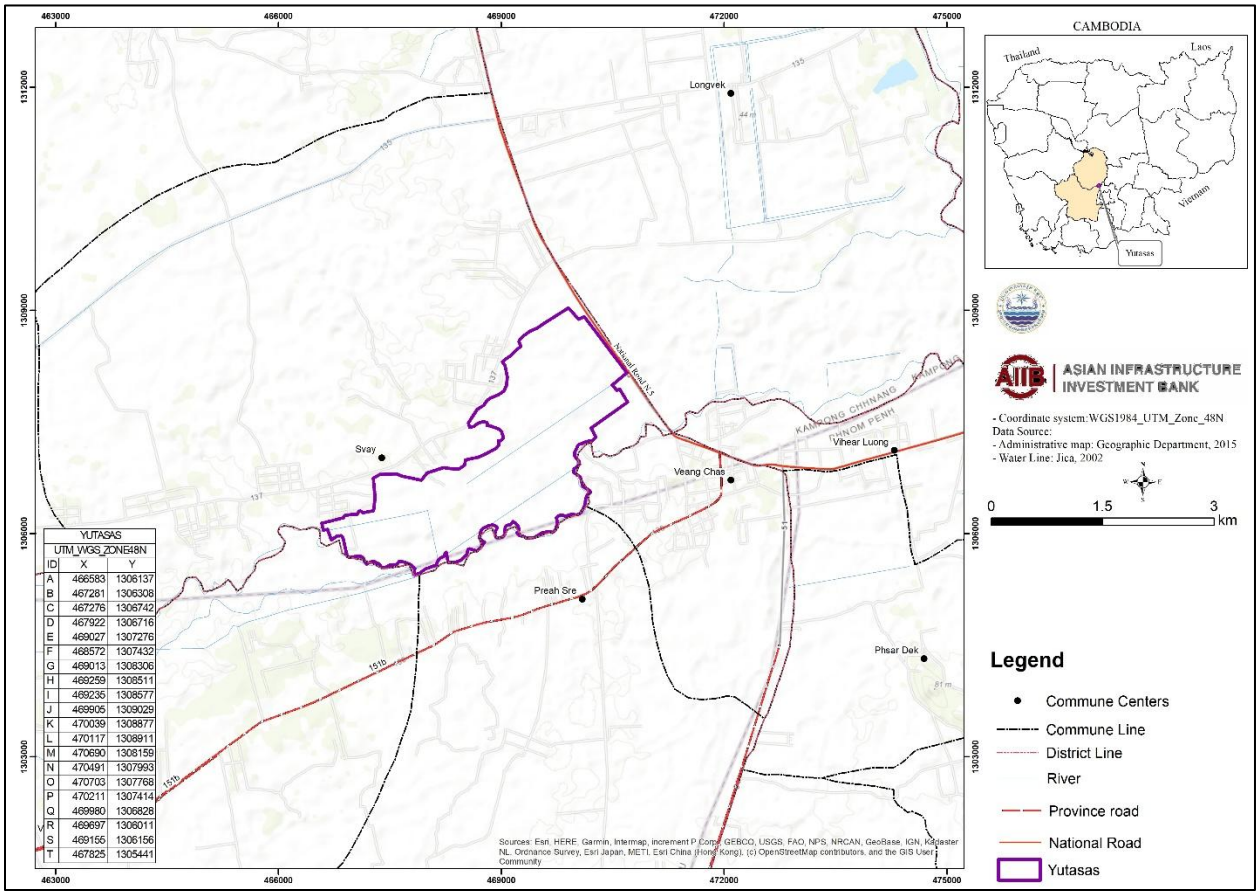
The Yutasas sub-scheme is located in Svay commune within the Sameakki Mean Chey district of Kampong Chhnang province, solely stretching within the boundary of Svay commune shared by a total of 5 villages which are home to a total household of 1,339, making a total population of 5,330 people (out of which 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)

Figure 1: Administrative map of Yutasas sub-command area



2.2 Characteristics of the Sub–scheme

2.2.1 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.

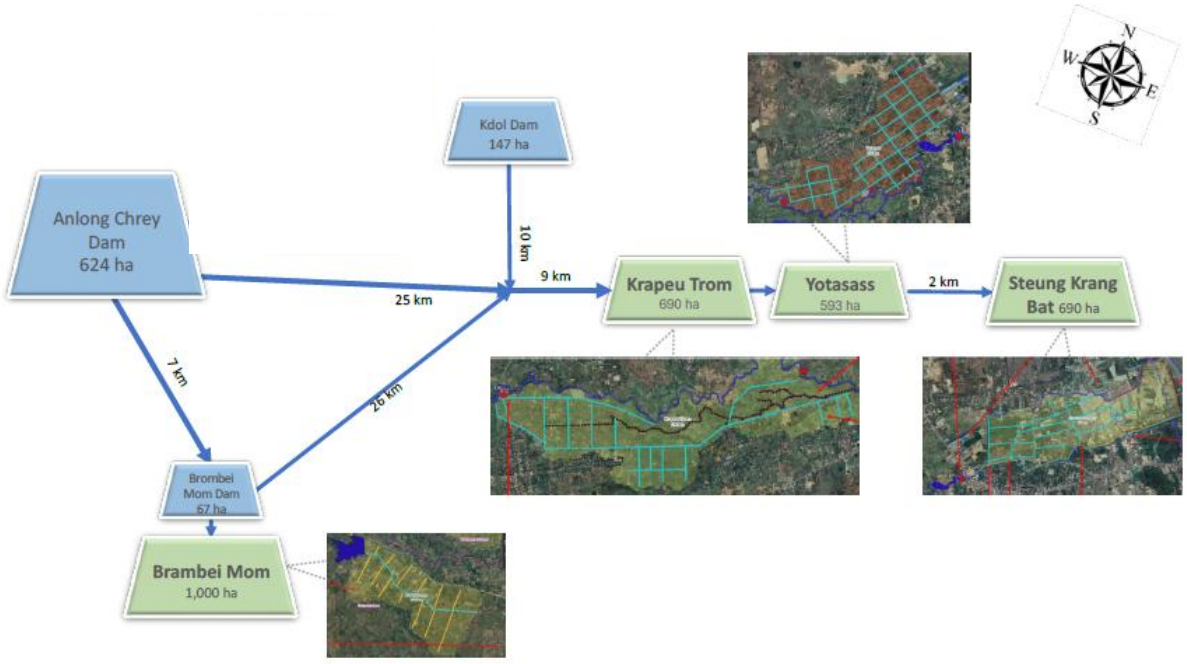
Yet, it is noted its intake downstream of Kropeau Troum and upstream of Steung Krang Bat.

Table 2: 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 3: Water sources for the Yutasas sub-schemesNo	**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



2.2.2 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.

2.2.3 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 4: 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%		

2.3 Proposed Investment under Yutasas Sub–scheme

2.3.1 Tentative Schedule for Sub–scheme Implementation

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 for the sub-schemes (Brambei Mom, Kropeu Trom, Yutosas, and Stoeung Krang Bat) with total completion by mid-2030 for Yutasas irrigation scheme.

Table 5: 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								●	●	●	●	●	●	●										

2.3.2 Key activities by Project Component

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.

2.3.3 Proposed Infrastructure

The rehabilitation, construction and activities of CAISAR project in Yutasas sub-scheme consist of canal, river training and drainage, improvement of water regulation and structure and tertiary system, and installation of solar power systems.

Canal. The design of the canal system aims to serve both irrigation and drainage functions, taking into account 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 take into account 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 PDWRAM, 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 3: Concept design of Yutasas 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.

These combined efforts seek to elevate irrigation capabilities, refine water distribution, and alleviate potential water-related risks within the project area.

2.4 Analysis of Alternatives

2.4.1 "Without" Project Alternative

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.

2.4.2 "With" Project Alternatives

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.

2.5 Project Area of Influence

2.5.1 Definitions

Under Yutasas 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**[1] that result from the incremental impacts (direct and indirect) from a) project activities proposed under Yutasas sub–scheme on the project command area, and b) Yutasas sub–scheme, and combined cumulative effect from Yutasas sub–scheme, past and planned projects, on the area downstream the Yutasas sub–scheme, and other relevant projects; and

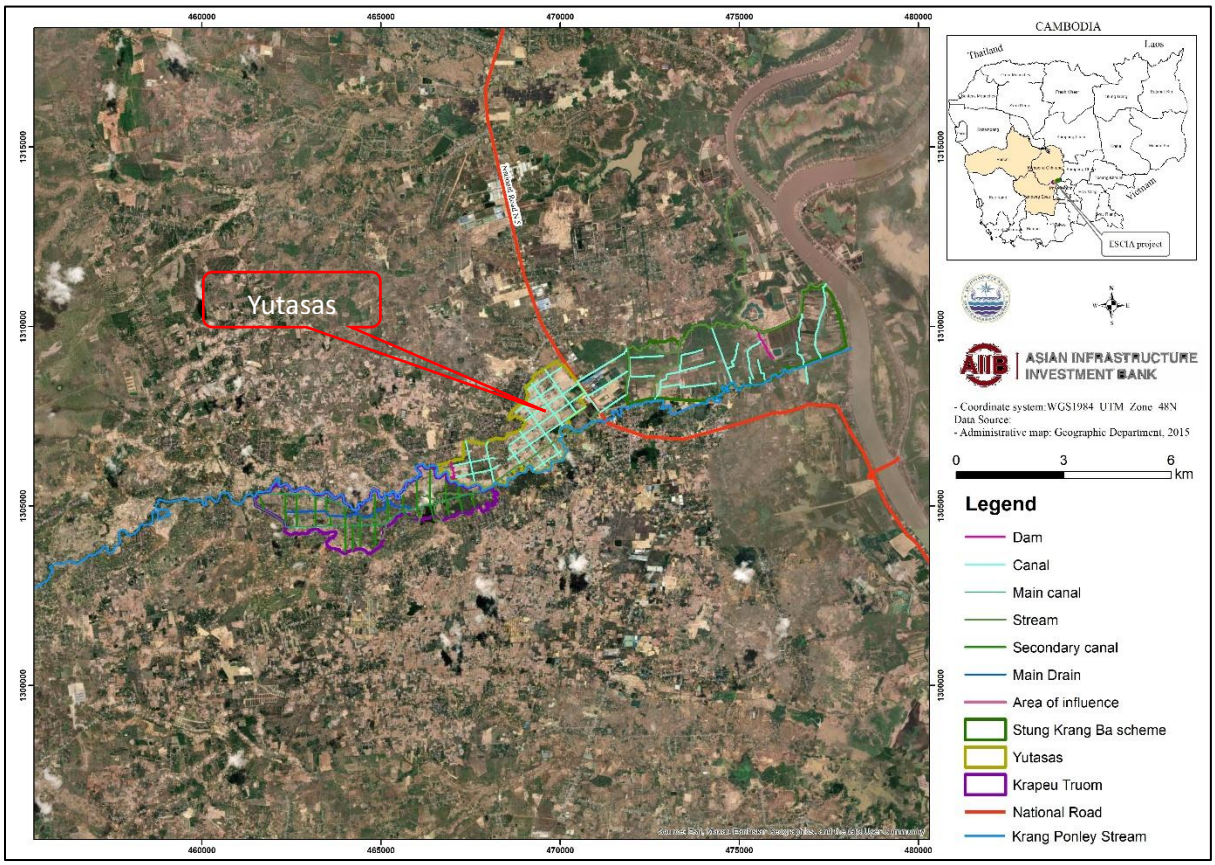
(iii) **Associated facilities** are facilities not included in the Project set out in the Legal Agreements governing the Project, but they are: (a) directly and materially related to the Project, (b) carried out, or planned to be carried out, contemporaneously with the Project; and (c) necessary for the Project to be viable and would not be carried out if the Project did not exist". Should adopt from the AIIB ES Framework.

[1] Cumulative impacts are limited to those impacts generally recognized as important on the basis of scientific concerns and/or concerns from Affected Communities.

2.5.2 Areas of Influence of Yutasas Sub–scheme

Under CAISAR, since project design for Yutasas is still ongoing, the area of influence for Yutasas 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 4: Locations of irrigation structures in Kropeau Truom, Yutasas, and Stoeng Krang Bat



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 (See also Chapter 5 – Environmental & Social Risks, Impacts, and Mitigation).

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 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.

- **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 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.

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.

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.

3.1.2 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.

3.2 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.

3.3 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.

3.4 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.

3.5 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 6: 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.	

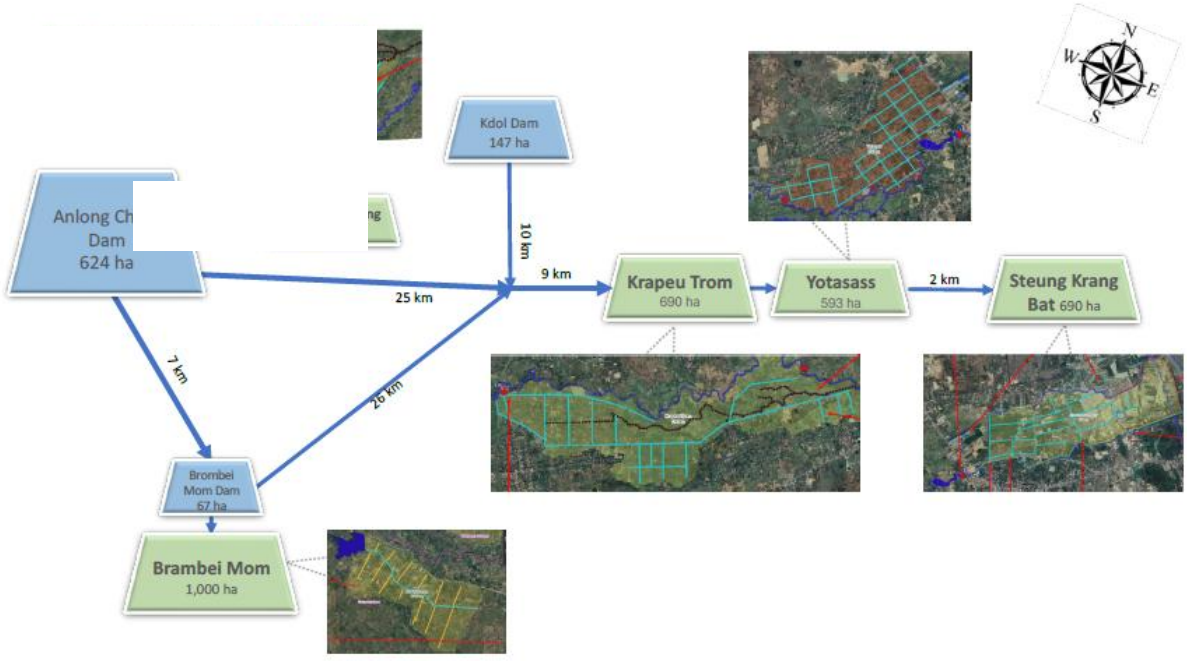
4. BASELINE CONDITIONS

4.1 Physical Conditions

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 5: Length from Sub-Scheme to Another of Krang Ponley



4.2 Environmental Conditions

4.2.1 Air Quality and Noise

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 582, which is equivalent to 12.7 µg/m3. The Yutasas, a sub-scheme within 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.

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.

4.2.2 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 7: Soil analysis results in an agricultural context

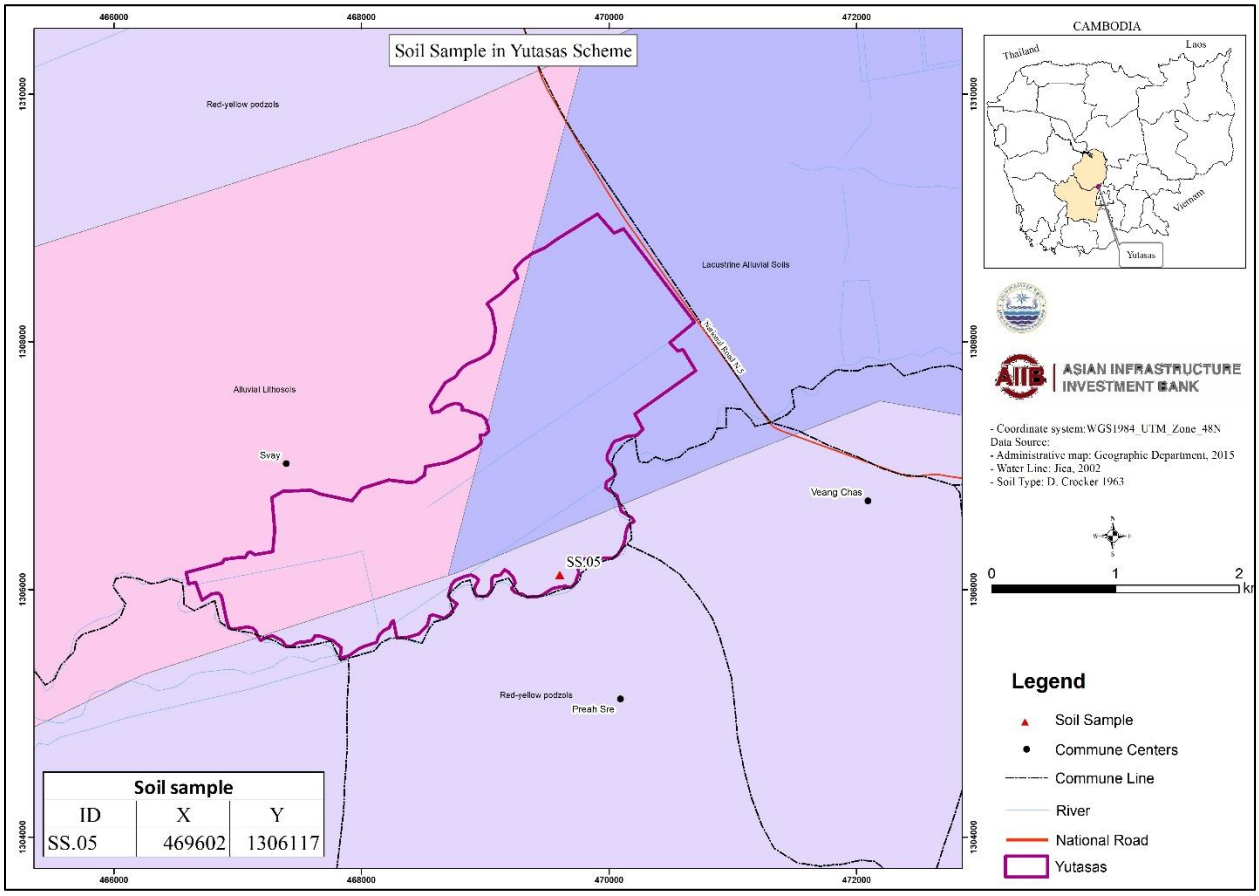
No.	Description Parameter		Result of SS.05
1	Particle Size (Pipette Method)	(<0.002mm), Clay %	7.30
		(0.002-0.02 mm), Fine Silt, %	21.10
		(0.02-0.05 mm), Coase Silt, %	11.70
		(0.05-0.2 mm), Fine Sand, %	30.29
		(0.2-2 mm), Coase Sand, %	28.78
2	Ninnu Moisture %, (Oven dry at 105 °C and 24 hours)		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),	Calcium (Ca)	5.43
		Magnesium (Mg)	1.48
		Sodium (Na)	1.50

[2] https://www.iqair.com/cambodia/kampong-speu, accessed on 23rd September 2024.

