ESIA REPORT

ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT

XE BANG HIENG RIVER BASIN

SAVANNAKHET PROVINCE, LAO PDR

Economic Research & Development

Implemented by:

Integrated Water Resources Management and Ecosystem based Adaptation in Xe BangHieng River basin and Luangprabang City

Contents

Acronyms and Abbreviations

ADB	Asian Development Bank
AR5	Fifth Assessment Report
CBD	Convention on Biological Diversity
CCKP	Climate Change Knowledge Portal
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DG	Diesel Generator
DWR	Department of Water Resources
EbA	Ecosystem-based Adaptation
EDL	Electricite du Laos
EG	Ethnic Group
EIS	Environmental Impact Statement
ESIA	Environmental and Social Impact Assessment
ESMMP	Environment and Social Management and Monitoring Plan
ESMP	Environmental and Social Management Plan
EWR	Explosive Remnants of War
FPIC	Free, Prior, and Informed Consent
GCF	Green Climate Fund
GDP	Gross Domestic Product
GoL	Government of Lao
GRM	Grievance Redress Mechanism
HHs	Households
ICFMS	Integrated Climate-Resilient Flood Management Strategy
ICM	Integrated catchment Management
IEE	Initial Environmental Examination
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resource Management
LDC	Least Developed Country
LFNC	Lao Front National Construction
M&E	Monitoring and Evaluation
MAE	Ministry of Agriculture and Environment
MoNRE	Ministry of Natural Resources and Environment
NDC	Lao PDR Nationally Determined Contribution
NPAGE	National Plan of Action on Gender Equality
NTFPs	Non-Timber Forest Products
OECD	Organization for Economic Co-operation and Development
OHS	Occupational Health and Safety
PAPs	Project Affected Persons
PBs	Project Board
PC	Project Coordinator
PMU	Project Management Unit
PONRE	Provincial Office of Natural Resources and Environment
POPP	Programme and Operations Policies and Procedures
PPE	Personal Protective Equipment
SES	Social and Environmental Standards
SESP	Social and Environmental Screening Procedure
SPI	Standardized Precipitation Index
UNDP	United Nations Development Programme
UNESCAP	United Nation Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
VEC	Value Ecosystem Components
WCS	Wildlife Conservation Society
XBH	Xe Bang Hieng River Basin

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EXECUTIVE SUMMARY

The IWRM-EbA Project is designed to support the government of Lao PDR in promoting integrated management of land and water resources at target sites in the Xe Bang Hieng River Basin and Luang Prabang city. This will increase the climate resilience of communities to the impacts of floods and droughts—both of which are projected to become more intense and frequent under future climate scenarios. The project, being implemented by the Department of Water Resources of the Ministry of Agriculture and Environment since December 2022, aims at strengthening climate resilience of communities in two particularly vulnerable areas of Lao PDR—namely, Savannakhet Province and Luang Prabang city—focusing on the impacts of floods and droughts.

The ESIA preparation process involved a series of public consultations at the provincial, district and village levels through active people's participation. Public consultation was aimed at informing the work of assessing proposed major projects for potentially significant adverse environmental, social, economic, health and heritage effects. The result of the consultation shows that the local community and local authority fully support the construction of unit infrastructure, but all activity must be coordinated with local authority.

The project involves construction of various small scale protective infrastructures such as evacuation shelter, riverbank stabilization, wetland modification/pond improvement, gravity-fed water supply and levee construction in ten target villages of five districts of Savannakhet Province.

The Environmental and social impact assessment (ESIA) was conducted using mixed-method approach that allowed a comprehensive understanding of the impacts by combining both qualitative insights and quantitative data. Data were collected from project staff, target beneficiaries, stakeholder consultation, onsite field visits, public consultations, and secondary data from project study reports.

The project has significant positive impacts through decreasing flood impacts within the area of influence. Despite its benefits at the local level, the project could also result in a few negative impacts from its pre-construction, construction and operation phase activities. The construction of protective infrastructures does not pose negative impacts on air, water and soil pollution, occupational health and safety risks, , noise and vibration impacts, land use changes, with moderate impact on plant and soil biodiversity.

The project is anticipated to generate environmental impacts to a lesser extent, including aquatic biodiversity, socio-economic, socio-cultural and health and safety. Therefore, the overall environmental impacts of the project implementation are primarily negligible, low to moderate risk due to the nature of the construction works. The project will introduce a few low risk environmental impacts through land clearing, excavation, cut/fill, transportation of construction materials and debris. This impact will mainly occur in the construction site and along the mobilization route. Reduced ambient air quality reduction and increased noise level is basically generated by the operation of earth moving and excavation equipment, and transportation of construction materials and workers. These activities may partially impact the local community living within the proximity of the project area.

The project implementation will also contribute to negligible soil erosion due to exposure to rain and wind during site clearing that would, in turn, result in sedimentation of surface drainage networks and then affect the quality of receiving water bodies. Solid waste, including debris from damaged facilities, spoils from grading and excavation activities, scrap wood and metals will be generated. Hazardous waste such as used lubricants and oily rags will also be generated in small quantities. Improper management of these waste streams would result in soil and shallow groundwater as well as surface water contamination.

Direct impact of the project implementation on biodiversity as well as their habitat is unlikely since the project is not located in or near an area that is of concern to biodiversity and the key biodiversity area of certain species. On the other hand, increased road traffic and congestion due to excavation and transportation activities will be felt directly by the community living within the project area and other roads used to access the project areas.

To facilitate the integration of environmental protection considerations and facilitate environmental impacts caused by the project, the Environment and Social Management Plan (ESMP) has been prepared that makes the provision for environment mitigation measures and monitoring requirements to be implemented by the contractor under the supervision of UNDP are formulated based on the risk and impact assessment described in this ESIA report. Upon contract award, contractors will be required to develop a Construction Environmental Management Plan (CEMP), detailing project-specific EHS mitigation measures and monitoring requirements based on the minimum requirements defined in the ESMP. No construction work (rehabilitation and new construction) will start prior to obtaining approval of the CEMP from UNDP. On the other hand, the contractor is required to mobilize competent EHS engineer and provide adequate resources and budget to implement the CEMP in a diligent and effective manner and deliver the CEMP implementation report on semi-annual basis to UNDP in timely manner.

1Introduction
1.1 Project Background

The Lao People's Democratic Republic (hereafter Lao PDR) is a landlocked Least Developed Country (LDC) in Southeast Asia. It has a population of ~7.1 million people[1] and lies in the lower basin of the Mekong River, which forms most of the country's western border with Thailand. The GDP of Lao PDR has grown at more than 6% per year for most of the last two decades and reached ~US$18 billion in 2018 (~US$2,500 per capita)[2]. Much of this economic growth has been dependent on natural resources, which has placed increasing pressure on the environment[3]. Agriculture accounts for ~30% of the country's GDP and supports the livelihoods of 70–80% of the population[4]. Despite positive economic growth, poverty remains widespread, and the impacts of the COVID-19 pandemic are likely to have an impact on Lao's graduation from LDC status. Extreme poverty—based on the international poverty line of US$1.90 per day—declined from ~18% in 2014 to ~13% in 2017[5,6].

Lao PDR is highly vulnerable to hydrological disasters, with severe flooding—often associated with tropical storms and typhoons—as well as drought the most regularly occurring natural disasters[7]. In 2018, for example, floods across the country resulted in ~US$370 million (~2% of GDP) in loss and damage[8], with agriculture and transport the two most affected sectors. An increase in the frequency of these climate hazards, including floods and droughts, has been observed since the 1960s, as well as an increase in the average area affected by a single flood[9]. Additionally, the increasing frequency and severity of floods because of climate change are further compounded by rapid urbanisation in Lao PDR[10]. Floods in 2019 — the worst in four decades — affected 45 districts and ~768,000 people country-wide floods, resulting in US$162 million in costs.

In addition, average increases in temperature of up to 0.05°C per year were observed in the period between 1970 and 2010. These trends are expected to continue, with long-term climate modelling projecting: i) an increase in temperature between 1.4°C and 4.3°C by 2100[11]; ii) an increase in the number of days classified as "Hot"; iii) an increase of 10–30% in mean annual rainfall, particularly in the southern and eastern parts of the country and concentrated in the wet season (June to September); iv) an increase in the number of days with more than 50 mm of rain; v) a 30–60% increase in the amount of rain falling on very wet days[12]; and vi) changing rainfall seasonality resulting in a longer dry season[13]. The increases in temperature and the length of the dry season are expected to increase the severity of droughts and increase water stress, particularly in cultivated areas.

Lao PDR is one of the least densely populated countries in Southeast Asia, with a population density of ~30 people per square kilometre—ranking 105th in the world[14,]. The population is, however, spread unevenly across the country, with most people residing in the valleys of the Mekong River and its tributaries, as well as around the capital of Vientiane[15]. Approximately 40% of the population is located within urban areas and the annual urban growth rate is ~4%. To meet the demands of this comparatively high urban growth rate, intensive urban development has taken place over the last decade across cities in Lao PDR. This rapid development has often come at the expense of adequate coordination, strategic spatial planning or investment in infrastructure. The combination of unplanned development and rapid urban growth has resulted in poorly designed urban areas. Furthermore, there has been insufficient integration of the effects of climate change into urban planning in Lao PDR, leading to high levels of exposure to climate risks. Flood impacts, in particular, are expected to become more severe if development continues at the present rate and in the current mode of planning. Importantly, current development does not adequately consider the upstream and downstream factors affecting flooding. Frequently, upstream areas are being covered with impermeable surfaces — such as roads and parking areas — that increase downstream flood impacts, while many buildings are constructed in flood plains. To increase the resilience of urban

[1] Population estimates from 2018. Work Bank Data. 2019. Lao PDR. Available at: https://data.worldbank.org/country/lao-pdr
[2] GDP and GDP per capita in current US$. Work Bank Data. 2019. Lao PDR. Available at: https://data.worldbank.org/country/lao-pdr
[3] World Bank. 2019. Lao PDR – Overview. Available at: https://www.worldbank.org/en/country/lao/overview#1
[4] FAO. 2019. GEF PIF: Climate Smart Agriculture alternatives for upland production systems in Lao PDR.
[5] This is the minimum level of income deemed adequate in a particular country. It represents the international equivalent of US$1.90 in the United States of America in 2011.
[6] World Bank. 2017. Lao PDR Economic Monitor: lowering risks and reviving growth.
[7] Guha-Sapir, D., Hoyois, P.H. & Below, R. 2016. Annual Disaster Statistical Review 2016: The Numbers and Trends. Brussels: CRED.
[8] Government of Lao PDR (GoL). 2018. Post-Disaster Needs Assessment (PDNA): 2018 Floods, Lao PDR. Available at: https://www.gfdrr.org/en/publication/post-disaster-needs-assessment-2018-floods-lao-pdr. Accessed on: 27 January 2021
[9] GoL. 2013. Second National Communication to the UNFCCC (SNC).
[10] Lao PDR Population and Housing Census (PHC) 2015. The 4th Population and Housing Census, Results of population and housing census.
[11] The lower value in this range is the projection for RCP4.5 and the higher value for RCP8.5.
[12] Projections i) to v) are from: World Bank Group. 2020. Climate Change Knowledge Portal: Lao PDR. Available at: https://climateknowledgeportal.worldbank.org/country/Lao PDR/climate-data-projections
[13] GoL. 2020. Nationally Determined Contribution (NDC).
[14] United Nations Department of Economic and Social Affairs. Population Division. World Population Prospects 2017. Available at: https://population.un.org/wpp/Graphs/DemographicProfiles/. Accessed on 6 May 2019.
[15] The population density in Vientiane was 209 people per square kilometre – nearly eight times higher than the national figure.

areas in Lao PDR, integrated and sustainable city planning and development approaches that consider the future impacts of climate change should be adopted.

In response to the need and problem mentioned above, Integrated Water Resource Management and Ecosystem-based Adaptation (EbA) in the Xe Bang Hieng River Basin and Luang Prabang city (IWRM-EbA) is developed to increase the climate resilience of vulnerable communities in the two provinces. First, the Xe Bang Hieng river basin in Savannakhet Province will address its vulnerability to the projected increase in both droughts and floods. This is a major rice-producing area and is particularly important for the country's food security. It is also one of the areas in the country which is most vulnerable to droughts and experienced severe flooding in 2017, 2018, and 2019. Second, the city of Luang Prabang is one of the cities in Lao PDR that is most vulnerable to flooding, as well as being an important cultural heritage site[16]. While urban flood risk management is being addressed in four other vulnerable cities in Lao PDR through a GCF project[17], Luang Prabang was not included.

The IWRM-EbA project consists of three important components:

- Component 1: Developing national and provincial capacities for Integrated Catchment Management (ICM) and integrated urban Ecosystem-based Adaptation (EbA) for climate risk reduction.
- Component 2: Ecosystem-based Adaptation (EbA) interventions, with supporting protective infrastructure115, and livelihood enhancement.
- Component 3: Knowledge management and Monitoring and Evaluation (M&E).

Detailed explanation of each component of the project are provided in section 3 of the report.

1.2 Purpose and Scope

Based on UNDP's SESP, IWRM-EbA has been given an overall SESP risk rating of "Substantial". This means that the project has "activities that could cause social and environmental problems that are more complicated than those of Moderate Risk projects but are still smaller in size and less serious than those of High Risk projects (for example, they can be reversed, are predictable, have a smaller impact, and pose less risk of combined effects)." Based on UNDP's SES, substantial risk project required scoped environmental and social impact assessments (ESIA) and an environmental and social management plan (ESMP).

Based on the SESP, this ESIA is applied to "Component 2: Ecosystem-based Adaptation (EbA) interventions, with supporting protective infrastructure, and livelihood enhancement" of the project in Savannaket province. Of many activities, the component has two important activities that require ESIA. These activities are:

- Activity 2.1.1: Conserve Xe Bang Hieng protected forests through enhanced conservation zone management and enhanced natural regeneration and restore Xe Bang Hieng degraded headwater conservation zones and implement EbA interventions to improve ecological integrity for the delivery of ecosystem services; and
- Activity 2.1.2: Construct protective infrastructure to reduce flood risk (through cascading weirs and drainage channels) and drought risk (by means of reservoir networks and rainwater harvesting.

This ESIA will identify and assess social and environmental impacts of the two activities in the target areas (see project description in section 3); evaluate alternatives; and design appropriate avoidance, mitigation, management, and monitoring measures. In particular, the ESIA will:

- assess project activities at the scale deemed appropriate for compliance with the SES.
- identify environmental and social impacts of the project activities in the target areas.
- address all relevant issues related to the SES Overarching Principles and Project-level Standards, as identified in the project's SESP and any other issues identified during the ESIA.

1.3 Approach and Methodology

The approach and methodology applied for the execution of the ESIA study is as provided below,

- Review of the ESMF, feasibility report and other relevant documents were reviewed to understand the proposed project component;
- Regulatory review was undertaken to understand the applicable, local and national legislation and regulatory frameworks;
- A detailed social and environmental assessment of the site and surrounding areas was undertaken through the following methods,

[16] The 'Town of Luang Prabang' is one of Lao PDR's three UNESCO World Heritage Sites and was the first site designated.

[17] The GCF Simplified Approval Process project entitled *Building resilience of urban populations with ecosystem-based solutions in Lao PDR* was approved in 2019 and will target the cities of Vientiane, Paksan, Pakse and Savannakhet.

    - Review of the Google Imagery of the proposed site to understand site specific issues and associated facilities;
    - Discussions with the beneficiary communities including the potentially project affected communities and identification of key issues through consultations;
    - Baseline data collection through discussions held with village heads and project teams in the study area with respect to ecology and socio-economic conditions.
- Collation of secondary information on socio-economic and environmental profile of the area was supplemented by information available in existing reports and institutional stakeholders with regard to the proposed project and its activities. The approach included,
    - Consultations with project affected communities;
    - Data compilation from secondary sources;
    - Consultations with Institutional Stakeholders.
- Assessment of environmental and social impacts based on understanding of the project activities and existing baseline status;
- Preparation of Environment and Social Management and Monitoring Plan.

1.4 Limitation

This report presents data from the Integrated Climate-Resilient Flood Management Strategies (ICFMS) plans conducted in Savannakhet Province, as well as data from site visits by the project team. It identifies potential environmental and social risks and impacts of the proposed project. The assessment was carried out based on the scope of work, provided documentation, team discussions, and methodology defined in the Inception Report. There is some reliance on verbal information from stakeholders that is not verifiable through observation or documentation. The Consultant is not responsible for undisclosed facts at the time of the assessment.

The statements, conclusions, and opinions contained in this report are only intended to detail out the key risks and impacts that is envisaged due to the proposed project based on the documents made available for review and interviews conducted with the varied stakeholders.

1.5 Report Layout

This report has the following sections of the report align with the UNDP's guidance note on impact assessment and management:
Section 2: describes the applicable environmental and social related policies and regulatory frameworks
Section 3: outlines the description of the proposed project
Section 4: details the environment and socio-economic baseline of the project area
Section 5: assess the environmental and social risks and impacts envisaged due to the project activities
Section 6: provides an analysis of alternatives
Section 7: provides summary of mitigation measures, and environmental and social management and monitoring plan
Section 8: provides details on engagement and consultation with stakeholders
Section 9: presents the conclusion and recommendations of the report

2 Legal and Institutional Frameworks

This section provides an overview of the administrative framework and identifies relevant Lao PDR legislation, international treaties, and industry standards and guidelines that the Project must follow. Specifically, this chapter provides a summary of the following:

- National environmental and social legislation applicable to the Project;
- International conventions to which Lao PDR is a signatory; and
- International standards and guidelines applicable to the Project.

2.1 Environment and Social Legislation and Policies

Lao PDR has adopted various policy, strategies and legal instruments to safeguard its environment and natural resources. This section provides a preliminary review of the national policy; legal and institutional frameworks related to the potential risks and benefits of the proposed project and prospective activities to be implemented with the use of the funding received.

Table 1: Applicable Regulatory Frameworks of the Assessment

Sector	Law, Policy and Strategy	Applicable to the project
Climate change	Nationally Determined Contribution (NDC) 2020	There is an increased focus on enhancing actions that aim to strengthen the Lao PDR's response to the threat posed by climate change. This includes the increasing risk of flooding in many parts of the country, as exacerbated by climate change impacts. The NDC outlines several key sectors for long term adaptation objectives, including: i) agriculture; ii) forestry and land use changes; and iii) water resources
	Decree on Climate Change, approved in 2019	Determines the principles, regulations and measures on the management, monitoring and inspection of tasks relevant to climate change. This intends to prevent, protect and decrease the potential impacts of climate change, with the aim of ensuring the safety of lives, health, property, environment, biodiversity, and infrastructure. In addition, the plan includes coordination with regional and international stakeholders to contribute to socioeconomic development for sustainability and green growth.
Natural Resources and Environment	Ministry of Agriculture and Environment (MAE) has developed a Vision towards 2030	Provides direction for: i) the development and management of natural resources and the environment; ii) building capacity for climate change adaptation; and iii) ensuring sustainable socioeconomic development. The Vision further highlights the impacts of floods and droughts on Lao PDR and how climate change affects the frequency and intensity of these disasters
	10-year Natural Resources and Environment Strategy (2016-2025)	Provides a vision and strategic direction for the development and management of natural resources and the environment, ensure sustainable socioeconomic development, and build capacity for climate change adaptation and mitigate the risks of natural disaster. This strategy aims to achieve sustainable utilisation and management of natural resources and the environment, together with improving a healthy environment and wealth for all people in Lao PDR.
Land use and water management	Environmental Protection Law (2013)	Defines principles, regulations and measures related to environmental management and monitoring of environmental protection, control, preservation and rehabilitation, as well as the reduction of global warning. Additionally, the law relates to the prevention and management of natural disasters, such as those the proposed project is responding to
	Urban Development Strategy to 2030	It outlines the vision of the Ministry of Public Works and Transport regarding urban development and the integration of the country into the main transport and development corridors of the Great Mekong Subregion from 2016 to 2030. The main objective is to define directions, targets and investment plans for urban development and should serve as the main reference for infrastructural developments and the protection of the country's architectural, cultural and environmental heritage. Rationales include the urbanisation of rural areas through the development of small towns towards reducing rural-urban disparities, as well as strengthened regional integration through the development of economic centres along main trans-country corridors.

	Decree on Environmental Impact Assessment (EIA) No. 389/GoI (2022)	The decree defined the rules, regulation and measures on for management and monitoring the implementation of environmental impact assessment work. Its purpose is to ensure that these activities are accurate, transparent, and consistent, aiming to prevent, mitigate, and resolve negative environmental impacts. It also seeks to guarantee fair compensation, resettlement, livelihood restoration, and an improved quality of life for affected people, maximize the efficient management and utilization of natural resources, protect the rights and interests of the nation and its people, and contribute to the implementation of the National Socio-Economic Development Plan in sustainable manner. Article 9: Projects are categorized as either IEE (Group 1) type projects or EIA (Group 2) type projects – refers to separate regulation defining the criteria for categorization. Articles 11-18: Requirements for IEE studies and reports, and procedures for review and approval of IEE reports by the relevant Provincial Department of Natural Resources and Environment. Articles 19 to 30: Requirements for EIA studies and reporting, and procedures for MAE's review and approval process and appointment of a panel of expert to assist with the technical review. Article 23 (7): Projects estimated to have significant impacts on public health must prepare a separate health impact assessment report to be approved by the Ministry of Health. Articles 39-42: Provisions on public involvement during the IEE and EIA process and project implementation. Article 43-50: Provisions on issuance, validity period, suspension, and withdrawal of Environmental Compliance Certificate for IEEs, EIAs and ESMMPs. Articles 51-58: Provisions on environmental monitoring and inspection of IEE and EIA projects. Articles 71-77: Provisions on institutional arrangement
Works Rights and Anti-Discrimination	Labour Law (2013)	Defines the principles, regulations and measures on administration, monitoring, labour skills development, recruitment, and labour protection in order to enhance the quality and productivity of work in society, so as to ensure the transformation to modernization and industrialization aimed at safeguarding the rights of employees and employers, as well as the legitimate interests and the continual improvement of their livelihoods, while contributing to the promotion of investment, national socio-economic development, and regional and international links.
	Decree on Labour Safety and Health was enacted in 2019	This decree states that decree states that workers have the legal right to require their employers to ensure occupational health and safety. Employees can submit petitions to labour management agencies to intervene if their employers do not improve the workplace environment to meet health and safety standards in line with workers' requests. Labourers also have the right to reject a job assigned by their employee if the work is deemed to be highly risky or dangerous, in accordance with the decree. Further to this, this decree also gives employees the right to receive information or knowledge concerning any risky or dangerous conditions, and to be informed of precautionary measures that would avoid risks and dangers.
Human Rights and Equality	5-year National Plan of Action on Gender Equality (NPAGE) (2021-2026)	The NPAGE prioritises women's health and reproductive health, political participation, economic empowerment, education, employment and social protection. NPAGE targets relevant to this project are: (i) ratio of women members in the national and regional committee to protect and control natural disasters and man-made disaster shall cover 30% of all positions; (ii) ratio of women who receive the training on protection and response to natural disaster and man-made disaster shall cover 40% of all participants; and (iii) ratio of women who receive training on

		energy-efficient and sustainable agriculture technology shall cover 50% of all participants.
	Decree on Compensation and Resettlement of People Affected by Development Projects, 2016	This Decree provides principles, regulations and standards on the management, monitoring of compensation of losses and the management of resettlement activities in order to properly and effectively implement development projects with the aims to ensure that the affected people are compensated, resettled and are assisted with permanent livelihood alternatives leading to improving of living conditions to be better off or to be at the same level as they were before.
	Law on Handling of Petitions 2014	provides objectives, principles and process of applying and handling different types of grievance, petition and complaints that may be raised by Project-Affected Persons (PAPs). The Law on Handling of Petitions — which supersedes a 2005 version — applies and protects rights and interest of all citizens and entities, state organizations, community and individuals

Source: PIMS 6547 Environmental and Social Management Framework

2.2 Lao National Environmental Impact Assessment

The EIA system in Lao PDR follows a well-established process applied in many jurisdictions around the world and is in many ways similar to the processes used by international funders. The EIA system operates with two levels of assessment depending on the type and size of the project. A less demanding IEE for specific types and sizes of projects that have well-known and limited environmental and social impacts; and a full-scale ESIA for project types and scales requiring comprehensive and often technically complicated assessments.

The general process for IEE type projects is illustrated in **Error! Reference source not found.**The first step is to determine whether the project is an IEE type, an EIA type or neither of these based on a categorization of types and sizes of projects in the Ministerial Agreement on Classification of Activities and Investment Projects in IEE and EIA Type Activities or Investment Projects, No 0358/MONRE of 24 February 2023. For IEE type projects, the project proponent shall undertake the required studies and consultations and prepare and submit an IEE Report and an Environmental Management and Monitoring Plan (EMMP) to the relevant PoNRE for their review, approval and issuance of an Environmental Compliance Certificate.

As shown in **Error! Reference source not found.**, PoNRE has 25 workdays to complete the technical review and approval process. This does not include the time that the project proponent may have to spend to revise the reports as per PoNRE's comments.

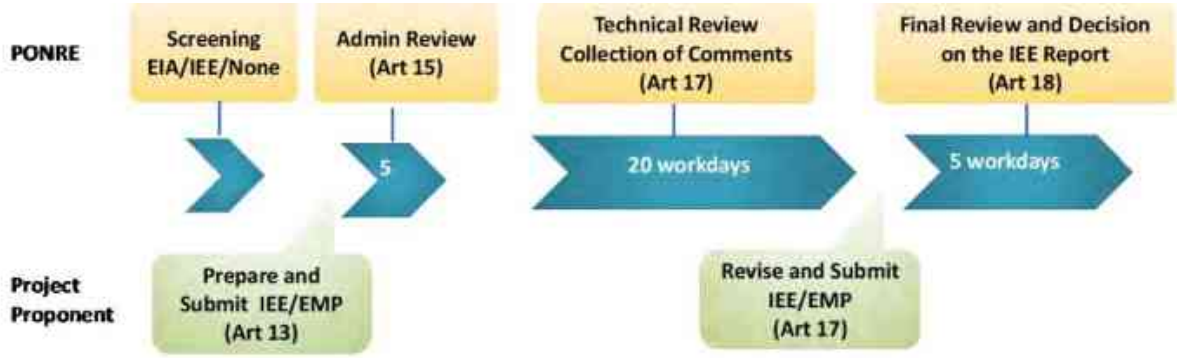


Figure 1 Diagram of the IEE Process

According to Decree No. 389/GoI (2022) on Environmental Impact Assessment (EIA) and Ministry Agreement No. 358/MONRE dated February 24, 2023, concerning the grouping list of investment projects and activities subject to EIA, it states that projects involving tree plantation, Non-Timber Forest Product (NTFP) rehabilitation, scientific research, biodiversity conservation, water resource and environmental protection are not required to conduct an Initial Environmental Examination (IEE) or EIA. As such, the project activity 2.1.1: Conserve Xe Bang Hieng protected forests through "enhanced conservation zone management and enhanced natural regeneration and restore Xe Bang Hieng degraded headwater conservation zones and implement EbA interventions to improve ecological integrity for the delivery of ecosystem services" does not require either EIA or IEE for it will involve tree plantation to restore the conservation zone. However, the project activity 2.1.2: Construct protective infrastructure to reduce flood risk (through cascading weirs and drainage channels) and drought risk (by means of reservoir networks and rainwater harvesting, these activities are falling in Group 1 (item 6 Infrastructure Investment Project or activity) are required to prepare an IEE Report together with an EMP and submit these to the relevant Provincial

Department of Natural Resources and Environment (PoNRE) for their review, approval and issuance of an Environmental Compliance Certificate (ECC). These requirements apply to both privately and publicly funded projects. However, in consultation with the project team, it was determined that this ESIA will adhere to UNDP's SES requirements instead of Decree No. 389/GoI (2022).

2.3 Institutional Framework

Various government bodies at the national and provincial levels play critical roles in implementing regulatory frameworks discussed in the preceding section. The Environmental Protection Law establishes the responsibilities of various government agencies, including the Ministry of Agriculture and Environment—formerly Ministry of Natural Resources and Environment (MoNRE), Department of Water Resources (DWR) and provincial authorities. The effective implementation of these regulatory frameworks relies on the coordinated efforts of various institutions. Below are the key responsibilities of national and provincial authorities which are relevant to this ESIA and IWRM-EbA Project.

Ministry of Agriculture and Environment (MAE)

- Regulatory authority on land and water resources and on environment conservation
- Administrating the EIA process
- Review and approve EIA reports
- Issue/renew, suspend or revoke ECCs for EIA type projects
- Issue warnings to the Project Owner in case of a noncompliance.
- Developing and negotiating environmental and social obligations in energy concession agreements.
- Inspecting and monitoring compliance with environmental and social obligations during project implementation
- Environmental Oversight Body under concession agreements—Issuing technical guidelines on EIA

Department of Water Resources (DWR)

DWR operates under MAE and focuses on water resources management. Its responsibilities include:

- Ensuring sustainable use and management of water resources.
- Developing and implementing water resource policies and regulations.
- Monitoring water quality and quantity.
- Managing water-related projects, including hydropower development.

Provincial Department of Natural Resources and Environment

- Regulatory authority on land and water resources and on environment conservation at the provincial level
- Administering the IEE process
- Review and approve IEE report and EMP
- Issue/renew, suspend or revoke ECCs for IEE type projects
- Issue warnings to the Project Owner in case of a noncompliance.
- Developing and negotiating environmental and social obligations in energy concession agreements.
- Inspecting and monitoring compliance with environmental and social obligations during project implementation.

2.4 International Treaties and Agreements

Lao PDR has ratified several international treaties and agreements related to the environment and social aspects. The table below provides broader requirements in relation to the project.

Table 2: International Treaties and Agreements

Agreement/Treaty	Alignment to IWRM/EbA
Convention on Biological Diversity (CBD) - Ratified in 1996	Focuses on conservation and sustainable use of biodiversity, critical for EbA and protecting ecosystems.
United Nations Framework Convention on Climate Change (UNFCCC) - Ratified in 1995	Addresses global climate change, forming a foundation for climate resilience strategies under IWRM/EbA.
Kyoto Protocol - Ratified in 2002	Sets targets for reducing greenhouse gas emissions, indirectly supporting climate-resilient water management.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) - Ratified in 2004	Helps regulate trade in endangered species, supporting biodiversity conservation for ecosystem resilience.
Ramsar Convention on Wetlands - Ratified in 1999	Promotes wetland conservation, critical for water resources and ecosystems in Lao PDR's River basins.
Paris Agreement - Ratified in 2016	Strengthens global efforts to combat climate change, with direct links to climate adaptation under EbA.

ASEAN Agreement on Transboundary Haze Pollution - Ratified in 2003	Addresses regional environmental issues such as haze pollution, impacting ecosystems and water resources.
The Nagoya Protocol under the CBD - Ratified in 2014	Focuses on equitable sharing of genetic resources, linked to sustainable use of ecosystems in EbA.
Vienna Convention for the Protection of the Ozone Layer - Ratified in 1993	Protects the ozone layer, indirectly influencing ecosystems and climate resilience.
Montreal Protocol - Ratified in 1994	Addresses substances depleting the ozone layer, with implications for long-term climate stability.

2.5 UNDP Social and Environmental Standards (SES)

In pursuant to the UNDP SES 2022 principles, the screening of the IWRM-EbA Project concluded the following Programming Principles and Standards:

- Programming Principles
    - Principle 1: Leave No One Behind
    - Principle 2: Human Rights
    - Principle 3: Gender Equality and Women's Empowerment
    - Principle 4: Sustainability and Resilience
    - Principle 5: Accountability

- Standards
    - Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management
    - Standard 2: Climate Change and Disaster Risks
    - Standard 3: Community Health, Safety and Security
    - Standard 4: Cultural Heritage
    - Standard 5: Displacement and Resettlement
    - Standard 6: Indigenous Peoples
    - Standard 7: Labour and Working Conditions
    - Standard 8: Pollution Prevention and Resource Efficiency

2.6 Comparative Analysis between UNDP SES and Regulatory Requirements

A comparative analysis has been undertaken to assess the applicability of UNDP SES, that were triggered during the screening process, and the national regulatory requirements to ensure that the project is environmentally and socially viable as illustrated in the table below.

Table 3: Comparison between UNDP SES and National Regulatory Requirements

UNDP SES	UNDP SES Requirement	National Regulations	Regulatory Requirement	Comparative Analysis	Key, Gaps, and Action Steps
Principle 2: Human Rights	UNDP recognizes the centrality of human rights to sustainable development, poverty alleviation, sustaining peace, and ensuring fair distribution of development opportunities and benefits. It is committed to supporting "universal respect for and observance of human rights and fundamental freedoms for all."	Lao PDR Constitution (amended 2015),	The Constitution of Lao PDR, amended in 2015, serves as the supreme legal document guaranteeing fundamental rights to all citizens. It ensures the right to life, liberty, security of persons, and equality before the law while explicitly prohibiting discrimination based on race, sex, religion, and social status. Articles 35, 36, and 37 emphasize equality for all citizens, the protection of ethnic groups' rights to preserve their customs and traditions, and the prohibition of acts that divide the nation or create discrimination among ethnic groups. For the project, this means ensuring non-discrimination, meaningful participation of ethnic communities, and the protection of vulnerable populations. The project must conduct consultations with ethnic groups and integrate their concerns into the project's design and implementation to align with constitutional guarantees.	UNDP upholds the principles of accountability and the rule of law, participation and inclusion, and equality and non-discrimination, noting that prohibited grounds of discrimination include race, ethnicity, sex, age, language, disability, sexual orientation, gender identity, religion, political or other opinion, national or social or geographical origin, property, birth, health status, or other status, including as an indigenous person or as a member of a minority. UNDP also makes sure that stakeholders are actively involved and well-informed during the planning, execution, checking, and assessment of programs and projects, although this is restricted by the country's human rights laws. The application of this principle ensures inclusivity and accessibility to all vulnerable groups in the project-affected and beneficiary communities.	UNDP ensures the inclusive participation of marginalized groups, which is more comprehensive than national laws. National law lacks detailed provisions on vulnerable group engagement and practical participation mechanisms. Adopt UNDP inclusivity guidelines; develop localized, accessible stakeholder engagement processes.
Principle 3: Gender Equality and Women's Empowerment	The promotion of gender equality and the empowerment of women are intrinsic to UNDP's human rights-based approach to development programming. This effort includes advocating for women's and girls' human rights, combating discriminatory practices, and challenging the roles and stereotypes that create inequalities and exclusion.	National Gender Equality Strategy (2021–2025),	The approach aims to increase women's decision-making positions to 30% and address gender inequities in education, health, and economic opportunity. It promotes gender-responsive development programs and policies. The project must incorporate gender equality from planning to implementation. The project must examine gender effects, encourage women to participate in consultations and decision-making, and track gender-disaggregated statistics to measure progress. The project should also address challenges to women's economic and social empowerment, such as inadequate resources or cultural norms.	UNDP Principle 3 ensures that projects undertaken by them promote gender equality and women's empowerment. UNDP strengthens interventions tackling structural changes and removes the institutional, societal, political and legal barriers to accelerate gender equality and women's empowerment. They strive to close the gender gap by focusing on empowering and creating agency for women and men. UNDP's requirement for Principle 3 provides a broader approach to gender equality and women's empowerment than the Gender Equality Act mentioned herein. Thus, the Principle 3 will be adopted for its specific requirement of meaningful participation of women in project decision-making and engagement in paid work during the construction work.	UNDP applies broader empowerment and agency-based gender equality than national Gender Equality Law. Limited focus on leadership roles, economic empowerment during project implementation. Ensure women's participation in decision-making; apply UNDP gender tools in planning and implementation.
Principle 5: Accountability	UNDP promotes accountability to programme and project stakeholders by (i) enabling active local community engagement and participation in decision-	Anti-Corruption Law (2012)	This Act regulates public and private sector corruption. It requires public authorities to declare their assets and manage public resources transparently, accountably, and honestly. Corruption reporting, investigation, and sanctions are	UNDP promotes accountability to programme and project stakeholders by actively engaging with them and being participants in the decision-making process. Thus, ensuring transparency of programming interventions through provision of timely, accessible and functional information. The	UNDP promotes robust GRM and transparency, lacking in national systems.