No.	Description Parameter		Result of SS.05
	(Method, 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 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)		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)

Figure 6: Location of soil sample selection



The soil test results provide valuable insights into the physical and chemical properties of the soil, indicating areas for improvement to enhance soil health and fertility. Starting with the particle size distribution, the soil contains 7.3% clay, 21.1% fine silt, and 11.7% coarse silt, along with 30.29% fine sand and 28.78% coarse sand. This composition classifies the soil as loamy sand, which tends to have good drainage but may struggle with water retention and nutrient holding capacity. Such soils often require amendments to improve their ability to support healthy plant growth.

In terms of moisture content, the soil holds 2.62%, a relatively low value, which is typical for sandy soils that drain quickly. The organic matter content, at 3.22%, is moderate and contributes to the overall fertility of the soil. Organic matter plays a crucial role in improving both water retention and nutrient availability. Similarly, the total carbon content is measured at 1.87%, which is also moderate and supports the soil's structure and long-term fertility.

When considering nitrogen levels, the soil contains only 0.17% nitrogen, which is on the lower end and may limit plant growth, as nitrogen is a critical nutrient for plants. The C/N ratio of 11 is within the typical range (10:1 to 12:1), indicating that organic matter decomposition and nutrient cycling are balanced and efficient. However, additional nitrogen inputs may be needed to support robust plant growth.

The phosphorus levels present an interesting situation: while the total phosphorus is low at 0.094%, the available phosphorus at 37 ppm is adequate for plant needs. This suggests that while the soil has a limited reserve of phosphorus, enough is available for short-term plant uptake. Monitoring phosphorus levels over time is recommended to ensure sustained fertility, particularly for crops with high phosphorus demands.

The cation exchange capacity (CEC) of 16.3 meq/100g is moderate, suggesting that the soil has a fair ability to retain essential nutrients like calcium, magnesium, and potassium. Among the exchangeable cations, calcium (5.43 meq/100g) and magnesium (1.48 meq/100g) are at adequate levels for most plants, while potassium (0.35 meq/100g) is low and may require supplementation. The base saturation of 54% indicates that a moderate proportion of the cations essential for plant growth are available, but there's room for improvement, especially with potassium.

One area of concern is the soil's exchange acidity, measured at 10.00 meq/100g. Though exchangeable aluminum is low (0.12 meq/100g), the high exchange acidity suggests the soil is prone to acidic conditions, which could limit nutrient availability. The pH of the soil is 5.66, indicating that it is slightly acidic. While many plants can tolerate this level of acidity, adjusting the pH to a more neutral range (around 6.5) by applying lime could improve nutrient availability and overall plant health.

Finally, the electrical conductivity of 63 µS/cm indicates low salinity, which is positive for most crops, as high salinity can inhibit growth. Overall, this soil could benefit from targeted nutrient management, pH adjustment, and organic matter enrichment. Adding compost, manure, or other organic materials can help improve water retention, nutrient availability, and overall soil structure. Additionally, applying lime to neutralize acidity and fertilizers to correct the low nitrogen and potassium levels will help optimize the soil's productivity for crop growth.

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[3].

[3] 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

1.1.1.1 The Result of Surface Water Quality Testing

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 8: Result of surface water quality

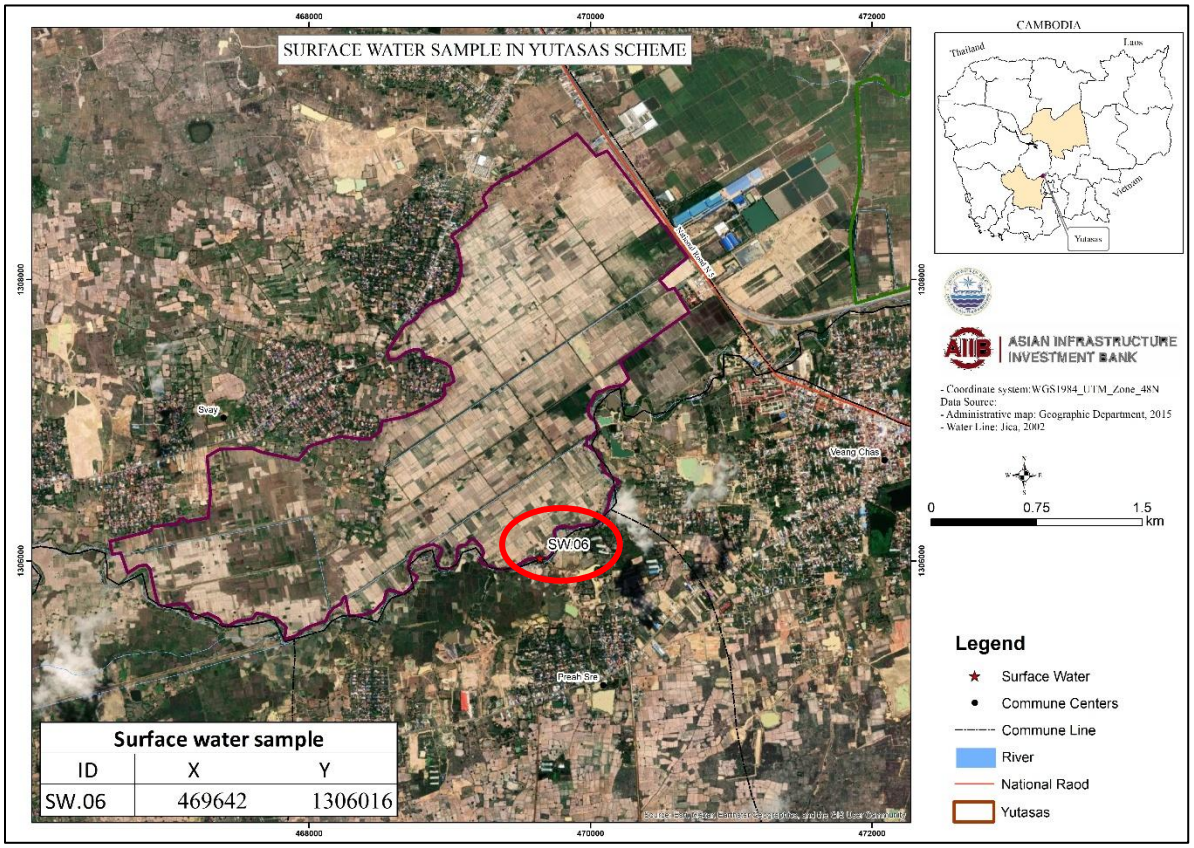
No	Parameter	Unit	Yutasas	Standard (MoE)	
			SW6	River	Lake and reservoir
1	Arsenic	mg/l	0.005	<0.01	<0.01
2	Cadmium	mg/l	0.001	<0.003	<0.003
3	Lead	mg/l	0.005	<0.01	<0.01
4	pH	-	6.91	6.5-8.5	6.5-8.5
5	Total dissolved solids	mg/l	91.58	<1000	<1000
6	Total suspended solids	mg/l	43	<100	<100
7	Total Nitrogen	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
11	Temperature	^{0}C	33.4	<45	<45
12	Dissolved oxygen	mg/l	5.65	>3	>4

(Source: Water Innovation Lab, 2024)

The water quality data for the Yutasas irrigation sub-scheme shows mixed results when compared with the Ministry of Environment (MoE) standards. The concentrations of arsenic, cadmium, lead, pH, total dissolved solids, total suspended solids, electrical conductivity, temperature, and dissolved oxygen all fall within acceptable limits, suggesting that the water is relatively uncontaminated in terms of these parameters. The pH level is within the ideal range at 6.91, ensuring that the water is balanced between acidic and basic conditions. The levels of total dissolved solids and suspended solids are low, indicating minimal particulate or dissolved substance pollution. The dissolved oxygen concentration of 5.65 mg/l is higher than the minimum required for supporting aquatic life.

However, there are significant concerns regarding the levels of total nitrogen, total phosphorus, and total coliform, which exceed MoE standards. The total nitrogen concentration of 17.7 mg/l is far above the acceptable limits of 3 mg/l for rivers and 2 mg/l for lakes/reservoirs, indicating potential nutrient pollution, likely from agricultural runoff. Similarly, the total phosphorus concentration of 0.9 mg/l is well above the safe thresholds, suggesting further nutrient pollution that could lead to harmful environmental effects, such as eutrophication and algal blooms. Most concerning is the total coliform count of 157,500 CFU/100mL, vastly exceeding the safe limit of 1,000 CFU/100mL, indicating possible fecal contamination or organic pollution, which poses significant health risks for human use. While many water quality indicators are within acceptable ranges, the high levels of nitrogen, phosphorus, and coliform indicate serious concerns regarding nutrient pollution and microbial contamination.

Figure 7: Map of surface water sampling locations

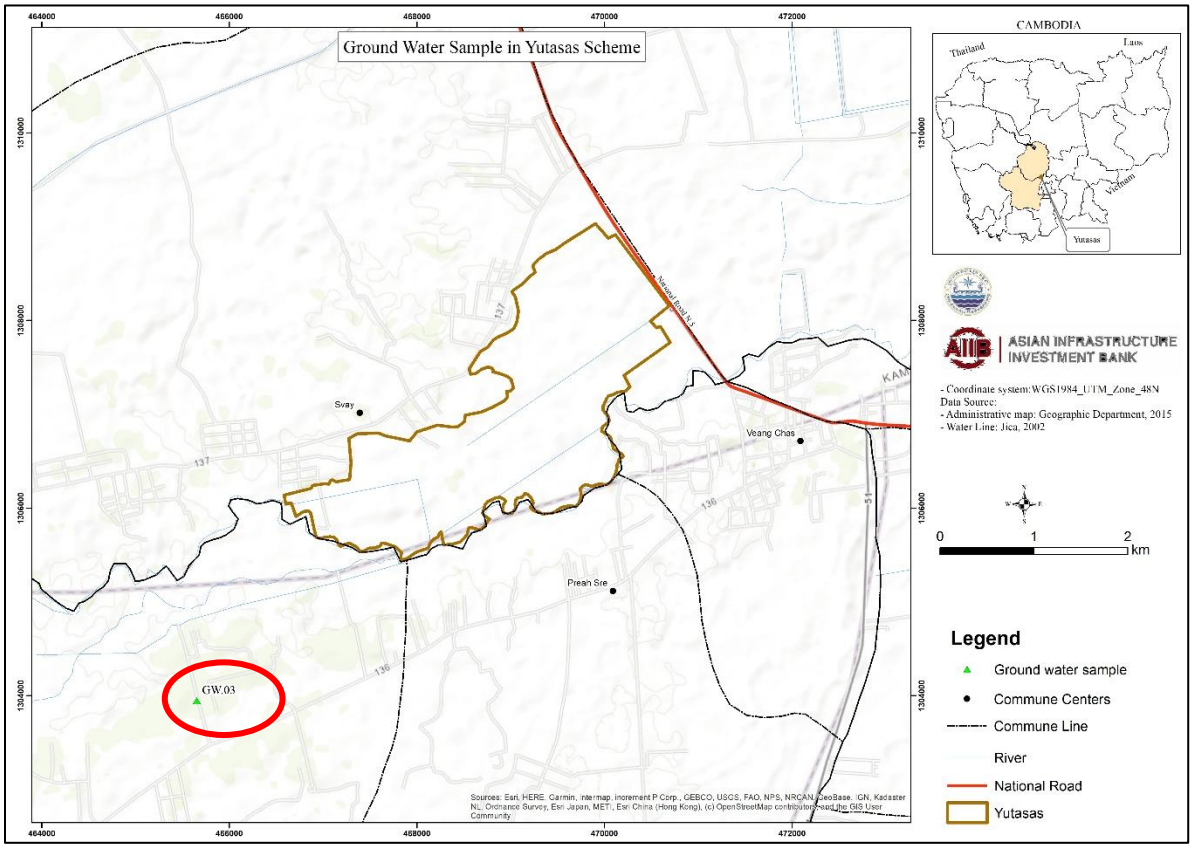


4.2.4 Groundwater Quality

4.2.4.1 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.

Figure 8: Map of groundwater sampling locations



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 9: Groundwater sampling locations

No.	Location				UTM	
	Province	District	Commune	Village	X	Y
GW2	Kampong chhnang	Rolea Bíer	Prasneb	Prey Sampov	443830	1355685

4.2.4.2 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 10 below.

Table 10: 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

No	Parameter	Unit	GW2	CDWQS
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)

The groundwater quality results for the Yutasas 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.

Figure 9: Groundwater sampling activity

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.

4.3 Biological Resources

4.3.1 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 11: Screening list of Endangered and Critically Endangered Species in Yutasas

No.	Local Name	English Name	Scientific Name	IUCN Category	Yutasas
	Reptile spices				
1	អណ្តើកព្រោច	Elongated Tortoise	*Indotestudo elongata*	CR	Yes
	Fish species				
2	ត្រីត្រសក់ក្រហម	Jullien's Golden Carp	*Probarbus jullieni*	CR	Yes
3	ត្រីចង្ហាស្ទឹង	Leaping barb/Flying Minnow	*Laubuka caeruleostigmata*	EN	Yes
4	ត្រីកាហោ /ត្រីគុលរាំង	Mekong giant barb/Giant Carp	*Catlocarpio siamensis*	CR	Yes

	Bird species				
5	ទាព្រៃស្លាបស	White-winged Duck	*Asarcornis scutulata*	EN	Yes

4.3.2 EN and CR Species Confirmation

The Yutasas area supports several endangered species. Confirmations were made for Jullien's Golden Carp, Flying Minnow, and Mekong Giant Barb. A female fisher reported catching five Jullien's Golden Carp during a flood, and two informants confirmed sightings of Flying Minnow in their ponds and the lower reservoir. Mekong Giant Barb were found in the reservoir after heavy rains, with informants indicating that the species were likely attempting to migrate upstream.

4.4 Socio-Economic and Cultural Conditions

4.4.1 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 12: 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 13: 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)

4.4.2 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 14: 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%

Parameters	Percentage	Parameters	Percentage
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 15: 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 16: 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%

Parameters	Percentage	Parameters	Percentage
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 17: 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%

4.4.3 Gender

4.4.3.1 Labor Division

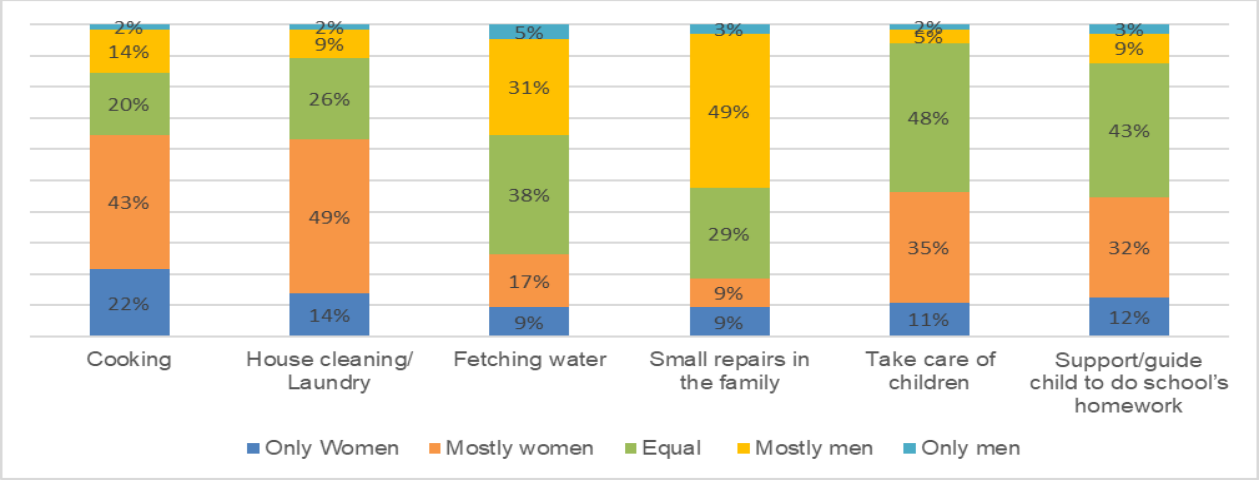
CAISAR Gender Assessment and Social Inclusion Plan reported that men spend on average of 59.4% of their time for farming whereas women spend only 40.5%. In traditional farming context, men involve the most during cultivation stage while women are more engaged in the later production. Heavy duty tasks 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.[4]

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] The ESCIA field survey showed that cooking, housing and cleaning, are mainly at the hand of women, except repairing in the household, men involve

[4] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.
[5] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

the most while fetching water, child caring, and schooling men and women involved equally (Figure 13).

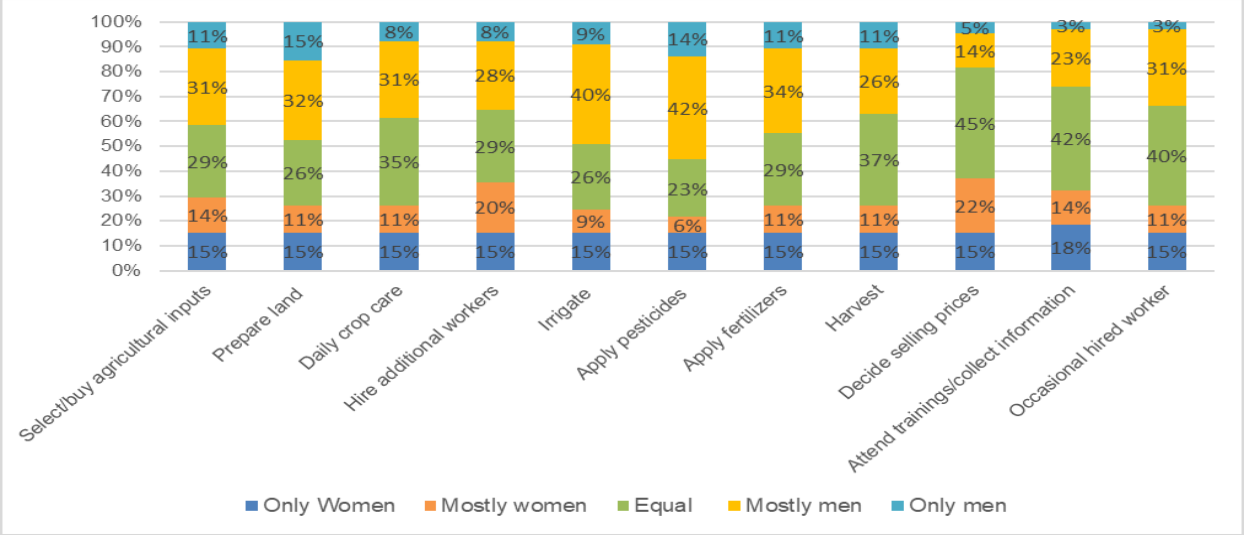
Figure 10: Division of Roles in Household Chores (n=65)



(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).

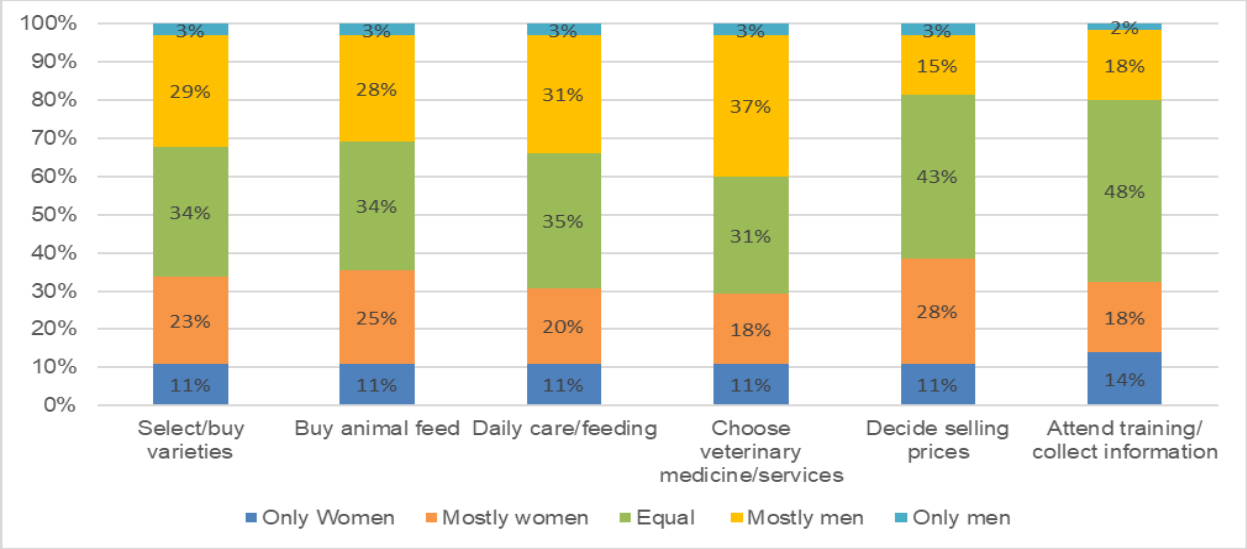
Figure 11: Share of Roles in Crop Cultivation (n=65)



(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 12: Share of roles in Animal Husbandry (n=65)



(Source: ESCIA Field Survey, 2024)

4.4.3.2 *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.[6]

4.4.3.3 *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] CAISARP (2024). Gender Assessment and Gender Action & Social Inclusion Plan. CAISAR Project. MoWRAM.

4.4.4 Agricultural Production

4.4.4.1 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 18: 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)

4.4.4.2 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 19: Vegetable production during wet and dry season

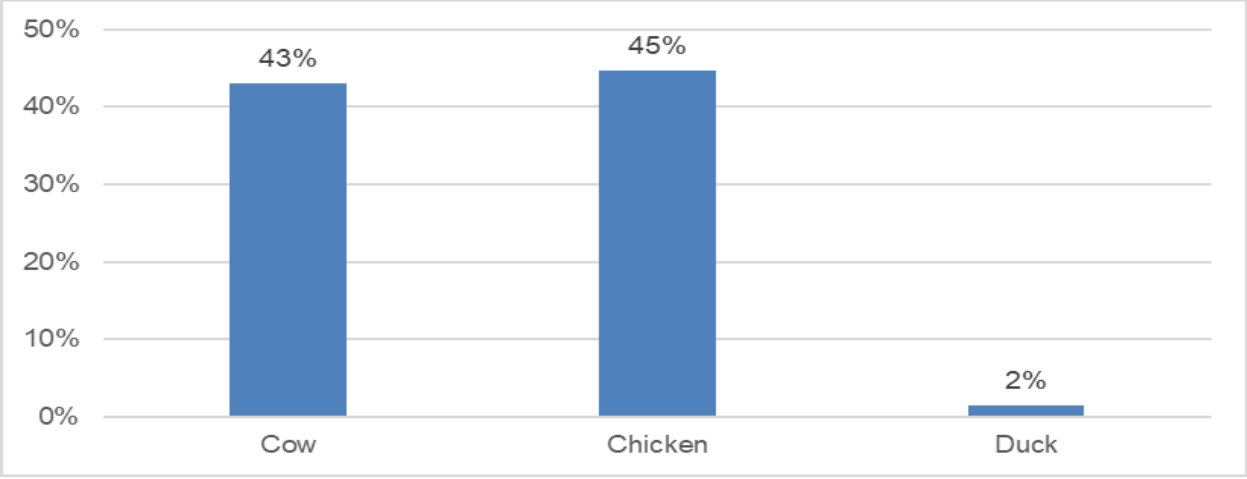
Parameters	Percentage	Parameters	Percentage
Wet season		**Dry season**	
Land size (m2)	1,039	Land size (m2)	995
Yield (kg/year)	385	Yield (kg/year)	477
Income (USD/year)	169	Income (USD/year)	209

(Source: ESCIA Field Survey, 2024)

4.4.4.3 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 13: Type of animal in command area



(Source: ESCIA Field Survey, 2024)

5. 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.

Table 20: Environmental Risks, Impacts, and proposed Mitigation Measures

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
BEFORE CONSTRUCTION						
UNEXPLODED ORDNANCES		**Comp 1,2**				
Although effort have been made to demine across the country, mortar shells, aerial bombs, and other unexploded ordnance may be found within the subproject area. Some demining operations have been carried out at shallow depths, and UXO maps have been generated but it is not known if there is UXO that is located in proximity of the structures where structural upgrading would be made. Of particular concern is the hazard posed by unexploded ordinance left during the war, particularly in area where deep excavation is required.	Construction/ Rehabilication of canals, farm roads, and relevant facilities that involve earthworks, soil excavation, river dreding, and so forth.	• Activity 1.4.1 • Activity 1.4.2 • Activity 1.4.3 • Activity 2.1.1 • Activity 2.1.2 • Activity 2.2.2	Residents, construction workers, animals, and any objectives nearby **High**	Based on the consultation with local authorities and community people, there have been no reported incidents of mines or unexploded ordnance (UXO) within the command areas. However, the risk remains due to the country's long history of civil war, with mine clearance efforts often limited to surface-level areas. As a result, construction activities involving deeper excavation could potentially expose mines or UXO, leading to explosion. This risk more likely to occur within the command area and at location where physical excavations are carried out.	**Nature & Duration:** short term **Extent:** Direct **Scale:** local **Magnitude:** Minor **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Negligible	• In case of finding the suspected objects during any work, UXOs must be followed • A UXO clearance plan should be developed as part of site-specific ESCMP and is implemented before commencing project activity. • Conduct assessment of UXO risks before site clearance. UXO screening/assessment will be carried out by certified UXO experts before any physical/construction activities, including mobilization of contractors to construction site, 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 subproject prior to commencing any subproject activities • As part of site-specific ESMP, conduct training and awareness activities for local community with regards to UXO risks and chance finds.
DURING CONSTRUCTION						
ENVIRONMENTAL POLLUTION		**Comp 1,2**				
Noise: Earthmoving activities and operation of machineries at construction sites will generate dusts and exhaust fumes. Construction activities, operation of vehicular movement, excavation machineries, concrete	Rehabilitation of irrigation canal and farm roads	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers **Minor**	There are limited large scale and heavy infrastructure construction being planned under the project within the areas, except the construction of small-scale hydraulic structures of the irrigation system. In addition, the larger ones are located	**Nature & Duration:** Temporary **Extent:** Direct **Scale:** local **Magnitude:** Minor **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Minor	• Right before the construction, 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. • Minimize project transportation through community areas where possible.

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
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.				outside the residential areas. In this regard, they are unlikely to affect community people as the duration is short while the people along the national road scheme will be possibly heard the traffic noise along the road instead.		• Ensure proper maintenance and proper operation of construction machinery to minimize noise generation. • Where possible, maintain existing trees, bushes, vegetated areas, to prevent part of sound (that may be generated from construction site, vehicle, operating heavy equipment) from reaching nearby residential areas. • No noisy construction-related activities will be carried out from 21:00 hours to 06:00 hours along residential areas, hospitals, schools and other sensitive receptors. • Noisy construction activities will be avoided during religious or cultural events near the subproject • All construction equipment and vehicles must be well maintained, regularly inspected for noise emissions, and shall be fitted with effective muffler and other appropriate noise suppression equipment consistent with applicable national and local regulations. • Use only vehicles and equipment that are registered and have necessary permits. Truck drivers and equipment operators should avoid, as much as possible, the use of horns in densely populated areas and where there are other sensitive receptors found such as schools, temples, hospitals, etc. • Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located (houses, schools, temples, hospitals, etc. • 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

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						disturb nearby households, hospital, school and other sensitive receptors. • Restrict use of vibrating rollers and operation of heavy equipment near sensitive structures.
Air pollution: Dust will be generated by transportation of material, clearing, grading, excavation, levelling, truck hauling, stockpiling, waste disposal, access road rehabilitation. In addition, the emission is also expected from machineries and vehicles, especially during dry season.	Transportation of materials, clearing, grading, excavation, levelling, truck hauling, stockpiling, waste disposal, access road rehabilitation	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers **Minor**	These activities generate dust and particulate matter (PM10 and PM2.5) from soil disturbances, stockpiles, and road works, leading to localized air pollution that can affect respiratory health. Exhaust emissions from trucks and heavy machinery release pollutants such as nitrogen oxides (NOx), carbon monoxide (CO), sulphur dioxide (SO2), and volatile organic compounds (VOCs), contributing to smog formation and greenhouse gas emissions. Additionally, waste disposal, particularly through burning, can release harmful pollutants into the air, further degrading air quality. However, the level of generation is minimal as the extent of the release is gradually moved from place to place and short in duration.	**Nature & Duration:** Short and long term **Extent:** Direct **Scale:** local **Magnitude:** Minor **Likelihood:** Unlikely **Inherent Risk**: Moderate **Residual risk:** Minor	• Right before the construction, conduct ambient air quality testing at the sensitive locations as per the detail engineering design comparing to the IFC EHS Guideline • Spray or sprinkle water on work surfaces regularly in windy and dry weather, when necessary. • Avoid open burning of debris, cut vegetation (trees, undergrowth) or construction waste materials. • Reduce the operation hours of generators, machines, equipment, and vehicles as much as possible and control vehicle speed. • Ensure regular maintenance of generators, machines, equipment, and vehicles used at project site. • To protect against dust and fumes, spray water onto the ground. • Construction equipment is maintained to a good standard and conduct immediate repairs of any malfunctioning construction vehicles and equipment. • Equipment and vehicles not in use should be switched off. • Machinery and vehicles causing excessive pollution (e.g., visible smoke) will be banned from construction sites. • All construction equipment and vehicles shall have valid certifications indicating compliance with vehicle emission standards. • The site of concrete mixing plants, crushing plants, quarries and other facilities that cause high dust and/or gaseous emissions should be at least

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						500 m from settlements and other sensitive receptors (schools, hospitals, etc.). • Tightly cover trucks transporting construction materials (sand, soil, cement, gravel, etc.) to avoid spills and dust emission.
Water pollution • Surface water quality reduction can occur due to construction, especially the earthwork, leakage of oils and chemical materials • Underground water quality reduction due to construction activities	Dredging and excavation activities, often required for the rehabilitation and upgrading of irrigation infrastructure in river systems	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers **Minor**	The small repair of dam, and canal rehabilitation, can significantly impact water quality, particularly through increased sedimentation. Disturbed soil from excavation can enter water bodies, potentially polluting domestic water sources as sediment is carried downstream when water is released from rehabilitated reservoirs or canals. No major construction or dredging being anticipated; therefore, the impacts are likely to be limited both on surface and groundwater.	**Nature & Duration:** Short term **Extent:** Direct & indirect **Scale:** Local & regional **Magnitude:** Minor **Likelihood:** Unlikely **Likelihood:** Unlikely **Inherent Risk:** Moderate **Residual risk:** Minor	• Construction diversion control should be prepared to avoid water flow, and spreading of all pollutants caused by the construction. • Do not fill up canals and creeks at the construction site. In case filling of local drainage system is necessary, consultation with local authorities shall be undertaken and their permission obtained beforehand. An alternative drainage shall be established before the existing canal is filled up. • Prohibit placement of construction materials, waste storage areas or equipment in or near drainage channels and water courses. • Discharge of oily wastewater, fuel, hazardous substances and wastes, and untreated sewage to watercourses/canals and on the ground/soil is prohibited. • Provide adequate drainage at the construction sites and other project areas to avoid flooding of surrounding areas and minimize flow obstruction of existing watercourses. • Include in engineering drawing the construction of retaining structures such as gabion baskets, riprap, etc. for riverbank protection. • Obtain required permits indicating water sources and permissible volumes • Maintain communication with local communities during construction stage to ensure that local water users provide timely feedback on water

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						quality, if any, during construction process. • Conduct water quality testing from upstream and downstream of the river system for quality test during and after construction to compare with the baseline and the national standard for monitoring purposes.
Soil pollution/ quality reduction: Leakage of oils, and chemicals used for machinery and construction process at farming land and construction sites. The fuel storage tanks in construction sites do not provide suitable storage places to contain accidental spills that affect soil quality. .	The activities affecting soil quality during this stage include dredging and the leakage of oils used for machinery and construction processes at construction sites.	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers/ Minor	Since excavation of the soil is at a small scale, the impact may be minimal. There are still oil leakage from equipment which can significantly impact soil quality. Oil introduces harmful contaminants like hydrocarbons and heavy metals, reducing soil fertility, disrupting microbial activity, and posing risks to nearby water bodies through runoff. In addition, excavation disturbs soil structure, increasing erosion and reducing its ability to retain water and nutrients, which can decrease agricultural productivity.	**Nature & Duration**: Short term **Extent:** Direct **Scale:** Local **Magnitude:** Moderate **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Minor	• During Construction • Scheduling construction activities during the dry season as much as possible. • Store fuels, oils, and chemicals safely in areas on an impermeable surface with proper containment berms. Spillage of oil and chemicals must be handled immediately to prevent infiltration. • Cover all restored areas with topsoil and re-vegetate (plant grass, fast-growing plants/trees) construction areas quickly once work is completed. • Construction diversion control should be prepared to avoid water flow, and spreading of all pollutants caused by the construction.
Solid waste: During construction, waste of various kinds will be generated including solid wastes, hazardous wastes, and domestic solid waste (at workers' camp site). Solid waste may include surplus excavated materials, used lumber for trenching works, waste generated from demolition of existing camp, structures, construction debris, and so forth.		• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers Soil in the rivers and farmland **High**	The rehabilitation and upgrading construction for existing irrigation infrastructure in command areas often involves the establishment of temporary worker camps, the use of heavy machinery like trucks and excavators, and the generation of various types of waste. Solid waste generated during construction may include surplus excavated materials, used lumber	**Nature & Duration:** Short and long term **Extent:** Direct **Scale:** Local **Magnitude:** Moderate **Likelihood:** Unlikely **Inherent Risk:** Moderate **Residual risk:** Minor	**For hazardous waste in agricultural production** • Crop residue: straw and stub should be collected for use as animal feed or for other purpose such as for mushroom growing, or for sale, or reuse for other farming purpose (e.g. incorporating into soil to improve soil fertility) • Empty pesticide containers: collected and kept appropriately as per recommendation in IPM good practices. • Never through and leave empty pesticide contain in the field which