UNDP SES	UNDP SES Requirement	National Regulations	Regulatory Requirement	Comparative Analysis	Key, Gaps, and Action Steps
	making, particularly those at risk of being left behind; (ii) ensuring transparency of programming interventions through provision of timely, accessible and functional information regarding supported activities, including on potential environmental and social risks and impacts and management measures; (iii) ensuring stakeholders can communicate their concerns and have access to rights-compatible complaints redress processes and mechanisms; and (iv) ensuring effective monitoring—and where appropriate, participatory monitoring with stakeholders—and reporting on implementation of social and environmental risk management measures.		also covered by the statute. All financial and operational actions for the project must be transparent and accountable. The project must have strong financial management systems, regular audits, and clear resource allocation and expenditure documentation. The project should also allow stakeholders to raise corruption issues and investigate them promptly and fairly. By following this law, the project may create stakeholder trust and use resources efficiently.	principles also mention setting up a robust Grievance Redressal Mechanism for the project which is broader in scope as related to the requirements under the respective regulations.	No mandate for project-level GRM or stakeholder engagement in decision-making. Establish accessible GRM; train implementers and local officials to manage and respond effectively.
Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	UNDP is committed to integrating biodiversity and ecosystem management into development planning and production sector activities, strengthening protected areas systems, and managing and rehabilitating ecosystems for adaptation to and mitigation of climate change.	Environmental Protection Law (2019)	Environmental conservation, pollution control, waste management, and EIAs are regulated under the Law on Environmental Protection (2019). Article 24 demands public engagement in EIAs, while Article 25 requires environmental disclosure. Article 26 penalizes environmental infractions, establishing accountability. The project needs a thorough EIA, public discussion, and transparency about its implications. To avoid penalties and maintain environmental sustainability, the project must minimize pollution, handle waste sustainably, and follow environmental requirements. This strategy and action plan promotes biodiversity conservation and sustainable resource use. It targets ecosystems, species, and genetic diversity in	UNDP SES Standard 1 ensures that the assessment of the impacts on the natural resources, biodiversity and ecosystem services should be undertaken as an integral part of ESIA studies so that adequate mitigation measures can be adopted to offset the risks and impacts identified. The Environmental Protection Law is restrictive in ensuring that an assessment of the impacts on the natural resources, biodiversity, ecosystem services and social aspects should be undertaken as an integral part of ESIA study. Hence, Standard 1 of UNDP SES shall be complied with to ensure that that the risks and impacts related to the project activities are identified so that appropriate mitigation measures are developed.	UNDP requires integrated biodiversity/ecosystem assessment; national law is more general. Limited application of ecosystem service valuation and biodiversity mitigation hierarchy. Integrate biodiversity and ecosystem service assessment into ESIA; apply mitigation hierarchy.

UNDP SES	UNDP SES Requirement	National Regulations	Regulatory Requirement	Comparative Analysis	Key, Gaps, and Action Steps
		Biodiversity Strategy (2016-2025)	accordance with the CBD. Integrating biodiversity protection into development planning and promoting community-based conservation are key strategies. The project must limit biological damage in ecologically sensitive places like the Xe Bang Hieng River Basin. The project must assess biodiversity, apply EbA, and include local communities in conservation. The project can meet national and global biodiversity goals and use natural resources sustainably by following this method.		
Standard 2: Climate Change and Disaster Risks	This Standard is applicable to projects that (i) have development outcomes that may be threatened by climate change or disaster risks; (ii) may contribute to increased exposure and/or vulnerability to climate change or disaster risks; or (iii) may produce significant GHG emissions.	National Strategy on Climate Change (2010)	This strategy addresses climate change impacts and promotes low-carbon development. It reduces greenhouse gas emissions and improves climate resilience in agriculture, water resources, and forestry. Considering climate change in development planning and building local capacity for adaptation and mitigation are key to the strategy. Climate adaptation measures like flood management systems and drought-resistant crops and sustainable land and water use are part of the project. The project must also reduce disaster risks and strengthen local climate change resilience. The project can achieve its development goals and support national climate change efforts by following this strategy.	UNDP SES Standard 2 ensures that the projects avoid or minimize the exacerbation of impacts caused by natural or man-made hazards, such as landslides or floods that could result from land use changes due to the project activities which is wider in scope as compared to nil regulations currently in place in the country. Standard 2 shall be complied with to ensure that the project does not contribute towards disaster risks and that adequate measures are developed and implemented throughout the project cycle.	UNDP includes disaster risk; no such requirement in national ESIA. Absence of risk reduction measures in ESIA framework. Conduct climate and hazard risk assessment; incorporate resilience strategies into design.
Standard 3: Community Health, Safety and Security	This Standard addresses the need to avoid or minimize the risks and impacts to community health, safety and security that may arise from project-related activities, with particular attention given to disadvantaged and marginalized groups.	Public Health Law (2011)	This Act regulates healthcare and public health in Laos. It sets standards for healthcare delivery, disease prevention, and health promotion and requires the government to provide healthcare to all citizens. Public health-critical issues like sanitation, water quality, and food safety are addressed by the law. This means ensuring project activities don't harm community health and safety. The project must assess health impacts, provide safe drinking water, and promote sanitation and hygiene. The project should also work with local health authorities to address project-related health risks like waterborne	UNDP Standard of Community Health, Safety and Security ensures that risks and impacts caused to the community are adequately mitigated which is broader in scope that the national regulations that looks into only the health and safety of workers. Standard 3 shall be complied with to ensure that the community health & safety including workers' health & safety aspects are evaluated and mitigated during the various phases of the project cycle. Structural elements shall be designed and constructed by competent professionals and certified or approved by the competent authorities or professionals. For projects with structural	UNDP covers both community and worker health; national laws focus on occupational safety only. UNDP requires certified structural review and monitoring, which is not covered in national laws. UNDP adheres to ILO and promotes safe and inclusive labour practices; national laws less comprehensive.

UNDP SES	UNDP SES Requirement	National Regulations	Regulatory Requirement	Comparative Analysis	Key, Gaps, and Action Steps
			diseases and pollution. By following this law, the project can improve local public health.	elements or components whose failure or malfunction may threaten the safety of the communities, UNDP ensures that the plans for project supervision, operation, and maintenance are developed and monitored. Independent expertise on the verification of design, construction, and operational procedures is used, and periodic safety inspections are carried out. This shall be complied with by the contractor for all structures that would be constructed as part of the project. UNDP ensures that the projects avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labour. The contractor will adhere to the national regulation while setting up the sanitary facilities for workers at the construction area. In addition, the proponent will also comply with UNDP Standard 3 requirements to ensure appropriate services for the labourers are provided to minimise the impact generated by the facilities on the environment.	Lack of guidance on public health risk and influx management. No requirement for third-party or independent inspection for structural elements. No alignment with ILO standards or gender-responsive OHS approaches. Include community/public health risks in ESIA; require health & safety plans for all phases. Use certified engineers; conduct third-party structural safety reviews for all infrastructure. Include labour provisions in contracts; monitor conditions using ILO-based checklists.
Standard 4: Cultural Heritage	The standard seeks to ensure that Cultural Heritage is preserved, protected and promoted in project activities in a manner consistent with UNESCO Cultural Heritage conventions or any other national or international legal instruments that might have a bearing on the use of Cultural Heritage	Cultural Heritage Law (2013)	This Act protects Lao PDR's historical sites, artifacts, and traditions. Public participation in cultural preservation is encouraged and cultural heritage damage is prohibited. Cultural heritage is important for national identity and sustainable development, according to the law. The project must avoid harming cultural heritage sites and practices, especially in Luang Prabang, a UNESCO World Heritage Site. Cultural heritage assessments, community conservation, and traditional knowledge integration are required. By following this law, the project can preserve Lao PDR's rich cultural heritage and promote sustainable development.	Standard 4 ensures that all cultural heritage is protected from damage, inappropriate alteration, disruption, removal or misuse; preservation and safeguards are maintained, promotion of equitable sharing of benefits from the use of Cultural Heritage is assured and meaningful consultation with stakeholders regarding preservation, protection, utilization and management of Cultural Heritage is promoted. The Act provides details of Maintenance, protected Area or good, sanctions and Statutes of limitation. The Act is restrictive in its approach of considering international conventions and regulations in terms of conserving and preserving cultural heritage. Standard 4 is to be complied with as it ensures that the Cultural Heritage is preserved, protected and promoted in project activities in a manner consistent with UNESCO Cultural Heritage conventions or any other national or international legal instruments that might have a bearing on the use of Cultural Heritage.	UNDP aligns with UNESCO heritage protection; national law is procedural and limited. Lacks provisions for stakeholder consultation or benefit sharing. Engage cultural heritage experts; follow UNESCO and national preservation guidance.
Standard 5: Displacement	Evaluate the risks and potential impacts of project-	Land Law (2019)	This Act governs land ownership, use, acquisition, and expropriation	UNDP SES Standard 5 seeks to ensure that project activities do not contribute to involuntary	UNDP treats resettlement as last resort with

UNDP SES	UNDP SES Requirement	National Regulations	Regulatory Requirement	Comparative Analysis	Key, Gaps, and Action Steps
and Resettlement	related land acquisition and/or access restrictions to people and communities subject to physical displacement and resettlement, and people and communities subject to economic displacement		compensation. Article 60 requires resettlement plans for affected communities, while Article 58 requires land acquisition compensation. The project aims to avoid displacement and provide fair compensation and livelihood restoration to affected households. The project must also include skills training and alternative income programs in its resettlement plans beyond financial compensation.	displacement and resettlement, which can lead to negative economic, social, and cultural consequences. If displacement is unavoidable, the standard requires that proper safeguards be put in place, including adequate compensation, livelihood restoration measures, and consultation with affected communities.	livelihood restoration; national law focuses on compensation. Focus on financial compensation, not on livelihood restoration or displacement avoidance. Prepare Resettlement Action Plan (RAP) with livelihood restoration and community engagement.
		Decree on Compensation and Resettlement (2016) and Law on Resettlement and vocation No.45/NA, 2018	This Act governs Lao PDR development projects that require land acquisition and resettlement. It requires resettlement plans to restore or improve livelihoods and compensation for affected individuals and communities. The decree emphasizes fairness, transparency, and participation in resettlement to ensure affected households are not worse off due to development. And Law on Resettlement and vocation set out the principles, rules, and measures regarding the supervision, inspection, and monitoring of resettlement and vocation to enhance its efficiency, effectiveness, compliance, and to be consistent with locality condition and development to ensure that Lao multi-ethic persons who live in resettlement and vocational areas have places to stay and places to make a living and to have stable vocation, with the aim to solve illegal relocation, eradicate poverty, improve livelihood of the Lao multi-ethnic persons physically and mentally, build security, develop social discipline, become development village and agglomerate big villages into towns in rural area, and contribute to the national-economic development as well as to national defense and security.	The act provides guidelines for compensation and relocation, but it lacks proactive measures to prevent displacement from occurring in the first place. The current legal framework focuses on financial compensation rather than long-term livelihood restoration or avoiding displacement where possible. Therefore, compliance with UNDP SES Standard 5 ensures that resettlement is considered a last resort and that affected populations receive comprehensive support beyond monetary compensation.	
Standard 6: Indigenous People	Evaluate the risks to, and potential impacts on, inter alia: human rights, lands, territories, natural resources,	Law on Ethnic Groups (2020)	This Act recognizes ethnic communities' rights and encourages their participation in development. It preserves ethnic groups' culture and ensures their participation in	UNDP SES Standard 6 mandates that projects must respect the rights of indigenous peoples and ensure that they are not negatively impacted by development activities. It emphasizes the need for	UNDP mandates FPIC for Indigenous Peoples; national law lacks enforcement mechanism.

UNDP SES	UNDP SES Requirement	National Regulations	Regulatory Requirement	Comparative Analysis	Key, Gaps, and Action Steps
	traditional livelihoods, tangible and intangible cultural heritage (incl. knowledge and practices) of indigenous peoples		decision-making. The law also prohibits discrimination and promotes ethnic community access to resources and opportunities. This means getting ethnic groups' Free, Prior, and Informed Consent (FPIC) and incorporating their traditional knowledge into project design. The project must also address ethnic community needs like water access and decision-making. The project can promote social inclusion and equitable development by following this law.	Free, Prior, and Informed Consent (FPIC), which allows indigenous communities to participate in decision-making processes regarding projects that may affect their lands, culture, and resources.	No formal FPIC processes or implementation guidance. Apply FPIC in consultation with indigenous groups before project initiation.
Standard 7: Labour and Working Conditions	The pursuit of inclusive and sustainable economic growth, full and productive employment and decent work for all requires the protection of workers' fundamental rights, their fair treatment, and the provision of safe and healthy working conditions.	Labour Law (2019) Degree on Occupational Health and Safety, 2019	This Act sets minimum wage, working conditions, and safety standards. Article 45 mandates minimum wages, while Article 50 requires safe workplaces and protective gear. For the project, this means fair wages, safe working conditions, and labour standards for all workers. To ensure compliance, the project must conduct third-party safety audits and include labour clauses in contractor agreements. Define principles, regulations, and measures on occupational health and safety (OHS) to prevent potential incidents and diseases; build environmentally friendly workplaces without health risks; promote the rights and interests of employees and employers; and contribute to investments and national socio-economic development. The law defines the rights and responsibilities of employees, employers, organizations, and personnel responsible for OHS. Article 16 stipulates the obligations of contractors and subcontractors in OHS management. Article 17 specifies the measures on provision and use of Ensure the use of appropriate and sufficient personal protective equipment (PPE).	UNDP Standard 7 ensures that the projects are gender-sensitive and considers the risks on the health and safety of the women and children. Standard 7 of UNDP shall be complied with by the contractor to ensure that the labourers are provided with safe and healthy working environment, considering the risks inherent to the particular sector (including gender bias) and specific classes of hazards in the work areas as the national regulation is restrictive in terms of encompassing risks inherent to various sectors and classes of hazards in the work areas. Standard 7 of UNDP shall be complied with as it ensures that the steps are taken to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work and ensures the application of preventive and protective measures consistent with the international good practice, as reflected in internationally recognized standards such as the World Bank Group's (WBG) Environmental, Health, and Safety (EHS) Guidelines. The national regulation is restrictive in its scope and fails to adopt measures consistent with the internal good practice and WBG's EHS guidelines. UNDP Standard 7 shall be complied with as it ensures compliance with national labour and occupational health and safety laws, with obligations under the international law, and consistency with the principles and standards	UNDP promotes gender-sensitive risk management and sector-specific safety; national laws are generic. Currently, there is no national law, regulation, or guideline specific to community health and safety. Weak enforcement of gender-sensitive occupational health and site safety. Develop gender sensitive OHS guidelines; ensure separate facilities and anti-harassment measures.

UNDP SES	UNDP SES Requirement	National Regulations	Regulatory Requirement	Comparative Analysis	Key, Gaps, and Action Steps
				embodied in the International Labour Organization's (ILO) fundamental conventions. The National Acts are restrictive in its scope as it looks at national aspects while the UNDP's standard is consistent with the international law and principles and standards.	
Standard 8: Pollution Prevention and Resource Efficiency	The Pollution Prevention and Resource Efficiency Standard recognizes that increased industrial activity, urbanization, and intensive agricultural development often generate increased levels of pollution1 to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global level. Pollution prevention and resource efficiency are core elements of a sustainable development agenda and UNDP projects must meet good international practice in this regard.	Environmental Protection Law (2019)	Environmental conservation, pollution control, waste management, and EIAs are regulated under the Law on Environmental Protection (2019). Article 24 demands public engagement in EIAs, while Article 25 requires environmental disclosure. Article 26 penalizes environmental infractions, establishing accountability. The project needs a thorough EIA, public discussions, and transparency about project implications. To avoid penalties and maintain environmental sustainability, the project must minimize pollution, handle waste sustainably, and follow environmental requirements.	UNDP's Standard 8 ensures that the projects avoid the release of pollutants, and when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. This applies to the release of pollutants into the air, water, and land due to routine, non-routine, and accidental circumstances. The Enhancement and Conservation of National Environment Quality Act, B.E. 2535 (1992) is restrictive as it discusses how effluents should be treated. Standard 8 shall be complied with as it considers minimisation and/or control mechanism in terms of controlling the intensity and mass flow of the pollutant's release. UNDP Standard 8 ensures that pollution prevention and control technologies and practices, consistent with international good practice, are applied during the project life cycle. The technologies and practices applied shall be tailored to the hazards and risks associated with the nature of the project. Adopting UNDP's Standard 8 would enhance achieving the standards set down for pollution prevention and resource efficiency.	UNDP requires prevention and minimization of pollution with international standards; national law focuses on treatment. No preventive approach or application of best international pollution practices. Adopt pollution prevention technologies; follow WBG EHS Guidelines and best available practices.

Source: Author

3 Project Description

3.1 Project Components

The overall objective of IWRM-EbA Project is to promote the integrated management of target sites in the Mekong River Basin for increased climate resilience of communities in Savannakhet Province and Luang Prabang City, vulnerable to floods and droughts. In these communities, the impacts of floods and droughts are projected to worsen under future climate change, as projected by the AR5 greenhouse gas emissions scenarios.

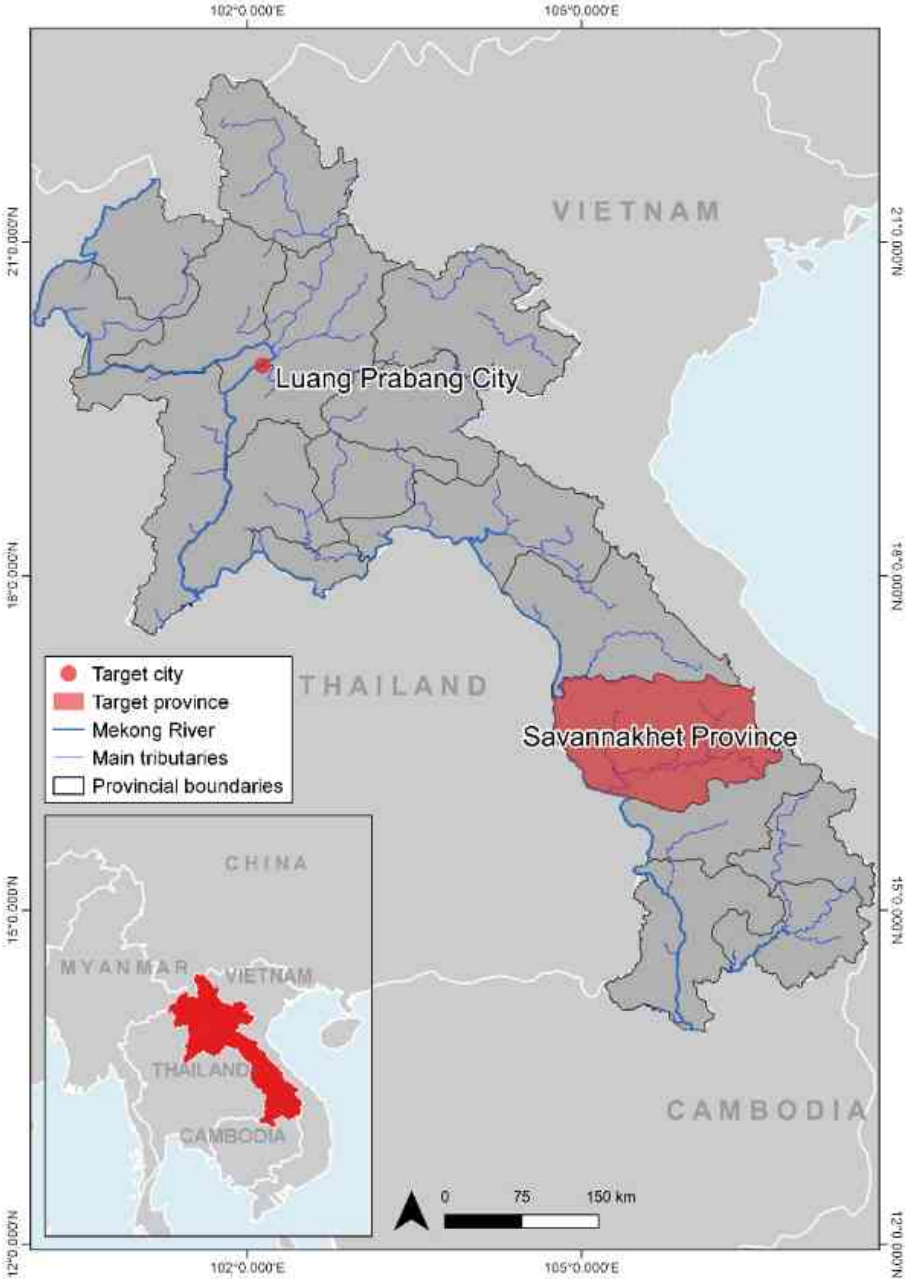


Figure 2. National map of Lao PDR showing Project Areas

The integrated management objective will be achieved by implementing a suite of complementary adaptation interventions, namely, i) development of national and provincial capacities to implement Integrated Catchment Management (ICM) and integrated Ecosystem-based Adaptation (EbA) in response to the increasing frequency and intensity of floods and droughts; ii) implementation of EbA interventions—primarily conservation and restoration of partly and severely degraded forests—within this ICM framework, with supporting protective infrastructures and sustainable livelihood enhancement; and iii) promotion of knowledge management and Monitoring and Evaluation (M&E) to ensure that the lessons learned and best practices for ICM, flood management and EbA are collected and disseminated to inform the upscaling of these interventions across Lao PDR.

The Project Components, Outcomes and Activities are as follows:

- Component 1: Developing national and provincial capacities for Integrated Catchment Management (ICM) and integrated urban Ecosystem-based Adaptation (EbA) for climate risk reduction.
- Component 2: Ecosystem-based Adaptation (EbA) interventions under an Integrated Water Resource Management (IWRM) framework, with supporting protective infrastructure and livelihood enhancement.
- Component 3: Knowledge management and Monitoring and Evaluation (M&E).

3.2 Component 2: Ecosystem-based Adaptation (EbA) and Water Resources Management (IWRM) framework

Output 2.1: Ecosystems conserved and restored through conservation zone management, ecosystem-based adaptation and protective infrastructure, supported by innovative communication and knowledge management tools/technology.

Activities under this Output will include:

Activity 2.1.1: Conserve Xe Bang Hieng protected forests through enhanced conservation zone management and enhanced natural regeneration and restore Xe Bang Hieng degraded headwater conservation zones and implement EbA interventions to improve ecological integrity for the delivery of ecosystem services.

As part of the Outcome 2.3, the project has been implementing Community Conservation Agreements (CCAs) to build climate-resilience and alternative livelihoods in headwater and lowland communities through the implementation of Community Conservation Agreements. These agreements, signed at 5 CCA villages comprising 632 individual households (Xepon: Keanghouapha and KengThamae; Nong: Saveu and Tanglalai; Xonnabouly: Meuanghong), are aimed at providing resilient and diversified income and livelihood opportunities through nature-based solutions approach.
Activity 2.1.2: Construct protective infrastructure to reduce flood risk (through cascading weirs and drainage channels) and drought risk (by means of reservoir networks and rainwater harvesting).

3.2.1 Conservation Zone Management and Natural Regeneration and Restoration of Xe Bang Hieng Headwater

Within Activity 2.1.1 of the Conservation of Xe Bang Hieng Protected Forest project, Enhance the management of conservation zones, facilitate natural regeneration, rehabilitate compromised headwater conservation zones, and implement ecosystem-based adaptation (EbA) strategies to improve ecological integrity and ecosystem services. The mentioned activities will be carried out in the following villages and districts. As illustrated in Figure 3, these villages are in the protected areas and the Ramsar Site.

- Nong District: Savue village, Nongvilay, Tangalai Neu
- Sepone district: Kenghuapa village, Sopsalou village, Thamae village

The project in Sepone district will focus on conserving protected areas and restoring degraded ecosystems. This will involve planting suitable species to restore ecosystem functions thereby ensuring natural regeneration, and forest area demarcation and management. Additionally, water management efforts like retention ponds and rainwater harvesting will address local water shortages. In Nong district, the project aims to conserve protected areas and restore degraded ecosystems by planting appropriate species and using methods like assisted natural regeneration and forest area demarcation and management.

As in figure 3, conservation activities includes enhancing conservation zones within four National Protected Areas (Phou Xang, Dong Phou Veng, Xe Ban Nuan[18]) and managing one Ramsar Site (Xe Champhone Ramsar Site); managing forest boundaries; and facilitating natural regeneration process. Restoration activities will involve enrichment planting to promote natural regrowth in secondary forests and reforestation by replanting ecologically appropriate species to restore ecosystem functioning.

[18] https://data.laos.opendevelopmentmekong.net/en/dataset/laos-protected-areas-and-heritage-sites

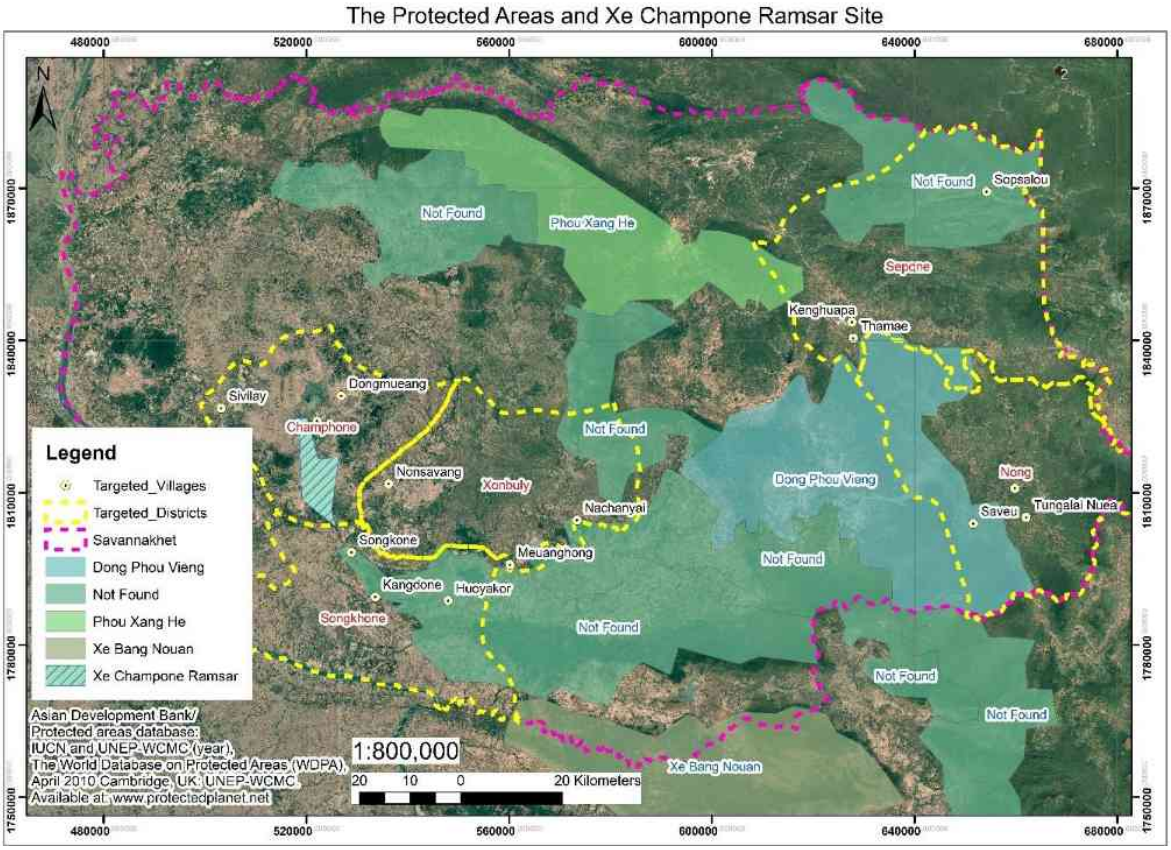


Figure 3: The Overlap maps of target villages/district, and protected areas and Ramsar site

3.2.2 Protective infrastructures to mitigate flood and drought risks

Task 2 aimsat developing protective infrastructures at designated locations, including flood evacuation centres, levees, groundwater wells, ponds, wetland delineation, riverbank stabilization, rainwater harvesting tanks, water filtration systems, gravity-fed water supplies, and solar-powered irrigation pumps. Task 2 encompasses the establishment of groundwater wells.

3.2.2.1 Infrastructure Sub-projects in XBH River

Ten target villages in the Xe Bang Hieng River Basin (Savannakhet Province) have been presented with the proposed infrastructure construction works. The building option has been selected, and in December 2024, an expert team from the UNDP project and the Department of Water Resources conducted a field study and collected data to design flood and drought control measures. The expert team examined options 1 to 15 in each village, encompassing the project wetland boundary, river cross-section, river longitudinal profile, surrounding project area, and data collection relevant to flood risk zones. The results of this extensive study was crucial in identifying the most efficient ways to alleviate the consequences of floods and droughts in the targeted districts and villages. The team sought to develop solutions that safeguard vulnerable people while also strengthening the resilience of local ecosystems through analyzing various optioneering measures. Table 4 below illustrates the location of settlements and available infrastructure options.

Table 4: Location of villages and infrastructure projects

District/Villages	UTM		Sub-projects
	X	Y	
Champhone district			
Phiaka	522293.28	1823927.456	Wetland modification
	523109.432	1824770.702	Flood protection with levee
	522708.00	1824255.81	Evacuation shelter
Dongmeuang	527059.346	1832725.473	Riverbank stabilization and levee works
Sivilay	501556.744	18275226.437	2 Wetland modification
Nong district			
Tangalai Nuea	662006.479	804985.185	1 Wetland modification

Sepone			
Sopalou	655571.755	1868605.682	Gravity-fed water supply
Thamae	628004.181	1840479.667	1 Wetland modification
Songkhone district			
Songkhone	532239.73	1798305.621	Wetland modification
	532110.523	1787819.965	Evacuation shelter
Xonnabouly			
Mueanghong	559626.812	1798549.697	Evacuation shelter
Nachanyai	572054.181	1802826.395	Evacuation shelter
Nonsavang	535875.166	1809277.601	Wetland modification

Source: Project Document

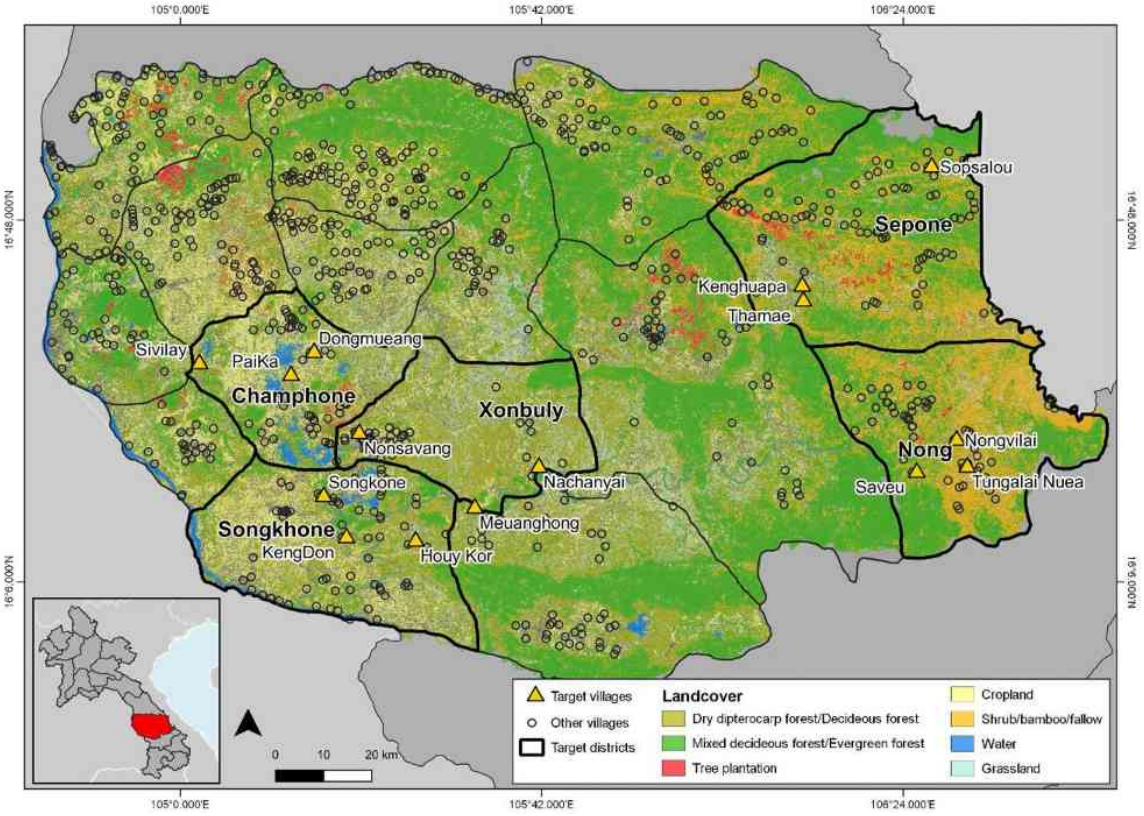


Figure 4 Map of the project's target districts and villages

(a)Champhone District

In Champhone District, the IWRM-EbA Project supported the communities of Dongmeuang, Phiaka and Sivilay Village in the Xe Bang Hieng River Basin in mitigating the dangers of floods and drought.[19]

Phiaka Village

The protective infrastructure to reduce flood risk activities will be constructed in Phiaka village, including wetland modification, evacuation shelter and flood protection with levee construction.

SN.	Activities	Area (m^2)	X	Y
1	Wetland modification	1,600	522293.28	1823927.456
2	Flood protection with levee	2,904	523109.432	1824770.702
3	Evacuation shelter	3,800	522708.00	1824255.81

[19] Alluvium and Hydrotech Consulting, October 2024 (Final), Hydrometeorological Network Upgrades and Early Warning System Updates for Flood and Drought, Report prepared for UNDP and DWR for the Project: Technical support for enhancing climate resilience through ICM and EbA (RFP-005-2023).