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				from trenching works, debris from the demolition of existing camp structures, and other construction remnants. Domestic waste generated by construction workers at the construction site, worker camps, and other facilities can also contribute to environmental pollution. While the direct impact of this waste is often localized to the construction site and camps, improper management can lead to further environmental damage. Hazardous waste, such as oil and chemicals used in construction operations, can pose a threat to the environment. If not handled carefully, these hazardous materials can leak into the soil, causing contamination and potentially contaminating nearby water bodies.		may contaminate soil and surface water which may affect aquatic animals and even humans. **For non-hazardous waste** • Reduce, recycle, and reuse waste [e.g. plastic wastes, 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. **For dredging materials** • 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). • Prepare short-term placement of dredge material during off-loading or re- handling activities. The quantity of dredge material to be stored at the site must not exceed the quantity of material that can reasonably be managed at the site during the construction periods • Consult properly regarding the selection and design of the waste disposal locations and storage facilities • Dewatering the dredge material prior to reuse of the materials
Domestic waste: Food waste (bone, and meat waste and vegetables), paper, glass, metals, plastics, textiles, etc. being disposed by in-migrant labourers.		• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers Water body along construction site		**Nature & Duration:** Short and long term **Extent:** Direct **Scale:** Local **Magnitude:** Moderate **Likelihood:** Unlikely	• Implement waste management plan with appropriate dump sites

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
			Moderate		**Inherent Risk**: Moderate **Residual risk:** Minor	
Wastewater: • Hazardous wastewater, such as oil or fuel, chemical used for machinery and construction process at the construction site. • Domestic wastewater comes from workers/staff's water consumption daily.			Nearby residents Construction workers Water body along construction site **Moderate**		**Nature & Duration:** Short and long term **Extent:** Direct **Scale:** local **Magnitude:** Moderate **Likelihood:** Likely **Inherent Risk**: Moderate **Residual risk:** Minor	• Segregate waste (e.g. hazardous and non-hazardous), collect, store and transport waste to designated waste disposal sites. **For hazardous waste in construction** • Setting up a systematic waste management and chain of custody system considering waste reduction at source, recycling, temporary storage, transport, and final disposal. • Develop procedures for the safe collection, storage, transport, and disposal of project hazardous waste at licensing/permitting site. • Never dispose of used oil on the ground and in water courses as it can contaminate soil and groundwater (including drinking water supplies). • Have a diluted wash wastewater disposal ground tank with internal water proofing layer to protect leakage. • Store fuel and hazardous substances and wastes on bonded paved areas with roofs and interceptor traps so that accidental spills do not contaminate the environment. If spills or leaks do occur, undertake immediate clean up. • Train relevant construction personnel in handling of fuels and other hazardous substances as well as spill control and clean-up procedures. • Ensure availability of spill clean-up materials (i.e. absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored. • Segregate hazardous wastes (oily wastes, used batteries, fuel drums)

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						and ensure that storage, transport and disposal shall not cause pollution and shall be undertaken consistent with national and local regulations. • Store waste oil, lubricant and other hazardous materials and waste in tightly sealed containers to avoid contamination of soil and water resources. • Ensure all storage containers of hazardous substances and wastes are in good condition with proper labelling. • Regularly check containers for leakage and undertake necessary repair or replacement. • Store hazardous materials above flood level. • Storage areas for fuel, oil, lubricant, bitumen and other hazardous substances will be located at least 100 m away from any watercourses. • Storage, transport and disposal of hazardous wastes, including spilled wastes, shall be consistent with national and local regulations. • Wherever possible, refuelling will be carried out at a fuel storage area. • Refuelling shall not be permitted within or adjacent to watercourses. • Where a significant amount of oily wastewater or spill/leakage of oil and grease may occur (i.e. equipment maintenance areas), drainage leading to an oil- water separator shall be provided for treatment of wastewater. The oil-water separator shall be regularly skimmed of oil and maintained to ensure efficiency. • Vehicle maintenance and refuelling will be confined to designated areas in construction sites designed to contain spilled lubricants and fuel. • Adequate precautions will be taken to prevent oil/lubricant/hydrocarbon

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						contamination of channel beds. Spillage if any will be immediately cleared with utmost caution to leave no traces. • All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities (i.e. firefighting equipment, sorbent pads, etc.) to combat emergency situations complying with all the applicable statutory stipulation. • For canal rehabilitation works, the project will have proper sludge handling and management procedures to manage the excavated sludge materials and to prevent harmful exposure to workers and surrounding communities.
BIODIVERSITY		*Comp 1,2*				
Habitat Loss and Fragmentation: Conversion of micro-forests or vegetations in wetlands at micro or large may be needed for canal construction can lead to broken down of the habitat. **Habitat fragmentation:** The remaining natural habitats may become isolated patches, making it difficult for species to migrate, find mates, and maintain healthy populations.	Rehabilitation of irrigation canal and farm roads	• Activity 2.1.2 • Activity 2.2.2	Terrestrial species **Moderate**	Prior to construction, there will be clearance of bushes, forest or vegetations along the rehabilitated canals, and access road. Other activities such as river dredging and rehabilitation activities, as well as dam construction and upgrading which will be potentially led to habitat loss and fragmentation. Thes project involve altering the natural course of rivers and waterways, which can disrupt existing aquatic ecosystems. Dredging activities can remove valuable aquatic vegetation and disturb sediment beds, destroying habitats for fish and other aquatic organisms. The	**Nature & Duration:** Short and long term **Extent:** Direct & indirect **Scale:** Local and regional **Magnitude:** High **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Minor	• Implement Biodiversity Action Plan

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				construction of culverts or water structures can create barriers that isolate upstream and downstream populations, limiting their access to food and breeding grounds. Additionally, these projects can introduce pollutants and sedimentation into the water, further degrading habitat quality and impacting biodiversity. But these impacts are likely to be considered high due to biodiversity assessment, in that there is rich of biodiversity hot spot even the surrounding area is mostly paddy fields.		
Loss of Biodiversity Species Decline: Habitat loss and degradation can lead to declines in species populations in the long run, 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, slightly contributing to the long-term impact.	Rehabilitation of irrigation canal and farm roads	• Activity 2.1.2 • Activity 2.2.2	Aquatic and terrestrial species **Moderate**	While project activities in the construction phase like river dredging and canal rehabilitation can have some short-term impacts on fauna and flora, these effects are generally not considered serious. The interventions are primarily focused on restoring existing irrigation systems, and the affected areas are not known for high biodiversity. The noise from construction activities may temporarily disturb wildlife, but it is unlikely to cause long-term harm. The movement of aquatic biodiversity might be restricted due to the cut-off of waterways in certain sub-schemes. Overall, the fauna and flora effects of	**Nature & Duration:** Short and long term **Extent:** Direct & indirect **Scale:** local and regional **Magnitude:** Major **Likelihood:** Possibly **Inherent Risk:** Moderate **Residual risk:** Minor	• Implement Biodiversity Action Plan • Apply Find Chance Procedure

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				these projects are anticipated to be minimal and reversible.		
Hunting, 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.	Rehabilitation of irrigation canal and farm roads	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Aquatic and terrestrial species **High**	The risks can be quite severe when there is a large workforce or where there is also a risk to the aquatic endangered species. This demand drives illegal hunting and trading, threatening biodiversity and destabilizing ecosystems. The rarity of these species raises their market value, encouraging unsustainable practices that can lead to extinction. Additionally, consuming wild animals poses health risks due to zoonotic diseases and can harm local economies by depleting valuable fish stocks, affecting communities reliant on these resources. It is likely to occur not only at the local level but at the regional level as well and the impact is severe and irreversible.	**Nature & Duration:** Short and long term **Extent:** Induced **Scale:** local **Magnitude:** Moderate **Likelihood:** Possibly **Inherent Risk:** Moderate **Residual risk:** Minor	• Implement Biodiversity Action Plan
• **Loss of fauna and flora** Construction activities, including the rehabilitation of irrigation canals and farm roads, can lead to the clearing of vegetation and the disruption of natural habitats. This is particularly concerning areas like the Lum Hach command area, where the project might involve constructing a canal across community forestry,	Construction of canals and roads, especially across community forestry	• Activity 2.1.2 Activity 2.2.2	Various species, particularly those dependent on forests and wetlands. **Minimal**	Lead to habitat loss and fragmentation, directly impacting fauna and flora. This impact could be minimal since the area has no significant forestry area. The construction of canals and roads may require clear micro-forest, leading to habitat loss and fragmentation. This is especially concerning given the presence of	**Nature & Duration:** long term **Extent:** Direct **Scale:** local **Magnitude:** Moderate **Likelihood:** likely **Inherent Risk:** High **Residual risk:** Minor	• Construction activities should avoid clearing vegetation outside the designated project area. Existing trees and vegetation should be protected. • Measures should be implemented to prevent sedimentation in water bodies and mitigate downstream impacts from erosion. • Construction waste should be properly managed to prevent soil and water pollution. • Wildlife protection measures should be implemented, such as exclusion

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
potentially causing a significant change for wildlife. While the overall impact on fauna and flora is anticipated to be minimal and reversible in most areas, the specific location and scale of construction activities play a crucial role in determining the severity of the impact. For instance, noise from construction might temporarily disturb wildlife but is unlikely to cause lasting harm. However, the construction of dams and other structures could alter water flow patterns, affecting fish migration and potentially leading to population decline.				endangered and critically endangered species, including the Isok barb/Jullien's Golden Carp (Probarbus jullieni) and Leaping barb/Flying Minnow (Laubuka caeruleostigmata).		fencing and wildlife corridors. Additionally, construction activities should be avoided during sensitive periods for wildlife. • Environmental impacts should be regularly monitored, and the project must comply with environmental permits. • Apply Find Chance Procedure
• **Destruction of farming ecosystem** - Heavy machinery and construction activities can compact the soil, reducing its porosity and ability to retain water and nutrients, ultimately leading to decreased land productivity. - Soil erosion from construction sites, exacerbated by the removal of vegetation and can transport sediments and pollutants into nearby water sources. - The risk of pollution from construction sites, specifically mentioning	• Construction activities • Alteration of water regimes due to irrigation infrastructure (dams, levees) • Pollution from agricultural runoff	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Aquatic and terrestrial species within and around farming areas **Moderate**	The project's construction of irrigation canals, flood control structures, and farm roads will involve large-scale earthworks, potentially leading to soil erosion and sedimentation, impacting water quality in rivers and canals crucial for irrigation. The removal of vegetation and ground disturbance during construction increases the risk of soil erosion and runoff, carrying sediment and pollutants into water sources used for irrigation and livestock. This pollution, coupled with the potential for increased use of agrochemicals due to enhanced irrigation	**Nature & Duration:** long term **Extent:** Indirect **Scale:** Local **Magnitude:** Moderate **Likelihood:** Possibly **Inherent Risk:** Moderate **Residual risk:** Minor	• Restrict the movement of heavy machinery to designated areas and use appropriate construction techniques to reduce soil compaction. • Implement erosion and sediment control measures such as silt fences, sedimentation basins, and hay bales to prevent soil loss and protect water quality. • Construction vehicles and machinery have to wash only in designated areas where runoff will not pollute natural surface water bodies. • Establish proper drainage systems to divert runoff from construction sites and prevent it from contaminating water sources used for irrigation and livestock. • Encourage the adoption of sustainable agricultural practices, such as reducing pesticide and fertilizer use, to

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
potential water contamination from sourcing aggregates and construction materials. - These pollutants, along with runoff from construction sites carrying sediment, oil, and chemicals, can directly harm crops, leading to reduced yields and potential health issues.				capacity, could negatively affect water quality, impacting the health of both crops and livestock.		minimize pollution from agricultural runoff. • Develop and implement a comprehensive water management plan that ensures the efficient use and allocation of water resources, minimizing the risk of over-extraction and downstream water scarcity.
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 Another source of GHG emission is waste burning from worker camp site. In addition, at the time of construction, there are possibility of smoke generated by burning of straw in the rice field.	Rehabilitation of irrigation canal and farm roads and burning of straw of farmers at the rice field	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Atmosphere **Minor**	The production and transportation of excavated soils and materials further add to greenhouse gas (GHG) emissions. However, due to the short duration of these construction activities, the overall increase in emissions is expected to be minimal and relatively small in scale.	**Nature & Duration:** Short and long term **Extent:** Direct, indirect, and cumulative **Scale:** Regional **Magnitude:** Moderate **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Minor	• 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.
DURING OPERATION						

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
ENVIRONMENTAL POLLUTION		Comp 1,2				
• **Hydrology** - Increased irrigation demands could deplete water sources, if management is not properly conducted. - This may lead to poor management of environment flow for the water system	• Increased irrigation. • Poor water management practices • Climate change impacts (altered rainfall patterns)	• Output 1.1 • Output 1.2Output 2.3	Tonle Sap Lake. Upstream Watersheds Wetlands Aquatic Ecosystems Downstream Communities **Moderate**	Irrigation systems can have both positive and negative effects. Proper design and management are essential for reducing negative impacts on the natural hydrological cycle, especially the water availability.	**Nature & Duration:** Short and long term **Extent:** Direct & indirect **Scale:** local and regional **Magnitude:** Minor **Likelihood:** likely **Inherent Risk**: Moderate **Residual risk:** Minor	• 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.
Water pollution: Increased use of chemical for intensified crop production may affect the overall water quality and affect people who rely on such water for domestic use. Impacts may include two levels: impact on surface water as immediate effect and underground water as long-term impact. **Soil pollution/ quality reduction:** Overuse of Agri-chemicals (e.g., chemical pesticides, fertilizers, etc.)	Intensification of agricultural production	• Output 1.1 • Output 1.2	Nearby residents Famers **Moderate**	When the irrigation become operationalize, the use of chemicals for farming activities can create potentially impact on soil and water quality, the extent of this impact is likely to be relatively moderate due to the intensification of agricultural production and changes in practices in the command areas as irrigation water become more available. The widespread use of chemical fertilizers and pesticides for rice	**Nature & Duration:** Short and long term **Extent:** Direct & indirect, cumulative **Scale:** local and regional **Magnitude:** Minor to Moderate **Likelihood:** Very likely **Inherent Risk**: Moderate **Residual risk:** Minor	• 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

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				production, particularly when optimized for higher yields, is far significant contributor to soil and water quality degradation. These agricultural practices can lead to soil nutrient depletion, salinization, and pollution, ultimately compromising the long-term sustainability of agricultural production.		
BIODIVERSITY						
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.	Intensifying farming	• Output 1.1 • Output 1.2	Aquatic and terrestrial species **Minor**	At the micro, local, and regional levels, habitat loss is likely to occur due to land clearance during the construction phase. This loss is driven by farmers seeking to maximize profit from available land, and the scale of habitat conversion could extend beyond the local level, potentially impacting the region.	**Nature & Duration:** Short and long term **Extent:** Direct, indirect & cumulative **Scale:** local and regional **Magnitude:** Moderate **Likelihood:** Likely **Scale:** local and regional **Inherent Risk:** Minor **Residual risk:** Minor	• Implement Simplified Pesticide Management Plan
Hunting, trading, and consumption of animal from the wild: Even after the construction being completed, there may be the continuation of the hunting as market are available.	Intensifying farming and activities within the sub-scheme	• Output 1.1 • Output 1.2	Aquatic and terrestrial species **Minor**	Although the activities are likely to continue, it is not directly caused by the project activities, but it can expand further beyond the completion of the construction. The impact is minimal and considered to be regional, if trading continues to exist.	**Nature & Duration:** Long term **Extent:** Induced **Scale:** local and regional **Magnitude:** Moderate **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Minor	• Implement Simplified Pesticide Management Plan
CLIMATE CHANGE						

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
GHG emission: The intensification of farming activities meaning that rice production will be increased into more times or more whereas the energy that are required for the production can be also increased. Smoke may be generated due to burning of straw in the rice field, particularly when water access for irrigation being increased. This will lead to the increase of volume of GHG emissions being emitted into the atmosphere.	Intensifying farming activities Increased used of energy for farming activities	• Output 1.1 • Output 1.2	Atmosphere **Minor**	Increased farming activities, driven by improved irrigation, can lead to higher GHG emissions due to factors such as fertilizer use, livestock production, and rice cultivation. Additionally, the energy requirements for operating pump stations, flood control systems, and other infrastructure elements can contribute to increased carbon emissions if not managed efficiently. These factors collectively highlight the potential for the project to have a significant impact on GHG emissions.	**Extent:** Direct & indirect Nature & **Duration:** Short and long term **Magnitude:** Minor **Likelihood:** Likely **Scale:** local and regional	• Encourage sustainable practices like crop rotation and agroforestry to reduce energy consumption and improve soil health. • Introduce renewable energy sources such as solar-powered irrigation to lower the carbon footprint of rice production. • Train farmers to use alternatives to straw burning, such as mulching or biomass energy generation, to reduce air pollution. • Utilize efficient irrigation methods like alternate wetting and drying (AWD) to conserve water and minimize methane emissions. • Advocate for policies that discourage straw burning and provide incentives for adopting sustainable agricultural practices.
ANNUAL CROP MANAGEMENT PLAN						
WATER						
Water resource efficiency: Over-extraction of water resources can lead to downstream water scarcity, altered hydrology, and damage to aquatic ecosystems.	Inefficient irrigation practices during operation	• Output 1.3 • Output 2.3	Downstream communities, aquatic ecosystems **Moderate**	Inadequate water management poses a significant risk to the long-term sustainability of water resources and dependent ecosystems and communities.	**Extent:** Direct & indirect Nature & **Duration:** long term **Magnitude:** Minor **Likelihood:** Likely **Scale:** local and regional	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 AND SOIL MANAGEMENT						

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
Soil erosion and soil erosion risk: Soil erosion can lead to loss of topsoil, reduced soil fertility, and increased sedimentation in water bodies.	Land preparation activities such as tillage, site clearing, and the use of heavy machinery can increase the risk of soil erosion.	• Output 1.1	Soil health, water quality, and agricultural productivity. **High**	Unsuitable management techniques and land preparation activities can lead to the physical and chemical degradation of soils.	**Extent:** Potentially major Nature & **Duration:** Short and long term **Magnitude:** Minor **Likelihood:** Likely **Scale:** local	• 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.
Nutrient application and management: Excessive or improper nutrient application can lead to nutrient runoff and leaching, contaminating water resources and causing eutrophication.	Excessive or improper application of fertilizers can lead to nutrient runoff and leaching.	• Output 1.1	Water quality, aquatic ecosystems, and human health **High**	Over-fertilization and nutrient runoff can contaminate water resources, negatively impacting aquatic ecosystems and potentially leading to eutrophication.	**Extent:** Potentially major Nature & **Duration:** Short and long term **Magnitude:** Minor **Likelihood:** Likely **Scale:** local	• 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.
PESTICIDE						
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.	Application of pesticides.	• Output 1.1	Human health (farmers and consumers), biodiversity, soil and water quality **High**	Pesticide use can have unintended consequences on human health, biodiversity, and environmental quality if not managed carefully.	**Extent:** Potentially major Nature & **Duration:** Short and long term **Magnitude:** Minor **Likelihood:** Likely **Scale:** local	• 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.

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
Pesticide residues on site soil: Pesticide residues can accumulate in the soil, potentially contaminating groundwater and impacting soil organisms.	Repeated pesticide applications, use of persistent pesticides, and improper disposal of pesticide containers.	• Output 1.1	Soil health, biodiversity, water quality **High**	Pesticide residues can accumulate in the soil, potentially harming soil organisms and affecting water quality.	**Extent:** Potentially major Nature & **Duration:** Short and long term **Magnitude:** Minor to Moderate **Likelihood:** Unlikely **Scale:** Local and Regional	• 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.
Pesticide residues on produce: Pesticide residues on produce can pose health risks to consumers.	Late pesticide applications close to harvest, improper pesticide application techniques, and inadequate pre-harvest intervals.	• Output 1.1	Consumers, human health.	Pesticide residues on produce can pose a risk to consumer health. **Moderate**	**Extent:** Potentially major Nature & **Duration:** Short and long term **Magnitude:** Minor to Moderate **Likelihood:** Likely **Scale:** Local and Regional	• 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.
AIR QUALITY, AIR EMISSIONS, AND ENERGY USE						
Energy use: Energy consumption contributes to greenhouse gas emissions and impacts operating costs.	Operation of machinery and equipment for various farming activities (tillage,	• Output 1.1	GHG emission, air quality, and operational costs	Increased energy use for farming activities, especially those powered by fossil fuels, can contribute to air pollution	**Extent:** Potentially significant Nature & **Duration:** long term **Magnitude:** Moderate **Likelihood:** Likely	The project needs to: • Promote the use of energy-efficient machinery and equipment. • Explore the use of renewable energy sources (solar, biofuels) for powering irrigation pumps and other farm operations.

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
	irrigation, harvesting, transportation) and the use of energy for processing and storage.			and greenhouse gas emissions. **Minor**	**Scale:** Local and Regional	• Encourage the adoption of sustainable practices that reduce energy needs, such as crop rotation, no-till farming, and optimized irrigation scheduling.

Table 21: Social Risks, Impacts, and proposed Mitigation Measures

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
BEFORE CONSTRUCTION						
Land acquisition and resettlement	Rehabilitation of irrigation canal and farm roads	• Activity 1.4.3 • Activity 2.1.1 • Activity 2.1.2 Activity 2.2.2	• Landowners • Informal land users, Informal resettles • Nearby construction site business owners/ **Moderate**	Land acquisition is anticipated for the sub-scheme. Based on the initial concept design, there is possibility regarding the acquisition of land for the construction.	Nature & Duration: Short and long term Extent: Direct and indirect Scale: local Likelihood: Likely Inherent Risk: Minor to Moderate	• The actual estimate of the land acquisition and land acquisition impacts has been on the process. The ESCIA team is working with the PMU, local authorities and communities to identify the scope of land acquisition and resettlement impacts of each sub-scheme. The information on the scope and cost estimate including the potentially affected households and persons, affected lands affected assets and affected income and livelihoods will be made available at the end of December 2024 as per the available information of the final concept design and decision making on the options of construction in each sub-scheme. However, the figure may be changed after the availability of the DED.
Economic displacement	Nearby residents	• Activity 1.4.3 • Activity 2.1.1 • Activity 2.1.2 Activity 2.2.2	• Landowners • Informal land users, Informal resettles Nearby construction site business owners **Moderate**	During the construction phase, the track-out of construction material transportation and the construction area will be affected directly on the economic activities of community people such as local businesses, transportation routes, rice production land, and daily movement within the command area. Diversion of water from the original channels can also cause the disruption of agricultural production, even crop failure. Once again, the estimated impact of	Nature & Duration: Short and long term Extent: Direct and indirect Scale: local Likelihood: Likely Inherent Risk: Minor to Moderate	• The actual estimate of the economic displacement has been on the process. The ESCIA team is working with the PMU, local authorities and communities to identify the scope of economic displacement of each sub-scheme. The information on the scope and cost estimate including the potentially affected households and persons, affected lands affected assets and affected income and livelihoods will be made available at the end of December 2024 as per the available information of the final concept design and decision making on the options of construction in each sub-scheme.

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				economic displacement is still early to conclude.		However, the figure may be changed after the availability of the DED.
Facility Design	Detail Engineering Design	• Activity 1.4.3 Activity 2.1.1	• All **High**	CAISAR project aims to achieve the environmental-friendly, and climate resilience aspect. These aspects need to be carefully considered with all possible options to be included in the design. In this regard, it is expected to be fully considered and reduce the impacts at the minimum.	**Nature & Duration: Short and long term** **Extent:** Direct and indirect **Scale:** local **Likelihood:** Likely **Inherent Risk:** High	• Ensure designs comply with recognized engineering standards and best practices for irrigation systems. • Use materials and designs that can withstand extreme weather conditions such as heavy rainfall, flooding, and drought. • Engage independent experts to review designs and construction plans to ensure quality and durability. • Conduct detailed hydrological studies to appropriately size culverts, canals, and structures to prevent water flow obstruction and ensure efficient irrigation. • Use adjustable gates and control structures to regulate flow during variable water conditions. • Plan for ongoing inspection and maintenance to address obstructions or sediment buildup that might impede water flow. • Include riprap, geotextiles, and vegetation around banks and structures to reduce erosion and stabilize land. • Install weirs, sediment barriers, or retention ponds to control sediment movement and accumulation. • Monitor and mitigate sedimentation or erosion impacts on adjacent areas, including upstream and downstream locations. • Involve local communities, water user groups, and stakeholders in the planning and design process to address their concerns and incorporate local knowledge.

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						• Provide training to local operators and stakeholders on system maintenance and sediment management practices. • Strengthen local authorities' capacity to oversee construction and monitor irrigation system performance.
DURING CONSTRUCTION						
Child Labor	Construction of the irrigation systems		Unskilled workers (mostly local people)	The risk of child involvement in project's labour force (e.g., contractors' labour) is foreseen because subproject activities will take place in rural areas where use of child labour is common. There is a possibility that local people under 18 years is engaged by construction contractors and subcontractors to perform unskilled works.	**Nature & Duration:** Temporary **Extent:** Direct **Scale:** local and regional **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Negligible	• Apply LMP for age check prior to engagement of labour
Forced Labor	Construction of the irrigation systems		Unskilled workers (mostly local people)	Risk of workers being forced to work (e.g. young people) to earn income for their family, and/or to pay debt. Forced labour could happen for both children under 18 and adults, particularly for households who are in high need to cash for specific family purpose.	**Nature & Duration:** Temporary **Extent:** Direct **Scale:** local and regional **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Negligible	• Strict Code of Conduct for workers with no tolerance for physical or verbal abuse of women or children • 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 contractor's workers.
COMMUNITY HEALTH AND SAFETY						
Disease transmission	Construction or Rehabilitation of irrigation canal and farm roads	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers	• Spreading and contracting of communicable diseases of labour forces having direct and indirect contact among themselves. • Risk of contracting non–communicable diseases of workers due to working	**Nature & Duration:** Temporary **Extent:** Direct & indirect **Scale:** local and regional **Likelihood:** Likely	• 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.

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				behaviours and pressures at the time of working away from home.	**Inherent Risk** Moderate **Residual risk:** Minor	• In the event of a disease outbreak (e.g. COVID-19), provide immediate training/awareness raising to the risk groups. • Contractor's workers will be trained 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: • Ensure the water is visibly clean and free from sand and silt. Filter the water to get rid of visible dirt. • Drink only clean and safe water – either portable water or water filtered through water purifiers. • Get water purifying devices like filters, RO units, etc., regularly serviced and maintained. • Ensure stored water is germ-free. • Add antiseptic liquid, such as Dettol, in dubious-looking bathing water. • Hand hygiene – regularly wash hands with soap after returning home, after using the toilet, before and after preparing food, before eating or drinking anything. • Teach hand hygiene to children. Children should make it a habit to always wash their hands when returning home after playing games. • Ensure food is washed and thoroughly cooked. • Use disposable glass and plates whenever possible when eating outside food, particularly street food. • Avoid eating stale cooked food, unrefrigerated food kept exposed outside for long hours.

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						• Take vaccinations for immunization against preventable diseases like Typhoid, Hepatitis A, Polio, etc.
Sexual Exploitation and Abuse, Sexual Harassment (due to labour influx)	Rehabilitation of irrigation canal and farm roads	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Project workers Local peoples, primarily vulnerable individuals (including female and children)	• The influx labour forces) but also people who are local and nonlocal that gravitate to construction sites temporarily to provide logistics services for contractor's workers during construction stage. This risk of Violence Against Children (VAC) is also anticipated due to increased level of SEA/SH and pre-existing risk of local domestic violence that might be present before the project.	**Nature & Duration:** Temporary **Extent:** Direct & indirect **Scale:** local and regional **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Minor	- 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

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						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
Security and Road and Traffic safety	Rehabilitation of irrigation canal and farm roads	• Activity 1.4.3	Project workers and local people traveling near construction sites	• Increased risk of road accidents, particularly for people living in the vicinity of the civil works and	**Nature & Duration:** Temporary	- Arrange security guard or engage local authority to guard the construction sites

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
		• Activity 2.1.2 • Activity 2.2.2	and on transportation routes.	those traveling near the construction areas during construction phase, particularly when road condition is not good, and safety measures are not effectively carried out by contractors. Risk of road accident may be due to people' failure in attending their children which put children at risks of accidents.	**Extent:** Direct & indirect **Scale:** local and regional **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Minor	- 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	• Rehabilitation of irrigation canals and farm roads. • Influx of construction workers into the project area. • Construction activities disturbing soil and water bodies.	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers	• Spreading and contracting of communicable diseases due influx of labour forces having direct and indirect contact with local people • Construction activities can disturb existing sediments and pollutants, temporarily increasing the risk of waterborne diseases	**Nature & Duration:** Temporary **Extent:** Direct & indirect **Scale:** local and regional **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Minor	• Ensure that safe drinking water and adequate sanitation facilities are available for both workers and the surrounding community to prevent waterborne diseases. • Organize health education campaigns for workers and community members, focusing on hygiene, safe water use, disease prevention, and the proper use of sanitation facilities. • Implement vector control measures, including regular drainage of stagnant water, distribution of insecticide-treated bed nets, and community spraying programs. • Provide workers with appropriate personal protective equipment (PPE) such as masks, gloves, helmets, and other safety gear to protect against respiratory diseases, dust, and physical injuries. • Implement proper waste disposal systems for construction debris and hazardous materials, along with measures to prevent air, water, and soil contamination from the construction site. • Conduct regular health screenings for construction workers,

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						especially for communicable diseases such as tuberculosis, and other infections. • Establish a grievance mechanism specifically for health-related issues, allowing community members to report any health concerns or complaints related to construction activities. • Monitor health trends in the project area, including disease outbreaks or unusual health issues, and report findings to local health authorities for coordinated action. • Implement dust suppression techniques, such as regular watering of roads, limiting construction activities during high winds, and using dust barriers where possible.
OCCUPATIONAL HEALTH AND SAFETY				•		•
Physical Hazards **Chemical hazards**	Construction or Rehabilitation of irrigation canal and farm roads	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Nearby residents Construction workers	• OHS risks identified under the project include physical hazards and chemical hazards. • Physical hazards represent potential for accident or injury or illness due to repetitive exposure to mechanical action or physical activities. • Chemical hazards represent potential for illnesses or injuries, both short and long term, and fatalities due to single acute exposure or chronic repetitive exposure to toxic, corrosive, sensitizing or oxidative substances.	**Nature & Duration:** Temporary **Extent:** Direct & indirect **Scale:** local and regional **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Minor	• Fence off all work sites adjacent to communities to avoid unauthorized access to the project sites and to prevent potential injuries. • Display warning signs including at unsafe locations. • If school children are in the vicinity, traffic safety personnel direct traffic during school hours. • Control driving speeds of project vehicles particularly when passing through communities or nearby schools, health centres or other sensitive areas. • Make sure the community is aware of the GRM and that they can access it. • Appoint an Environmental Health and Safety Officer (EHSO) who shall be responsible for training, monitoring and reporting on ESHS
Personal Protective Equipment						

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						concerns and implementing health and safety related programs. • Conduct orientation for construction workers regarding emergency response procedures and equipment in case of accidents (i.e. head injury from falling, burns from hot bitumen, spills of hazardous substances, etc.), fire, etc.; health and safety measures, such as on the use of hot bitumen products for paving of project roads, etc.; prevention of HIV/AIDS, malaria, diarrhoea, and other related diseases, as well as Code of Conduct (including discussion of SEA/SH/VAC). • Regularly train/remind drivers of strictly observing speed limits and exercise good driving practices when driving construction supported vehicles through residential areas as well as other sensitive areas such as schools, pagodas, hospitals, markets, and other populated areas, including parking. • Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials by providing covers over transporting dump trucks. • Barriers (i.e., temporary fence) shall be installed at construction areas to deter pedestrian access to these areas except at designated crossing points. • Sufficient lighting at night as well as warning signs should be provided in the periphery of the construction site. • The public/residents, and in particular children, shall not be allowed in high-risk areas, i.e.,

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						excavation sites and areas where heavy equipment is in operation. • Provide fencing on all areas of excavation greater than 2m deep. • Ensure reversing signals are installed on all construction vehicles. • Measures to prevent malaria if in areas where malaria is an issue, shall be implemented (i.e. provision of insecticide treated mosquito nets to workers, spraying of insecticides, installation of proper drainage to avoid formation of stagnant water, etc.). • Discharge of untreated sewage shall be prohibited. • Conduct road safety training for workers and roadside community. • Provide trainings on HIV/AIDS and STDs to workers and the community (separately) • Provide trainings on SEA/SH and VAC to workers and the community (separately) • Ensure particular attention is provided to the needs of women and other vulnerable persons. For instance, specific trainings for them should be facilitated by appropriate trainers (i.e. women-only training on HIV/AIDS and/or SEA/SH should be led by a female trainer). • Ensure access to grievance redress mechanism. • Ongoing consultations and awareness raising of local communities.
Underpaid pay and unequal treatment			Unskilled workers (possibly local people and construction workers)	Unskilled workers may be recruited and may be underpaid compared to the nature, scope, and quantity of work that they are	**Nature & Duration:** Temporary **Extent:** Direct & indirect	• Implement a grievance mechanism where workers can report issues related to underpayment or unequal

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				expected to perform. They may also be asked to work under conditions that are hazardous to them, such as working without Personal Protective Equipment (as may be required for such work). Underpayment may also take place on the basis of gender, temporary work status – at the discretion of contractors.	**Scale:** local and regional **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Minor	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 labour 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. • Regularly engage with labour rights organizations or third-party auditors to evaluate labour conditions and make improvements where necessary.
CULTURAL HERITAGE	Rehabilitation of irrigation canal and farm roads	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Underground cultural sites/ **Minor**	Presence of cultural sites are reported. Although the construction occurs only at the existing canals and rivers, there is still possibility that these sites will be damaged by the construction's activities, especially the sacred site of local communities	**Nature & Duration:** Temporary **Extent:** Direct & indirect **Scale:** local **Magnitude:** Minor **Likelihood:** Likely	• Conduct archaeological surveys before construction in culturally sensitive areas. • Develop mitigation strategies to protect cultural heritage sites and involve local communities in preservation efforts. • Apply Chance Find Procedures.