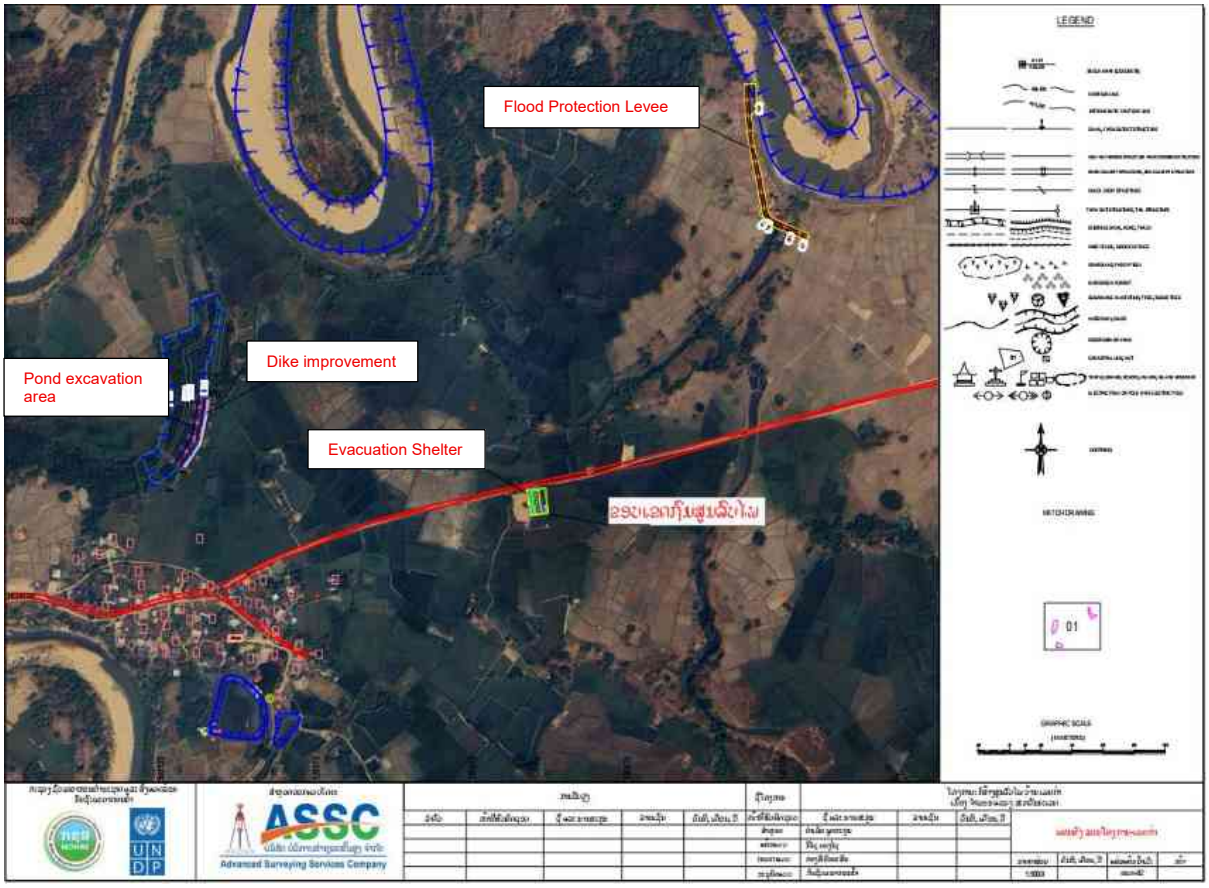


Figure 5 Activity locations in Paika Village, Champhone District

The existing community pond is located approximately 500m north of Phiaka village's resident area. The area surrounding the pond consists of private agricultural land. This 4-hectare pond is scheduled for significant improvements, with approximately 1,600 square meters undergoing a thorough clearing of debris, sludge, and sediment. The excavated material will be repurposed to reinforce and raise the level of the existing pond dikes by 100 meters. The accompanying figures illustrate the pond's location and the proposed improvement plan. The Figures 5 and 6 show the pond's location, highlighting the specific area targeted for improvement area and Figure 7 presents the engineering design for the pond improvement.

Figure 6 Pond improvement in Phiaka village, Champhone District

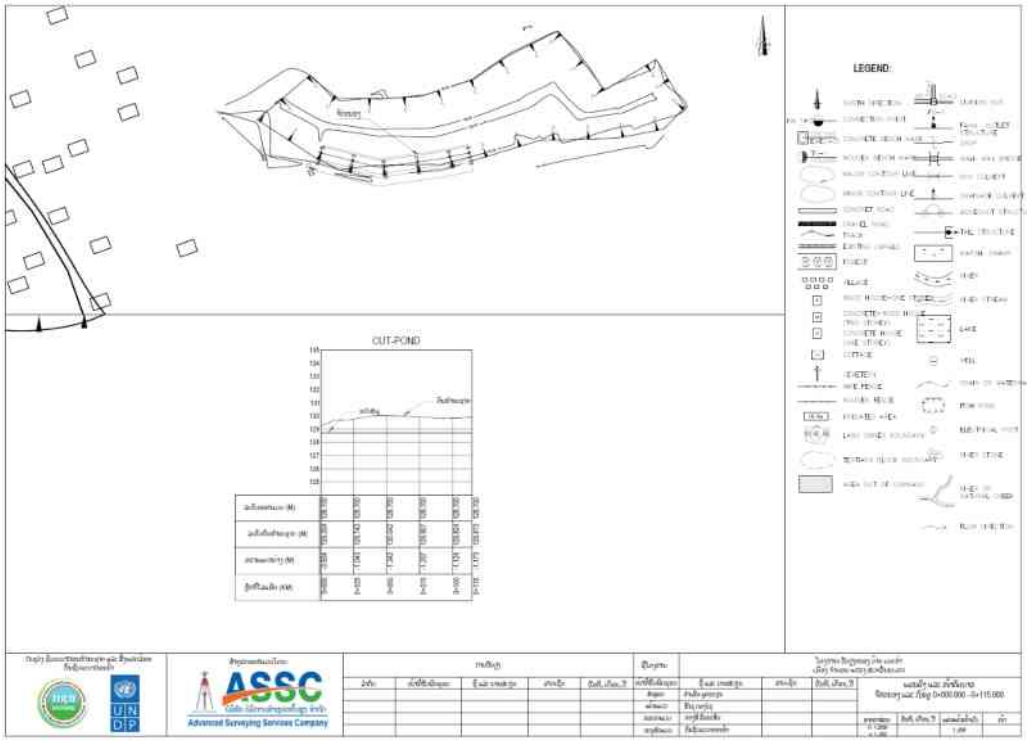


Figure 7 Drawing for Pond improvement in Phiaka Village, Champhone District

The proposed evacuation shelter facility will be located at Phiaka Village Primary School. Although this location offers a large area, but it has a history of 2-meter flood levels, which requires an above 2-meter elevation (approximately 2,000 square meters) to prevent future flooding. The facility will comprise a 10m x 36m accommodation building consisting of three rooms. This structure will feature a concrete building, tiled floors and a SCG fiber cement roof. Additionally, the facility will include six separate male and female toilets, as well

as kitchen facilities. (*Note: The community shelter dimensions, and architectural design are standardized across all locations)*. Figure 8 shows the proposed location of the shelter evacuation and Figures 9, 10 and 11 depict the engineering design and 3D image of the evacuation facility.

Figure 8 Evacuation shelter in Phiaka Village, Champhone District

Figure 9 Drawing for Shelter Evacuation in 3D in Phiaka Village, Champhone District

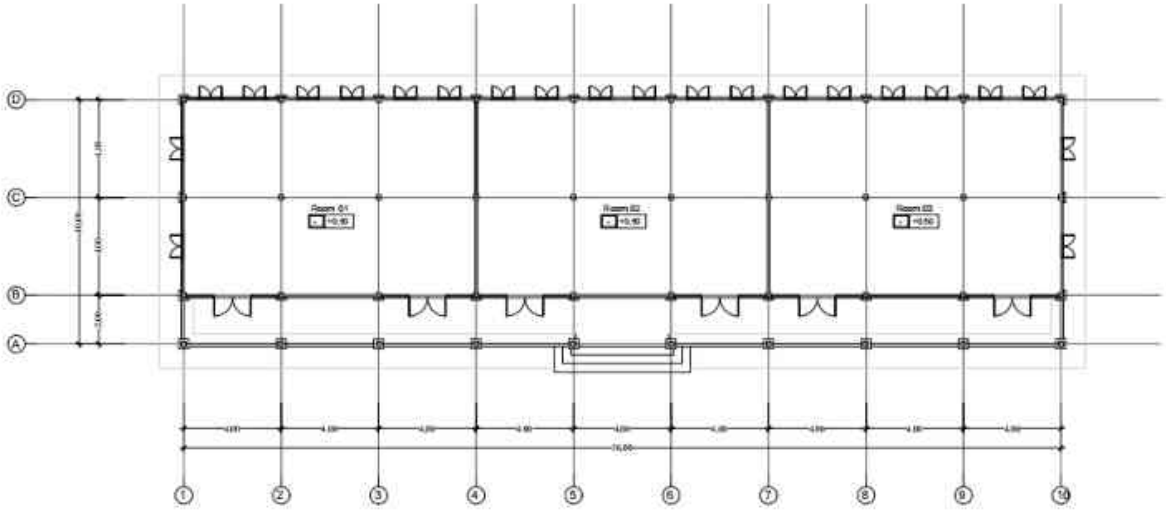


Figure 10 Drawing of evacuation shelter in 2D in Phiaka Village, Champhone District

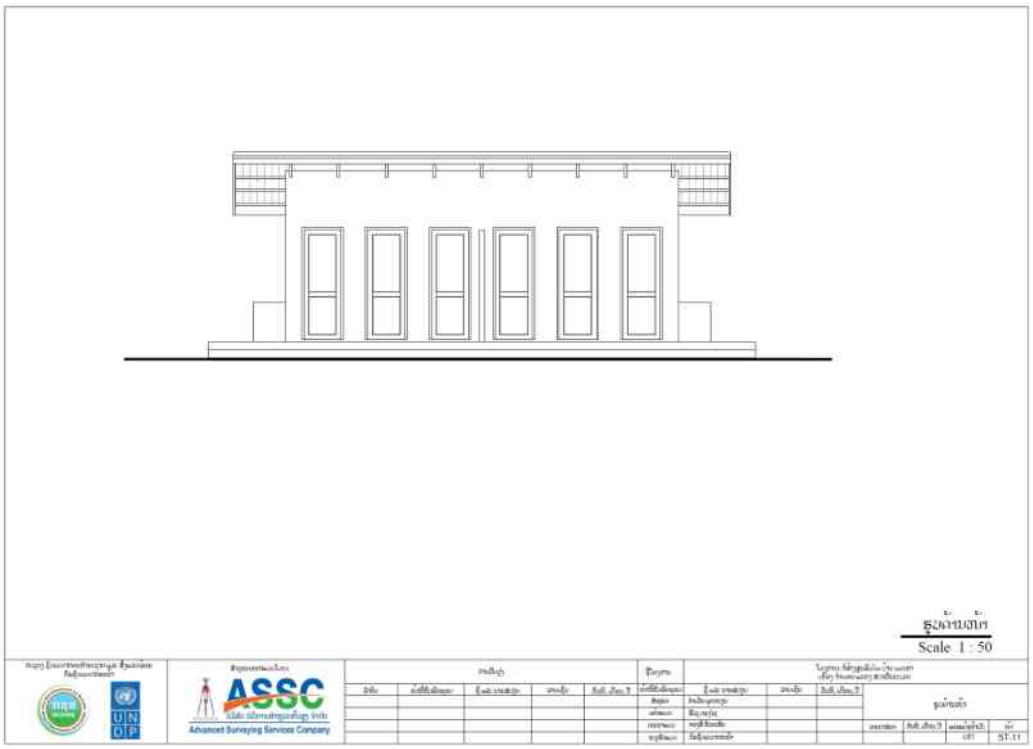


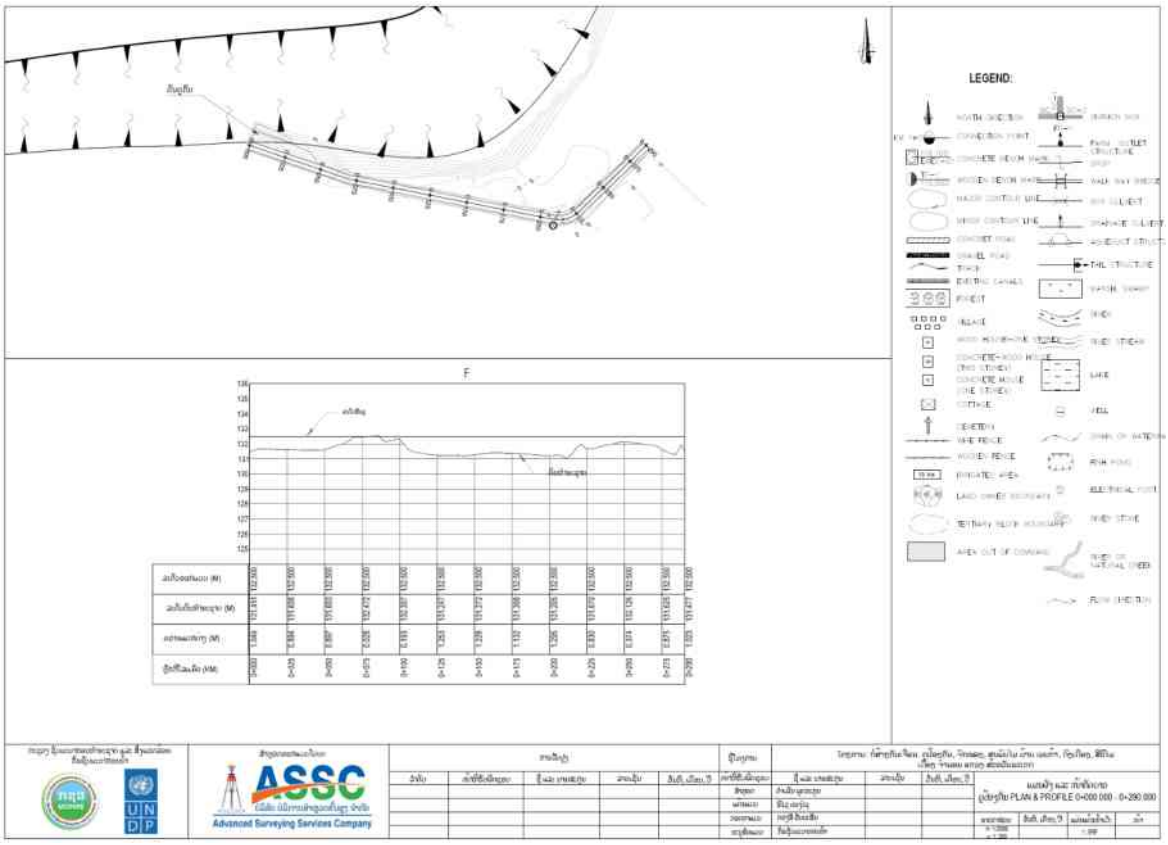
Figure 11 Drawing for Toilet of evacuation shelter in Phiaka Village, Champhone District

	
New Evacuation Shelter Location compounded in the primary school area	Unpaved road to the construction site of evacuation shelter

Source: Site visit on 03 July 2025

A new flood protection levee is proposed to be constructed along the Xe Champhone River. This project involves extending and strengthening existing levee sections previously constructed by landowners. The proposed levee will have a length of 290 meters, a height of approximately 1 to 1.5 meters, with a width of 5 meters. These levees will be located on three abandoned rice field plots, generously donated by three households to the village for the purpose of protecting their agricultural land from recurring flood damage. The levee's foundation will consist of compacted soil, with a sub-base of crushed rock (grave). To facilitate construction, an access road is required. The existing pathway will be upgraded to a width of 4 meters and a length of 300 meters. This access road will traverse through the agricultural land of one household.

Figure 12 Flood protection levee in Phiaka Village, Champhone District



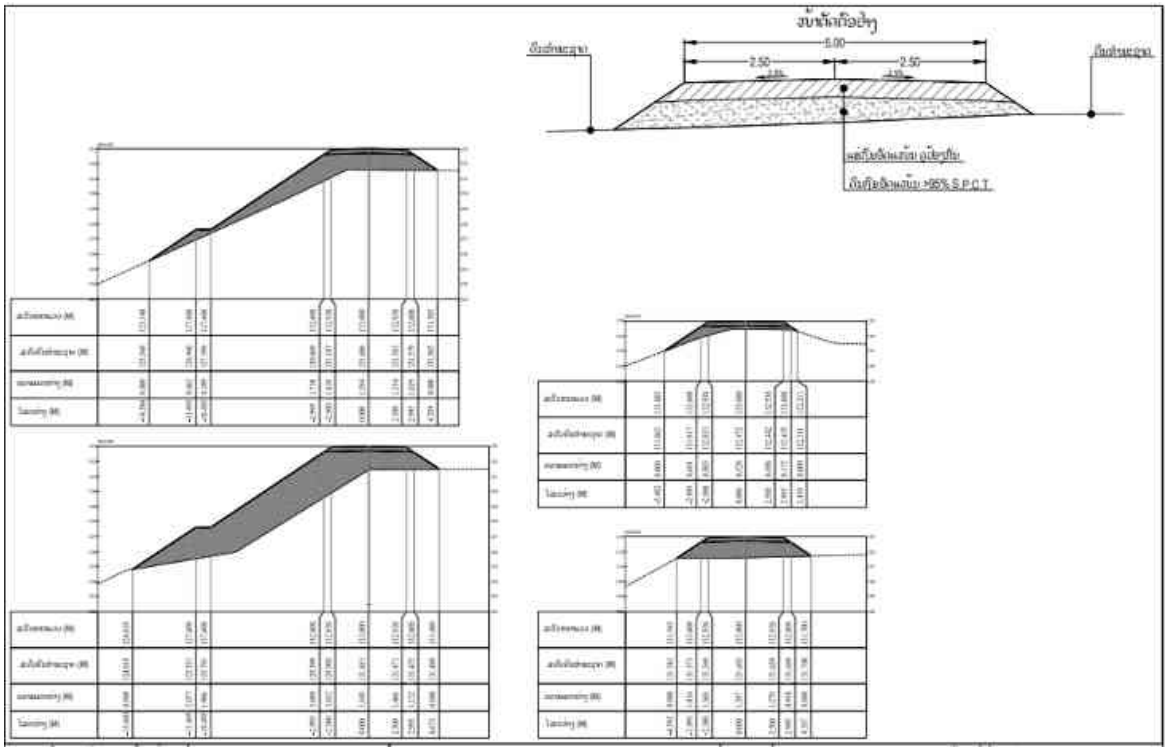


Figure 13 Drawing for flood protection levee in Phiaka Village, Champhone District

Dongmeuang Village

	
Concrete access road to the construction site	Unpaved road to the construction site
	
The houses near the access road	Current riverbank of the construction site

Source: Stie visit on 03 July 2025

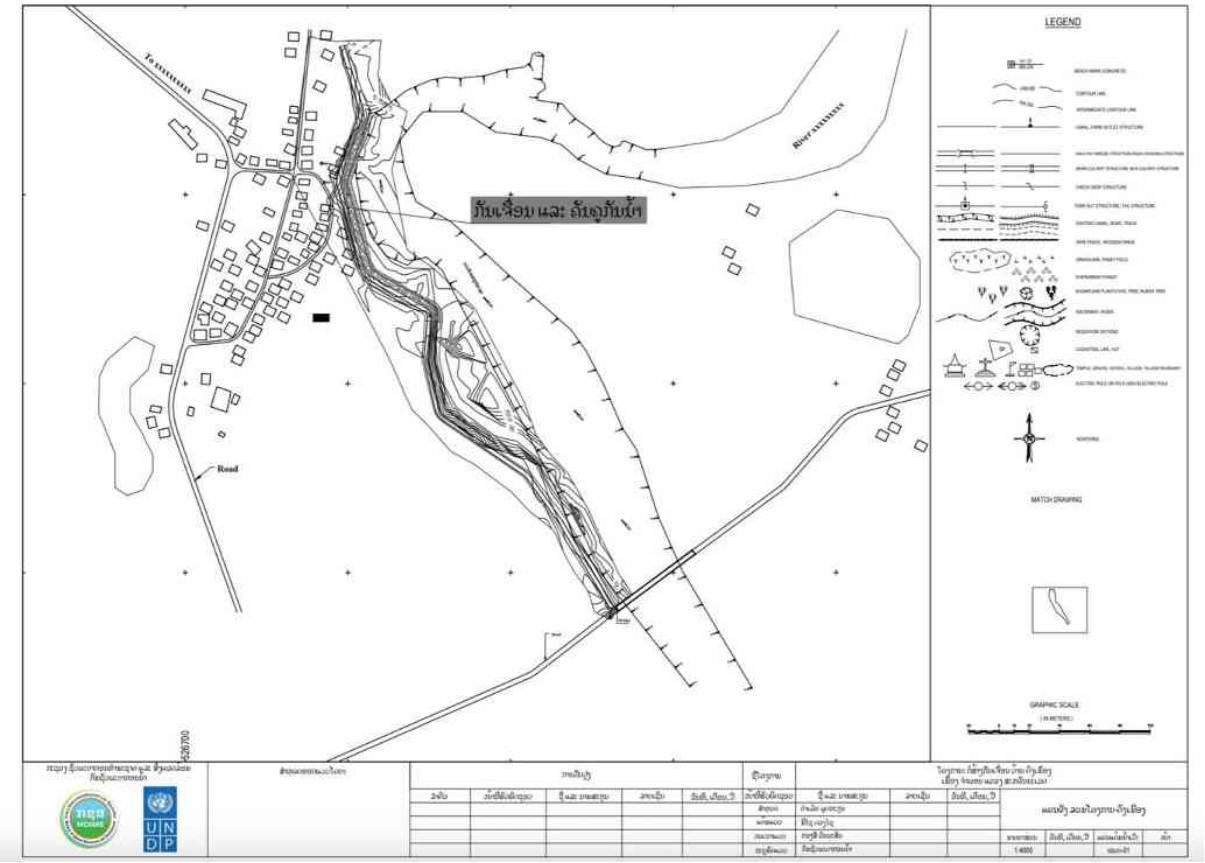


Figure 14: *Drawing of flood protection levee and riverbank stabilization in Dongmeuang village, Champone District*

Sivilay Village

Two community ponds, situated near the villager's agricultural land, currently serve as irrigation sources for rice fields and livestock. These ponds are slated for improvement through the clearing of sludge and sediment. Specifically, 3,470 square meters will be cleared in Pond No. 1, and 7,047 square meters in Pond No. 2. The excavated material will be repurposed to reinforce and raise the level of the existing pond dikes. The pond dikes will be constructed using compacted excavated soil, with a surface layer of 300mm of crushed rock sub-base. Furthermore, a steel water control gate will be installed.

The proposed upgrade of two ponds in Sivilay village aims to reinforce failing flood levees while creating water storage for dry-season agriculture, addressing the current extreme fluctuations between flood-level waters covering rice fields and complete dry-season depletion. The project has garnered strong community support with surrounding landowners recognizing the dual benefits of flood protection for their fields and reliable irrigation during droughts—one northern landowner unable to farm currently has even volunteered to provide excavated soil for levee reprofiling. Notably, the upgrades will proceed without land boundary conflicts or construction access issues, as all affected parties understand the shared advantages. While requiring careful technical design to regulate water levels and temporary construction coordination, this community-driven initiative presents a sustainable solution to the village's water management challenges, combining flood mitigation with agricultural security through voluntary landowner participation and no private property impacts.

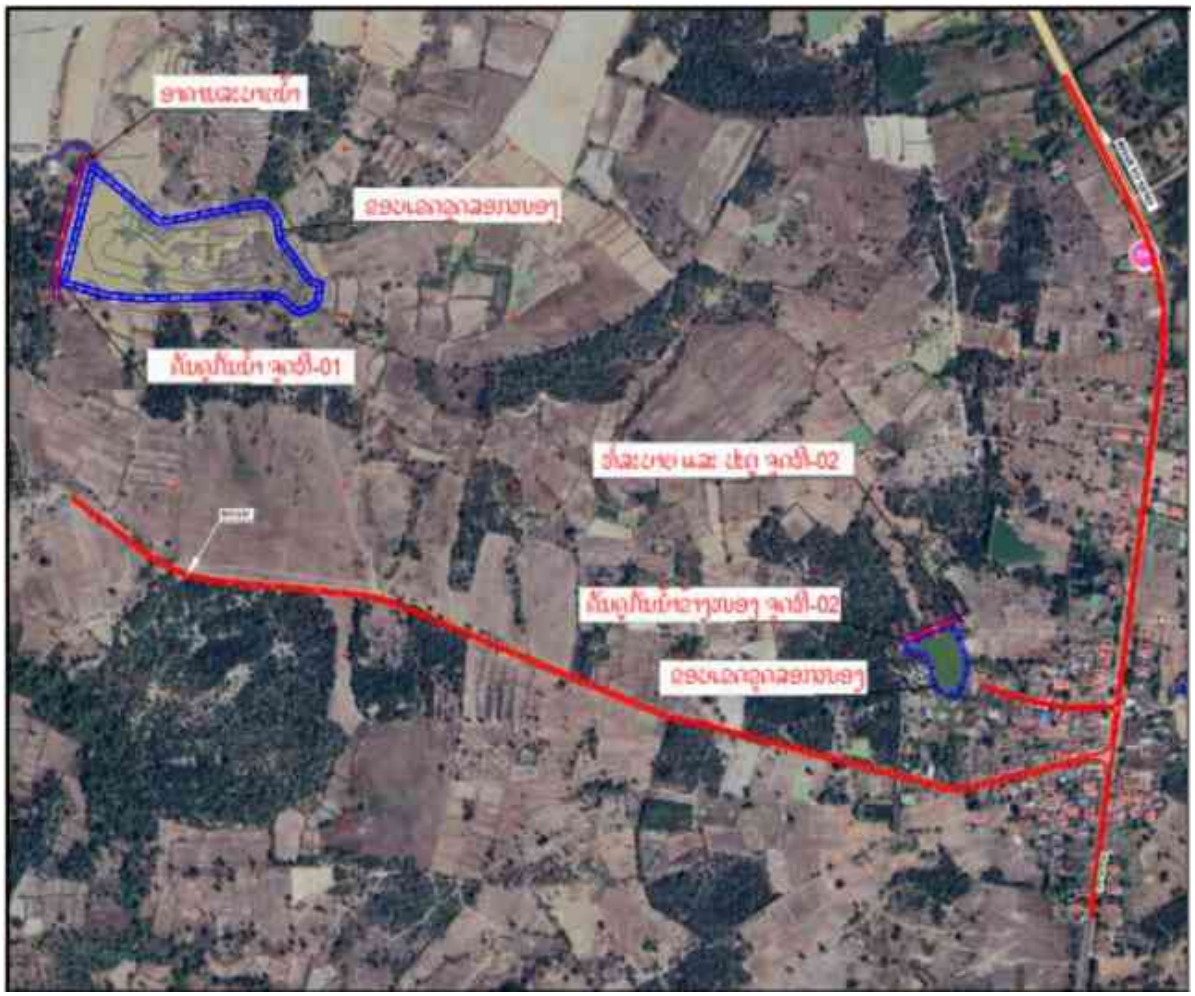
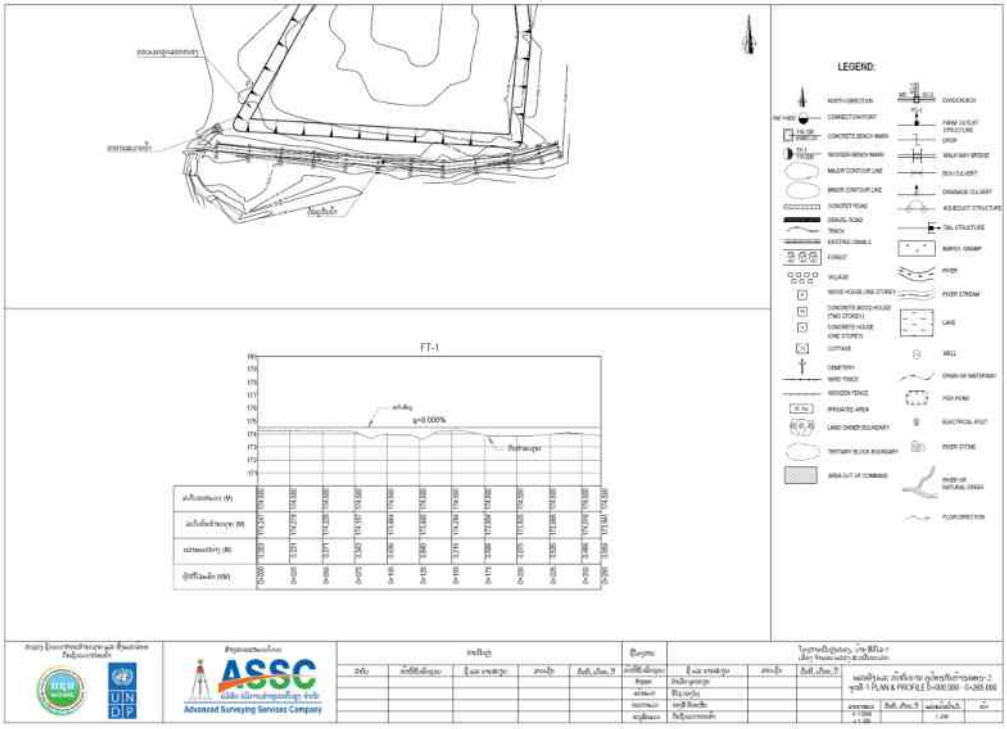


Figure 15 Map illustrating the location of the two proposed community ponds improvement and their facility.

	
The existing Levee of the 2nd pond	Unpaved road to the construction site

Source: Site visit on 03 July 2025

Figure 16 Upgrading 1st community pond in Sivilay Village, Champhone District



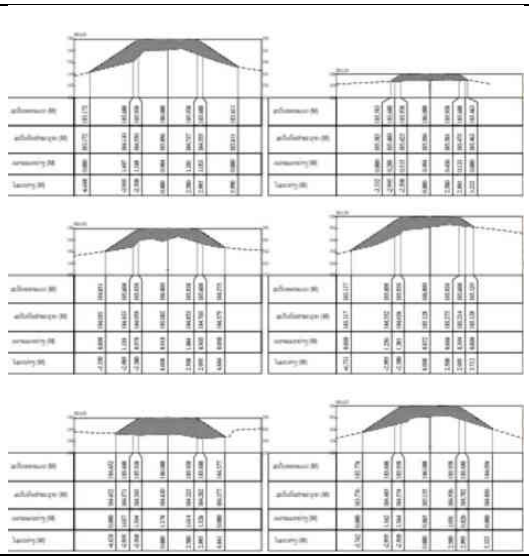
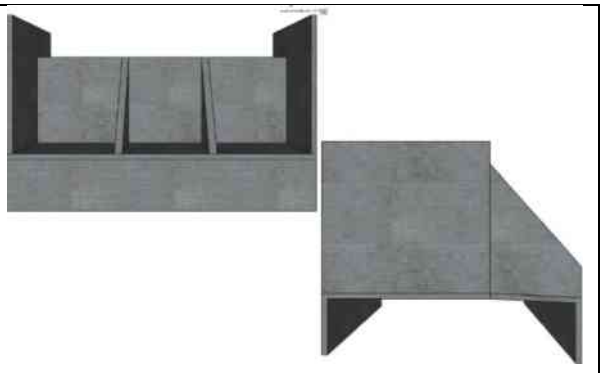
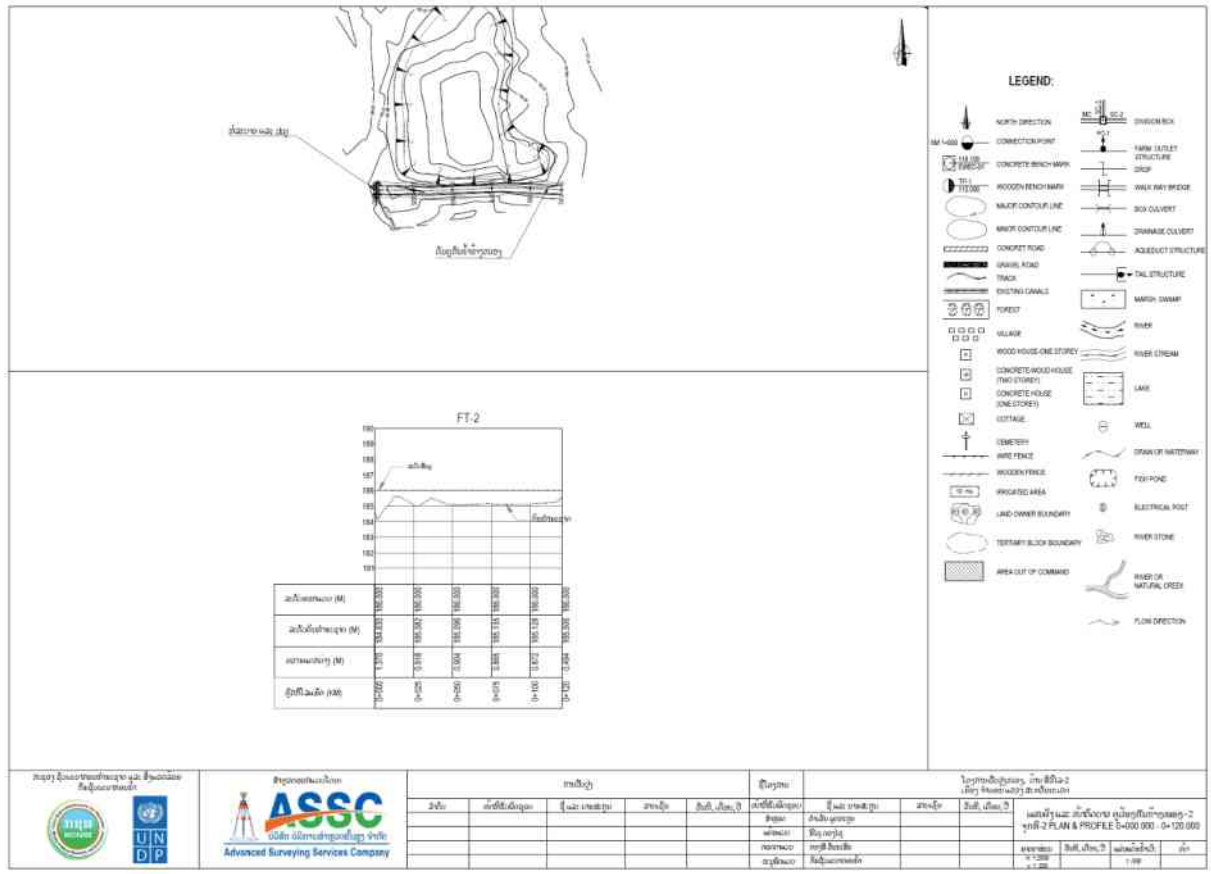
	
Pond No. 1 Dike Cross section	Water gate structure

Figure 17 Drawing upgrading 1st community pond in Sivilay Village, Champhone District

Figure 18 Upgrading 2nd community pond in Sivilay Village, Champhone District



Pond No.2 Dike Cross section	Water gate structure

Figure 19 Drawing for upgrading 2nd community pond in Sivilay Village, Champhone District

(b)Nong District

In Nong District, the project has been supporting community resilience efforts against flood and drought threats by formulating a five-year action plan for the period 2025 to 2029. The project addresses flood and drought hazards in designated villages within the Xe Bang Hieng River Basin in Tangalai Neua village.[20]

[20] Alluvium and Hydrotech Consulting, October 2024 (Final), Hydrometeorological Network Upgrades and Early Warning System Updates for Flood and Drought, Report prepared for UNDP and DWR for the Project: Technical support for enhancing climate resilience through ICM and EbA (RFP-005-2023).

Tangalai Neua village

- Community pond construction/wetland modification

A new community pond/wetland will be constructed on a communal land plot. Approximately, 0.5 hectares (50m x 95m) will be excavated to a depth of 2 meters to create a water storage facility. This pond will support various village needs, including household water usage and home gardening activities. The construction of this pond has received full community support, with villagers expressing enthusiasm for the improved water infrastructure that will benefit their daily lives and agricultural activities.