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
					Inherent Risk Minor **Residual risk:** Negligible	
Loss access to land and other assets:	• Temporary land acquisition for construction of: • New irrigation canals (tertiary and quaternary canals) • Roads (widening of existing roads) • Hydraulic structures (dams, reservoirs) Temporary restriction of irrigation access from existing reservoirs during construction	• Activity 1.4.3 • Activity 2.1.2 Activity 2.2.2	• Farmers • Fishers • Households along road sections • Vulnerable groups **Moderate**	The project's construction phase presents a significant risk of temporary or permanent loss of access to land and assets for local communities. Even in cases where physical resettlement is minimal, the acquisition of land, particularly along construction road, and main canals, can disrupt farming activities, restrict access to water resources, and business impacting the livelihoods of those affected. Temporary restriction of irrigation access during construction is anticipated, particularly from farming activities along the River, feeder canals, main canal existing reservoirs. This will affect income generation for farmers reliant on irrigation, and business along the canals.	**Nature & Duration:** Short term **Extent:** Direct **Scale:** local **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Minor	• Once risks and impacts have been minimized or reduced, mitigate through compensation payment for affected assets and income generation activities. • Where land acquisition impacts remain, compensate people as per the project's LARPF. • Prioritize public land acquisition. If not feasible, acquire private agricultural land, which is anticipated to be small-scale at the household level due to linear land impact. • Avoid impact on land collectively owned by IP communities through alternative designs. • Conduct a thorough assessment of the project area's habitats to identify potential impacts on local flora and fauna. • Establish construction exclusion zones around sensitive habitats to prevent disturbance. • Implement habitat restoration programs in areas where construction has occurred.
Loss access to natural resources	• Upgrading of existing reservoirs. • Construction of new dams. • Implementation of river training measures. • Temporary restriction of water access from existing reservoirs during construction.	• Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	• Farmers • Fishers • Downstream communities **Moderate**	Farmers along main streams and feeder canals in the sub-scheme will face the issues. Additionally, the influx of construction workers and the establishment of temporary facilities like worker camps could put pressure on local resources, including water sources and forest products, potentially leading to	**Nature & Duration:** Short term **Extent:** Direct **Scale:** local **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Minor	• Develop a water management plan: To minimize waterbody alteration during pre-construction activities and implement efficient water management practices to prevent over-extraction and ensure equitable water distribution during the operational phase of the project. • Engage with local communities and authorities: To understand and address concerns about potential impacts on natural resources, ensuring that project

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				exploitation and environmental degradation.		design and implementation minimizes disruption to existing livelihoods. This should also include awareness campaigns to inform workers about the importance of protecting natural resources and respecting local customs and traditions. • Develop and implement a plan to manage the influx of workers: This plan should include providing workers with information about local resources, rules, and regulations, monitoring worker activities to ensure compliance, and providing alternative options for water and other essential resources.
CROSS-CUTTING						
Social inequality	Engagement and consultations during system design and construction	• Activity 1.1.1 • Activity 1.4.1 • Activity 1.4.2 • Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Vulnerable groups	Risk of being unequally engaged and treated, during the design phase, construction and after completion of the system	**Nature & Duration:** Temporary **Extent:** Direct & indirect **Scale:** local **Magnitude:** Minor **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Minor	• 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

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						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	Engagement and consultations during system design and construction	• Activity 1.1.1 • Activity 1.4.1 • Activity 1.4.2 • Activity 1.4.3 • Activity 2.1.2 • Activity 2.2.2	Vulnerable groups	The rich grabs both available land and water resources, creating greater social disparities	**Nature & Duration:** Temporary **Extent:** Direct & indirect **Scale:** local **Magnitude:** Minor **Likelihood:** Likely **Inherent Risk** Moderate **Residual risk:** Minor	• 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

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
						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
DURING OPERATION						
Community Health and safety	• Intensifying farming activities • Irrigation system operation	• Activity 1.4.3 • Activity 2.1.2 Activity 2.2.2	Laborers Community people	• Farmers and other labour directly involved in using chemicals inputs for crop production may be affected in terms of health (long-term) due to potential a) increased use of chemical inputs (e.g. pesticide) • Overuse of pesticide causing harmful residue within agricultural produce which affect consumers' health in the long run.	**Nature & Duration:** Temporary **Extent:** Direct & indirect **Scale:** local **Likelihood:** Likely **Inherent Risk:** Moderate **Residual risk:** Minor	• Promote sustainable agriculture practices • Implement Simplified IPM Plan
CROSS-CUTTING						
Gender inequality	Limited access for women to training, resources, and decision-making processes related to irrigation and agriculture.	• Activity 1.1.4 • Activity 1.1.3 • Activity 1.1.4	Women farmers and laborers	The risk is rooted in pre-existing gender inequalities in Cambodia, where women have less access to resources, technology, and decision-making power. The assessment has shown that women are less resilient to climate change than men, and they face specific vulnerabilities in terms of income, housing, and access to information and support systems. Socially determined gender roles can	**Nature & Duration:** Short term and long term **Extent:** Direct, indirect, cumulative **Scale:** local **Likelihood:** Likely **Inherent Risk:** Moderate	• 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

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
				also impact the adoption of climate-smart technologies. Consequently, these factors could lead to unequal access to water resources, limited participation in FWUCs, and a disproportionate burden of negative impacts on women's livelihoods.		make adjustments as needed to ensure that women are benefiting from the project.
Social inequality	• Competition for water resources among different user groups (farmers, communities, industries). • Potential displacement or restricted access to land due to irrigation infrastructure expansion. Engagement and consultations during system design and construction	• Activity 1.1.1 • Activity 2.3.1 • Activity 2.3.2	• Farming communities • Indigenous populations (if present). • Landless or land-poor households. • Vulnerable groups/ . **Minor**	The focus group discussions confirmed that the landowners of project areas in all command areas are mainly local communities, giving similar access capacity to the consultation process. However, the field survey reported that the vulnerable are generally those who have no farmland, giving them limited access to benefit from the rehabilitated system. There are arguments at provincial and district level regarding the effort given to the poor which may end up limited efficiency and effectiveness due to lack of various resources and capacity in making the support reach its full potential. The scale of the impact is minimal due to the proportion of the poor is quite small at the command area. However, the poor may benefit from the system as some of them own a small piece of land at home for gardening.	**Nature & Duration:** Short term and long term **Extent:** Direct, indirect **Scale:** local and regional **Likelihood:** Likely **Inherent Risk:** Minor	• 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	• Unequal distribution of project benefits, favoring powerful	• Activity 1.1.1	• Smallholder farmers • Marginalized communities	Since the landowners within the command areas are primarily from the local community, it is unlikely that	**Nature & Duration:** Short term and long term	• Transparent and accountable FWUC management: Clear guidelines, diverse representation, and grievance redress

Risks and Impacts	Key activities that cause risks and impacts	Project component	Receptors/ Sensitivity	Assessment of Risks and Impacts	Extent	Proposed Mitigation Measures
	individuals or groups at the expense of the intended beneficiaries. • Engagement and consultations during system design and construction	• Activity 2.3.1 • Activity 2.3.2	• Vulnerable groups/ **Minor**	elite land capture will occur. Additionally, the current high land prices make it unaffordable compared to the investment cost, reducing the incentive for such practices. However, there is a possibility that the wealthy may attempt to encroach upon protected areas, using their power, networks, or resources to seize land. While this is unlikely given the government's current commitment in its new mandate, if it does happen, the impact could extend to the regional level.	**Extent:** Direct, indirect **Scale:** local and regional **Likelihood:** Likely **Inherent Risk:** Minor	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. 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 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:

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

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

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.

6.3.1.2 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.

6.3.1.3 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.

6.3.2 Social Aspects

6.3.2.1 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.

6.3.2.2 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

6.3.2.3 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.

6.3.2.4 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.

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 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.

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, 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.

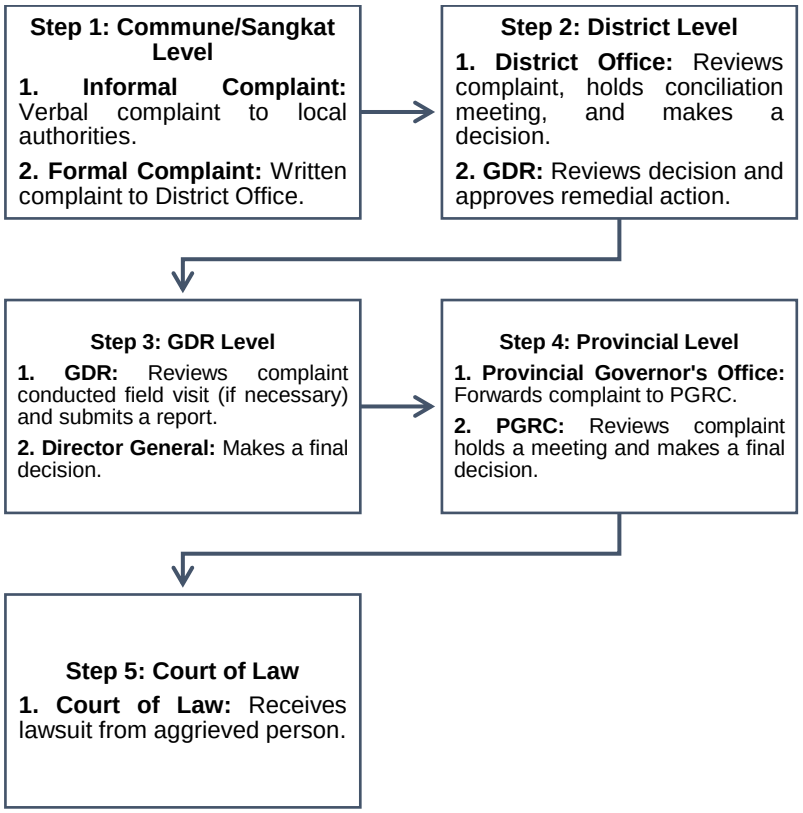
- Step 2 − District level. AH can lodge a written complaint to the Head of the District Office (where the subproject is located). The AH can bring a community elderly or their representative to discuss their grievance at the District Office. A conciliation meeting shall be held, and a decision be made 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 14. Redress Procedure for Complaints related to Land Acquisition



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7.4.2 Redress Procedure for Complaints Related to Labor and Working Conditions

Project workers can lodge their grievance/complaint as follows:

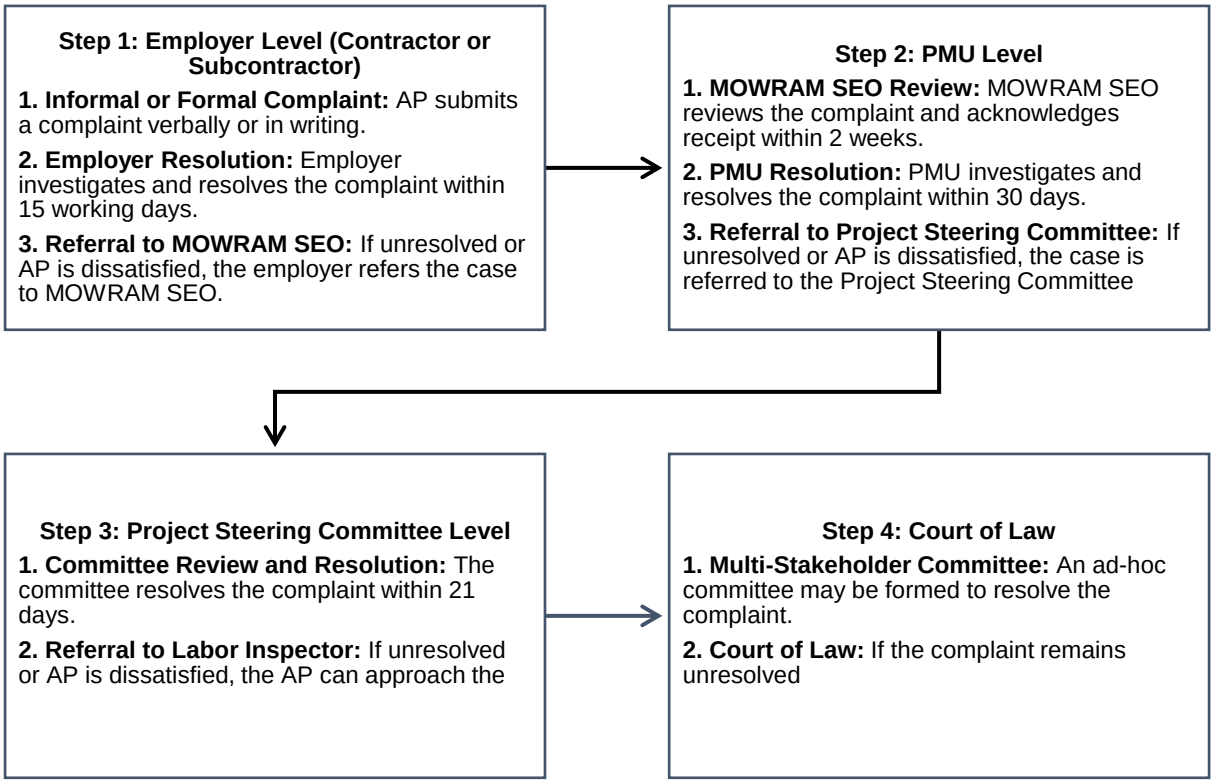
- Step 1 – Employer Level (Contractor and Subcontractor). Aggrieved person (AP) can submit their grievance to their Employer who serves as the first focal point for receiving and resolving grievance. Grievance can be lodged verbally or in writing, in person or by phone, text message, mail or email (anonymous 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 15. 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.

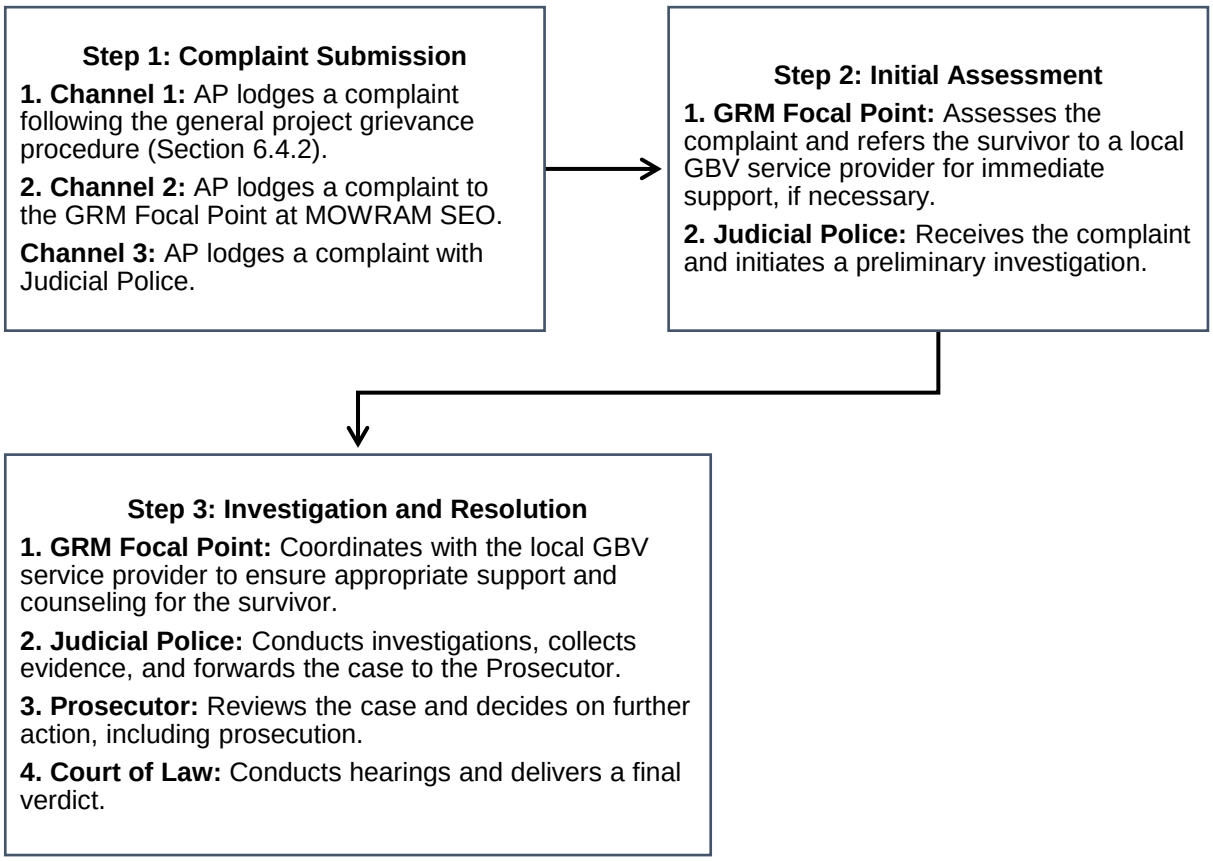
- SEA/SH/GBV survivors will be referred to a local GBV service provider for immediate support if they make a complaint directly to PMU.
- Confidentiality of survivors is protected. GM operator (at PMU and local GBV service providers) will keep confidential for SEA/SH/GBV allegation report.
- No identifiable 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 16. 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 22: Environmental monitoring plan during construction phase

Monitoring Parameters	Monitoring Activities	Location	Measurements	Frequency	Responsibility
	DURING CONSTRUCITON PHASE		•		
Soil quality	• Avoid construction activities in the rainy season and/or days of heavy rains. • Management activities of fuel, oils, and chemical substances. • Cover all restored areas with topsoil and re-vegetate	Construction site	• Site inspection • Visual observation	Daily	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 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. ANV1 X: 470186 Y:1305388	• Air quality monitoring equipment	Every 06 months	
Noise	• 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 noise 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

Monitoring Parameters	Monitoring Activities	Location	Measurements	Frequency	Responsibility
	• Measuring noise and vibration level	There is one location for noise and vibration quality sampling. ANV1 X: 470186 Y:1305388	• Measuring equipment and/or appropriate monitoring methods	Every 06 months	SEO E&S specialist consultants PMU
Soil quality/ quality reduction	• Avoid construction activities in the rainy season and/or days of heavy rains. • Management activities of fuel, oils, and chemical substances. • Cover all restored areas with topsoil and re-vegetate	Construction site	• Site inspection Visual observation	Daily	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, • Electrode Conductivity.	There is one location for soil quality sampling. SS1 X:469602 Y:1306117	• Soil quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU
Water Quality	• 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

Monitoring Parameters	Monitoring Activities	Location	Measurements	Frequency	Responsibility
	Parameters for surface water quality test: • Depth • pH • Electrode Conductivity (EC) • Arsenic (AS) • Cadmium (Cd) • Lead (Pb) • Total Nitrogen (TN) • Total Phosphorus (TP) • Total Dissolved Solid (TDS) • Total Suspended Solid (TSS) • Dissolved Oxygen (DO) • Total Coliform	There is one location for surface water quality sampling: SW1 X: 469642 Y:1306016	• Water quality monitoring equipment		
	• Testing wastewater quality and pesticide residues in water (to be conducted overseas)	Final outlet from Septic Tank	Water quality monitoring equipment	Every 06 months	SEO E&S specialist consultants PMU
Solid waste/wastewater	• 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.	Construction site	• Site inspection Visual observation	Daily	SEO E&S specialist consultants PMU
Hazardous and non-hazardous waste	• Hazardous and Non-hazardous waste management strategies • Sludge management	Construction site	• Site inspection • Visual observation	Daily	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Activities	Location	Measurements	Frequency	Responsibility
	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
Flora and Fauna	• Avoid cutting down trees or destruction of vegetation • No hunting, fishing, or collection of animal and plant materials • Construction of fish ladder passage • 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	Daily	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	Construction sites	• Site inspection • Visual observation	Daily	SEO E&S specialist consultants

Monitoring Parameters	Monitoring Activities	Location	Measurements	Frequency	Responsibility
	• Avoid extraction of gravel from watercourses. • Adopting of slop stabilization techniques.				PMU
Protected Areas	• Exclude a subproject located in 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 (to be conducted overseas)	There is one location for surface water quality sampling: SW1 X: 469642 Y:1306016 Y:1414410	Site inspection Visual observation	Annually	SEO E&S specialist consultants PMU
Soil quality/ quality reduction	• 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),	There is one location for soil quality sampling. SS1 X:469602 Y:1306117	Soil quality monitoring equipment	Annually	SEO E&S specialist consultants PMU

Monitoring Parameters	Monitoring Activities	Location	Measurements	Frequency	Responsibility
	- 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.				
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
Hunting, trading, and consumption of animal from the wild	• Incidents of illegal hunting, trapping, or fishing • Presence of wildlife products for sale • Reports of wildlife consumption	The entire sub-scheme	Site inspection Visual observation Community interviews	Annually	SEO E&S specialist consultants PMU Local authorities
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	Irrigation intake points Representative fields within the sub-scheme	Water flow measurements Soil moisture	Daily	PMU FWUC

Monitoring Parameters	Monitoring Activities	Location	Measurements	Frequency	Responsibility
	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).		monitoring Crop water use assessments		
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	• Soil residue analysis	Periodically (e.g., annually or	PMU Third-party

Monitoring Parameters	Monitoring Activities	Location	Measurements	Frequency	Responsibility
		storage facilities		before planting sensitive crops)	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
Energy use	• Monitor fuel consumption for machinery and equipment used in farming operations. • Track electricity usage for irrigation pumps and other energy-consuming activities. • Assess the efficiency of energy use by calculating energy consumption per unit of crop yield.	Fuel storage facilities Irrigation pump stations	• Fuel consumption records • Electricity meter readings	Regularly (e.g., monthly or seasonally)	PMU

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 23: Social monitoring plan during construction and operational phase

Monitoring Parameters	Activities Subject to Monitoring	Locations	Measurements/ Indicators	Frequency	Responsibility
During construction phase					
Labor Influx	• Prepare Contractors' Labor Management plan	• Contractors' office • Construction sites	• Labor management plan prepared and submitted to PMU for approval (as part of Contractor's ESMP) • Total workers planned to be mobilized on-site monthly for entire subproject cycle (including managers, skilled workers and unskilled workers) • Total workers planned to mobilize and mobilize monthly (by gender, local vis-vis migrant)	• Before construction is proceeded • Updated as needed (subject to PMU's prior review)	• Contractors (including main contractors and subcontractors) • PMU

Monitoring Parameters	Activities Subject to Monitoring	Locations	Measurements/ Indicators	Frequency	Responsibility
	• Recruitment of local labor	• Construction sites	• Number of local people engaged monthly (sex disaggregated), and included in Contractors' monthly progress report (to PMU)	• Monthly and during subproject cycle	• Contractors • PMU
	• Ensure equity and gender-based job opportunities	• Construction sites	• Total female workers mobilized on-site per month • Number of local female workers mobilized on-site per month • Number of IP workers mobilized if month (if IPs are present in subproject area)	• Monthly and during subproject cycle	• Contractors • PMU
Security and Road and Traffic safety	• Security cautions • General disease prevalence • Worker health • Communicable diseases	• Construction sites • Access roads to construction sites • Newly constructed/re habilitated 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
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

Monitoring Parameters	Activities Subject to Monitoring	Locations	Measurements/ Indicators	Frequency	Responsibility
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
Social Conflicts	• 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
Community Health and Safety	• General disease prevalence within the subproject area and neighboring areas • General health of workers • Communicable diseases among workers and the subproject community • Construction activities that give rise to risks related to traffic accidents and other construction related accidents • Fatality • Disease outbreaks • Environmental pollution incident • Dam failure (during construction)	• Construction sites • Camp site and Worker camps • Community and neighboring community	• Site inspection • Observation • Consultation with workers • Consultation with local authorities and commune health center	• Daily • Monthly • Within 48 hours for	• Contractors • PMU
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	• Contractors • Primary supplier PMU

Monitoring Parameters	Activities Subject to Monitoring	Locations	Measurements/ Indicators	Frequency	Responsibility
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	
GRM	• All grievances shall be recorded (including verbal grievance). Grievance resolution process and resolution result and status will be updated/monitored regularly to ensure grievances are processed/resolved within the timeframe specified for each step in grievance redress procedure.	• Worker in construction sites Community and neighboring community	• Site inspection • Observation Consultation with local authorities and local community	• Daily Monthly	• Contractors PMU
During operation phase					
Irrigation Operation and Maintenance	• Operation and maintenance for the subproject and irrigation system	• Within target command area • Downstream the target command area	• Inspect and evaluate system dam safety • Prepare before construction completion and adopt during operation	• Monthly • As soon as the rehabilitated dam and irrigation system is operated again	• PMU (during project life) • PDWRAM (after subproject completion)
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	• Construction sites • FWUC meetings • Community	• 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

Monitoring Parameters	Activities Subject to Monitoring	Locations	Measurements/ Indicators	Frequency	Responsibility
	decision-making processes related to water management.	consultations			
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
Water Use Conflict between upstream and downstream	• Establishment of water user groups for target command area • Development of guidelines/manual for water use coordination within target command area (upstream and downstream) • Policy actions related to water use coordination at sub-basin/basin level • Ensure an effective monitoring mechanism (which is built on water user consensus) is in place, transparent, and information on water use and distribution is regularly recorded to facilitate equitable water use across the entire command area.	• Within target command area • Downstream the target command area	• Number of water user groups to be established for the target command area • Percentage of command area (ha) that are coordinated by established water user group • Percentage of command area (ha) that benefit from water fee (contributed by water user) • Number of waters use conflicts that are reported, recorded, and resolved by affected water user group • Number of waters use conflicts that are reported to, recorded and resolved by provincial Department of Water Resources	• Monthly	• PMU • Established water user groups • PDWRAM

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 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 24: Estimated cost for ESCMP implementation

No.	Items	Qty	Unit	Cost (USD)	Total (USD)
1	UXO clearance	Lum-sump	1	50,000	50,000
2	Land Acquisition and Land Impact Assessment and the preparation of the Land Acquisition and Land Resettlement Plan	Lum-sump	1	15,000	15,000
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				**152,000**

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 25: 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

No.	Items	Unit	Qty	Cost	Total
	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