Figure 20 Map of New pond construction in Tangalai Neua Village, Nong District

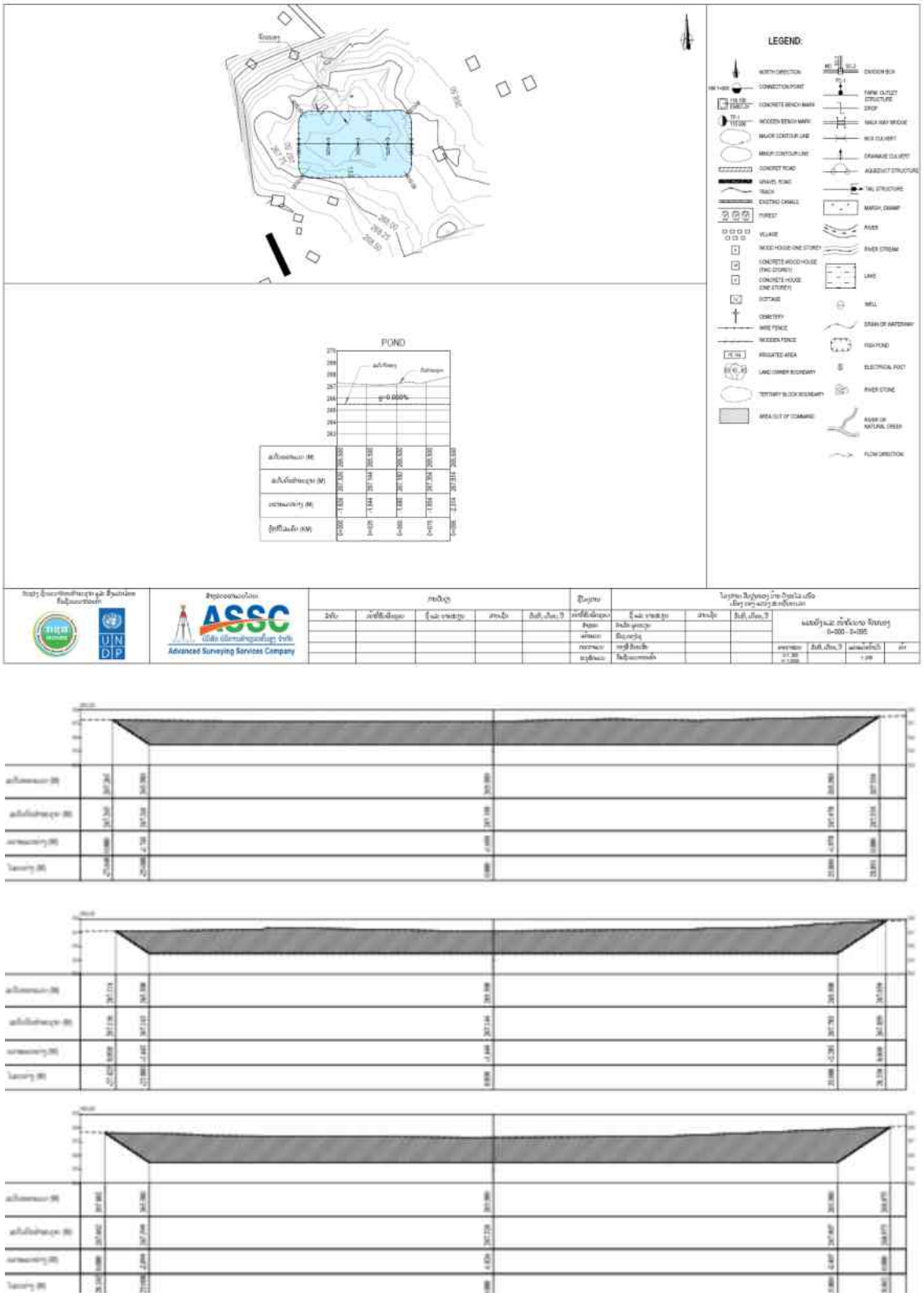


Figure 21 Plan profile and cross section of new pond construction in Tangalai Neua Village, Nong District

(c)Sepone District

The Sepone District presents a five-year Action Plan (2025—2029) for strengthening the climate resilience of communities against flood and drought hazards. Recommendations for infrastructure improvements to mitigate

flood and drought hazards in the Xe Bang Hieng River Basin belong to the communities of Sopsalou and Thamae villages.[21]

- Sopsalou village

A new gravity-fed water supply system is proposed for Sopsalou Village, designed to serve 55 households for domestic use. The system will utilize the existing water intake to collect headwater from a stream, transmitting it to a water tank via an HDPE 50 pipeline. Water will then be distributed from the tank to village taps through an HDPE 32-18mm pipeline, operating by gravity. The water tank will be situated within the buffer zone of a national forest protected area, with certain sections of the transition pipes laid along pathways within the protected area (60–70 hectares). While villagers have consented to the construction and the district has already prepared the designated plot within the protected area territory, final approval requires formal authorization from the Ministry of Agriculture and Environment.

Figure 22 Installation of water tanks in Sopsalou Village, Sepone District

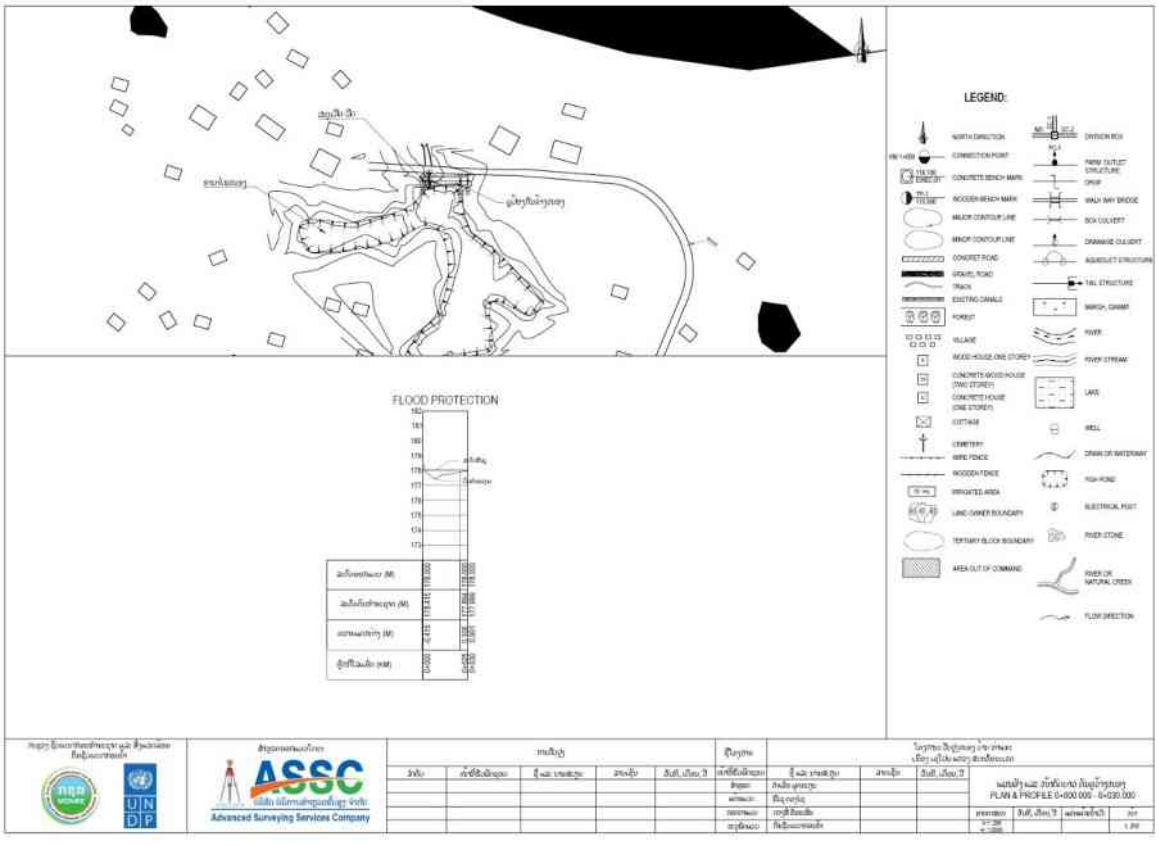
[21] Alluvium and Hydrotech Consulting, October 2024 (Final), Hydrometeorological Network Upgrades and Early Warning System Updates for Flood and Drought, Report prepared for UNDP and DWR for the Project: Technical support for enhancing climate resilience through ICM and EbA (RFP-005-2023).

Figure 23 Drawing of Water Tank in Sopsalou Village, Sepone District

- Thamae village

The project will upgrade the village's existing 0.669-hectare public pond and renovate adjacent flood levees/dykes near the roadway to improve water storage capacity and flood protection. The pond dikes will be constructed using compacted excavated soil, with a surface layer of 300mm of crushed rock sub-base. Furthermore, a steel water control gate will be installed. As the pond serves as a vital community water source and aquatic habitat, the modifications are carefully designed to enhance these functions while causing no negative impact to water quality or existing aquatic life - in fact, the improvements are expected to increase both water availability and biodiversity. Any necessary clearance of small, non-valuable trees during construction will utilize the wood for community purposes, ensuring no waste.

Figure 24 Upgrading community pond (wetland modification) in Thamae Village, Sepone District



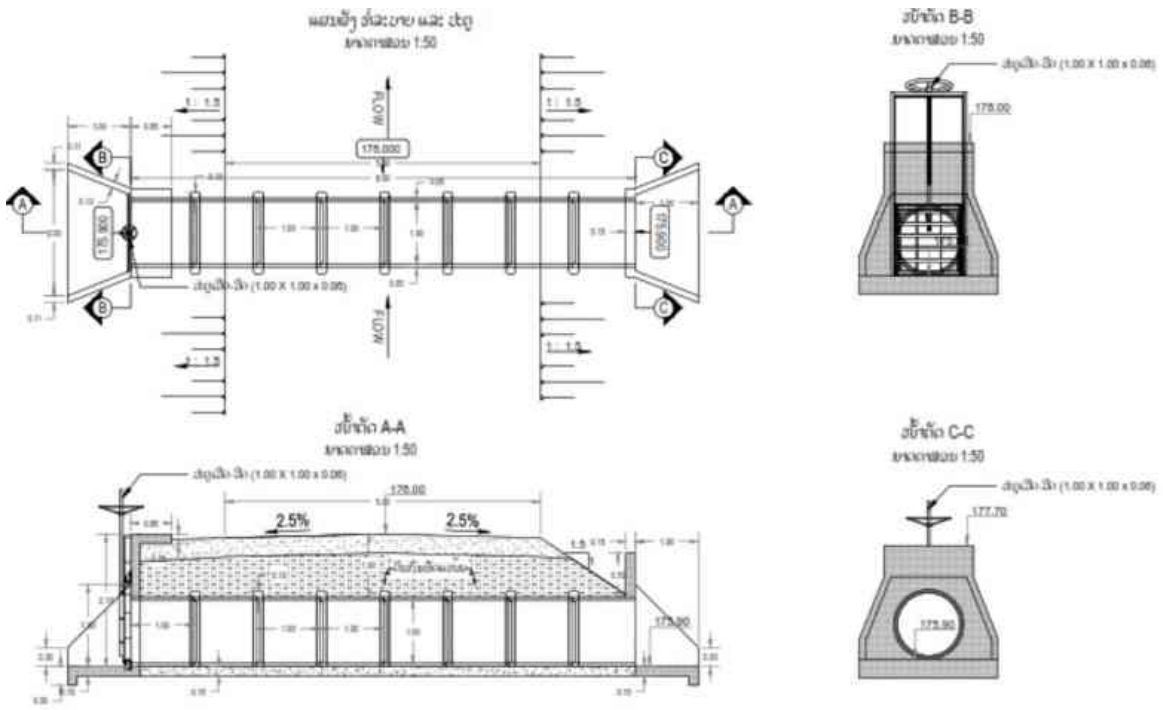


Figure 25 Plan Profile and cross section of dikes and water gates of Community Pond Infrastructure in Thamae Village, Sepone District

(d)Songkhone District

In Songkhone District, the project has been supporting to improve the following village infrastructures:

- Songkhone village

(1) The evacuation shelter will be constructed on a 5-hectare site of community land, 5-hectare is proven to be flood-resistant even during severe 2019 flooding, with no land boundary concerns or construction access issues. The design, dimensions, and facilities of the evacuation shelter have been detailed in the section pertaining to Phiaka Village.

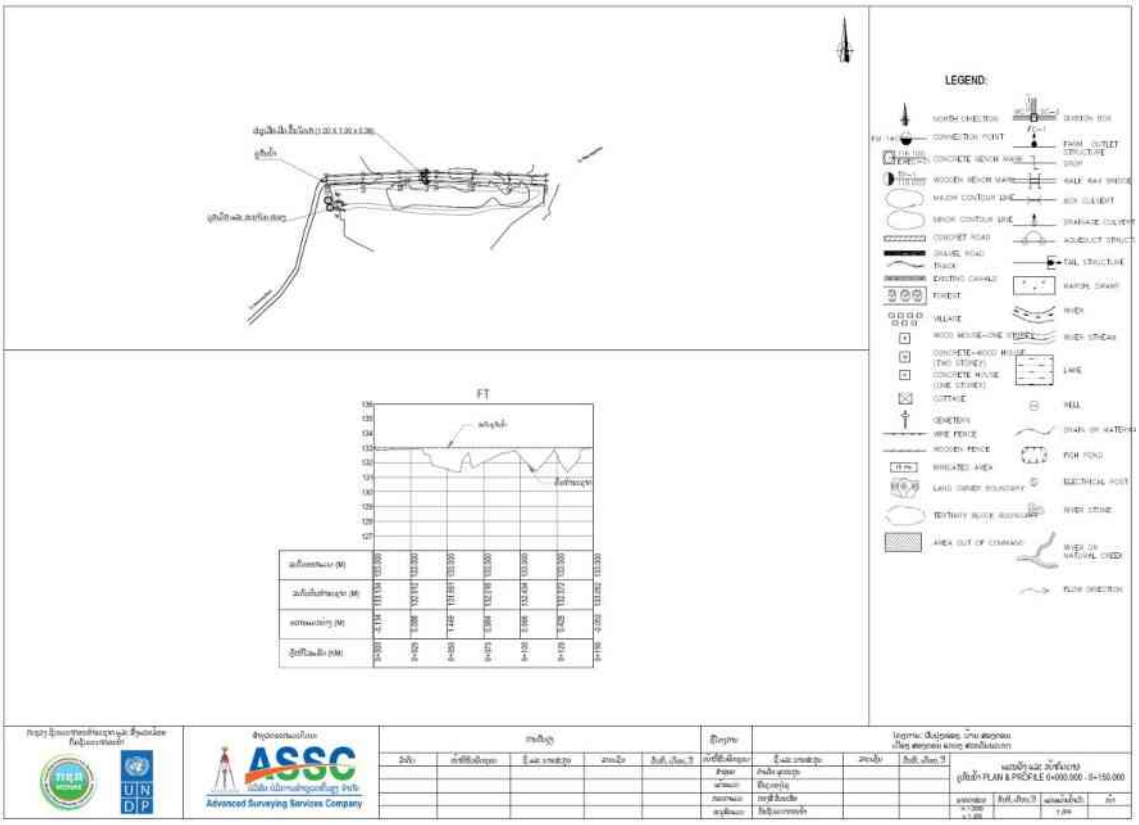
Figure 26 The proposed evacuation shelter location in Songkhone Village, Songkhone District

	
Location of evacuation shelter	unpaved access road to the evacuation shelter

Source: Site visit on 02 July 2025

(2) The community pond upgrade enhances existing dikes using the soil/sediment excavated from the pond as the backfill material. The pond dikes will be constructed using compacted excavated soil, with a surface layer of 300mm of crushed rock sub-base. Furthermore, a steel water control gate will be installed.Upon its improvement/modification, the pond is expected to provide critical dry-season irrigation through a solar-powered pump system thereby providing the much-needed water for agriculture.

Figure 27 Upgrading community pond in Songkhone Village, Songkhone District



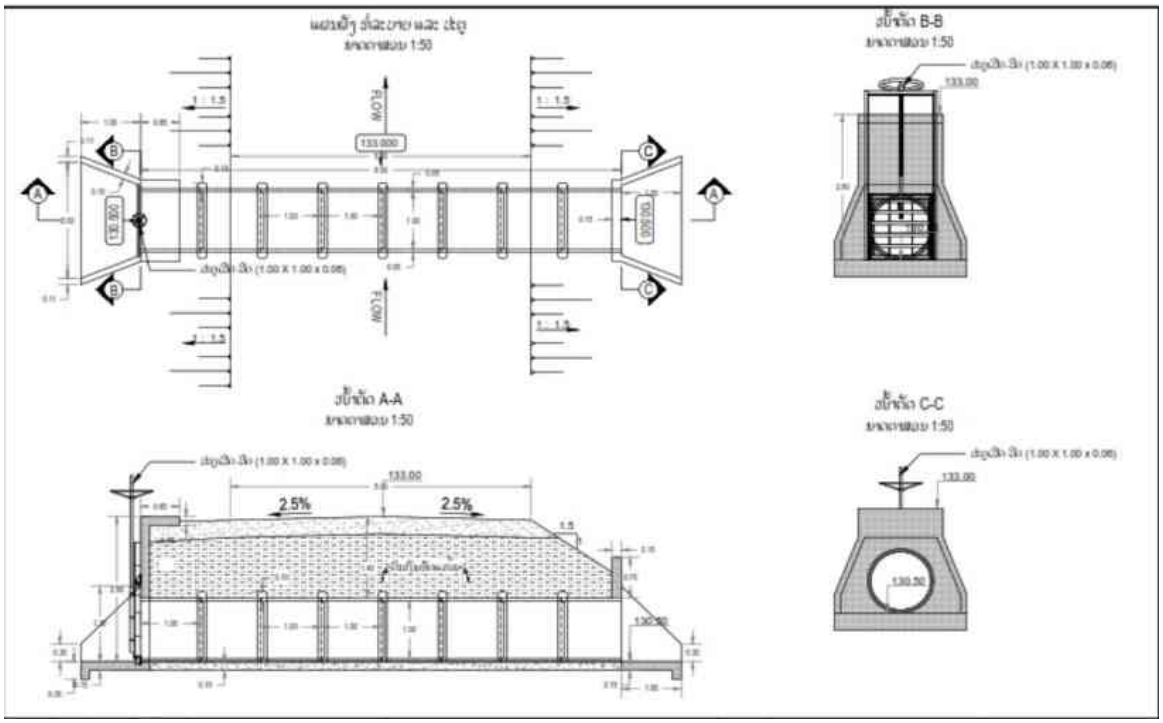


Figure 28 Plan profile and cross section of pond dikes and water grates for upgrading community pond in Songkhone Village, Songkhone District

(e)Xonnabouly District

In Xonnabouly District, the project has been supporting the construction of protective infrastructures in the following villages:

- Meuanghong village

The evacuation shelter site is located on the private land, approximately 1km from the village centre. This provides an adequate distance from residential areas while maintaining accessibility. A local landowner has generously volunteered a 60m x 60m plot for the construction of the evacuation shelter and has expressed willingness to donate additional space should future needs arise.

The design, dimensions, and facilities of the evacuation shelter have been detailed in the section pertaining to Phiaka Village.

Figure 29 Previous (left side) and new (right side) community shelter evacuation in Meuanghong Village, Xonnabouly District

- Nachanyai village

The selected project site consists of village land containing small, non-valuable trees, with convenient access road connectivity while being adjacent to deeper forest areas. Of particular cultural significance is the presence of Brou ethnic group's burial ground located west of the project area. Comprehensive assessments confirm the project will neither impact this sacred site nor obstruct access to the traditional area. The engineering team has specifically designed a clear, dedicated pathway through the project location to maintain unimpeded access to the burial ground. While some minor vegetation clearance will be required for the shelter construction, the environmental impact is assessed as negligible given the low-value vegetation being removed.

The design, dimensions, and facilities of the evacuation shelter have been detailed in the section pertaining to Phiaka Village.

Figure 30 Proposed flood evacuation shelter in Nachanyai Village, Xonnabouly District

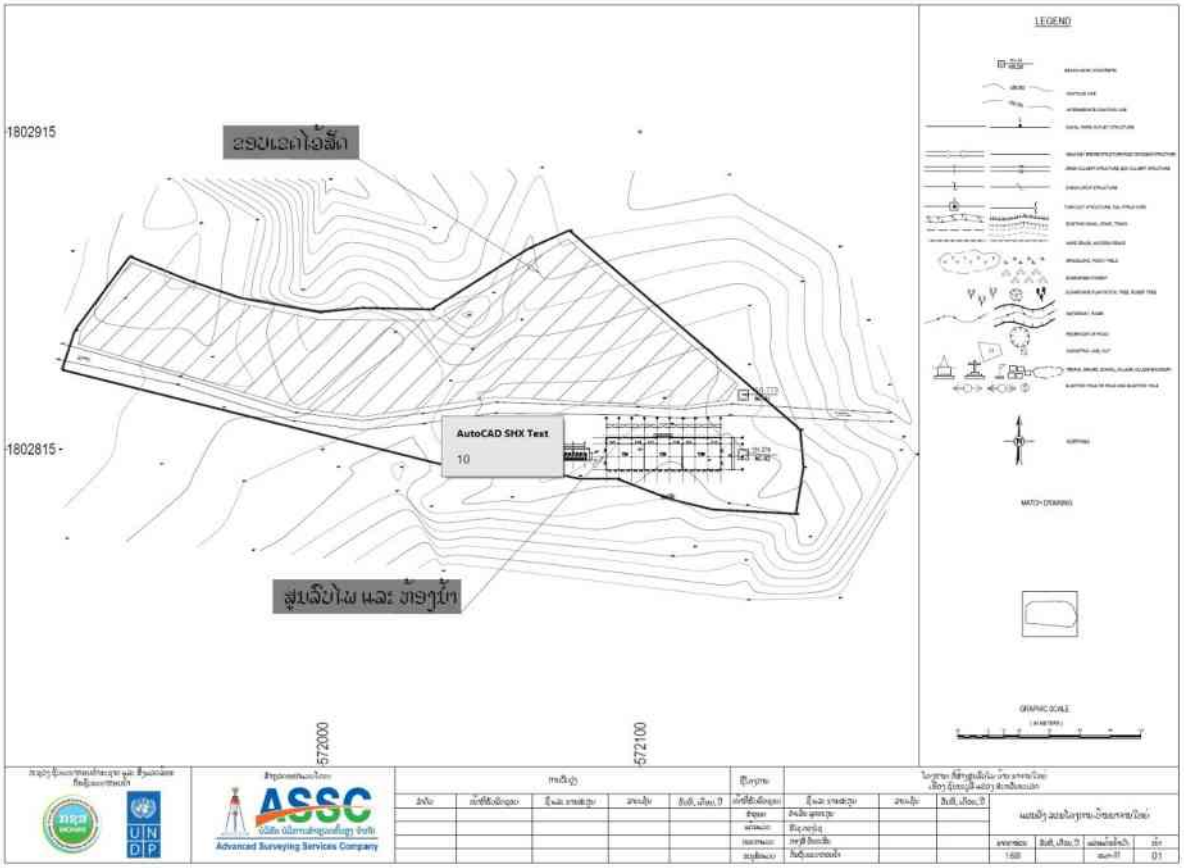


Figure 31 Drawing of flood evacuation shelter in Nachanyai Village, Xonnabouly District

- Nonsavang village

The upgrading the existing wetland is including the clearing the sludge and sediment from both the wetland itself and the connecting canal. The excavated material will be repurposed as backfill for canal strengthening. The infrastructure development will include rehabilitation of a 600-meter canal and creation of a 0.6-hectare pond connected to modified wetlands, all to be constructed on public land. The proposed wetland modification aims to enhance water storage capacity, improve fish production, enrich aquatic ecosystems, and provide reliable dry-season irrigation for 32 hectares of agricultural land. The upgrading wetland in Nongsavang village has received full support from local leadership and community representatives. Village authorities have confirmed the site selection avoids any boundary issues with private plots and won't require temporary access to roads that might disrupt surrounding areas.

Figure 32 Community Pond improvement in Nonsavang Village, Xonnabouly District

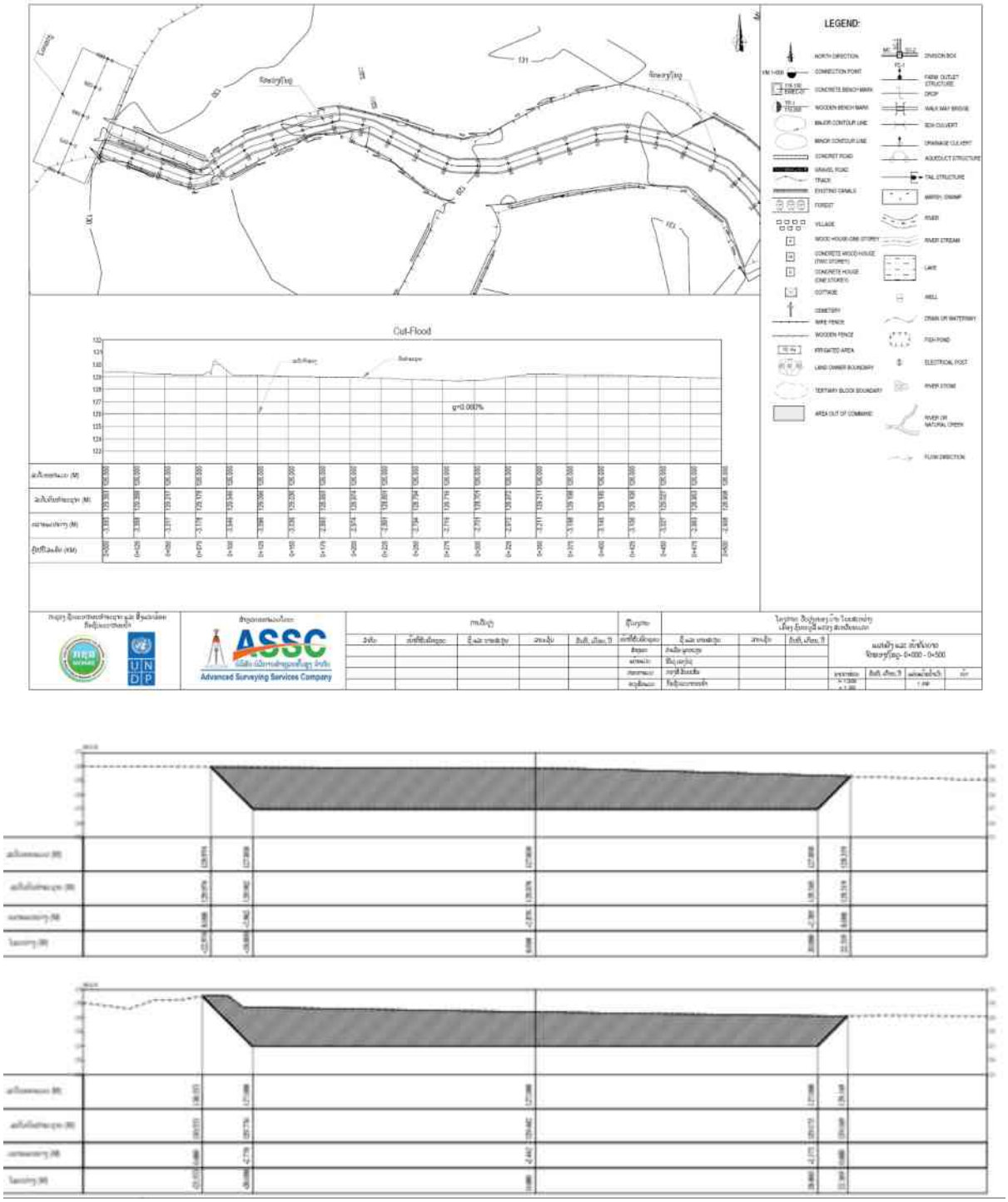


Figure 33 Plan profile and cross section of community Pond improvement in Nonsavang Village, Xonnabouly District

3.2.3 Land requirement

The construction of sub project infrastructure will be carried out on public land occupied by the residents. The acquisition of land is minimal due to the scale of the projects. In total, the project will need around 3,14 ha of land to construct all projects. Below is a list of land and ownership status.

Table 5: Land requirements for construction of sub-projects

Villages	UTM		Preferred Infrastructure	Area required (m2)	Ownership
	X	Y			

Champone district					
Piaka village	522138	1824095	Upgrading pond (17.788m^2), Shelter evacuation (1.619m^2), and flood protection levee (2.904m^2)	22.311	Public land
Dongmeiang village	526832	1829093	Flood protection levee and Riverbank stabilization (4.932m^2), and shelter evacuation (11.509m^2)	16.441	Public land
Sivilay village	503142	1826701	2 Upgrading ponds	83.130	Public land
Nong district					
Tangalai Nuea village	661698	1806015	1 upgrading pond	4.840	Public land
Sepone district					
Sopalou village	654016	1869486	Water tank installation	264	Public land
Thamae village	628012	1840606	1 upgrading pond	6.690	Public land
Songkhone district					
Songkhone village	531804	1797895	Upgrading pond (3.771m^2), shelter evacuation (9.742m^2), and riverbank stabilization (4.468m^2)	17.981	Public land
Xonnabouly district					
Mueanghong village	560256	1794798	Shelter evacuation	2.230	Public land
Nachanyai village	573577	1804685	Shelter evacuation	11.080	Public land
Nonesevang village	536140	1812109	Upgrading pond	18.117	Public land
			Total	**31.427**	

3.2.4 Project Schedule

The overall schedule for the pre-construction and construction stages is anticipated to be established during the dry season and finalized within the contractual agreement with the contractor. The estimated duration of the construction of all sub-projects is from October 2025 to June 2026. The exact timeframe for the construction of individual projects is contingent upon the procurement process.

Table 6: Sub-project infrastructure construction schedule

Villages	UTM		Preferred Infrastructure	Schedule
	X	Y		
Champhone district				
Phiaka village	522293.28	1823927.456	Pond improvement (1,600m^2),	Oct 2025-June 2026
	523109.432	1824770.702	flood protection levee (2,904m^2)	As above
	522708.00	1824255.81	Shelter evacuation (3,800m^2),	As above
Dongmeuang village	527059.346	1832725.473	Flood protection levee and Riverbank stabilization (16,500m^2)	As above
Sivilay village	501556.744	18275226.437	1st pond (3,200m^2) 2nd pond (1,350m^2)	As above
Nong district				
Tangalai Nuea village	662006.479	804985.185	1 Pond improvement (4,840m^2)	As above
Sepone district				
Sopalou village	655571.755	1868605.682	Water tank installation (240m^2)	As above
Thamae village	628004.181	1840479.667	1 Pond improvement (6,690m^2)	As above
Songkhone district				
Songkhone village	532239.73	1798305.621	Pond improvement (3,771m^2),	As above
	532110.523	1787819.965	Evacuation shelter (9,742m^2),	As above
Xonnabouly district				

Mueanghong village	559626.812	1798549.697	Shelter evacuation (2,230m^2)	As above
Nachanyai village	572054.181	1802826.395	Shelter evacuation (11,080m^2)	As above
Nonsavang village	535875.166	1809277.601	Pond improvement (18,117m^2)	As above

Source: Project Team

4 Environmental and Socio-economic Baseline Information

This section discusses the baseline data acquired on the social and economic conditions of the project area and its surroundings. This data is essential to evaluate the project's potential consequences and suggest critical areas for action. Through the examination of demographic trends, employment statistics and access to vital services, the project team may more effectively address the requirements of the local populace. It relies on both primary testimonies and publicly accessible reports and studies, guaranteeing a thorough comprehension of the situation. Moreover, engaging stakeholders will be crucial for validating these findings and promoting a collaborative approach to development, which will enhance the project's efficacy and sustainability.

Ten target villages are connected to the protective infrastructures that will help gather and study the basic environmental and socio-economicinformation thus enabling a thorough evaluation of the effects of planned developments. This analysis will guide decision-making processes to ensure that sustainable practices are implemented effectively. While five villages, including Nongvilay, Savue, Kenghuapa, Huay Kor and Keng Don, have no protective infrastructures, there should be no harm caused by the project’s interventions.

4.1 Introduction

This section outlines the physical, biological, and socio-economic conditions of the project area, including the flood protection levee infrastructure, community shelters, pond improvement/wetland modification and riverbank stabilization works. The physical environment covers air, water and soil quality evaluated through field monitoring. Data on terrain, geology, hydrology and natural hazards are gathered from literature and government agencies. Stakeholder interactions and secondary sources assess the socio-economic environment, considering population dynamics and livelihoods. The study also references materials from the UNDP Country Office accessible through public sources.

The project team utilized various methodologies to ensure comprehensive data collection, including remote sensing and *in-situ* measurements. These efforts aim to provide a holistic understanding of the interactions between the different environmental components and their impact on local communities. This comprehensive approach allows for a detailed examination of how environmental factors influence each other and the well-being of nearby populations. By integrating diverse data sources, the project team can better inform stakeholders and guide effective management strategies.

The parameters which are covered in this baseline chapter as part of ESIA is provided below:

- Physical Environment
- Climate and Meteorology
- Natural Hazard
- Water Quality
- Ambient Air Quality
- Ambient Noise Quality and Vibration
- Ecology
- Ecosystem Services
- Cultural Heritage
- Community Health and Safety
- Socio Economic Environment
- Traffic Density and Profile

4.2 Physical Environment

4.2.1 Topography

Lao PDR, a landlocked nation in Southeast Asia, spans latitudes 14° to 23°N and longitudes 100° to 108°E, bordered by five nations and in the Lower Mekong Basin. It stretches 1,700 km longitudinally and 100 km to 400 km latitudinally, with an area of 236,800 km². About 80% of the territory is mountainous, while the remaining 20% are lowlying plains prone to annual flooding. Elevations range from 104 meters in Attapeu to 2,820 meters at Phoubia Mountain in Xieng Khuang. As of 2020, the population reached 7.5 million, with two-thirds residing in the southern and central regions. Laos boasts natural resources such as water, forests, minerals and wildlife, many still in robust condition. Since the beginning of 2001, resource exploitation has intensified, particularly through hydroelectric dam construction along the Mekong River and its tributaries.

The geography and landlocked status of Lao PDR render the nation significantly reliant on road transportation for commerce and economic development. The East-West and North-South economic corridors of the nation link Lao PDR with Southeast and East Asian countries. Flood and drought occurrences are prevalent in Lao PDR. Poverty and hunger persist and given that a significant section of Lao PDR's population depends on agriculture for their

living, climate change is expected to profoundly affect the nation and its people. The implications of climate change are seen particularly significant by the country's water and forestry resources, agriculture, energy and health sectors.[22]

Savannakhet Province has a substantially diverse landscape. The province has extensive lowland regions next to the Mekong River, with heights generally between 100 and 150 meters above sea level. These productive floodplains are optimal for agriculture yet susceptible to seasonal inundation. The eastern and upland areas of Savannakhet have gently undulating hills and mountainous highlands, with heights ranging from around 400 meters to over 1,000 meters above sea level. Detailed topographic information is essential for formulating strategies to manage water resources and utilize land sustainably, enhancing agricultural output while mitigating catastrophe risks.

Topographical information at the village level is unavailable. District-level data can be utilized to obtain information on the topography of the subproject area. Details provide insights into elevation, slope, and land use patterns, which are essential for evaluating the property's appropriateness for diverse activities. Moreover, engagement with local authorities or geospatial specialists may provide more accurate information customized to the unique requirements of the subproject.