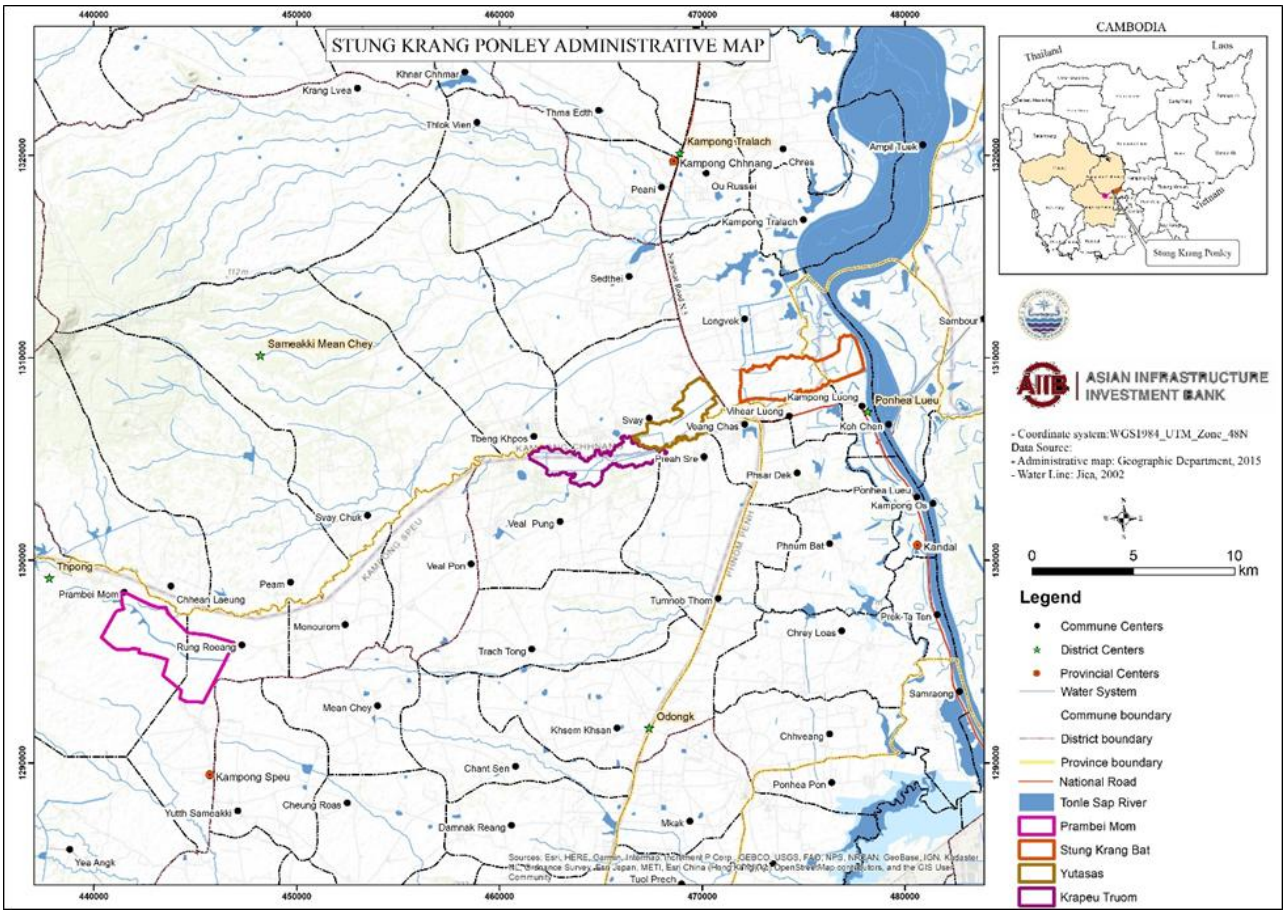


Figure 2. Length from Sub-Scheme to another of Krang Ponley

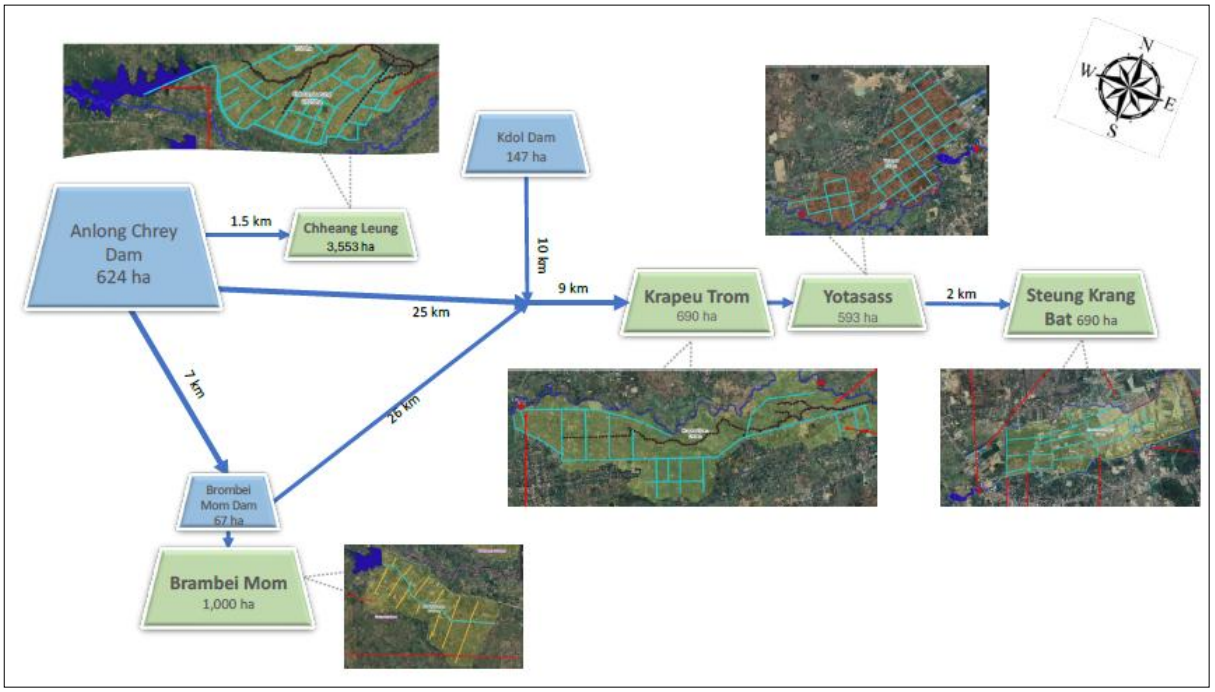


Figure 3. Concept design of Yutasas irrigation scheme

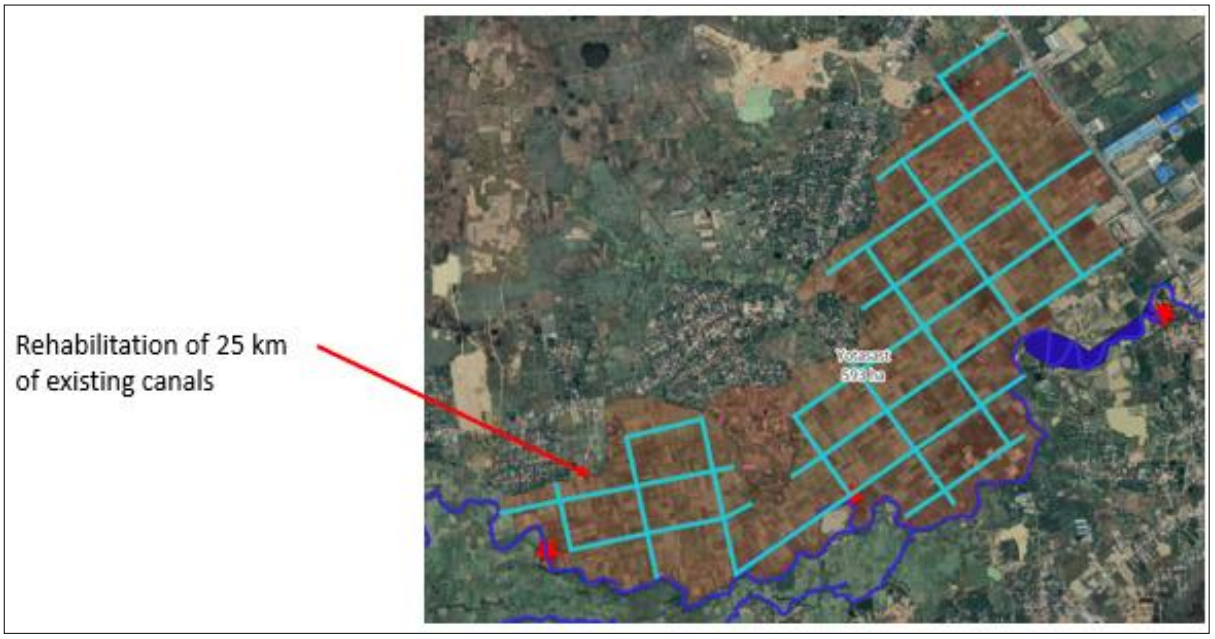


Figure 4. Map of Construction Sites and Residential Area in Stung Krang Ponley

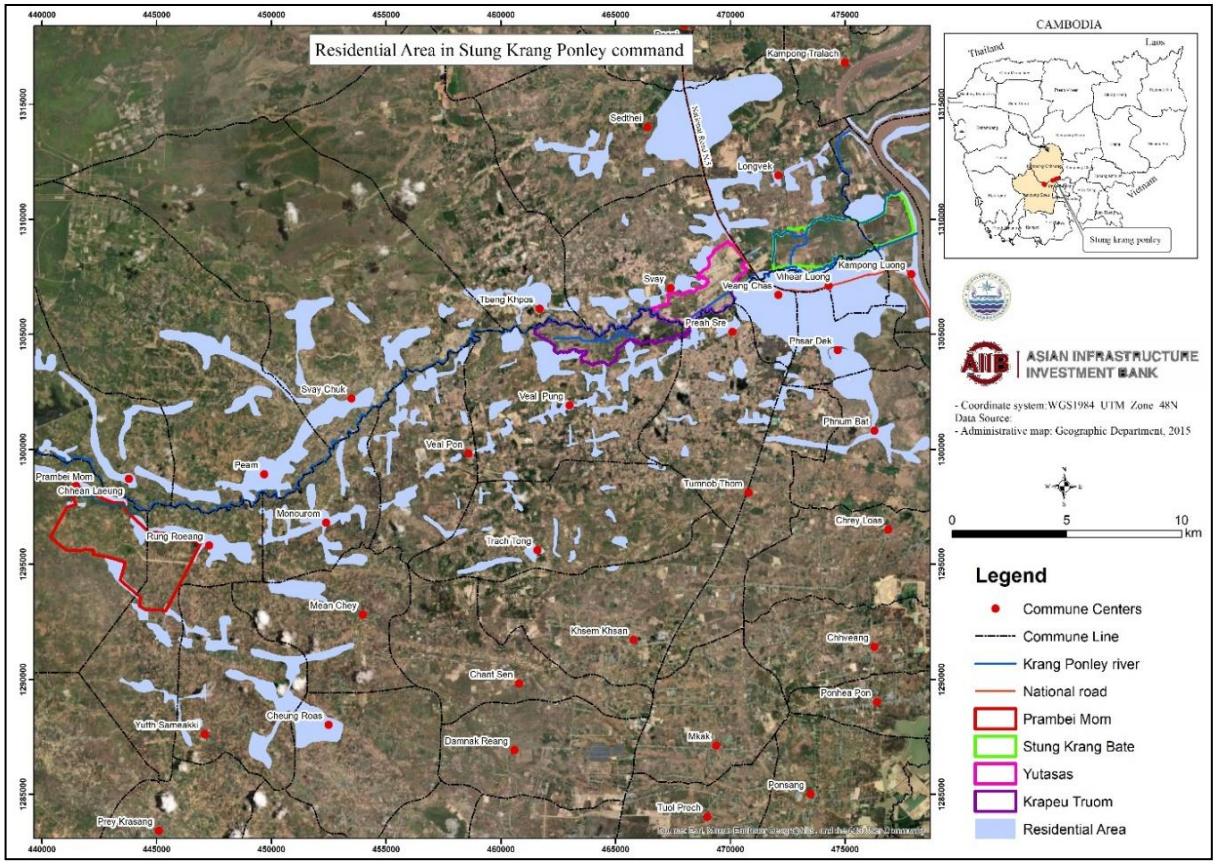
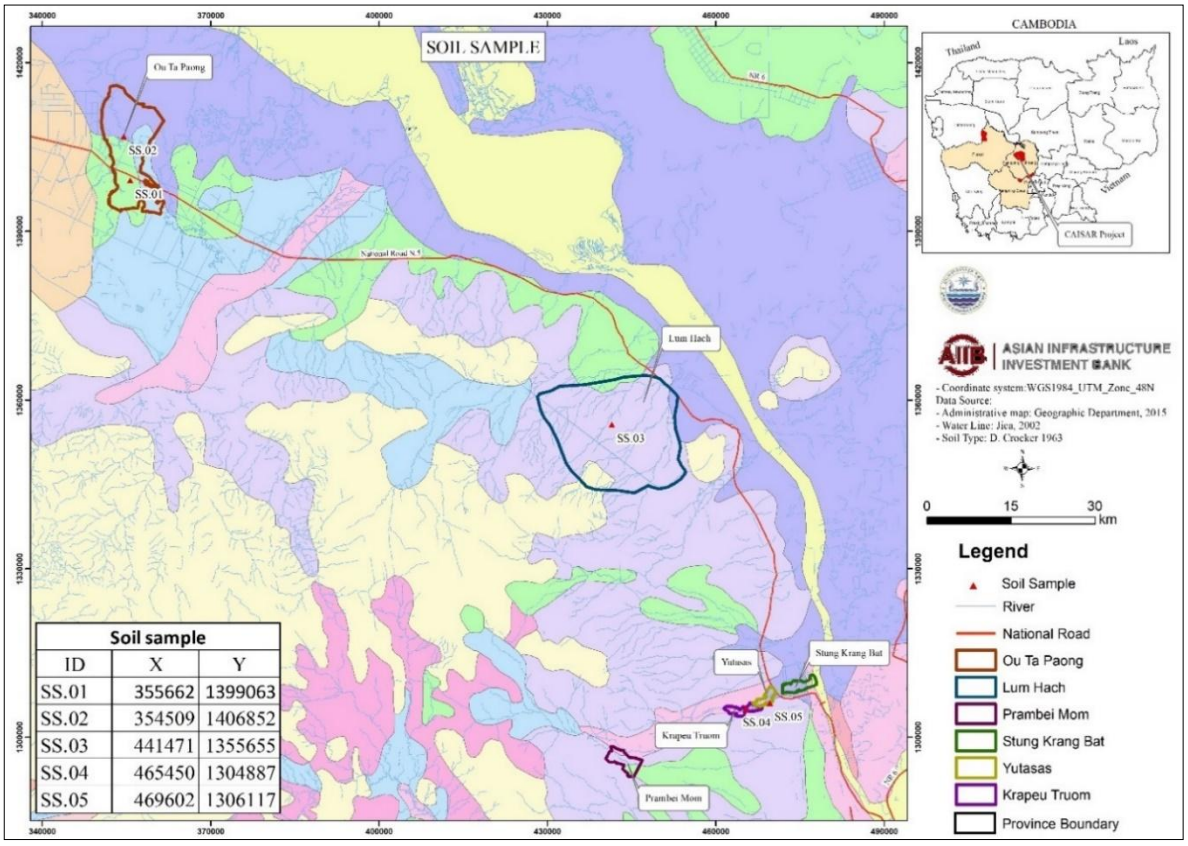
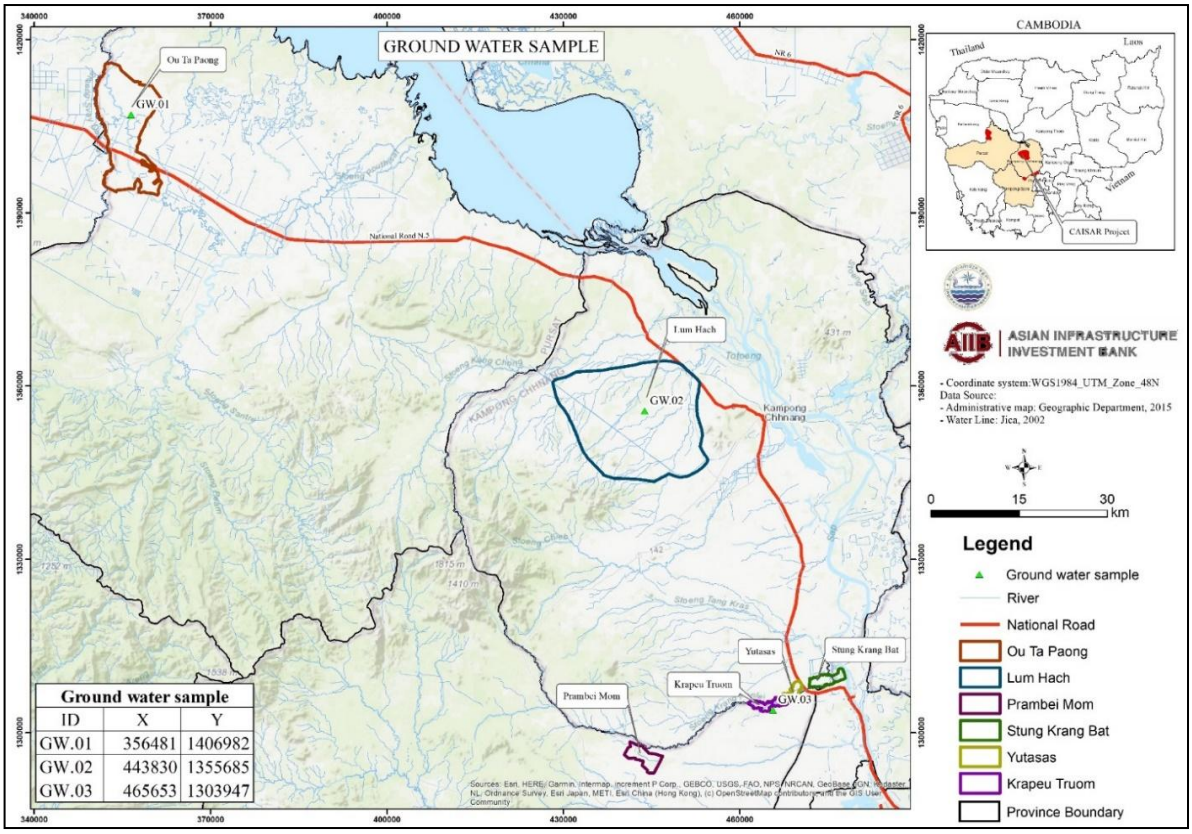


Figure 5. Location of soil sample selection



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[7]. Rice farmers tend to apply more pesticide when they see pests on their field[8]. Vegetable farmers also typically mix various types of pesticides per spray which is not good practice[9].

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

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

[7] https://ipmil.cired.vt.edu/our-work/projects/rice-ipm-for-cambodia/

[8] 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.

[9] 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.

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 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[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.

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.

3. Analysis to prepare for determining CH status

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.

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

[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.

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 spices						
1	អណ្តើកព្រោច	Elongated Tortoise	Indotestudo elongata	CR	Yes	Yes
II. Fish species						
2	ត្រីក្រសក់ក្រហម	Jullien's Golden Carp	Probarbus jullieni	CR	Yes	Yes
3	ត្រីចង្វាស្តើង	Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	Yes	Yes
4	ត្រីកាហោ /ត្រីកុលរាំង	Mekong giant barb/Giant Carp	Catlocarpio siamensis	CR	Yes	Yes

II. Bird species						
5	ទាព្រៃស្លាបស	White-winged Duck	Asarcornis scutulata	EN	Yes	No

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.

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.

Table 3: Critical Habitat Status of each conformed species in Yutasas command Area

English Common Name	Scientific name	IUCN Red List Status	Restricted Range	IBAT listing	Confirmed based on 3 screenings	Likelihood of Occurrence with AoI (Present, Possible, Unlikely and Not Present)	Reasons for Exclusion and data sources	Critical Habitat Determination of Species
Bird species								
White-winged Duck	*Asarcornis scutulata*	EN	No	Yes	No			
Fish speices								
Jullien's Golden Carp	Probarbus jullieni	CR	No	Yes	Yes	Present (rare)	Strongly and accurately confirmed by key informants	Stueng Krang Ponlai, at the lower part of the reservors of this sub-scheme.
Leaping barb/Flying Minnow	Laubuka caeruleostigmata	EN	No	Yes	Yes	Present (rare)	Strongly and accurately confirmed by key informants	Stueng Krang Ponlai, at the lower part of the reservors of this sub-scheme.
Mekong giant barb/Giant Carp	Catlocarpio siamensis	CR	No	Yes	Yes	Present (rare)	Strongly and accurately confirmed by key informants	Stueng Krang Ponlai, at the lower part of the reservors of this sub-scheme.
Reptile Species								
Elongated Tortoise	Indotestudo elongata	CR	Np	Yes	No			

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 fishpond 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 rain. 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.

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).

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.

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.

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.

5. Mitigation Measures

To minimize the negative impacts of the irrigation renovation scheme on biodiversity, the following mitigation measures should be implemented:

5.1 During design

During the design phase of construction activities, it is important to consider measures that minimize impacts on biodiversity in order to protect natural habitats nearby. Key mitigation measures during this stage may include:

- Avoidance and Minimization: Plan the project to avoid these sensitive areas whenever possible. If avoidance is not feasible, minimize impacts through careful design and engineering.
- Sustainable Design: Incorporate sustainable design principles to reduce the project's environmental footprint, such as minimizing water consumption and energy use.
- Fish Passageways: If necessary, construct fish passageways to facilitate fish migration and maintain connectivity between aquatic habitats.

5.2 During construction

During the actual construction phase of the project, effective mitigation measures should be implemented to further minimize impacts on biodiversity:

- Minimizing Disturbance: Use low-impact construction techniques to minimize disturbance to habitats and wildlife.
- Erosion Control: Implement measures to prevent soil erosion, such as temporary erosion control structures and revegetation.
- Wildlife Protection: Take precautions to protect wildlife during construction, such as fencing off sensitive areas and avoiding construction activities during breeding seasons.
- Train and educate labor staff to avoid harming biodiversity during construction.

5.3 During operation

After completion of construction, ongoing operation activities should also incorporate mitigation measures:

- Water Management: Implement efficient water management practices to minimize water wastage and reduce the impact on aquatic ecosystems.
- Monitoring and Adaptive Management: Establish a monitoring program to track the project's impacts on biodiversity and adjust operations as needed to address any negative effects.
- Community-Based Conservation: Involve local communities in conservation efforts, such as habitat restoration, monitoring, and enforcement of regulations.

- Mitigation of Pollution: Implement measures to prevent pollution from the project, such as proper disposal of waste and maintenance of equipment.
- Awareness raising: Raising public awareness about endangered fish species and educating people about the importance of not catching fish at fish passage areas is crucial for their conservation.

6. Biodiversity Action Plan for Yutasas Sub-scheme

Protect and restore biodiversity within Yutasas sub-schemes

Overall, these Conservation Action Plans aim to minimize habitat loss, reduce pollution, promote sustainable water management practices, protect endangered species' habitats, raise public awareness about conservation issues, and monitor biodiversity changes over time. By implementing these measures effectively, it is possible to achieve a net gain in ecological value for these sub-schemes while balancing agricultural needs with environmental conservation.

Objectives

- **Habitat Preservation: Maintain and restore the ecological integrity of natural habitats, including wetlands, forests, and waterways.**
- **Species Conservation: Protect endangered and critically endangered species and their populations.**
- **Sustainable Resource Management: Promote sustainable agricultural practices that minimize negative impacts on biodiversity.**
- **Community Engagement: Foster local community involvement in conservation efforts.**

Strategies

- **Habitat Restoration:**
    - **Restore degraded habitats through reforestation, wetland restoration, and erosion control measures.**
    - **Create wildlife corridors to connect fragmented habitats.**
- **Species Conservation:**
    - **Develop and implement species-specific conservation plans for endangered and critically endangered species.**
    - **Establish protected areas or reserves to safeguard critical habitats.**

    - Monitor populations and track their recovery.
- Sustainable Agriculture:
    - Promote sustainable agricultural practices, such as organic farming and integrated pest management.
    - Provide incentives for farmers to adopt environmentally friendly methods.
- Water Management:
    - Improve water management practices to minimize water pollution and maintain healthy water flows.
    - Implement measures to reduce sedimentation and erosion.
    - Community Engagement:
    - Educate local communities about the importance of biodiversity conservation.
    - Involve communities in conservation efforts through participatory planning and monitoring.

Implementation

- Partnerships: Collaborate with government agencies, NGOs, local communities, and other stakeholders to implement conservation measures.
- Monitoring and Evaluation: Establish a monitoring and evaluation framework to track progress and assess the effectiveness of conservation actions.
- Resource Allocation: Secure adequate funding and resources to support conservation activities.
- Policy Development: Advocate for policies that promote biodiversity conservation and sustainable development.

Specific Actions for Yutasas

- Develop a comprehensive conservation plan for the endangered species identified in the area.
- Protect and restore wetlands and forests within the command area.
- Implement measures to reduce the impact of agricultural activities on biodiversity.

Additional Considerations:

- **Climate Change: Incorporate climate change adaptation measures into the conservation plan.**
- **Monitoring and Evaluation: Develop a robust monitoring and evaluation system to track progress and adapt strategies as needed.**
- **Community Involvement: Ensure that local communities are actively involved in the planning, implementation, and monitoring of conservation efforts.**

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


រដ្ឋបាលស្រុកសាមគ្គីមានជ័យ

Annex 9: Laboratory Testing Result

Groundwater Quality Testing Result

ក្រុមហ៊ុន វ៉ាធើរ អ៊ិនណូវេសិន ល្បេ

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

Samrach Phan

Surface Water 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: 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......[illegible]......អ.ន.ក

ថ្ងៃ......[illegible]......ខែ......[illegible]......ឆ្នាំ......[illegible]......ព.ស.២៥៦[illegible]
រាជធានីភ្នំពេញ ថ្ងៃទី......[illegible]......ខែ......[illegible]......ឆ្នាំ២០[illegible]

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	(< 0.002mm)ឥដ្ឋ, Clay %		9.90
	(0.002-0.02 mm)ល្បាប់ ម៉ត់, Fine Silt , %		37.65
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		21.71
	(0.05- 0.2 mm) ខ្សាច់ម៉ត់, Fine Sand,%		30.59
(Pipette Method)	(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 (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
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.គ្គិសនីរបស់ជាតិប្រៃដី Electrode Conductivity µS/cm , (1:5 Soil: water)			96.80
ប៉េហាស់ទឹក, pH H2O , (1:5 Soil: water)			5.36
ប៉េហាស់អំបិល , pH KCL , (1:5 (Soil : 1N KCL)			4.21

អាសយដ្ឋានលេខ: ៥៤ប/៤៩អេហ្វ ផ្លូវលេខ ៣៩៥-៦៥៦ សង្កាត់ទឹកល្អក់៣ 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)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
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
ប៉េហាសទឹក, 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 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
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

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 ម៉ត់, Fine Silt , %		30.00
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		19.81
	(0.05- 0.2 mm) ខ្សាច់ម៉ត់, 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
ផូស្វ័រអាចរលាយ 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
អត្រាចំរែកនៃកាចុង, 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
បច្ចុប្បន្ន.អ.ឌីមើលជាតិប្រៃជី 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 ម៉ត់, Fine Silt , %		21.10
	(0.02- 0.05 mm)ល្បាប់ គ្រើម, Coase Silt , %		11.70
	(0.05- 0.2 mm) ខ្សាច់ម៉ត់, 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
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

បានឃើញ និងឯកភាព
ប្រតិភូរាជរដ្ឋាភិបាលកម្ពុជាទទួលបន្ទុកជាអគ្គនាយក
នៃអគ្គនាយកដ្ឋានកសិកម្ម

អគ្គនាយករង

ហូ 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	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	វត្តព្រៃច្រាប	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