Figure 36 indicates that the elevation data for the topographical region has varied from 147 m to 1053 m above sea level. The data reveals that the Champhone, Xonnabouly, and Songkhone districts demonstrate comparable features in terms of elevation fluctuation, ranging from 147 m to 591 m. These districts indicate a varied array of topographical characteristics. Sepone and Nong districts possess greater elevation compared to the other three districts, with elevations ranging from 147 m to 1053 m above sea level.

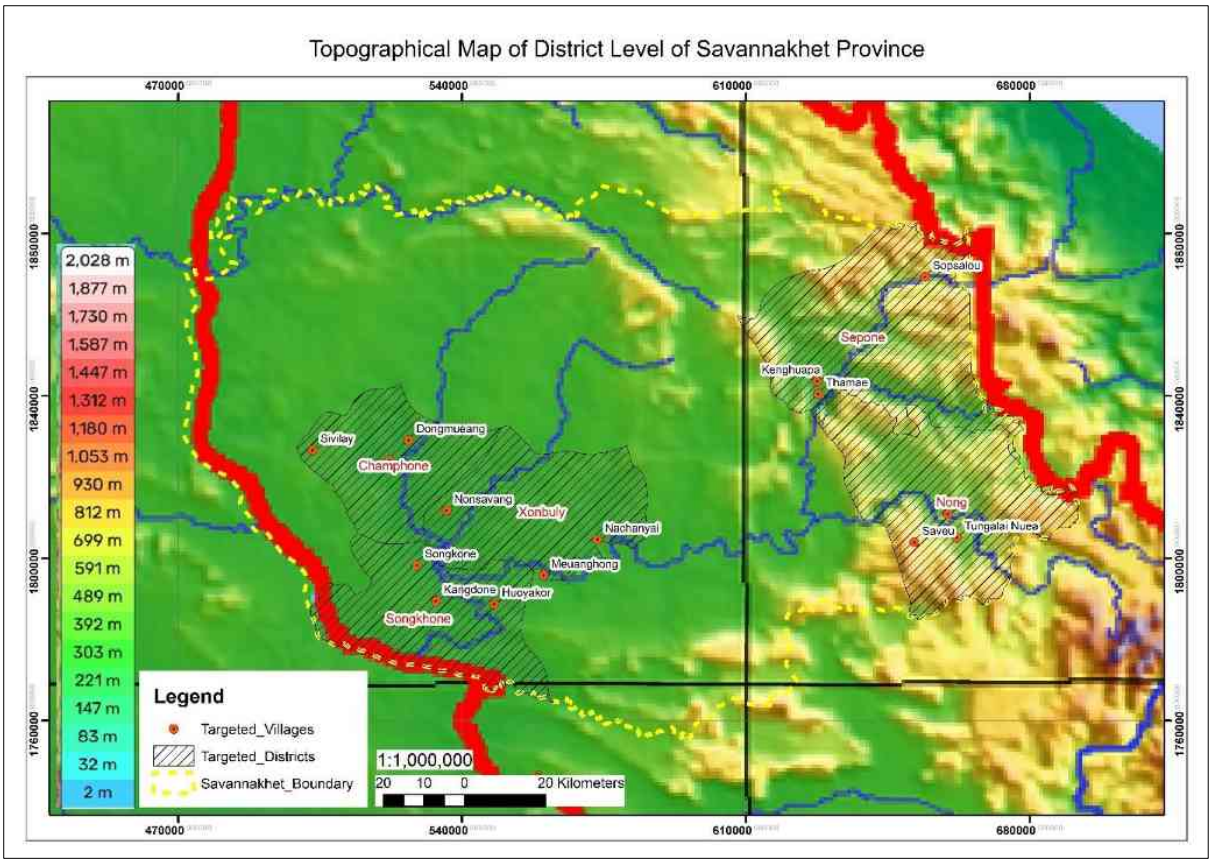


Figure 4 Topographical Map at the District Level

Source: https://en.m.wikipedia.org/wiki/File:Laos_Topography.png

4.2.2 Land Use

Land use is goerned by specific circumstances of each target village. During the course of the assessment, the project team employed a series of questionnaires to collect baseline information from village heads regarding their respective areas. This data will facilitate the identification of the distinct requirements and resources of each hamlet,

[22] https://climateknowledgeportal.worldbank.org/country/lao-pdr

enabling customized development plans. The project has ensured meaningful participation of local leaders to guarantee that land use decisions align with the distinct attributes and interests of each community.

Table 7 below shows that land use pattern across the target villages reflect significant diversity in land allocation and resource utilization. Paddy fields dominate the landscape in several villages, particularly in Sivilay (1,095 ha), Nonsavang (406.13 ha), Songkhone (310.9 ha), and Mueanghong (350.5 ha), highlighting a strong emphasis on irrigated rice cultivation in these areas. Crop land is also notable in Mueanghong (225 ha) and Nachanyai (274 ha), suggesting a combination of paddy and upland farming systems. Settlement areas vary considerably, with Songkhone (197.37 ha) and Nachanyai (75 ha) having the largest residential or built-up areas, possibly indicating larger or more densely populated communities. Among the few villages with forested land, Nachanyai stands out reporting significant areas of production forest (2,300 ha), protection forest (40.17 ha), and conservation forest (77.42 ha), along with grassland (38.24 ha) and wetlands (9.83 ha). Similarly, Mueanghong also has a notable share of protection forest (33.13 ha) and conservation forest (68.25 ha), as well as grassland (50 ha), reflecting a more diverse land use mosaic that integrates natural resource conservation with agriculture. In contrast, villages such as Tangalai Nuea and Sopalou have no recorded land use data, suggesting either a lack of formal classification or unavailable data during the survey period. Overall, the land use in the village is primarily agricultural with a focus on rice cultivation, though some villages like Nachanyai and Mueanghong show a broader integration of forest, conservation, and mixed land systems that may support biodiversity and ecosystem services alongside livelihoods.

Table 7: Land use categories of each target village

District/Village	Land Use Categories Area (ha)							
	Settlement	**Production Forest**	**Protection Forest**	**Conservation Forest**	**Grassland**	**Wetland**	**Crop land**	**Paddy filed**
Champhone								
Phiaka	33.98	-	-	-	-	-	-	201.45
Dongmeuang	4.19	-	-	23	-	4	20.81	2432
Sivilay	22.5	-	-	-	-	-	3	1,095
Nong district								
Tangalai Nuea	5	-	3	2	-	-	85	5
Sepone								
Sopalou	-	-	-	-	-	-	-	-
Thamae	3.36	-	-	-	-	-	-	28.48
Songkhone								
Songkhone	197.37	-	-	12.8	-	-	-	310.9
Xonnabouly								
Mueanghong	9.5	-	33.13	68.25	50	-	225	350.5
Nachanyai	7.5	2,300	40.17	77.42	38.24	9.83	274	87.75
Nonsavang	57.8	-	-	-	-	-	-	406.131

Source: Village Heads, July 2025

4.2.3 Geology

Savannakhet Province, the largest in Laos, is situated on the Khorat Plateau, a broad sedimentary basin extending across parts of Laos and northeastern Thailand. The province's geology is predominantly composed of sedimentary formation belonging to the Khorat Group, which dates to the Mesozoic era (Triassic to Cretaceous periods). These layers sit on top of older rocks that have changed due to heat and pressure, as well as limestone formation from the Carboniferous to Permian periods, especially the Ratburi Limestone Formation. The Khorat Group, made up of sandstone, siltstone, mudstone and conglomerates, was formed in a setting with rivers and lakes and has important underground water sources that are vital for the area's water supply.[23]

The atlas of mineral resources of the ESCAP Region, published by the United Nations Economic and Social Commission for Asia and the Pacific in cooperation with the Department of Geology of Mines in Lao PDR in 1999, is used for referencing, as shown in Figure 35. It indicates that Champhone district is classified into two types: Quaternary—**Q**, which includes alluvial deposits of the Mekong River and its tributaries, and Late Mosaic, primarily Mid-Late Mosaic—**Mz_3**, characterized by sandstones in the lower part that are predominantly fine-grained towards the top with evaporites, particularly rock salt and gypsum.

While Songkhone and Xonnabuly districts share the same classification such as Quaternary—**Q**, which includes alluvial deposits of the Mekong River and its tributaries, Late Mesozoic, primarily Mid-Late Mesozoic— **Mz_3**, characterized by sandstones in the lower part that are predominantly fine-grained towards the top with evaporites,

[23] Opus Library (2005). Groundwater Flow in the Khorat Plateau. Retrieved from opus.lib.uts.edu.au.

particularly rock salt and gypsum, and Mid-Mesozoic—**Mz_2** (mainly Late Triassic to Early Cretaceous, predominantly terrestrial sediments, mainly sandstones, Thin coats in place, Marin Late Triassic occurs in the NE and the NW, Marine Liassic is found in the SE).

Besides, Nong is classified as having two types of Quaternary—**Q**, which includes alluvial deposits of the Mekong River and Mid-Mesozoic—**Mz_2** (mainly Late Triassic to Early Cretaceous, predominantly terrestrial sediments, mainly sandstones. Thin coats in place, Marin Late Triassic occurs in NE and NW, Marine Liassic is found in SE.

Moreover, Sepone has a very complex classification, including Quaternary—**Q**, which includes alluvial deposits of the Mekong River; Quaternary—**QB** (possible also Neogene in part—basalt including alkaline varieties (basanite, lindbergite, etc.); Mid-Mesozoic—**Mz2** (mainly Late Triassic to Early Cretaceous, predominantly terrestrial sediments, mainly sandstones, thin coats in place; Marin Late Triassic occurs in the NE and the NW, Marine Liassic is found in the SE); Early Mesozoic—**Mz1** (mainly Early-Mid Triassic, mainly marine, terrestrial in certain areas). Mostly clastic sediments and some limestones. Volcanic rocks, mainly acidic (rhyolite, dacite, tuff), are widespread in the N and SE; Early Paleozoic (Cambrian-Silurian) —**Pz1** (with probable Proterozoic). Some undifferentiated Lower Devonians in NE less generally metamorphosed to phyllites, schists, and marble. Some basic meta-volcanics. Ultrabasic lenses occur in a narrow belt in the NE; Mid-Paleozoic-**Pz2** (mainly Devonian-Early Carboniferous, some Silurian—mainly marine rocks, in places weakly metamorphosed). Limestones commonly occur and may be recrystallized to marble, and granite **(r)** and lesser granodiorite and quarts diorite of Carboniferous, Permian, Triassic (dominant), and Paleogene age.

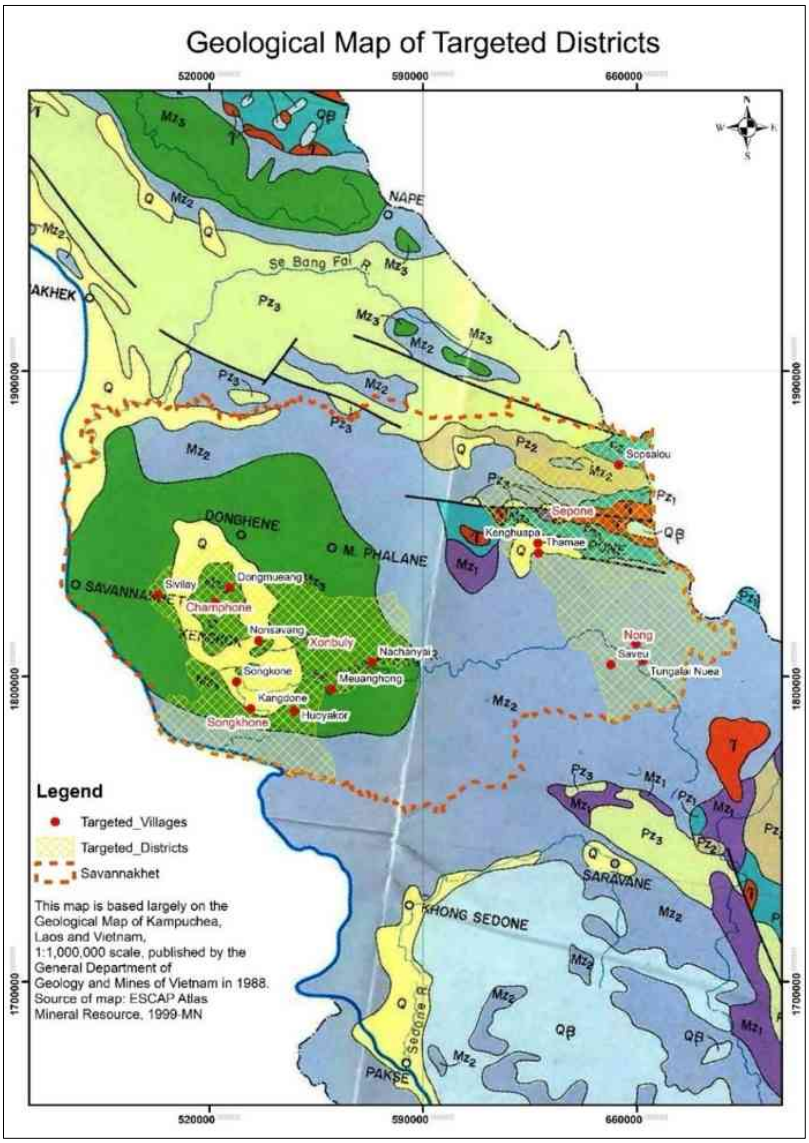


Figure 34 Geological map of the targeted districts

4.3 Climate and Meteorology

4.3.1 Temperature and rainfall

In reference to the temperature at the target villages, regional data from provincial and national levels are utilized to characterise the temperature conditions within the specific districts and villages Rainfall data at the district and village levels are unavailable. So, references rely on provincial and national dataAnnual rainfall in Savannakhet Province experiences a tropical savanna climate (Köppen-Geiger classification Aw), characterized by distinct wet and dry seasons. The average annual precipitation is approximately 1,547 mm (60.9 inches), with significant variability throughout the year. Wet season typically spans from May to October, with August being the wettest month, receiving up to 344.9 mm (13.6 inches) of rainfall. Conversely, dry season occurs from November to April with January being the driest month recording minimal precipitation.

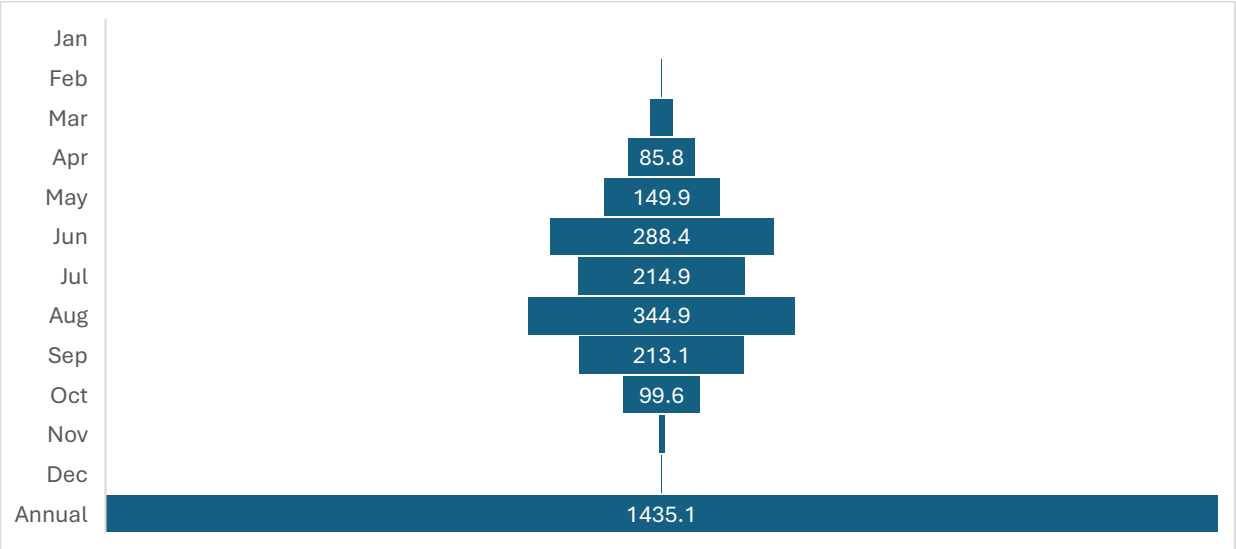


Figure 35 Monthly rainfall (mm) in 2024 in Savannakhet Province

Source: Climate-Data.org (2024). *Climate: Savannakhet.* Retrieved from https://en.climate-data.org/asia/laos/savannakhet/savannakhet-1358/

4.3.1.1 Champhone District

Champhone District is in a tropical region lying in a monsoonal zone. It has two main seasons—a dry season from November to early May and a wet season from May to October. The monthly average temperature in the district remains relatively stable throughout the year, peaking at around 42°C in April (based on Kengkok station weather data from 1990—2020). The district receives an annual average rainfall of approximately 1,144 mm (based on Kengkok station weather data from 2003—2022), with most of the rain falling during the wet season. About 90% of the Xe Champhone River's flow occurs during the wet season, with significant increases from June to September (based on Kengkok station weather data from 2011—2020). Groundwater likely influences the hydrology of the Xe Champhone River and the surrounding natural depressions. According to the groundwater conceptual model by Wiszniewski et al. (2005), groundwater flows from the primary recharge zones in the weathered and fractured bedrock aquifers at the catchment's edges, moving down the slope through the shallow and narrow alluvial aquifer, and eventually reaching discharge areas in natural depressions and the Xe Champhone River.

4.3.1.2 Nong District

Nong District is situated in a tropical area, which also extends into a monsoonal zone. It experiences two primary seasons—a dry season from November to early May and a wet season from May to October. The monthly average temperature in the district is relative stable throughout the year with a peak of around 42 °C in April (based on M. Nong station weather data 1995—2018). The district receives an average annual rainfall of about 1,592 mm (based on M. Nong station weather data 1995—2022) with most of the rainfall occurring during the wet season. About 95.2% of the flow in the Xe Lanong River is therefore during the wet season with flow increasingly significantly from June until September (based on Xe Lanong River station flow data 1995—2004).

4.3.1.3 Sepone District

Sepone District is situated in a tropical area, which also extends into a monsoonal zone. It experiences two primary seasons—a dry season from November to early May and a wet season from May to October. The monthly average

temperature in the district is relatively stable throughout the year with a peak of around 42 °C in April (based on Xepon station weather data 2000—2020). The district receives an average annual rainfall of about 1,680 mm (based on Xepon station weather data 2003—2022) with most of the rainfall occurring during the wet season. About 91.4% of the flow in the upper Xe Bang Hieng River is therefore during the wet season with flow increasingly significantly from June until September (based on Sopnam station flow data 1995—2020.

4.3.1.4 Songkhone District

Songkhone District is situated in a tropical area, which also extends into a monsoonal zone. It experiences two primary seasons—a dry season from November to early May and a wet season from May to October. The monthly average temperature in the district is relatively stable throughout the year with a peak of around 42 °C in April (based on Kengkok station weather data 1990—2020). The district receives an average annual rainfall of about 1,441 mm (based on Lahanam station weather data 1995—2022) with most of the rainfall occurring during the wet season.

4.1.3.5 Xonnabouly District

Xonnabouly District is situated in a tropical area, which also extends into a monsoonal zone. It experiences two primary seasons—a dry season from November to early May and a wet season from May to October. The monthly average temperature in the district is relatively stable throughout the year with a peak of around 42 °C in April (based on Kengkok station weather data 1990—2020). The district receives an average annual rainfall of about 1,354 mm (based on B. Nonsavang station weather data 2003—2022) with most of the rainfall occurring during the wet season. About 87.6% of the flow in the Xe Xangxoy River is therefore during the wet season with flow increasingly significantly from June until September (based on Phalan station flow data 2003—2018).

4.4 Natural Hazard

4.4.2 Flood

Floods and droughts have long been impacting riverine communities of the Xe Bang Hieng River Basin. Riverine flooding is caused by high rainfall throughout the basin including in the upper areas, and overflow of rivers leading widespread inundation of the surrounding areas. Flood hazard mapping shows that riverine flooding occurs primarily in the western area of the basin in the lowland regions, particularly within Champhone, Songkhone and Xonnabouly districts (Antea, 2024). These districts are affected by flooding primarily due to their geographical and hydrological characteristics. They are traversed by several rivers, including the Xe Bang Hieng and Xe Champhone Rivers, which are prone to overflow during the wet season. The topography of this region is predominantly low-lying, making it more susceptible to water accumulation and flooding.

4.4.2.1 Champhone District

Flood hazard mapping shows that a significant area of Champhone district is exposed to riverine flooding for storm events with a 2-, 10-, 50- and 100-year return period. A summary of flood impacts - damage costs and population affected – is provided in 11. A lack of flood early warning, emergency response preparedness and resources, and flood defence infrastructure exacerbates the situation, resulting in significant impacts on agriculture, infrastructure, and local communities. With climate change (RCP8.5 scenario), flood depth is expected to increase significantly putting population and infrastructure in the district at greater risk, although the flood extent for the 10-, 50- and 100-year return period is not expected to change much.

Flood mapping in the target villages of Dongmeuang and Phiaka shows a significant number of dwellings are exposed to flooding for storm events with a 50-year and 100-year return period under the current climate scenario. Some dwellings are also exposed to flooding for the 1 in 10-yr event. Flood impacts—damage costs and population affected—are estimated to be higher in Dongmeuang compared to Phiaka. Flood mapping shows no significant risk of riverine flooding in Sivilay village.

These findings highlight the need to raise awareness of flood risks in the communities and their preparedness and capability to respond, as well as flood defence infrastructure where feasible. Whist attention is required in lowland villages impacted by riverine flooding, protection of forested areas and floodplains in the upstream catchment areas is also important to regulate hydrology and buffer peak flows.

Table 8: Flood exposure and estimates of impacts for Champhone District (based on data in Antea, 2024)

	Return period

	2 years	10 years	50 years	100 years
Current climate (historical data)				
Number of villages exposed to flooding	28	37	40	52
Number of people severely impacted	65,196	80,668	88,297	120,412
Potential damage cost across district	$ 3,755,276	$ 2,807,050	$ 34,768,358	$ 102,729,401
Future climate (RCP8.5 scenario)				
Number of villages exposed to flooding	34	41	45	54
Number of people exposed to flooding	87,437	69,750	114,352	119,871
Potential damage cost across district	$ 1,845,151	$ 25,693,895	$ 90,666,149	$ 105,072,520

Source: Antea, 2024

4.4.2.2. Nong District

Whilst widespread riverine flooding is not an issue in the upland region (including Nong district) compared to the lowland region, there are still impacts from localised riverine flooding and riverbank erosion. In both Nongvilai and Tangalai Neua villages for instance, about 20 households in each village close to the XeLanong River were affected by rising river water level in 2009. In TangAlai Neua, these houses have since moved to higher grounds. In Nongvilai, river water level rose did not reach house floor level – nevertheless the families sought shelter at the school as a precaution. At the district level, there are gaps in the understanding of flood and riverbank erosion risks at the institutional and community level, and a lack of integration of these risks into land use planning. There are also gaps in flood early warning services, including poor mobile phone coverage network in remote areas of the district which impacts on dissemination of warnings.

4.4.2.3 Sepone District

Whilst widespread riverine flooding is not an issue in the upland region (including Sepone district) compared to the lowland region, there are still impacts from localised riverine flooding and riverbank erosion. In Kaengthamae village for instance, about 20 households close to the Xe Bang Hieng River were affected by rising river water level in the 2020 floods. The previous site for Kaenghuapa village (before relocation in 2020) was also affected by the 2019 and 2020 floods. In Sopsalou village, natural movement of the Xe Bang Hieng River is impacting on existing rice paddy fields and potentially on the viability of the focus zone site. At the district level, there are gaps in the understanding of flood and erosion risks at the institutional and community level, a lack of integration of these risks into land use planning, and lack of flood defence infrastructure for both riverine and flash flooding. There are also gaps in flood early warning services, including poor mobile phone coverage network in remote areas of the district which impacts on dissemination of warnings.

4.4.2.4 Songkhone District

Flood hazard mapping for the Xe Bang Hieng River Basin shows that a large area of Songkhone district is exposed to riverine flooding for storm events with a 2-, 10-, 50- and 100-year return period. This includes the floodplain the lower valley of the Xe Champhone and Xe Xangxoy Rivers, and floodplain along the Xe Bang Hieng River. Numerous village built-up areas lie along the periphery of the flood extent for the 1 in 100-year event, but about 12 villages have built-up areas that would be significantly exposed. Riverbank erosion in Songkhone village is also putting at risk existing dwellings, buildings and roads. A summary of flood impacts - damage costs and population affected – is provided in Table 12 (Antea, 2024). A lack of flood early warning, emergency response preparedness and resources, and flood defence infrastructure exacerbates the situation, resulting in significant impacts on agriculture, infrastructure, and local communities. With climate change (RCP8.5 scenario), flood depth is expected to increase significantly putting population and infrastructure in the district at greater risk, although the flood extent for the 10-, 50- and 100-year return period is not expected to change much (Antea, 2024).

Flood mapping in the target villages of Songkhone and Kaengdon shows a significant number of dwellings are exposed to flooding for storm events with a 50-year and 100-year return period under the current climate scenario (see Appendix A). In Songkhone Village, some dwellings are also exposed to flooding for the 1 in 10-yr event under the current climate scenario. However, under future climate scenario, the number of dwellings exposed to flooding increases markedly for the 1 in 10-yr event. In Kaengdon Village, dwellings are not exposed to riverine flooding for the 1 in 10-yr event under the current climate scenario. However, under future climate scenario, there is a significant number of dwellings exposed to flooding for the 1 in 10-yr event. Flood mapping show no significant risk of riverine flooding in Huaykhor village.

Table 95: Flood exposure and estimates of impacts (based on data in Antea, 2024)

	Return period			
	2 years	**10 years**	**50 years**	**100 years**
Current climate (historical data)				
No. of villages exposed to flooding	21	29	36	38
No. of people severely impacted	88,244	96,042	88,297	121,446
Potential damage cost across district	$ 4,952,184	$ 2,889,136	$ 20,671,928	$ 50,161,128

Future climate (RCP8.5 scenario)				
No. of villages exposed to flooding	27	34	37	41
No. of people exposed to flooding	105,193	90,901	119,184	122,935
Potential damage cost across district	$ 1,082,436	$ 14,359,737	$ 49,273,596	$ 51,624,090

Source: Antea, 2024

4.4.2.5 Xonnabouly District

Flood hazard mapping shows that the floodplain area in the lower valley of the Xe Champhone and Xe Xangxoy Rivers (in the western part of Xonnabouly district) is exposed to riverine flooding for storm event with a 2-, 10-, 50- and 100-year return period. A summary of flood impacts—damage costs and population affected—is provided in Table 13 (Antea, 2024). Homes and dwellings are exposed to flooding for the 1 in 100-year storm event (current climate) in 14 villages.

Flood mapping shows a relatively small number of dwellings are exposed to flooding in the target village of Nonsavang for the storm event with a 100-year return period under current climate scenario. Along the Xe Bang Hieng River on the southern boundary of the district, flood mapping show no significant risk of riverine flooding in the target villages of Meuanghong and Nachanyai. In Meuanghong, a few dwellings closest to the river may be exposed to riverine flooding for the 1 in 100-year event.

In the western end of the district where riverine flooding is a risk, a lack of flood early warning, emergency response preparedness and resources, and flood defence infrastructure exacerbates the impacts of flooding on agriculture, infrastructure, and local communities. With climate change (RCP8.5 scenario), flood depth is expected to increase significantly putting population and infrastructure at greater risk, although the flood extent 10-, 50- and 100-year return period is not expected to change much (Antea, 2024).

These findings highlight the need to raise awareness of flood risks in the communities (particularly in the west of the district) and their preparedness and capability to respond, as well as flood defence infrastructure where feasible. Whist attention is required in villages impacted by riverine flooding, protection of forested areas and floodplains in the upstream catchment areas is also important to regulate hydrology and buffer peak flows.

Table 10: Flood exposure and estimates of impacts (based on data in Antea, 2024)

	Return period			
	2 years	**10 years**	**50 years**	**100 years**
Current climate (historical data)				
No. of villages exposed to flooding	16	18	21	23
No. of people severely impacted	56,239	58,138	60,897	86,430
Potential damage cost across district	$ 1,383,707	$ 1,829,088	$ 27,033,487	$ 49,850,283
Future climate (RCP8.5 scenario)				
No. of villages exposed to flooding	19	24	26	28
No. of people exposed to flooding	58,474	57,028	85,652	87,121
Potential damage cost across district	$ 261,041	$ 21,442,206	$ 49,796,099	$ 52,204,998

Source: Antea, 2024

4.4.3 Landslide

Savannakhet Province, situated in central Laos, features more level terrain. According to available data, the landslide susceptibility in this region is classified as very low. This classification suggests that the area's rainfall patterns, terrain slope, geology and land cover make localized landslides a rare occurrence.[24] However, it is important to note that heavy rainfall can still lead to flooding in Savannakhet. In October 2020, the province experienced significant flooding, affecting 125 villages and nearly 30,000 people. While the primary concern was flooding, such events can sometimes trigger localized landslides, especially in areas with vulnerable soil conditions.[25]

4.4.4 Drought

The rainfall pattern in the east of the Xe Bang Hieng River Basin (upland region) is different to the west (lowland region), with higher rainfall and shorter duration of consecutive dry days (i.e. periods without any rainfall) in the

[24] Think Hazard (2024). *Landslide hazard assessment for Savannakhet Province, Laos.* Retrieved from https://thinkhazard.org/en/report/1764-lao-people-s-democratic-republic-savannakhet/LS.

[25] ReliefWeb (2020). *Flood impact report in Savannakhet Province, Laos.* Retrieved from https://reliefweb.int/disaster/fl-2020-000213-lao.

east for the 5-, 10, 50- and 100-year return periods.[26] This suggests that the security of water supply from rainfall driven systems such as ponds, local watercourses, and shallow springs is less vulnerable in the upland region with lower likelihood of such systems drying up or ceasing to flow.

The Standardized Precipitation Index (SPI) is an index which quantifies precipitation deficits relative to the normal local climate. It is calculated using accumulation periods of 3-months, 6-months and 1-year to reflect relevance for agricultural practices. The SPI shows that the longer dry period in the western area of the basin tends to occur during the dry season and is less divergent from a normal year compared to the east. For a 3-month moving average under current climate, the SPI indicates that the western area is likely to experience 'moderately dry' condition with a 5-year return period. For a 6-month moving average under current climate, the western area is likely to experience 'severely dry' condition with a 5-year return period. For a 6-month moving average under current climate, the western area is likely to experience 'extremely dry' condition with a 50-year return period.

These findings highlight that effort to mitigate the impacts of drought is required across Savannakhet Province. However, districts in the lowland region will require higher level of investment given their larger population, higher intensity of agriculture, and higher vulnerability of rainfall driven systems to droughts.

4.4.4.1 Champhone District

Impact of droughts in terms of damage cost to agriculture is found to be higher in the lowland region given the higher intensity of agriculture compared to the upland region. Damage cost in the lowland increases to the west of the basin (including Champhone District) where there is higher intensity of rice paddy cultivation. Sivilay village to the west for instance could incur damage cost to agriculture of about USD 500,000 for a 6-month drought period with a 1 in 100-year return period (Antea, 2024). Similarly, Dongmeuang and Phiaka could incur damage to agriculture of about USD 330,000 and USD 210,000 respectively.

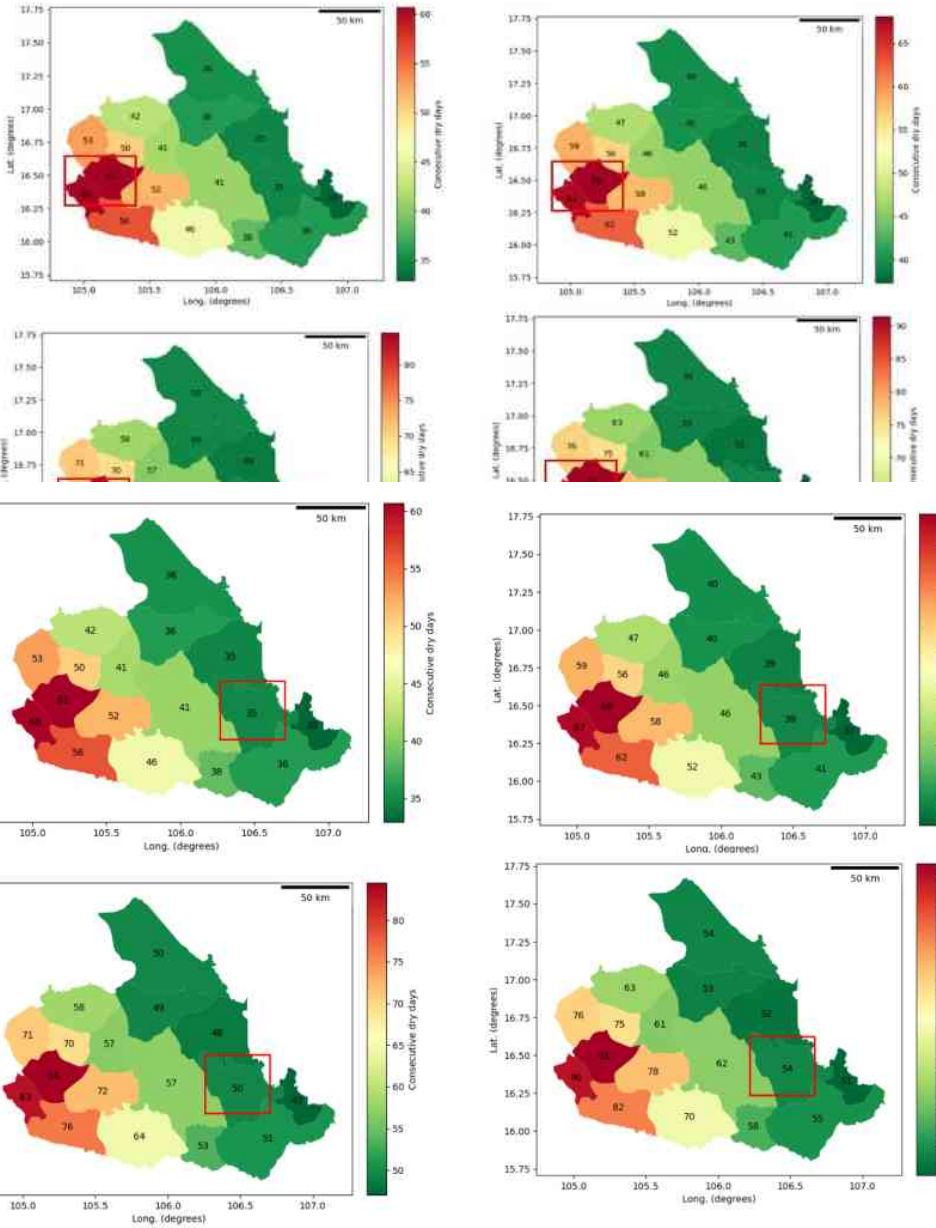


Figure 36 year (left bottom), a ne District

4.4.4.2. N

Efforts to m n terms of damage cc griculture compared 600, USD 59,600 anc a 6-month drought pe

[26] Antea pared for UND

[27] Antea pared for UND

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Figure 37 Consecutive dry days (yearly mean per district) for a 5-year (left top), 10-year (right top), 50-year (left bottom), and 100-year (right bottom) return period (Source: Antea, 2024). Red Box indicates Nong District

4.4.4.3 Sepone District

Efforts to mitigate the impacts of drought is required across Savannakhet Province. Impact of droughts in terms of damage cost to agriculture is found to be higher in the lowland region given the higher intensity of agriculture compared to the upland region. In Sepone district, damage to agriculture is estimated at about USD 110,000, USD 80,000 and USD 26,000 for target villages of Kaenghuapa, Kaengthamae and Sopsalou respectively for a 6-month drought period with a 100-year return period.

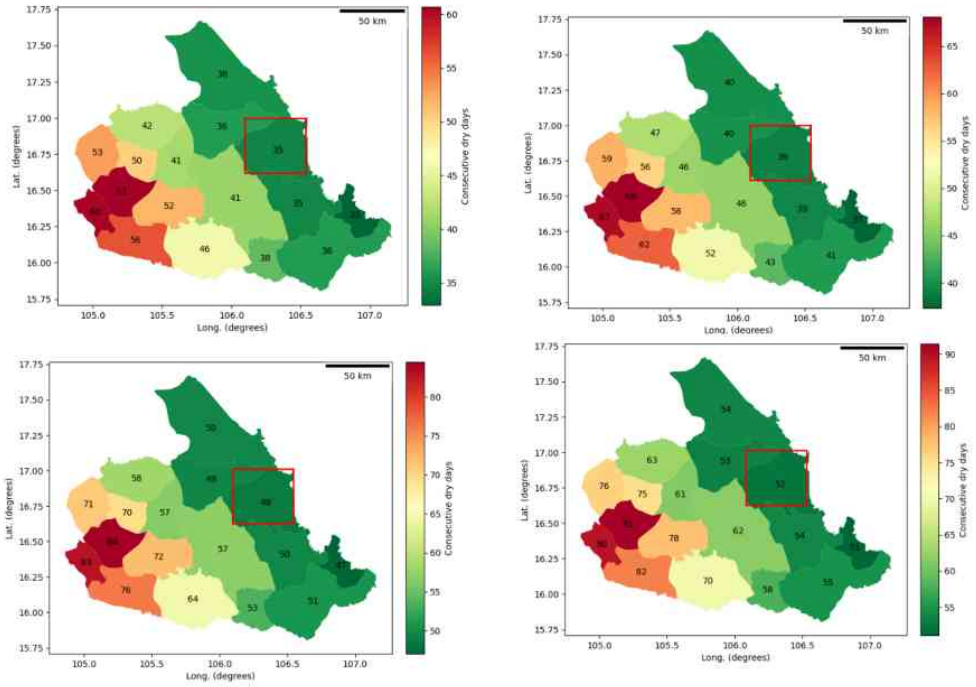


Figure 38 Consecutive dry days (yearly mean per district) for a 5-year (left top), 10-year (right top), 50-year (left bottom), and 100-year (right bottom) return period (Source: Antea, 2024). Red Box indicates Sepone District

4.4.4.4 Songkhone District

The impact of droughts in terms of damage cost to agriculture is found to be higher in the lowland region given the higher intensity of agriculture compared to the upland region. Damage cost increases to the west of the basin (including Songkhone District), where there is higher intensity of rice paddy cultivation. For instance, the target villages could incur damage cost to agriculture for a 6-month drought period with a 1 in 100-year return period of about USD 290,000 for Huaykhor village, USD 200,000 for Kaengdon village and USD 140,000 for Songkhone Village.

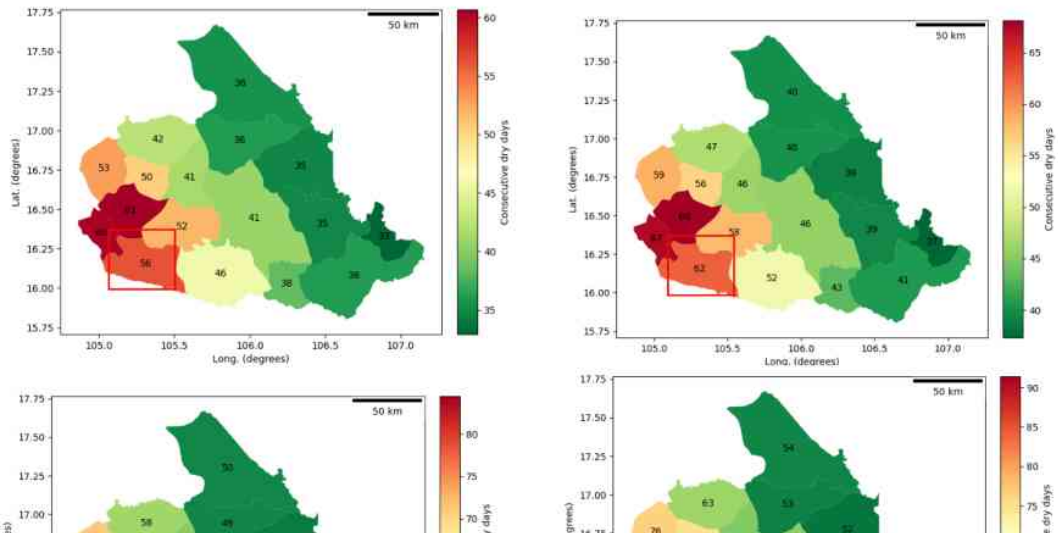


Figure 39 Consecutive dry days (yearly mean per district) for a 5-year (left top), 10-year (right top), 50-year (left bottom), and 100-year (right bottom) return period (Source: Antea, 2024). Red Box indicates Songkhone District

4.4.4.5 Xonnabouly District

Impact of droughts in terms of damage cost to agriculture is found to be higher in the lowland region given the higher intensity of agriculture compared to the upland region. Damage costs in the lowland increases to the west of the basin where there is higher intensity of rice paddy cultivation. In Xonnabouly District, damage to agriculture is estimated at about USD 165,000, USD 140,000 and USD 13,000 for target villages of Nachanyai, Nonsavang and Meuanghong respectively for a 6-month drought period with a 100-year return period.

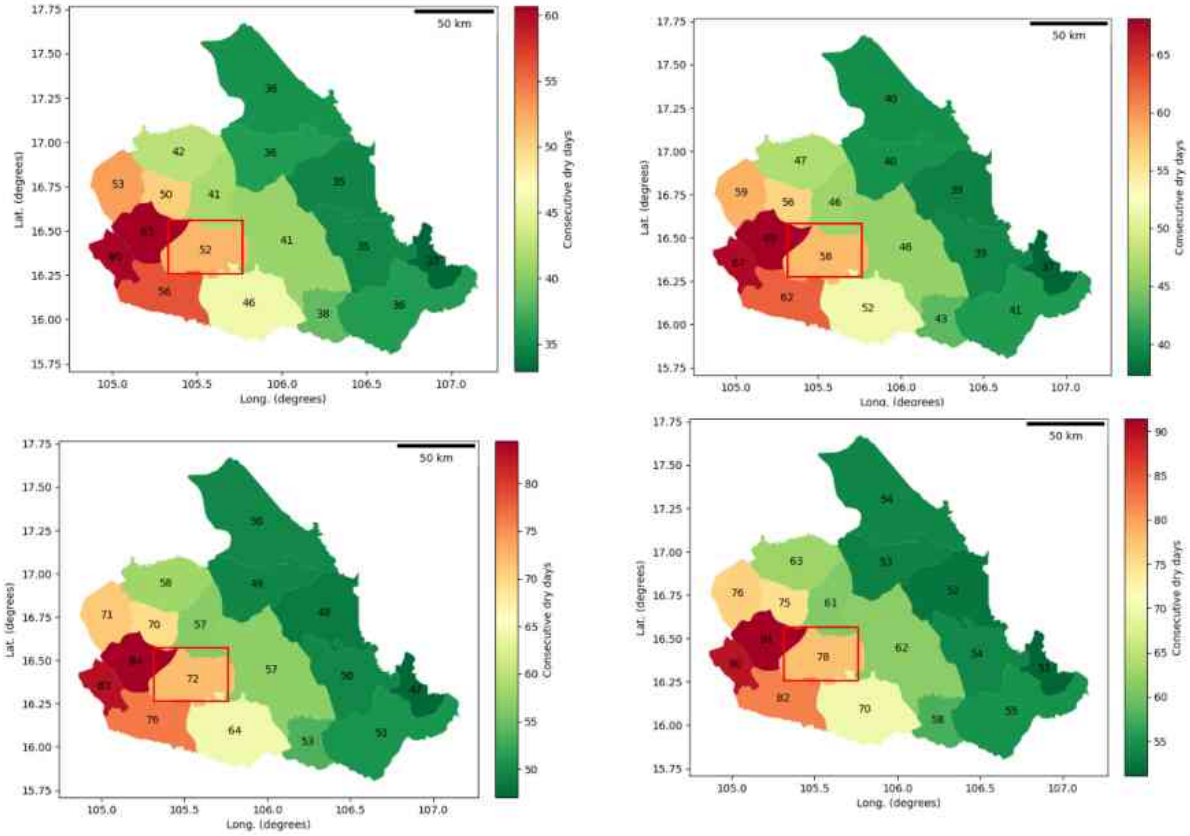


Figure 40 Consecutive dry days (yearly mean per district) for a 5-year (left top), 10-year (right top), 50-year (left bottom) and 100-year (right bottom) return period (Antea, 2024). Red Box indicates Xonnabouly District

4.5 Water Quality

4.5.1 Surface Water Quality

Surface water quality assessment would be conducted using the combined expertise of the community and the project team. During field visits and observations at the specific protective infrastructure projects, input would be gathered regarding the perception of water quality in nearby ponds, lakes and rivers. Generally, local communities perceive that the surface water quality is satisfactory and can be safely consumed after appropriate treatment such as filtering and boiling for domestic use. This perception is likely accurate given the remoteness and rural nature of the project areas. Table 11 presents the status of the surface water quality at each sub-infrastructure project location.

Table 6: Observed Conditions of Surface Water at Sources

Sub infrastructure projects	Location	Description	Perceived water quality
Flood protection levee and riverbank stabilization	Dongmeuang village	Preservation and Restoration of Ramsar wetlands.	Good
Flood protection	Phiaka village	Xe Champhone River	Good
Riverbank stabilization	Songkhone village	Banghieng River	Good

Source: field observation

4.5.2 Groundwater Quality

Input on groundwater perception was gathered during field visits. Local communities view groundwater as good, likely due to the rural, less industrialized areas. Samples will be taken at various locations, including the construction site, community pond and water tank. The table below shows groundwater quality status at each sub-infrastructure project site.

Table 7: Perceived Condition of Groundwater at the target villages

UTM		Sub infrastructure projects	Location	Description	Perceived water quality
X	Y				
522293.28	1823927.456	Pond improvement	Phiaka village	Community borewell	Good, consumable with care such as using filter and boiling
501556.744	18275226.437	Pond improvement	Sivilay village	Community borewell	Good, consumable with care such as using filter and boiling
655571.755	1868605.682	Water tank installation	Sopalou village	Community borewell	Good, consumable with care such as using filter and boiling
628004.181	1840479.667	Pond improvement	Thamae village	Community borewell	Good, consumable with care such as using filter and boiling
532239.73	1798305.621	Pond improvement	Songkhone village	If sub-project will drill well to use for toilet	Good, consumable with care such as using filter and boiling
535875.166	1809277.601	Pond improvement	Nonsavang village	Community borewell	Good, consumable with care such as using filter and boiling

Source: field observation

4.6 Ambient Air Quality

No ambient air quality testing was conducted. Air quality is observed based on the consultation with stakeholders. Air quality in the project area is generally good since there are no industries producing discharges/emissions and emissions from vehicular exhaust are insignificant (low traffic density). However, practices such as paddy rice burning and forest clearing can pose significant concerns.

4.7 Ambient Noise Quality and Vibration

No ambient noise and vibration tests were conducted. The project sites are far from activities generating noise and vibration as there are no industries within the proposed project sites. The existing ambient noise levels and vibration is observed as “very low”. The stakeholders in the target village also confirmed that the target villages generally

have good ambient noise and vibration due to the tranquillity of the village; no heavy traffic and absence of construction activities in the project sites.

4.8 Ecology

Conservation activities include enhancing conservation zones within four National Protected Areas (Phou Xang, Pho Sa Dok Bua, Dong Phou Veng, and Xe Ban Nuan) and managing one Ramsar Site (Xe Champhone Ramsar). The Champhone District in Laos is home to several rivers and streams, including the Xe Champhone River catchment region. The Xe Champhone River is a vital natural resource for farming and irrigation, making it an important agricultural hub in Laos. The district also has three district protection forests, including the Ramsar-designated Xe Champhone wetland. The Xe Champhone wetland harbours the Siamese Crocodile, Elongated Tortoise and other species. The proposed expanded core zone of the Ramsar site includes Sui Lake and Phiaka village. The Xe Champhone setland supports the Siamese Crocodile population and provides adequate habitat for crocodiles and fish. However, the conversion of riparian buffers into farmland poses a significant threat to waterways thereby deteriorating water quality. The government protects a large amount of forest in Savannakhet Province's Nong and Sepone districts, which are characterized by numerous rivers and streams. The Ramsar site boundary includes floodplains and wetlands in the lower valley of the Xe Champhone and Xe Xangxoy Rivers.

The Xe Champhone Ramsar Site has identified three species. These species are vital to the local environment, offering crucial functions such as pollination and nutrient cycling. Comprehending their activities and interactions will be essential for the efficacy of the conservation initiatives executed in the area.

- The Siamese Crocodile is found in the Xe Champhone Wetlands located in the Champhone province. The country has recognized it as the most substantial population of the critically endangered species.
- The Elongated Tortoise is also found in the Xe Champhone Wetlands located in the Champhone province. People have observed this rare species in the area. Conservation efforts are vital.
- The bird community is also found in the Xe Champhone Wetlands located in Champhone district. The government has acknowledged the community for its conservation initiatives.

4.9 Ecosystem Services

Most of the structures are in the centre of each target village as part of the infrastructure investment plan. This plan ensures that the protected forest and Ramsar zone will benefit from the infrastructure while the local people and ecosystem will not be harmed. This careful planning aims at creating a sustainable balance between development and conservation fostering a harmonious relationship between the community and their natural surroundings. As a result, both the local economy and the environment can thrive together promoting long-term resilience and biodiversity.

Across the project sites, the proposed infrastructure improvements—particularly pond upgrades, flood levees, and wetland modifications—directly contribute to enhancing ecosystem services such as water storage, flood regulation, aquatic biodiversity, and agricultural productivity. In Dongmeuang, riverbank stabilization and levee construction are designed not only to reduce flood risks and soil erosion but also to support aquatic ecosystem restoration in Ramsar-designated wetlands. In Phiaka, pond and levee upgrades are expected to improve aquatic life and fish production, while also providing flood mitigation and expanded irrigation potential. Similarly, Sivilay's pond upgrades address extreme hydrological fluctuations, creating reliable dry-season water sources that support agriculture and natural recharge. In Tangalai Neu, a small-scale pond upgrade enhances household water access and home gardening, directly supporting provisioning services without disturbing local air, water, or noise conditions. Thamea's pond and levee upgrades enhance biodiversity and water quality, reinforcing the pond's role as a vital aquatic habitat.

Songkhone's infrastructure—especially riverbank stabilization—preserves fishing resources, while a solar-powered pump system linked to a pond provides climate-resilient irrigation. In Nongsavang, wetland modification and canal rehabilitation significantly expand water storage, fish production, and aquatic ecosystem richness, supporting irrigation over 32 hectares. These benefits are achieved with minimal environmental disruption and no impact on wildlife habitats. Throughout these projects, the sustainable reuse of excavated soil (e.g., for fishponds, road improvement, or levee strengthening) further enhances ecosystem functionality by reducing erosion and promoting community-based natural resource management. Overall, the projects integrate nature-based solutions and infrastructure to strengthen regulating, provisioning, and supporting ecosystem services while maintaining strong community ownership and cultural sensitivity.

4.10 Xe Bang Hieng Basin Protected Areas

Champhone district features several rivers and streams predominantly located within the Xe Champhone River catchment area. The Xe Champhone River, a tributary of the Xe Bang Hieng River, functions as the principal watercourse supplemented by many ponds and minor streams. The Xe Champhone River serves as a significant natural resource for communities, including Dongmeuang and Phiaka target villages, offering rich banks for agriculture and irrigation, thereby establishing the district as a crucial agricultural centre in Laos (Lao National Land Management Authority, 2015). Three district protection forests exist: Nhot Houay Bak (2,988 ha), Nongthongbak (1,095 ha), and Houay Khen (6,639 ha).

The Xe Champhone River sustains vital habitats, including the Ramsar-designated Xe Champhone wetland, a vast expanse of marshes, swamps and inundated wooded forests. The proposed expanded core zone of the Ramsar site encompasses the extensive Sui Lake (994 hectares) (Figure 41). Phiaka village and a portion of Dongmeuang village are included within the proposed expanded buffer zone of the Ramsar site.

The Xe Champhone Wetlands sustains the greatest population of the severely endangered Siamese Crocodile in the nation, with other species including the rare Elongated Tortoise. During the arid season, they offer sanctuary for crocodiles and fish in consistently inundated deep ponds and marshes. During the rainy season, fish utilize the location for spawning and migration. Local inhabitants utilize the location for agriculture, communal fishing, and cattle husbandry. Principal risks to watercourses encompass the transformation of riparian buffers into agricultural land, leading to a deterioration in water quality due to increased silt and contaminants entering the waterways. Threats to the Ramsar site are agricultural development and disruption of crocodile habitats resulting from floods induced by weir building. These findings underscore the necessity of safeguarding, rehabilitating, and managing ecosystems to guarantee their health and the continued provision of vital services and resources to populations.

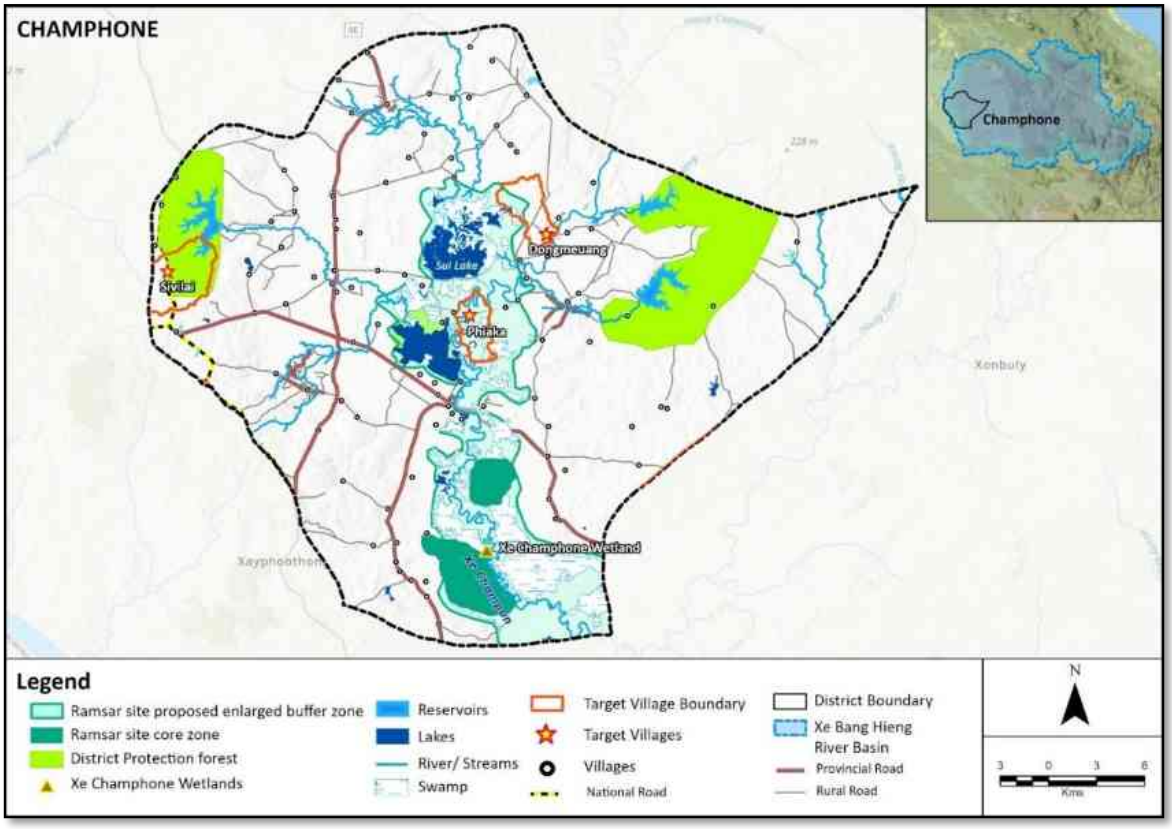


Figure 1 The ecosystems in Champhone District

Table 13 indicates land cover in Nong, Sepone, Songkhone and Xonnabuly districts characterized by a very diverse ecology.

Table 8: Land cover comprised in Nong, Sepone, Songkhone, Xonnabouly District

Type of land cover	Nong (%)	Sepone (%)	Songkhone (%)	Xonnabouly (%)
Vegetation	53.5	43.9	-	-
Mixed deciduous forests	22.2	31.6	16.3	27.9
Evergreen forests	13.9	13.5	-	-
Agricultural/crop	6.6	8	-	-
Rice paddy fields	-	-	51.5	31.1
Dry dipterocarp forests	-	-	23.8	32.5

- **Sepone district**

Sepone district is surrounded by protected areas and contains three major rivers—the Xe Bang Hieng, Xe Kok, and Xe Poun—as well as several commercial plantations. The interactions between these plantations and rivers affect the 88 villages located in the district. Specifically, the use of chemicals by plantations and their high-water requirements have contributed to the degradation of riparian ecosystems and increased risk of water insecurity in downstream communities. Despite plantations occupying approximately 11,000 hectares of the 2,500,000 hectares in the district, increasing ecosystem degradation has led to a decrease in the areas available to villages for harvesting non-timber forest products while also resulting in increased soil erosion along riverbanks.

Protected areas in Sepone district are vital for preserving biodiversity and mitigating ecological challenges, yet their proximity to human settlements requires a delicate balance between conservation and community livelihoods. These areas provide essential services, such as buffering against flooding and soil erosion, particularly in a region increasingly affected by climate change.

Sepone communities face ecosystem degradation and erratic rainfall. Floods between 2018 and 2020 impacted 51 of 88 villages, burying 30 hectares of rice paddies in Keng Hua Pa under mud. Heightened flooding and drought risks force communities to turn to slash-and-burn agriculture.

- **Nong district**

Nong district is located in the headwaters of the Xe Bang Hieng River Basin and consists mainly of mountainous areas or plateaus, with limited land available for livelihood activities such as agriculture. Consequently, the demand for land has resulted in significant deforestation through logging and swidden agricultural practices, which reduce the protective functions provided by ecosystems in the district. As a result, land degradation diminishes the productivity of agricultural land, thereby increasing reliance on these practices and creating a cycle of degradation that raises pressure on protected areas as the available land decreases.

4.11 Cultural Heritage

The baseline information from the village chief offers cultural heritage and religious data at the village level. Ten village leaders are participating in the protective infrastructure project and have collected essential information. This collaboration improves the project's efficacy and cultivates a sense of communal ownership. The initiative seeks to preserve and promote the distinct cultural identity of each village through the engagement of local leaders while ensuring sustainable development.

Table 14 exhibits diversity of cultural and spiritual heritage, reflecting deep-rooted religious and traditional beliefs. Buddhist temples are the most prominent cultural feature, present in nearly all villages except Tangalai Nuea, Sopalou, Thamae, and Nachanyai. Notably, Nonsavang and Mueanghong each host two temples, including significant sites such as Phachanlai Temple and Phoxayyalam Temple in Nonsavang. Altars are present in most villages with Buddhist temples, symbolizing household or communal spiritual practices, while burial grounds or cemeteries are widely found, with Sivilay (3) and Nachanyai (4) having the highest numbers, possibly indicating larger or older settlements. Worship trees—sacred natural features—are less common, appearing only in Dongmeuang and Mueanghong. Meanwhile, spiritual or worship forests represent a unique aspect of local animist traditions and coexist alongside Buddhist practices. These are identified in six villages, with Dongmeuang and Tangalai Nuea notably referencing "Monkey Forest" as sacred ecological spaces. Songkhone village hosts the historically significant Sybounheung Temple, classified as an old temple, further emphasising its cultural importance. Overall, this spatial distribution of cultural sites highlights the close integration of spiritual life with the natural landscape, pointing to the need for cultural sensitivity and preservation considerations in any local development or planning initiatives. However, only the proposed levees and riverbank stabilisation for the Xechamphone River in Dongmuang Village are near Monkey Forest. The locations of all other activities are distant from cultural sites.

Table 9: Description of cultural sites in the target villages

District/Village	Cultural Site				
	Buddhist Temple	**Altar**	**Burial ground / cemetery**	**Worship tree**	**Spiritual forest / worship forest**
Champhone					
Phiaka	01	01	01	-	02
Dongmeuang	01	01	01	01	01 (Monkey forest)
Sivilay	01	01	03	-	-
Nong					

Tangalai Nuea	-	-	01	-	01 (Monkey forest)
Sepone					
Sopalou	-	-	01	-	01
Thamae	-	-	01	-	01
Songkhone					
Songkhone	01 (Sybounheung Temple - old temple)	01	02	-	01
Xonnabouly					
Mueanghong	02	01	01	01	01
Nachanyai	-	-	04	-	02
Nonsavang village	02 (Phachanlai Temple and Phoxayyalam Temple)	01	01	-	-

Source: Village Heads, July 2025

4.12 Community health and safety

Savannakhet Province faces significant challenges related to poverty, healthcare access and environmental management. As of the 2018-2019 Lao Expenditure and Consumption Survey, Savannakhet accounted for approximately 20.6% of the nation's poor population.[28] The province's rural areas, where poverty is most prevalent, face substantial challenges in accessing healthcare and maintaining safety standards. The high poverty rate exacerbates social inequities, including gender disparities in literacy and access to health services. Savannakhet's efforts to improve community health and safety must focus on addressing these inequities and bolstering infrastructure. Initiatives to enhance flood management and protect natural assets such as forests and waterways are critical to mitigating the impacts of climate change and ensuring the safety and well-being of its residents. Comprehensive urban and rural planning that includes stronger regulation of development and preservation of natural resources will be essential in achieving sustainable improvements in community health and safety.

While the province faces substantial challenges related to poverty and healthcare access, community health and safety remain generally positive, thanks to the low levels of conflict and the protection of natural resources. The quality of air in Savannakhet is generally good, with natural resources from protected areas contributing to a healthy environment. However, rural roads can generate dust, which may impact air quality. Despite this, the traffic in rural areas is relatively low, minimizing the extent of dust pollution. Occasional air pollution from smoke due to forest clearance and burning is a concern in some areas. Nevertheless, the proximity of communities to protected natural areas helps mitigate this risk, ensuring that air quality remains largely unaffected.

One of the more significant risks to community health and safety is traffic accidents. Although traffic is less dense in rural areas, including the project's target districts and villages, children are often allowed to wander freely in the communities, which can present a risk of accidents. The target districts and villages enjoy a peaceful environment, with no significant conflicts observed between communities. The harmonious coexistence of different ethnic and cultural groups contributes to the overall safety and wellbeing of the residents. The presence of protected natural areas and the generally low levels of conflict ensure that residents feel safe. However, attention must be given to the risks posed to children, such as potential accidents and drowning during floods. The communities the target districts and villages benefit from a relatively safe and healthy environment.

Figure 42 shows that Sovannakhet province has only 12 locations for health facilities, from health centers to provincial hospitals. This limited number of health facilities can cause major problems for the local population, particularly in terms of access to essential medical services. As a result, residents may face long travel times to reach adequate healthcare, which could impact their overall well-being.

[28] https://thedocs.worldbank.org/en/doc/923031603135932002-0070022020/original/LaoPDRPovertyProfileReportENG.pdf

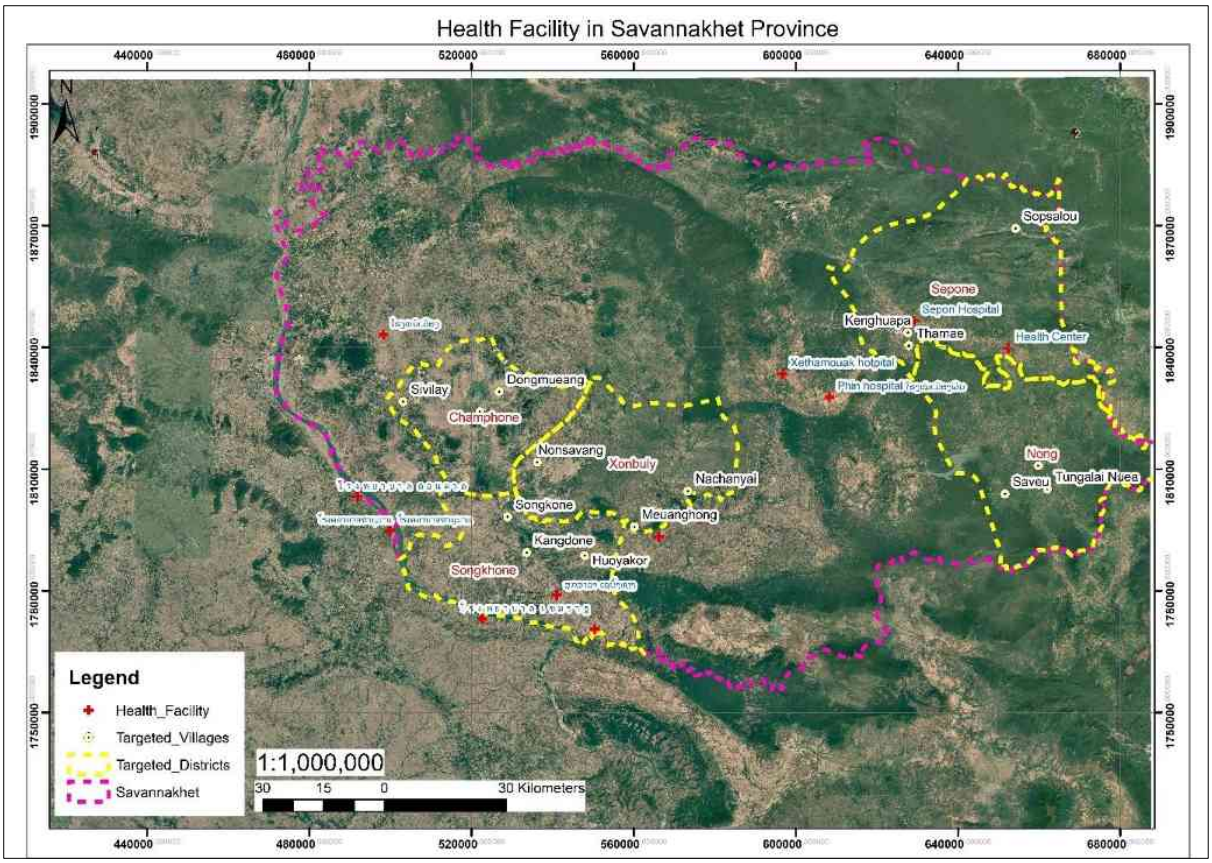


Figure 42 Health Facility in Savannakhet Province

Source: https://data.laos.opendevelopmentmekong.net/en/dataset/health-facilities-in-mekong-countries-2020

4.13 Explosive Remnants of War (ERW)

Explosive Remnants of War (ERW) includes Unexploded Ordnance (UXO), which are munitions that failed to detonate as intended. ERW in Lao PDR is the legacy of Vietnam War. Residents often find these remnants where they live, farm, and play, posing serious health and safety risks.

According to Landmine and Cluster Munition Monitor, by the end of 2023, Lao PDR had approximately 1,500km² of confirmed hazardous areas. Systematic cluster munition remnants surveys were completed in only five of the 15 contaminated provinces by that time. In 2024, the Twelfth Meeting of States Parties extended Lao PDR's Article 4 clearance deadline to 1 August 2030. In Lao PDR, men and boys face higher risks due to their involvement in rural activities. The country recorded 50,966 casualties from 1964 to 2023. In 2023, 47 people were affected by ERW, with 11 killed and 36 injured. Savannakhet recorded 11 casualties in 2023, which is the highest number after Xiangkhong Province (19 cases).

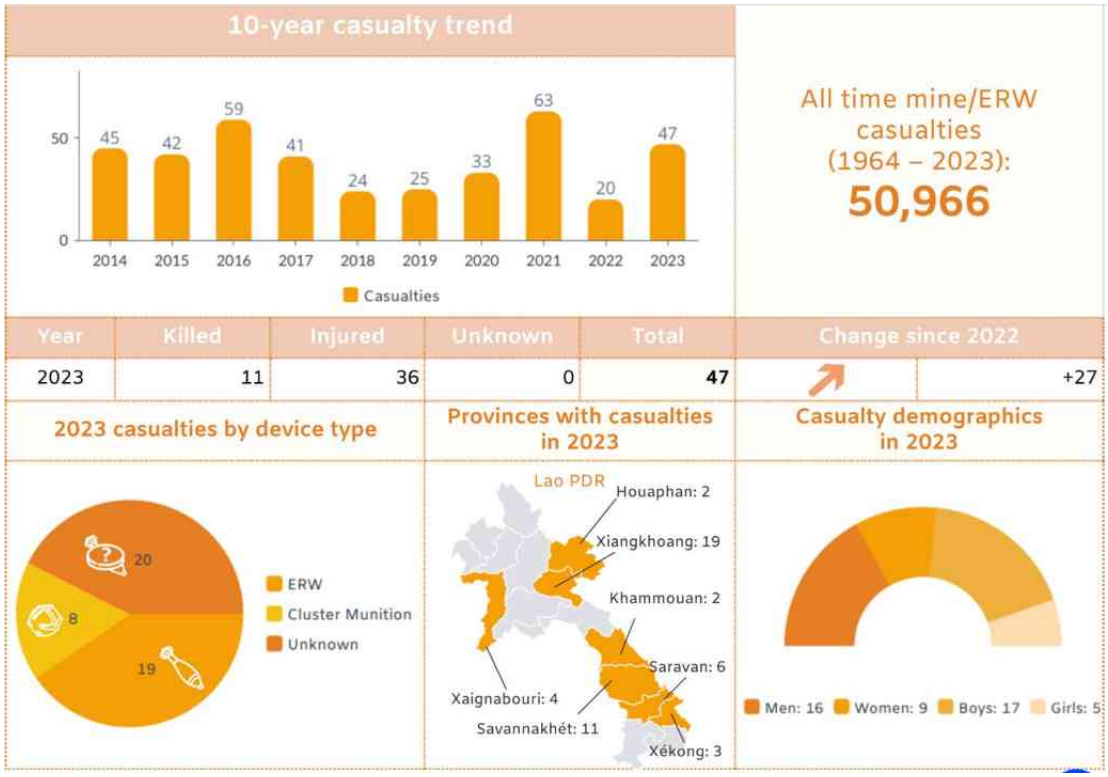


Figure 40 Casualties of ERW in 2023

Source: Landmine and Cluster Munition Monitor, 2024[29]

Information and data regarding the ERW in each target village is not available, but the overlay of the country-level map of ERW with the districts and target villages, and the conditions as to whether the village is located in the potential remnant of ERW is provided below. The map indicates that the target districts and villages are located in the potential ERW. Target villages of Sepone and Nong districts are in a heavily identified ERW.

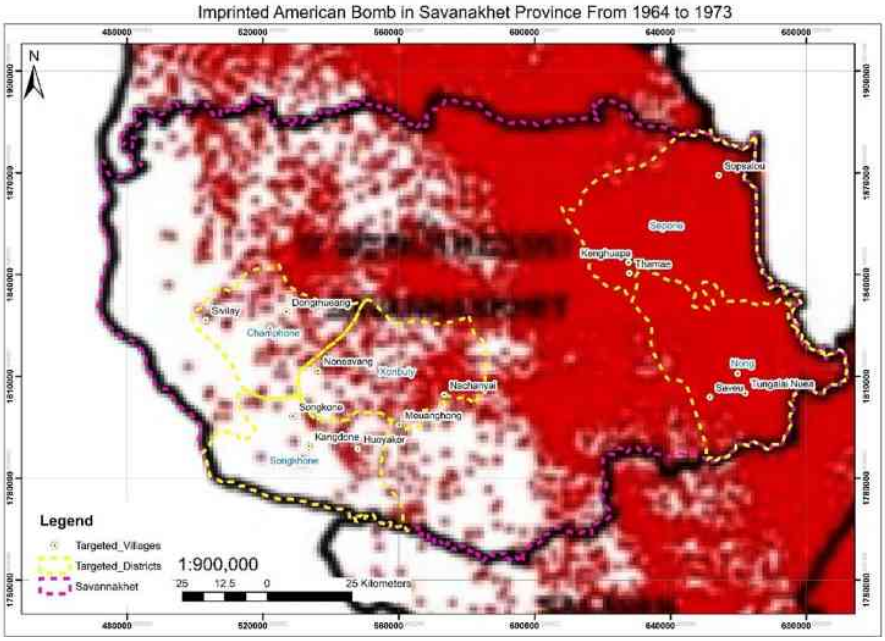


Figure 44 Imprint of American bomb in Savannakhet, Lao PDR, from 1964 to 1973.

Source: https://asiasociety.org/northern-california/legacies-war-laos

Table 10: Intensity of ERW presence at each target village

[29] https://the-monitor.org/country-profile/lao-pdr/impact?year=2023

Districts/Villages	Situation of ERW
Champhone	
Phiaka	Medium density of ERW
Dongmeuang	Medium density of ERW
Sivilay	Medium density of ERW
Nong	
Tangalai Nuea	High density of ERW
Sepone district	
Sopalou	High density of ERW
Thamae	High density of ERW
Songkhone	
Songkhone	Low density of ERW
Xonnabouly	
Mueanghong	Medium density of ERW
Nachanyai	Medium density of ERW
Nonsavang	Medium density of ERW
Nong	
Tangalai Nuea	High density of ERW
Sepone	
Sopalou	High density of ERW
Thamae	High density of ERW
Songkhone	
Songkhone	Low density of ERW
Xonnabouly	
Mueanghong	Medium density of ERW
Nachanyai	Medium density of ERW
Nonsavang	Medium density of ERW

Source: Author's observation from the existing map

Baseline information regarding ERW has been disseminated to all target village heads to collect data from the village. This effort seeks to gather precise data effectively, facilitating a thorough evaluation of the dangers associated with ERW in the area. The project aims to foster public involvement and improve safety protocols through close collaboration with local leaders. The cases from 2023 and 2024 collected data regarding major injuries, severe injuries, and deaths.

Table 11: Cases of ERW from 2023 to 2024 in target villages

District/Villages	Minor injuries (case)		Severe injuries (Case)		Death (case)	
	2023	2024	2023	2024	2023	2024
Champhone						
Phiaka	-	-	-	-	-	-
Dongmeuang	20	-	20	-	01	01
Sivilay	-	-	-	-	-	-
Nong						
Tangalai Nuea	-	-	-	-	-	-
Sepone						
Sopalou	03	-	01	-	-	-
Thamae	-	-	-	-	-	-
Songkhone						
Songkhone	-	-	-	-	-	-
Xonnabouly						
Mueanghong	-	-	-	-	-	-
Nachanyai	-	-	-	-	-	-
Nonsavang	-	-	-	-	-	-

Source: Village Heads, July 2025

High density villages in Nong and Sepone districts are at risk of accidents, restricted land use and increased vulnerability for residents. Champhone and Xonnabouly districts have medium density ERW while Songkhone district has low density indicating lower risk exposure. However, recorded incidents from 2023—2024 are limited to a few villages with Dongmeuang village having the highest casualties. This highlights the need for clearance, awareness and safety measures in high-risk areas. The study emphasizes the need for continued ERW risk education, community reporting systems, and targeted clearance operations, particularly in high-density zones and villages with recent casualties. Collaboration with local leaders and public awareness initiatives is crucial to mitigate threats, safeguard livelihoods, and enable safe land use in affected communities.

4.14 Socio-economic Environment

4.14.1 Administrative Arrangements

Lao PDR operates as a unitary state with a centralized political system where the Lao People's Revolutionary Party (LPRP) maintains strong control over governance at all administrative levels. The country follows a four-tier territorial organization, comprising the central government, provinces (Khoueng), districts (Muang) and villages (ban).[30] The central government oversees national policy formulation, economic planning and overall governance while provinces (17 provinces plus Vientiane Capital) serve as administrative extensions of the state, led by governors appointed by the central government. Districts function as intermediaries ensuring policy implementation at the local level whereas villages, the lowest administrative units, are governed by village chiefs responsible for maintaining local order and mobilizing community participation.[31] Although decentralization policies have been introduced, actual fiscal and administrative autonomy remains limited with provinces and districts heavily dependent on central funding.[32] Subnational governments are responsible for public service delivery, including education, healthcare land use planning and infrastructure management, but constraints such as limited financial resources and human capacity hinder effective governance.[33] Furthermore, ethnic and regional diversity influences governance structures, particularly in rural and remote areas where traditional leadership and customary laws play a role in decision-making.[34] While ongoing reforms aim to strengthen local governance, challenges such as bureaucratic inefficiencies and weak institutional capacity continue to affect service delivery at the subnational level.[35]

4.14.2 Agriculture Pattern

The agricultural system across the project areas consists of a diverse mix of traditional and commercial land use patterns that support both subsistence and market-oriented livelihoods. Rain-fed agriculture remains the most widespread practice, heavily reliant on seasonal rainfall and thus highly vulnerable to climate variability, particularly in areas for producing lowland rice. In contrast, irrigated agriculture is practiced in zones with access to ponds, canals, or floodplain water systems, enabling more stable year-round cultivation and greater crop productivity, especially during dry seasons. Additionally, many households maintain orchards and small crop plantations, cultivating fruit trees, vegetables, or herbs for both household consumption and local markets, often integrated with agroforestry or home gardening. On a larger scale, commercial plantations of rubber, sugarcane, and eucalyptus are expanding, particularly in accessible lowland areas, driven by external investment and contract farming. While these plantations generate income and employment, they also raise concerns about water demand, land use change and ecological degradation. Table 17 below shows the pattern of agricultural land use of each target village.

The surveyed villages of Savannakhet Province primarily rely on rain-fed cultivation, with areas like Dongmeuang, Sivilay, Mueanghong, Nonsavang, and Songkhone heavily reliant on this method. Irrigated farming is present but limited, with notable areas in Phiaka, Dongmeuang, and Songkhone benefiting from developed systems. Orchard and small crop plantations are observed in several villages, indicating a diversification of land use towards fruit trees or horticultural crops. Commercial plantations like rubber, sugarcane, and eucalyptus are limited, likely based on market access or land suitability. The data underscores the need for improved water management, climate-resilient farming practices, and market-oriented crop planning to enhance productivity and reduce vulnerability to climatic variability in the region.

Table 12: Agricultural pattern in target villages

District/Village	Agricultural Patterns (ha)			
	Rain-fed	Irrigation	Orchard / small crop plantation	Commercial plantation (rubber, sugarcanes, eucalyptus)
Champhone				
Phiaka	201.45	135.20	-	-

[30] United Nations Development Programme (UNDP). (2020). *Strengthening local governance in Lao PDR: Policy framework and institutional assessment*. UNDP Reports.
[31] World Bank. (2021). *Public sector reform and decentralization in Lao PDR: An assessment of progress and challenges*. World Bank Publications.
[32] Organisation for Economic Co-operation and Development (OECD). (2022). *Multi-level governance and decentralization in Southeast Asia: Lao PDR case study*. OECD Publishing.
[33] Asian Development Bank (ADB). (2019). *Decentralization and service delivery in Lao PDR: Challenges and policy recommendations*. ADB Publications.
[34] United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). (2020). *Traditional governance and local administration in Southeast Asia*. UNESCAP Working Papers.
[35] Lao PDR Government. (2021). *Local administration and governance reforms in Lao PDR*. Ministry of Home Affairs Report.

Dongmeuang	2,432	12	-	2 (rubber); 4 (sugarcanes)
Sivilay	547	-	5	75
Nong				
Tangalai Nuea	20	-	5	10
Sepone				
Sopalou	9	9	-	25 (casava)
Thamae	28.48	-	2	50
Songkhone				
Songkhone	310.9	105	35.84	-
Xonnabouly				
Mueanghong	350.5	-	225	-
Nachanyai	87.75	8	274	-
Nonsavang	406.131	33.71	-	-

Source: Village Heads, July 2025

4.14.3 Demographic Profile

The target villages in Xonnabouly district have a diverse demographic profile, including ethnic diversity, varied population sizes, and age distributions. Nonsavang village, the most populous, has a youth-heavy population, requiring education, healthcare, and employment opportunities. Other villages with large populations include Sivilay, Songkhone, Mueanghong, and Nachanyai, which have a balanced gender distribution and ethnic groups. Smaller villages like Phiaka and Tangalai Nuea have simpler demographic compositions, predominantly Lao and Taoiy. Most villages have a large proportion of working-age and older adults, representing the main labour force in agriculture and household support. However, the presence of children and youth under 20 years highlights the need for sustained investment in education, child health, and youth employment. Gender ratios remain balanced across all villages, indicating no major disparities in sex-based population distribution.

Table 13: Population variance by age group in target village

Villages	<5yearss	6-15	16-20	21-45	> 46	Total
Champhone district						
Phiaka village	21	48	78	103	370	620
Dongmeuang village	115	210	218	200	170	910
Sivilay village	285	298	292	421	407	1683
Nong district						
Tangalai Nuea village	22	112	157	67	90	448
Sepone district						
Sopalou village	-	-	-	-	-	-
Thamae village	95	130	120	150	149	644
Songkhone district						
Songkhone village	31	311	260	269	290	1161
Xonnabouly district						
Mueanghong village	58	72	200	309	476	1115
Nachanyai village	132	184	184	448	182	1130
Nonsavang village	369	457	448	1089	1091	3454

Source: Village Heads, July 2025

Table 14: Population of the target villages

District/Village	Ethnicity	No. HHs	Total Pop	M	F
Champhone district					
Phiaka village	Lao	117	620	290	330
Dongmeuang village	Lao	122	910	448	462
Sivilay village	Laolum / Makong	218	1683	823	860
Nong district					
Tangalai Nuea village	Taoiy	75	448	210	238
Sepone district					
Sopalou village	Ty	74	306	149	157
Thamae village	Makong	115	644	318	326
Songkhone district					
Songkhone village	Laoloum / Phuthai / Laosoung	226	1161	576	585
Xonnabouly district					
Mueanghong village	Lao	378	1115	567	548

Nachanyai village	Brou	236	1130	562	568
Nonsavang village	Laoloum / Laotherng	560	3454	1707	1747

Source: Village Heads, July 2025

4.14.4 Ethnicity and Indigenous people

Lao PDR is a culturally diverse country. Although Lao is the official language, other ethnic languages are still used among different ethnic groups. Most ethnic groups do not have the written language, and their traditional customs and religious beliefs vary according to the ethnic groups they belong to. Buddhists form the big majority, and they mainly belong to the general Lao peoples.

To adapt to the new changes and bring forth unity among various ethnic communities in Lao PDR, the LFNC identified 49 ethnic categories. The official terminology uses in the Constitution for describing the diverse population of the Lao PDR has been "Bunda Chon Phao" or "all ethnic communities", while the name of the groups is normally used to classify the EG. According to LFNC, the Lao ethnic communities are categorized into four ethno-linguistic communities as below:

- The "Lao-Tai" (also referred to as "Tai-Kadai"), which includes the dominant "Lao ethnic communities" and the "lowland Tai" speaking communities. The "Lao-Tai" consists of 8 ethnic sub-communities and includes (1) Lao (2) Leu (3) Xaek (4) Tai (5) Nuane (6) Thai neua (7) Phoutai and (8) Yang.
- The second linguistic group is "Austro-Asiatic, also called Mon-Khmer" group, which consists of 32 ethnic sub-groups as table below.
- The "Hmong-Iomien" group which consists of 2 ethnic subgroups: Hmong and Lomien (Lomien is also called Yao).
- The "Chinese-Tibetan" (also referred to as "Sino-Tibetan"), which includes the Chinese and Tibeto-Burman Ethnic Community and consists of 7 ethnic subgroups such as (1) Akha or Ko (2) Sila (3) Hor (4) Phounoy (5) Lahou (6) Hayi and (7) Lolo.

Table 20: List of Ethnic Groups under Mon-Khmer Linguistic Family

SN	**Sub-Ethnic**	No.	**Sub-Ethnic**	No.	**Sub-Ethnic**
1.	Khmou	12	Phong	23	Bid
2.	Pray	13	Thene	24	Lamed
3.	Xingmoon	14	Eudou	25	Samtao
4.	Katang	15	Makong	26	Taoiy
5.	Yru	16	Triang	27	Katu
6.	Yae	17	Brao	28	Kriang
7.	Hahak	18	Oey	29	Suay
8.	Jeng	19	Kadang	30	Pako
9.	Nhaheun	20	Lavy	31	Nguane
10.	Kmer	21	Toum	32	Ty
11.	Moy	22	Kree		

Source: Project ESMF

Most ethnic groups in Lao PDR are poor and disadvantaged. Despite efforts made by the GoL institutions to improve socio-economic conditions of these peoples, many of them still lag behind other Lao peoples, especially in terms of poverty rate, literacy and health. Many ethnic groups still cannot speak and read Lao language and thus unable to effectively benefit from schools and health clinics, which have only Lao speaking staff. While majority of the ethnic groups live in remote areas of the country, they practice subsistence farming. The government is making efforts to promote their well-being through various livelihood development activities such as promoting skills through handicraft and local trade.

The ethnic landscape of 10 target villages in Savannakhet Province is diverse, with Lao and Laoloum groups being the most represented. Makong and Brou communities are concentrated in specific locations, with Makong people in Thamae and part of Sivilay, and Brou in Nachanyai. Taoiy and Ty are found only in Tangalai Nuea and Sopalou, respectively. Phouthai and Lao minority households exist in Songkhone, suggesting multi-ethnic coexistence. Sivilay has one of the most diverse ethnic compositions hosting both Makong and Laoloum, and Nonsavang is largely Laoloum but also includes a Laotherng minority. These variations have implications in service delivery, language accessibility, cultural sensitivity, and participatory planning, emphasizing the need for inclusive engagement approaches that consider the cultural and linguistic needs of each ethnic group during project implementation.

Table 15: Population of ethnic groups in target villages

District/Village	**Total household and No. of people of Ethnicity per village**							
	Brou	**Makong**	**Taoiy**	**Loaloum**	**Laotherng**	**Ty**	**Phouthai**	**Lao**
Champhone								

Phiaka	-	-	-	-	-	-	-	117 (620)
Dongmeuang	-	-	-	-	-	-	-	122 (910)
Sivilay	-	54 (463)	-	164 (1220)	-	-	-	-
Nong								
Tangalai Nuea	-	-	75 (448)	-	-	-	-	-
Sepone								
Sopalou	-	-	-	-	-	74 (306)	-	-
Thamae	-	112 (634)	-	-	-	-	-	-
Songkhone								
Songkhone	-	-	-	182 (1135)	-	-	3 (19)	1 (7)
Xonnabouly								
Mueanghong	-	-	-	-	-	-	-	378 (1115)
Nachanyai	236 (1130)	-	-	-	-	-	-	-
Nonsavang	-	-	-	540 (3314)	20 (140)	-	-	-

Source: Village Heads, July 2025

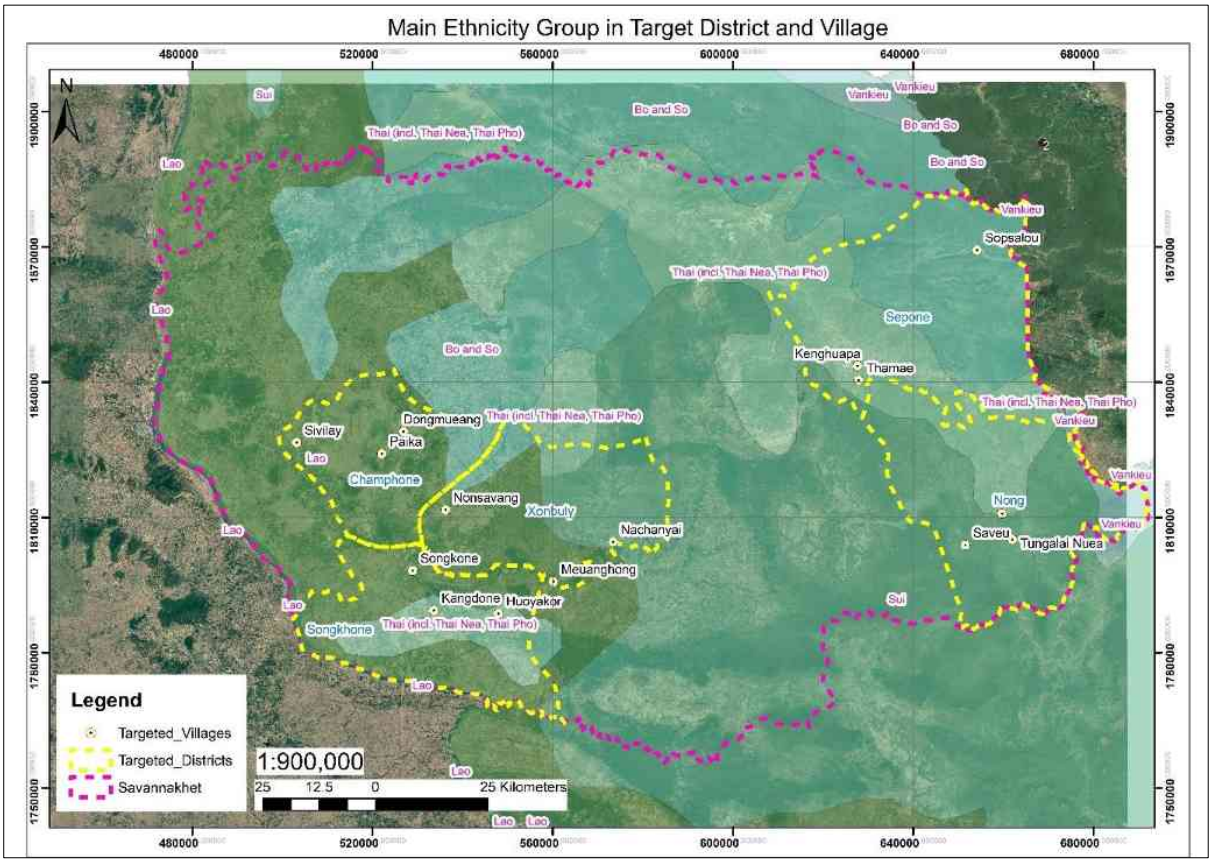


Figure 41 Main Ethnic Groups in Target District and Village

Source: https://data.laos.opendevelopmentmekong.net/en/dataset/geo-referencing-of-ethnic-groups-of-laos

4.14.5 Landholding

The land use and landholding characteristics in all target villages exhibit distinct patterns due to variations in topography, climate, and socio-economic activities. In cooperation with the project, the village head used the baseline sheet for the data on the land use categories in the village, as shown in the table below.

Table 16: Land tenure at each target village

District/Village	Land Tenure (No. of Households)					
	Official registered by state		Recognized by village head		Collective land tenure / traditional land use	
Champhone						
Phiaka	-	-	620	100%	-	-
Dongmeuang	-	-	120	100%	-	-
Sivilay	215	100%	-	-	-	-
Nong						
Tangalai Nuea	-	-	-	-	75	100%
Sepone						
Sopalou	-	-	-	-	74	100%
Thamae	-	-	20	18%	95	82%
Songkhone						
Songkhone	186	82%	40	18%	-	-
Xonnabouly						
Mueanghong	-	-	200	100%	-	-
Nachanyai	-	-	-	-	236	100%
Nonsavang	-	-	560	100%	-	-

Source: Village Heads, July 2025

4.14.6 Occupation Pattern

The primary occupation of people in Savannakhet varies based on geographical and economic factors. While agriculture remains the dominant livelihood source in both provinces, there are significant differences in secondary occupations, income diversity, and employment sectors.

Table 17: Occupation pattern at each target village

District/Village	Occupational pattern					
	Farming (pop)		Worker (pop)		Civil servant (pop)	
Champhone						
Phiaka	438	70.64%	180	29.03%	2	0.32%
Dongmeuang	891	97.91%	-	-	19	2.09%
Sivilay	1662	99%	-	-	23	1%
Nong						
Tangalai Nuea	351	78%	10	2.23%	2	0.44%
Sepone						
Sopalou	306	100%	-	-	-	-
Thamae	600	94%	30	5%	4	1%
Songkhone						
Songkhone	559	48%	242	21%	34	0.03%
Xonnabouly						
Mueanghong	985	88%	-	-	-	-
Nachanyai	814	72%	-	-	-	-
Nonsavang	1,400	65%	876	25%	352	10%

Source: Village Heads, July 2025

Table above states that the majority of the target villages' occupational structure is heavily centered on farming, with over 70% of the population engaged in agriculture. However, there is a degree of economic diversification, particularly in larger or urbanized villages. Nonsavang village has a more varied occupational profile, with 65% of the population in farming, 25% as workers, and 10% as civil servants. Songkhone village has a more mixed rural economy, with only 48% in farming, 21% in wage labour, and a small share in civil service. Phiaka and Tangalai Nuea villages show some variation, with 70-78% in farming and small proportions in wage labour or government employment. These occupational patterns suggest that agriculture is the economic backbone of these communities, but emerging diversification may offer greater economic resilience.

4.14.7 Labour, working conditions and occupational health and safety

Detailed information on labour, working conditions, and occupational health and safety at the village and district levels is unavailable, with references primarily based on national and provincial contexts.

Health and safety in infrastructure construction are paramount to preventing accidents and ensuring the well-being of workers. Small and large contractors at district and provincial level must comply with national and international

health and safety regulations, which include providing appropriate personal protective equipment (PPE), ensuring machinery and tools are in proper working condition, and maintaining safe work environments. Despite these regulations, many contractors fail to fully implement the necessary safety measures, resulting in hazardous working conditions. Regular safety training and drills, which are essential to equip workers with the knowledge required to handle emergencies and reduce workplace hazards, are often inadequately conducted.

The exploitation of workers' rights is a significant issue within the construction sector. Contractors are obligated to ensure that workers receive fair wages, timely payments, and reasonable working hours as stipulated by labour laws. However, instances of wage theft, delayed payments, and excessive working hours are prevalent. Employment contracts should be clear and comprehensive, outlining the terms of employment, duties, and workers' rights. Unfortunately, many workers, especially those in rural areas, do not receive formal contracts, leaving them vulnerable to exploitation. Furthermore, the work environment often lacks non-discriminatory practices, resulting in inequality based on gender, race, or background.

Like the national level, rural construction projects in Savannakhet province face unique challenges, including limited access to resources and workforce training. Contractors in these areas are often particularly negligent in implementing health, safety, and labour rights standards. Collaboration with local authorities and organizations is crucial to provide support and resources to the workforce. Yet, in many cases, contractors fail to engage sufficiently with the local communities, exacerbating the issues of worker exploitation.

One of the critical issues in construction labour in the city as well as in the remote provinces is the elimination of child labour. Despite strict age verification processes, child labour remains a significant problem, particularly in rural areas where enforcement of these policies is weak. Contractors must be vigilant in monitoring their workforce and enforcing policies that prohibit the use of child labour, adhering to national and international child labour laws. However, the prevalence of poverty and lack of educational opportunities contribute to the persistence of child labour in the construction sector. Children employed in construction are exposed to hazardous conditions, long working hours, and insufficient remuneration. This not only hinders their development but also perpetuates the cycle of poverty.

4.14.8 Basic Amenities

4.14.8.1 Educational Facilities

A high primary enrollment rate and an educational infrastructure that supports excellent student-teacher ratios are two of the many accomplishments that National Education has acquired. At the basic level, the province boasts a 95% enrollment rate, although the percentage drops significantly at the secondary and higher levels. The educational opportunities available to those living in rural districts are not equal, notably in secondary education. Poverty and a lack of resources contribute to the low educational attainment that is prevalent in urban areas.

4.14.8.2 Healthcare Facilities

The national healthcare report indicates that there is a shortage of access to healthcare in distant locations, as well as high rates of death among infants and mothers. There are 12 hospitals and 85 health facilities in the province, and the province has a vaccination rate of 80% and a healthcare access rate of 75% at the same time. Rural healthcare in districts presents issues due to the limited facilities and staff that are required for successful coverage areas. Even if those living in metropolitan regions have easier access to medical facilities, there are still gaps in health care services. Each target district is equipped with a district hospital, and furthermore, each village cluster also has a healthcare center (Souksala)

4.14.8.3 Electrical Supply

All households in the ten target villages are connected to the national electricity grid and sufficient for their power demand.

4.14.8.4 Water Supply and Sanitation

Water supply and consumption differ across districts, including the target village. Most villages rely on piped water, bottled water, borewells, ponds, and rivers for consumption and domestic use. These sources also support animal husbandry and agricultural irrigation. The description of the sources of water in each district and village is provided in the table below.

Table 18: Sources of water for domestic use and consumption in each village

District/Village	Source of Water Consumption (No. of Households)

	Water supply	Bottle water	Bore well	River	Pond / lake	Water tank	Pipe water from Natural source
Champhone district							
Phiaka village	42 (35%)	117 (100%)	4 (3.5%)	5 (5%)	3 (2%)	-	-
Dongmeuang village	122 (100%)	-	-	-	-	-	-
Sivilay village	-	218 (100%)	181 (83%)	-	-	-	-
Nong district							
Tangalai Nuea village	-	-	75 (100%)	75 (100 %)	-	-	-
Sepone district							
Sopalou village	67 (90.5%)	-	-	-	-	74 (100%)	74 (100%)
Thamae village	-	-	110 (97%)	50 (43%)	-	50 (43%)	-
Songkhone district							
Songkhone village	186 (100%)	186 (100%)	03 (1%)	2 (1%)	-	-	-
Xonnabouly district							
Mueanghong village	-	200 (53%)	-	178 (47%)	-	-	-
Nachanyai village	-	-	142 (60%)	47 (20%)	47 (20%)	-	-
Nonsavang village	-	-	560 (100%)	-	560 (100%)	-	-

Source: Village Heads, July 2025

The data shows a mix of formal and informal water access systems in surveyed villages. Bottled water is the most common source, with 100% coverage in Dongmeuang and Songkhone. Bore wells remain an important source in many rural villages, with Nonsavang relying entirely on bore wells and ponds/lakes. In remote areas like Tangalai Nuea, the entire population relies on river water and bore wells, reflecting limited formal water systems. Sopalou village relies almost entirely on pipe water from natural sources and water tanks, suggesting community-managed water harvesting or gravity-fed systems. Natural water bodies, such as rivers and lakes, are still actively used in several villages, with Mueanghong showing significant dependence on river water and Nachanyai reporting 20% of households using ponds or lakes. This suggests a need for improved water infrastructure, safe drinking water provision, and water quality monitoring, particularly in more isolated and underserved communities.

4.15 Traffic Density and Profile

Based on the field observations of environmental and social consultants in three different districts, namely Champhone District, Songkhon District, and Xonnabouly District, the traffic situation is not busy, with almost no cars passing through in an hour.

From Table below, the analysis of vehicle ownership and road accident data across target villages reveals notable variations in transportation patterns and associated safety risks. Motorbikes are the commonly used mode of transportation in all target villages followed by small tractors. Villages in Xonnabouly and Songkhone districts report the highest numbers of vehicles, with Nonsavang village standing out significantly—owning 250 trucks and 700 motorbikes—far exceeding other villages. In contrast, villages in Nong and Sepone districts, such as Tangalai Nuea and Sopalou, show very low vehicle ownership, especially in motorized vehicles like trucks and cars. Road accident data from 2023 and 2024 further highlights that most villages recorded no incidents during this period. However, four villages—Nonsavang, Mueanghong, Thamae, and Sivilay—reported accidents, with Mueanghong and Nonsavang emerging as accident hotspots. Mueanghong saw a sharp rise in cases from 19 in 2023 to 31 in 2024, while Nonsavang experienced a decrease from 13 to 8, though remaining relatively high. The data suggest a strong correlation between high vehicle density and increased accident rates, particularly in areas with rapid motorization. In contrast, villages with fewer vehicles, such as those in Nong and Sepone, reported no accidents, implying lower traffic risk. These findings underline the urgent need for targeted road safety interventions in high-risk areas like Mueanghong and Nonsavang, including traffic regulation, public awareness campaigns, and infrastructure improvements to manage growing vehicular pressure and enhance community safety.

Table 19: Number of vehicles used in each target village

District/Village	Vehicle

	Truck	Small Tractor	Tractor	Bus / Van / Car	Motorbike	Bike cycle
Champhone						
Phiaka	04	87	1	-	103	20
Dongmeuang	17	78	05	3	130	15
Sivilay	25	212	2	-	225	25
Nong						
Tangalai Nuea	-	25	-	-	53	8
Sepone						
Sopalou	-	10	-	-	26	6
Thamae	-	80	2	-	115	-
Songkhone						
Songkhone	8	162	6	-	186	100
Xonnabouly						
Mueanghong	08	200	-	1	150	-
Nachanyai	2	159	-	-	159	-
Nonsavang	250	437	3	-	700	3

Source: Village Heads, July 2025

Table 20: Road accident occurrences from 2023 and 2024 in each target village

Villages	Road Accident Cases	
	2023	2024
Champhone district		
Phiaka village	-	-
Dongmeuang village	01	01
Sivilay village	01	02
Nong district		
Tangalai Nuea village	-	-
Sepone district		
Sopalou village	-	-
Thamae village	2	2
Songkhone district		
Songkhone village	-	-
Xonnabouly district		
Mueanghong village	19	31
Nachanyai village	-	-
Nonsavang village	13	8

Source: Village Heads, July 2025

The transportation profile of target villages shows a growing presence of motorized vehicles, with motorbikes being the most common mode of transport. Villages like Nonsavang, Sivilay, Songkhone, and Dongmeuang have high levels of motorbike ownership. Small tractors are also widely used for agricultural and transport purposes. Nonsavang has an unusually high number of trucks, indicating a greater scale of mobility, trade, or agricultural transport. However, road accident data from 2023-2024 show relatively few reported incidents across most villages. Mueanghong and Nonsavang are road safety hotspots, with a sharp increase in accidents. The data suggests a clear correlation between vehicle volume and road safety risks, particularly in more populated or economically active villages. Targeted interventions such as traffic regulation, driver awareness campaigns, and road infrastructure improvements could ensure safer transportation practices.

5 Social and Environment Risks and Impacts

5.1 Introduction

This section presents a summary of the environmental, socio- economic, demographic and cultural context in which the proposed project activities is to be implemented and made operational. While identifying the above key features, the section also discusses the type and range of impacts likely to result from the different project activities, measuring its extent and severity. The specific purpose of this section is to,

- Identify and assess the range of potential impacts and extent of their severity;
- Explain the ways in which the proposed project activities might affect environment, ecology, socio-economic resources, demographics, livelihoods, cultural patterns, as well as access and infrastructure issues;
- Suggest viable mitigation measures for the identified impacts;
- Develop a management plan based on the proposed mitigation measures.

These impacts have been identified through secondary information, reports, and stakeholder records undertaken in developing this report.

5.2 Impact Evaluation Criteria

The consultant will use these attributes to rank the sensitivity of environmental and social conditions as high, moderate, or low.

Table 21: Definition of sensitivity criteria of the environmental and social impacts

Sensitivity	Description
High	The environmental and social conditions are listed on a recognized register for conservation significance. They are intact and retain their intrinsic value, unique to their environment, and isolated in a poorly represented region. These conditions have not been noticeably impacted by threats. Project activities would adversely affect their value.
Substantial	The environmental and social conditions have potential adverse social and environmental risks and impacts that are more varied or complex than those of moderate risk projects but remain limited in scale and are of lesser magnitude than those of high risk projects (e.g. reversible, predictable, smaller footprint, less risk of cumulative impacts).
Moderate	The environmental and social conditions are documented as significant at a regional level and might be listed on recognized or statutory registers. These conditions are in moderate to good condition, despite exposure to threatening processes. Many intrinsic characteristics and structural elements are retained. The conditions are well represented in the systems/areas they occur, though their abundance and distribution are limited by threatening processes. These processes have reduced their resilience to change. As a result, changes due to project activities may lead to degradation of their value. However, replacement of unavoidable losses is possible given their abundance and distribution.
Low	The environmental and social conditions are not listed on any recognized or statutory register but may be acknowledged locally by relevant, suitably qualified experts or organizations, such as historical societies. These conditions are currently in a poor to moderate state due to threatening processes that have diminished their intrinsic value. They are neither unique nor rare, with numerous representative examples existing throughout the system or area. The conditions are abundant and widely distributed within the host systems or areas. There is no detectable response to change, or any changes do not result in further degradation of the environmental and social conditions. The abundance and wide distribution ensure that the replacement of unavoidable losses is feasible.

Source: author's modification from various sources

The magnitude of an impact on environmental and social conditions is an assessment of the geographical extent, duration, and severity of the impact. These attributes are defined as follows:

- Geographical Extent: An assessment of the spatial extent of the impact where the extent is defined as site, local, regional or widespread (meaning state-wide national or international).
- Duration: the timescale of the effect, i.e., if it is short, medium, or long-term.
- Severity: An assessment of the scale or degree of change from the existing condition, as a result of the impact. This could be positive or negative

Table 28: Magnitude of impacts on environmental and social conditions

Aspect	Description
Geographical Extent	An assessment of the spatial extent of the impact where the extent is defined as site, local, regional or widespread (meaning state-wide or national or international)
Duration	The timescale of the effect, i.e., if it is short, medium or long term

Severity	An assessment of the scale or degree of change from the existing condition as a result of the impact. This could be positive or negative

Source: author's modification from various sources

Table29: Magnitude criteria of impacts on environmental and social conditions

Magnitude	Description
High	An impact that is widespread, long-lasting, and results in substantial and possibly irreversible change to the environmental and social conditions. Avoidance through appropriate design responses or the implementation of site-specific environmental and social management plans are required to address the impact.
Moderate	An impact that extends beyond the area of disturbance to the surrounding area but is contained within the region where the project is being developed. The impacts are short term and result in changes that can be ameliorated with specific environmental and social management plans.
Low	A localized impact that is temporary or short term and either unlikely to be detectable or could be effectively mitigated through standard environmental management plans.

Source: author's modification from various sources

The significance of an impact on environmental and social conditions is determined by the sensitivity of the value itself and the magnitude of the impact it experiences. The model significance assessment matrix below shows how using the criteria above, the significance of an effect is determined.

Table 30: Matrix of significance of the impacts

	Sensitivity		
Impact magnitude	**High**	**Moderate**	**Low**
High	Major	High	Moderate
Moderate	High	Moderate	Low
Low	Moderate	Low	Negligible

Source: author's modification from various sources

The classifications (major, high, moderate, low or negligible) for significance of an impact are as follows:

- Major Significance of Impact: Arises when an impact will potentially cause irreversible or widespread harm to an environmental and social conditions that is irreplaceable because of its uniqueness or rarity. Avoidance through appropriate design responses is the only effective mitigation.
- High Significance of Impact: Occurs when the proposed activities are likely to exacerbate threatening processes affecting the intrinsic characteristics and structural elements of the environmental and social conditions. While replacement of unavoidable losses is possible, avoidance through appropriate design responses is preferred to preserve its intactness or conservation status.
- Moderate Significance of Impact. Although reasonably resilient to change, the environmental and social conditions would be further degraded due to the scale of the impact or its susceptibility to further change. The abundance of the environmental and social conditions ensures it is adequately represented in the region, and that replacement, if required, is achievable.
- Low Significance of Impact. Occurs where environmental and social conditions are of local importance and temporary and transient changes will not adversely affect its viability provided standard environmental and social management plans are implemented.
- Negligible Significance of Impact. Impact on the environmental and social conditions will not result in any noticeable change in its intrinsic value, and hence, the proposed activities will have negligible effect on its viability. This typically occurs when the activities occur in industrial or highly disturbed areas.

5.3 Impact Assessment for Conservation of Xe Bang Hieng Basin Region

Conservation activities will include enhancing conservation zone management, forest boundary management and natural regeneration processes, while restoration activities will include the enrichment planting to promote natural re-growth in secondary forests and reforestation through replanting ecologically appropriate species to restore ecosystem functioning.

The activities mentioned aim to benefit communities positively. This assessment focuses on negative impacts, as positive impacts are covered by the project's monitoring and evaluation. The following section evaluates the negative impacts to develop measures that mitigate adverse effects and enhance positive outcomes.

5.3.1 Enhancing conservation zone management and forest boundary management

Potential Impacts

Enhancing conservation zone management and forest boundary management, while crucial for ecological restoration, might restrict local communities' traditional access to forest resources. Specifically, these activities may disrupt the livelihoods of farmers, including those from ethnic groups, by restricting access to land traditionally used for agriculture, access to non-timber forest products (NTFPs), grazing areas, collecting fuelwood and other economic activities. Furthermore, such interventions may interfere with cultural traditions tied to these lands. As illustrated in Table 30, encompassing ethnically diverse groups such as Brou, Makong, Taoiy, Laoloum, Laotherng, Ty, Phouthai and Lao linguistic communities, are expected to be impacted by the activities.

Table31: Ethnic groups impacted by the land tenure arrangement and economic displacement

District/Village	Total household and No. of people of Ethnicity per village							
	Brou	Makong	Taoiy	Loaloum	Laotherng	Ty	Phouthai	Lao
Champhone district								
Phiaka village	-	-	-	-	-	-	-	117 (620)
Dongmeuang village	-	-	-	-	-	-	-	122 (910)
Sivilay village	-	54 (463)	-	164 (1220)	-	-	-	-
Nong district								
Tangalai Nuea village	-	-	75 (448)	-	-	-	-	-
Sepone district								
Sopalou village	-	-	-	-	-	74 (306)	-	-
Thamae village	-	112 (634)	-	-	-	-	-	-
Songkhone district								
Songkhone village	-	-	-	182 (1135)	-	-	3 (19)	1 (7)
Xonnabouly district								
Mueanghong village	-	-	-	-	-	-	-	378 (1115)
Nachanyai village	236 (1130)	-	-	-	-	-	-	-
Nonsavang village	-	-	-	540 (3314)	20 (140)	-	-	-

Mitigation Measures

- Conduct stakeholder engagement to initiate any activities with the communities involving protected area demarcation. The engagement will involve consulting affected communities about potential impacts and management measures, ensuring participatory mapping, planning, implementing, and monitoring conservation zone and forest boundary management.
- Conduct Free, Prior and Informed Consent (FPIC) to allow local resource users to decide on their participation in an intervention and its continuation.
- Develop and support alternative livelihood options for communities whose access to traditional resources is restricted.
- Provide training to local communities in sustainable forest management techniques, alternative farming practices, and business development.

Table32: Impact Significance of conservation zone management and forest boundary management

Aspect	Scenario	Magnitude	Sensitivity	Significance
Conservation zone management and forest boundary management	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Low	Negligible

5.3.2 Impacts of natural regeneration processes and enrichment planting

Potential Impacts

While natural regeneration and enriching planting can significantly aid in the recovery of degraded areas, they are not without potential adverse impacts. These include the risk of introducing non-native species that may outcompete indigenous flora, thereby disrupting the existing ecosystem balance. Additionally, the disturbance caused by planting activities can lead to soil erosion and loss of habitat for local wildlife. Inadequate planning and execution may also result in the overutilization of resources, eventually hindering the long-term sustainability of the regeneration efforts. Therefore, careful consideration and monitoring are essential to mitigate these potential negative outcomes.

Location: protected areas in Sepone and Nong districts.

Mitigation Measures

To address the potential negative impacts, the following mitigation measures will be implemented:

- Conduct thorough site assessments to identify and protect existing valuable habitats and species.
- Avoid invasive species and select native species that are well-adapted to the local environment and can coexist with existing vegetation.
- Implement phased planting schedules to minimise disruption to local wildlife.
- Limit the disturbed area to the absolute minimum necessary for project activities
- Immediately restore disturbed areas to a natural state after project completion, using native vegetation.
- Regular monitoring and management of the planted areas to ensure the success of the regeneration and to prevent the invasion of non-native species.
- Engage local communities in the process to ensure their support and involvement, and to address any concerns related to land use and livelihoods.

Table33: Impact Significance on Natural Regeneration Process and Enrichment Planning

Aspect	Scenario	Magnitude	Sensitivity	Significance
Natural regeneration process and enrichment planning	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Low	Negligible

5.4 Impact Assessment of Protective Infrastructure

The negative impacts of the protective infrastructure project are classified by the phases of construction: pre-construction, construction, and operation phases.

To allocate the impact from construction activities, Table 34 lists construction projects in each village to be assessed by this report.

Table34: Location of Protective Infrastructure

District/Village	UTM		Sub project
	X	Y	
Champhone district			
Phiaka village	522293.28	1823927.456	Pond improvement,
	523109.432	1824770.702	Flood protection levee
	522708.00	1824255.81	Evacuation shelter
Dongmeuang village	527059.346	1832725.473	Riverbank stabilization and levee works
Sivilay village	501556.744	18275226.437	2 Pond Improvement
Nong district			
Tangalai Nuea village	662006.479	804985.185	1 Pond Improvement
Sepone district			
Sopalou village	655571.755	1868605.682	Water tank installation
Thamae village	628004.181	1840479.667	1 Pond Improvement
Songkhone district			
Songkhone village	532239.73	1798305.621	Pond improvement
	532110.523	1787819.965	Evacuation shelter
Xonnabouly district			
Mueanghong village	559626.812	1798549.697	Evacuation shelter
Nachanyai village	572054.181	1802826.395	Evacuation shelter
Nonsavang village	535875.166	1809277.601	Pond improvement

The sub project activities aim to benefit communities positively. This assessment focuses on negative impacts, as positive impacts are covered by the project's monitoring and evaluation. The following section evaluates the negative impacts to develop measures that mitigate adverse effects and enhance positive outcomes.

5.4.1 Pre-construction and construction phase

This section presents a summary of the negative environmental and social impacts from the activities related to pre and construction phases of the project. The impacts are based on the information received through the site visits, consultation undertaken, documentation review, and information provided by the project team.

5.4.1.1 Environmental, Health and Safety

Air Pollution

Potential Impacts

This impact is applied to all projects and village as in Table 34.

The main sources of air quality impact include:

- Traffic and the transportation of equipment and construction materials from the supplier source to the construction site, and engine exhaust emissions from construction machinery and equipment, will lead to minor localised temporary increases in levels of nitrogen oxides (NOx), sulfur oxides (SOx) site, and engine exhaust emissions from construction machinery and equipment, will lead to minor localised temporary increases in levels of nitrogen oxides (NOx), sulfur oxides (SOx) and particulate matter.
- Fugitive dust from earthworks, vehicle movement and loading and unloading at construction site borrow pits/ quarries and spoil disposal sites.
- These impacts are mainly a concern for the construction workers and people living along roads where pipes will be laid and the transport routes to borrow pits, sand and gravel quarry sites or supplier sources.
- As the construction is scheduled in the dry season, dust emissions from unpaved roads, and the handling of construction materials, such as sand, gravel and soil from the quarries, can increase the levels of particulate matter in the air, posing health risks to workers and nearby residents.

Mitigation Measures

- Regular use of dust protection measures, such as water tank trucks with sprinklers, to reduce dust emissions during transportation, handling of construction materials, and movement of vehicles.
- Trucks to be covered with tarpaulin sheets during transportation of construction materials.
- Maintain construction vehicles and machinery to a high standard to minimize emissions and ensure compliance with the exhaust emission standards. All mobile equipment should be fitted with catalytic converters.
- Enforce a speed limit of 20 km/h for construction related traffic through inhabited areas and on the access road
- Prohibit unauthorized burning of waste or other materials.

Impact Significance

The potential for impact on air quality will be limited to the project area (local) with medium sensitivity for the communities. The overall impact on air quality is expected to be negligible after mitigation measures.

Table35: Impact Significance on Air Quality for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Air quality	Without Mitigation	Local	Medium	Low
	With Mitigation	Local	Low	Negligible

Noise and Vibration

Potential Impacts

This impact is applied to all projects and village listed in Table 34.

In addition to air quality issues, infrastructure construction projects often generate significant noise and vibration, which can adversely affect both the environment and the community. The operation of heavy machineries such as excavators and bulldozers produce high level of noise that can disrupt the peace and tranquillity of nearby residential areas. Prolonged exposure to excessive noise can lead to a range of health problems, including stress, hearing loss, and sleep disturbances. Vibration from construction activities can also cause structural damage to buildings and infrastructure, particularly those that are old or poorly constructed. This can result in costly repairs and pose safety risks to the occupants.

Mitigation Measures

- Operation hours of construction activities to be restricted during nighttime. Consultation with nearby residents in advance of construction activities particularly if noise generating construction activities are to be carried out outside of ‘daytime’ hours: 7am—5.30pm.
- Minimise the need for and limit the emissions as far as practicable if noise generating construction works are to be carried out outside of the hours: 7am—5.30pm
- The contractor should conduct employee and operator training to improve awareness of the need to minimize excessive noise in work practices through implementation of measures

- Identify properties, structures and habitat locations that will be sensitive to vibration and noise impacts resulting from construction of the project.
- Provide advance warning to the community on timing of noisy activities. Seek suggestions from community members to reduce noise annoyance and notify the communities about how to raise their concerns (if any) through the Grievance Redress Mechanism.
- Enforce a speed limit of 20 km/h for construction related traffic through inhabited areas.

Impact Significance

The geographical extent of potential impact on noise and vibration due to the construction is expected to be local, duration is expected to be medium, and the significant is low. With the implementation of the mitigation measures, the overall impact on noise and vibration is expected to be negligible.

Table36: Impact Significance on Noise and Vibration for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Noise quality and vibration	Without Mitigation	Local	Medium	Low
	With Mitigation	Local	Low	Negligible

Soil Erosion

This impact is applied to villages with the following infrastructures: pond improvement, riverbank stabilization and flood protection levees (see Table 34).

Potential Impacts.

The main sources of the soil erosion include:

- Topographical Alteration: Activities such as earthwork or digging foundations for the levee/dikes, shaping the riverbank, and creating access roads involve disturbing large volumes of soil. This loose, exposed soil is highly susceptible to detachment and transport.
- Excavated soil, sand, and aggregate stockpiled on-site can be easily eroded by wind or rain, especially if not properly contained or covered.
- Sediment Movement: The direct interface with the rivers and ponds means that eroded soil can directly enter the water body, leading to immediate and severe water quality degradation (turbidity, sedimentation).
- Runoff Induced Erosion: Unprotected excavated areas are particularly vulnerable to erosion caused by surface runoff, leading to the generation of muck which can further degrade soil and water quality.
- Disruption of Natural Drainage Patterns: Construction can alter natural drainage patterns, exacerbating the rate of erosion and sedimentation.

Mitigation measures

To address and minimize the negative impacts of construction activities on soil erosion, the following mitigation measures are recommended:

- Confine all construction activities and disturbance to the absolute minimum area required for the works. Clearly delineate work areas with fencing or markers to prevent accidental disturbance.
- Implement the project in small, manageable sections. Complete stabilization and revegetation of one section before moving to the next. This minimizes the total area of exposed soil at any given time
- Implement erosion control measures such as silt fences, straw wattles, and check dams to minimize sediment runoff.
- Apply straw, wood chips, or other organic mulches on newly graded or disturbed areas to protect soil from rain splash erosion and wind erosion.
- Utilize vegetative cover, such as planting grass or shrubs, to stabilize soil and reduce exposure to erosive forces.
- Sow fast-growing, non-invasive cover crops on disturbed areas that will remain exposed for an extended period.
- As soon as a section of the riverbank, levees or dikes are completed, immediately prepare the soil and plant native, local vegetation (grasses, shrubs, trees) suitable for riverbank conditions. This is the most effective long-term erosion control.
- Stockpiles should be located away from drainage paths, protected with temporary covers (tarpaulins, geotextiles), or immediately seeded with fast-growing cover crops if left for extended periods.
- Apply hydroseeding techniques to disturbed soil areas promptly to promote quick revegetation.
- Construct temporary drainage channels to redirect water flow and prevent pooling in vulnerable areas.
- Schedule construction activities during dry periods to reduce the risk of erosion due to rainfall.

Impact Significance

The geographical extent of impact on soil erosion is expected to be local. The impact duration is perceived to be short and intensity to be moderate. The intensity will be reduced to minor with the implementation of the mitigation measures. The overall impact significance is expected to be negligible with the implementation of mitigation measures.

Table37: Impact Significance on Topography for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Noise quality and vibration	Without Mitigation	Local	Medium	Medium
	With Mitigation	Local	Low	Negligible

Water Quality – Surface and Groundwater

This impact is applied to villages with the following infrastructure: pond improvements, riverbank stabilization and flood protection levees (see Table 34).

Potential Impacts

- Excavation, earthmoving, and material transport near the river will inevitably lead to soil erosion and increased suspended solids in rivers and ponds. This can smother aquatic habitats, reduce light penetration, and affect aquatic life, including fish.
- Spills of fuel, lubricants, hydraulic fluid from machinery, or leaching of chemicals from construction materials (e.g., concrete, cement) can pollute river water.
- Improper disposal of construction waste (debris, packaging, domestic waste from workers) into or near the river can directly contaminate wate.

Mitigation Measures

- The construction activities must be held during the dry season.
- Where possible install silt fences, sediment traps, and retention ponds downstream of construction areas to capture sediment runoff.
- Work in sections to minimise the exposed area at any given time.
- Reduce, recycle, and reuse waste [e.g. plastic waste, electronic waste, agricultural waste (natural, animal faces for later use as manure, plant waste)] wherever and whenever possible.
- Construction sites and camp sites must build latrines for appropriate domestic waste management.
- Establish designated fuelling and maintenance areas at least 50 meters from the river, on impermeable surfaces.
- Ensure readily available spill containment and clean-up kits on-site and train personnel in their use.
- Store all fuels, lubricants, and chemicals in secure, bunded areas
- Hazardous waste, including any spills of chemicals or fuels, should be collected separately and disposed of following environmental regulations.
- Strictly prohibit the disposal of any waste into the rivers or ponds
- Promote clean living practices, reduce plastic usage, and improve waste management.

Impact Significance

The geographical extent of impact on water resources and quality is local with medium sensitivity. The impact will be reduced to negligible with the implementation of the mitigation measures.

Table38: Impact Significance on Water Resources and Quality for Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Water quality	Without Mitigation	Local	Medium	Medium
	With Mitigation	Local	Low	Negligible

Hazardous Waste

Potential Impacts

This impact applied to all protective infrastructure in 10 target villages (see table 33).

During the construction, solid waste—both non–hazardous and hazardous—are anticipated to be generated, primarily due to camp set up, rehabilitation and construction of flood protection levee, riverbank stabilization, community shelter evacuation and upgrading community pond. In particular, solid waste could be generated from operations that involved site clearing, excavation, trenching, demolition of existing cement and earthworks

structures, construction and disassembly of worker camps, maintenance of machineries, and so forth. Regarding dredged and excavated material, the construction activities can lead to surface erosion and sedimentation, particularly in water bodies. However, the estimates for dredged or excavated material per scheme do not estimate amounts for reuse or disposal. Improper handling of solid waste generated from the above operation may result environmental pollution that may include soil and water contamination, habitat disruption, visual pollution and give rise to concerns of public health.

Mitigation Measures

- All vehicles/drivers will be provided with plastic bags for waste collection to prevent any unauthorised waste disposal, with particular attention paid to the prevention of littering.
- Establish designated fuelling and maintenance areas at least 50 meters from the river, on impermeable surfaces.
- Store all fuels, lubricants, and chemicals in secure, bunded areas.
- Ensure readily available spill containment and clean-up kits on-site and train personnel in their use.
- The Contractor will be required to train the workers in proper waste management.
- Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum).
- Safe temporary storage of hazardous waste as required.
- Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations.

Impact significance

The geographical extent of impact on water resources and quality is local with medium sensitivity. The impact will be reduced to Low with the implementation of the mitigation measures.

Table39: Impact Significance on Hazardous Waste for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Hazardous waste	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Medium	Low

5.4.1.2 Occupational, Health and Safety

Occupational Hazard and Safety

Potential Impacts

This impact is applied to all protective infrastructure in 10 target villages (see Table 34).

These hazards can result in a range of consequences, from minor injuries requiring medical attention to severe and potentially fatal accidents. The sources highlight several specific types of physical hazards, including Falls from Heights, Falling Objects, Falls into Open Holes, and Injuries from Heavy Equipment. Given that the province is recognised as an area containing ERW, workers and communities can be exposed to ERW.

Mitigation Measures

- Appoint an Environment, Health and Safety Officer who is a qualified engineer
- The construction contractor and workers must be trained on safety practices as per the construction safety management plan before starting construction.
- Ensure safety measures for all electrically driven machinery before and during construction.
- Follow traffic norms and maintain safe speeds for vehicle movements on unpaved tracks.
- Provide PPEs such as helmets, safety belts, welding masks, gloves, and shoes to workers handling welding and electricity.
- Ensure fall protection for workers at heights.
- Inspect PPE periodically and maintain a record.
- Install signage and strong barriers to guard against danger to persons at work, pedestrians and traffic from falling or slipping into excavations;
- Conduct excavation and dredging under the supervision of a Safety officer and provide proper signage at excavated areas.
- Provide fire extinguishers onsite, monitor them regularly, and keep an accident report to minimize future incidents.
- Display sign boards and safety signages in the regional language and install hard barricading at all active work sites.
- A first aid kit must be on site at all times
- Working in or near river/pond:

    - Identify construction work and sites that involve working in or near water and prepare site and work specific hazard assessments and include relevant control and mitigation measures in the ESMP.
    - Restrict work to the low flow season, and in any case not to carry out work during rain events;
    - Always work in teams consisting of minimum three workers within eyesight of each other;
    - Ensure that waterproofed communication devices are available;
- Enforce safety rules with clear sanctions for repeat offenders.
- Conduct internal monthly audits by PMU of the Contractor and regular monitoring by the Contractor.
- Collect and transport waste oils and lubricants to recyclers or designated disposal sites promptly.
- Ensure no open fires within the project area and replenish first aid kits regularly.
- Conduct ERW survey and clearance before construction activities commence
- Undertake hazard and risk assessment of planned work

Impact Significance

The potential for impact on health and safety will be local spread with medium sensitivity and moderate impact significance. With the implementation of mitigation measures, the significance of the impact reduces to low.

Table40: Impact Significance on Physical Hazard for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Physical hazard	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Low	Low

Labour and Working conditions

Potential Impacts

This impact is applied to all protective infrastructures in 10 target villages (see Table 34).

Up to 25 workers may be employed by contractors for each site of the construction. Contractors may not follow or be in violation of National Labour Laws during construction of protective infrastructure. This may pose potential physical safety risks to workers or lead to the potential for child labour.

- Potential risks and vulnerabilities related to occupational health and safety due to physical hazards during Project construction.
- Potential failure to comply with national labour standards.
- Potential for grievances or objections from affected stakeholders.

Mitigation Measures

    - .
- Monitor the construction and civil works, a labour management procedure that includes the ESMP of the project.
- Make sure that the project team and assigned UNDP staff perform regular, unannounced site visits and audits to observe compliance with the national labor law and UNDP health, safety, and working conditions standards.
- Manage and implement any civil works with regard to labour and workers' safety that will be completed as required in accordance with the following:
    - Labour Law, 2013 (No. 43/NA) of the Lao People's Democratic Republic.
    - Ministerial Decision on Occupational Safety and Health on Construction Sites (No. 3006 of 2013).
    - Decree on the Labour Safety and Health 2019 (No. 22/GO), Ministry of Labour and Social Welfare.
    - United Nations Supplier "Code of Conduct" which provides the minimum standards expected of suppliers to the UN. The Code of Conduct, which includes principles on labour, human rights, environment, and ethical conduct.
    - UNDP Programme and Operations Policies and Procedures (POPP): Construction Works Policy

Impact Significance

The potential for impact on labour related aspects will be local with medium sensitivity and with the implementation of mitigation measures, the significant is expected to be negligible.

Table41: Impact Significance on Labour and Working Conditions for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Labour and working conditions	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Low	Negligible

5.4.1.3 Community, Health and Safety

Community Health and Safety

Potential Impacts

This impact is applied to all protective infrastructure in 10 target villages (see Table 34).

The construction phase may present a range of safety risks to local communities, including accidents, compromised water quality, and exposure to hazardous waste. The transportation of dangerous materials heightens the possibility of incidents and spills, potentially contaminating both soil and water resources. Construction activities can also produce dust and emissions, diminish air quality and increase the risk of respiratory issues among residents. Additionally, waste generated from worker camps—particularly hazardous waste—poses further risks to both the local community and onsite personnel. The anticipated influx of approximately 15 to 25 workers per site may raise safety concerns, such as the transmission of diseases and potential disregard for local cultural and traditional norms.

Moreover, there is a potential for the release of pollutants into the environment due to both routine and non-routine circumstances, such as equipment failures or accidental spills. In general, the adverse impact could be:

- Diversion / containment of surface water.
- Potential impact related to the use or handling of hazardous substances and chemicals
- Potential generation of non-hazardous waste.
- Potential for grievances or objections from affected stakeholders.
- Potential air pollution due to emission from construction equipment and vehicles
- Machinery activities may be exposed to ERW

Mitigation measures

To mitigate these negative impacts, the following measures are recommended:

- Prior to start of construction work, the contractor in cooperation with the PMU will consult with the local authorities and potentially affected residents/private landowner. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM).
- The contractor shall fence off the construction area and control access to the site.
- The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities.
- The contractor in cooperation with the local authorities shall implement traffic management to ensure a smooth traffic and prevent congestion.
- Contractors shall install worker camps in order not to allow workers to stay or mingle with the communities
- Consult with nearby communities to check if the sub-project site is known as ERW area and engage a specialist for ERW clearance.
- The contractors must train workers to adhere to the Workers' Code of Conduct.

Impact significance

The potential for impact on community health and safety will be local with medium sensitivity and with the implementation of mitigation measures, the significant is expected to be low.

Table42: Impact Significance on Community Health and Safety for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Community health and safety	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Medium	Low

Land Acquisition for Construction Projects

Potential Impacts

This impact is applied to projects in 05 target villages (see Table 43 below).

Most of the construction is on public land, with some nearby or adjacent land plots are private land. The levee construction site will be located on three abandoned rice field plots, generously donated by three households to the village for the purpose of protecting their agricultural land from recurring flood damage.

Temporary worker camps may be built on private land. Access to the site requires crossing nearby lands, potentially disrupting local activities temporarily. Moreover, individuals or communities may dispute when construction begins.

During the filed consultation, the project team identified the following households whose land temporarily affected by the construction activities.

Table43: Sub-projects with potential adverse impacts on land acquisition for construction sites

Villages	UTM		Sub project	Area required (m2)	Ownership	Private land plot sharing a boundary with the construction site (HHs)	Private land plot will have impact by the temporary access road to construction site (HHs)
	X	Y					
Champhone district							
Dongmeiang village	527059.346	1832725.473	Flood protection levee and Riverbank stabilization (16,500m^2)	16,500	Public land	08 (N/A)	-
Phiaka	523109.432	1824770.702	Flood protection Levee	3,338	Private land of 3 HHs		1 (30m)
Sivilay village	501556.744	18275226.437	1st pond (3,200m^2) 2nd pond (1,350m^2)	4,550	Public land	09 (9.469ha)	-
Sepone district							
Thamae village	628004.181	1840479.667	1 Pond improvement (6,690m^2)	6,690	Public land	-	4 (3ha)
Songkhone district							
Songkhone village	532239.73	1798305.621	Pond improvement (3,771m^2),)	17,981	Public land	04 (1.3ha)	03 (2.7ha)
	532110.523	1787819.965	shelter evacuation (9,742m^2				
Xonnabouly district							
Nonsavang village	535875.166	1809277.601	Pond improvement (18,117m^2)	18,117	Public land	07 (33.71m^2)	16 (44.3m^2)

The list of households whose land affected temporarily by the project activities are provided in Annex 1.

Mitigation Measures

To address the potential impacts of land acquisition for construction projects, the following mitigation measures should be implemented:

- Provide information to community on the schedule of construction activities through a billboard
- Inform landowner and get agreement on the construction schedule in advance 7 days
- Avoid, minimise ground disturbance during the peak cultivation period.
- Treat landowners with respect.
- Do not load material and waste on the vegetated areas.
- Create safety temporary path if access if disrupted.
- Disturbance to the ground shall be kept minimal.
- Actively involve the community, especially ethnic groups, in planning, implementation, and monitoring.
- Ensure no ownership claims on the land through due diligence.
- Survey to identify affected landowners for site access.
- Negotiate access with landowners.
- Avoid accessing or crossing land during harvest or plantation seasons.
- Conduct FPIC if landowners or communities are ethnic groups.
- Set up a grievance redress committee per UNDP SES guidelines.
- Engage local authorities to ensure a transparent land transfer to the project.
- Contractors must lease the private land for worker camp constructions (if needed).

Impact Significance

The impact on land acquisition is expected to be medium. The impact duration is perceived to be short and the sensitivity to be medium. The impact is negligible with the implementation of the mitigation measures.

Table44: Impact Significance on Land Acquisition for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Land acquisition for construction projects	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Low	Negligible

Cultural Heritage

Potential Impacts

This impact is applied to all projective infrastructures in 10 target villages (see table below)

Table45: Sub project with potential adverse impacts on cultural heritage

Villages	Cultural Site				
	Buddhist Temple	Altar	Burial ground / cemetery	Worship tree	Spiritual forest / worship forest
Champhone district					
Phiaka village	01	01	01	-	02
Dongmeuang village	01	01	01	01	01 (Monkey forest)
Sivilay village	01	01	03	-	-
Nong district					
Tangalai Nuea village	-	-	01	-	01 (Monkey forest)
Sepone district					
Sopalou village	-	-	01	-	01
Thamae village	-	-	01	-	01
Songkhone district					
Songkhone village	01 (Sybounheung Temple - Old temple)	01	02	-	01
Xonnabouly district					
Mueanghong village	02	01	01	01	01
Nachanyai village	-	-	04	-	02
Nonsavang village	02 (Phachanlai Temple and Phoxayyalam Temple)	01	01	-	-

The planned construction projects pose potential risks to the cultural objects and religious sites of both ethnic minority groups and local communities in the project areas. These impacts include the disruption of sacred sites, such as altar, spiritual forest and burial ground, religious sites (temples) and cultural landmarks.

Mitigation Measures

To mitigate adverse impacts, the following measures will be applied:

- Implementing chance find procedure
- Consult and check with the communities and village heads to identify any potential risks and impacts on cultural sites, such as altar, spiritual and worship sites, in the village.
- Raise awareness about the cultural significance of the sites and the measures in place to protect them.
- Engage with local communities throughout the project lifecycle, where appropriate implement FPIC.
- Seek expert inputs specific cultural objects if found during the construction, and communities' opinion if relocation is needed
- Organise ceremony based on local cultural and religious practices before commencing construction activities.

Impact Significance

The potential for impact on cultural heritages will be local with medium sensitivity and with the implementation of mitigation measures, the significant is expected to be negligible.

Table46: Impact Significance on Cultural Heritage for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Cultural heritage	Without Mitigation	Local	Medium	Low
	With Mitigation	Local	Low	Negligible

Soil Quarry and Excavation

The impact applies to sub-projects as stated in Table 48.

The projects listed in Table 48 plan to source soil from areas within or near the village to facilitate construction activities. Specific extraction sites are yet to be determined. If these locations are not carefully chosen and robust mitigation measures are not enforced, soil extraction could negatively impact the environment, including wildlife habitats, local vegetation, community livelihoods, and health and safety.

Mitigation Measures

- Apply the UNDP screening procedure to select soil extraction sites
- Eclosed the pit/ quarries with fence or signpost to warn potential risk of drowning for human and animals
- Endure that the quarries are voluntarily donated by the villagers or the responsible authorities
- Ensure that accessing the quarries will not restrict livelihood activities of the villagers, and cause damage to the rice paddy field, crops and other plantation.

Impact Significance
The potential adverse impacts of soil extraction quarries on community livelihoods and safety will be local with medium sensitivity and with the implementation of mitigation measures, the significant is expected to be negligible

Table47: Impact Significance of soil quarry and excavation for pre-construction and construction phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Soil quarry and excavation	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Medium	Negligible

5.5.1.4 Biodiversity

Habitat Loss, Fragmentation and Ecological Disturbance

The impact applies to sub-projects in the following villages:

Table48: Subprojects with potential adverse impacts on biodiversity

Villages	Sub project
Champhone district	
Phiaka village	Pond improvement
	Flood protection Levee
Dongmeuang village	Riverbank Stabilization and levee
Sivilay village	2 pond improvements
Nong district	
Tangalai Nuea village	Pond improvement
Sepone district	
Sopalou village	Community water supply and storage
Thamae village	Pond improvement
Songkhone district	
Songkhone village	Pond improvement
Xonnabouly district	
Nonsavang village	Pond improvement

Infrastructure projects, such as flood protection levees, riverbank stabilisation, community pond upgrading, and installation of water tanks and soil extraction quarries, can have impacts on wildlife habitats. These activities, such as installing pipes through the forest, removing trees and vegetation from the old ponds or wetland, may cause

habitat loss, fragmentation, and disturbance to wildlife, affecting the biodiversity and ecological balance of the areas. The presence of workers from other regions can increase the demand for local foods, including wildlife and endangered species, which are considered exotic delicacies or believed to have health benefits.

Mitigation Measures

- Implementing measures such as habitat restoration, creating wildlife corridors, and ensuring that water management practices are sustainable and supportive of biodiversity.
- Installing signage to restrict access and prohibit harmful activities.
- Reporting illegal activities, such as hunting and logging, to the appropriate authorities.
- Rescuing, relocating and properly handling wildlife and birds encountered during land clearing and construction, including bird nests.
- Avoid clearing natural trees and bushes that are likely to be a wildlife shelter.
- Avoid contact with monkeys, such as feeding and hunting them.
- For highly sensitive areas (e.g monkey forest/nesting sites), establish temporary exclusion zones during construction.
- Schedule construction period to avoid breeding seasons, such as nesting season,
- Restore habitats to counteract areas disturbed during construction, such as non-invasive tree plantation.
- Educate the community on local wildlife behaviour, avoidance techniques, and deterrent methods. Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species.

Collaborate with local communities and protected forest offices to monitor wildlife populations and report any suspicious activities.

Impact Significance

The potential for impact on habitat will be local with medium sensitivity, and with the implementation of mitigation measures, the significance is expected to be low.

Table49: Impact Significance on Habitat Loss, Fragmentation and Ecological disturbance for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Habitat loss and fragmentation	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Medium	Low

Aquatic Resources

The impact applies to sub-projects in Table 50.

Potential Impact

- Construction of riverbank stabilisation and levees, as well as the modification or improvement of wetlands and existing ponds, can potentially impact aquatic resources such as fish refuges, breeding grounds, aquatic animals, and vegetation.
- Noise, vibrations, and the physical presence of machinery and workers can disturb the movement, breeding patterns, and behaviour of fish and other aquatic creatures.
- Expanding or reinforcing pond dikes will directly change existing pond edge habitats, which are often rich in aquatic plants and invertebrates and serve as vital breeding or feeding grounds for fish, amphibians (frogs, toads), waterbirds, and possibly reptiles such as turtles.

Mitigation Measures

- Clearly mark the boundaries of the construction zone to prevent encroachment into sensitive aquatic or riparian areas outside the project footprint.
- For natural pond improvement, design dike strengthening to minimise the footprint and disturbance to the natural pond edge.
- Schedule construction activities to avoid critical breeding, spawning, migration periods for key aquatic and riparian species (e.g., fish spawning season, crocodile breeding/hatching season). Consult with local fisheries and wildlife authorities for specific timings.
- Use a phased approach for pond improvement by avoiding drying the entire pond.
- Avoid blocking fish migratory channels
- Carry out any required in-water or direct riverbank activities during the dry, low-flow season to reduce turbidity and minimise impacts on aquatic life.
- Ensure all construction debris, domestic waste, and hazardous waste are properly collected, segregated, and disposed of at approved off-site facilities, never into the river or ponds.

- Restrict noisy activities to daytime hours.
- Move construction activities away from sensitive areas as quickly as possible.

Table50: Impact Significant on Aquatic and Riparian Habitat for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Vegetation Cover	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Medium	Low

Vegetation Cover

The impact applies to sub projects as stated in Table 52.

The construction of the project and extraction of soil from quarries/borrow pits can induce impacts on vegetation cover. Vegetation loss across all project sites is minimal, typically involving small trees or bushes on public land. Projects such as Nachanyai, Nongsavang and Thamae involve minor clearance of non-valuable vegetation. In most cases, communities plan to reuse cleared vegetation (e.g., firewood), and no large or protected trees are reported to be affected.

Mitigation Measures

- Avoid extracting soil from quarries in forested land
- Avoid clearing large or old-growth trees—use alternative siting where possible
- Replant native vegetation or grasses post-construction, especially around pond banks and levees
- Maintain vegetative cover in buffer zones near sensitive areas
- Replant trees, non-invasive species, to restore vegetation cover around the construction site.

Impact Significance

The potential for impact on vegetation cover will be local with medium sensitivity and with the implementation of mitigation measures, the significant is expected to be low.

Table51: Impact Significant on Vegetation Cover for Pre-Construction and Construction Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Vegetation Cover	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Medium	Low

5.4.2 Impact Assessment for Operation Phase

5.4.2.1 Community Health and Safety

Potential impacts

This impact is applied to target villages as in the table below, and soil quarries.

Table52: Villages and projects with potential adverse impacts on community health and safety during operation

Villages	Sub project
Champhone district	
Phiaka village	Pond improvement
	Flood protection Levee
Dongmeuang village	Riverbank Stabilization and levee
Sivilay village	2 pond improvements
Nong district	
Tangalai Nuea village	Pond improvement
Sepone district	

Sopalou village	Community water supply and storage
Thamae village	Pond improvement
Songkhone district	
Songkhone village	Pond improvement
Xonnabouly district	
Nonsavang village	Pond improvement

During the operation and maintenance of infrastructure construction projects, such as ponds, riverbank stabilization, and flood protection levee, may induce negative impacts on community health and safety. Key concerns include:

- Contamination: Ponds may become polluted when hazardous waste and chemical fertilizers from nearby rice fields drain into them.
- Waterborne Diseases: Stagnant water bodies like ponds can become breeding grounds for mosquitoes and other disease vectors, leading to outbreaks of waterborne diseases such as malaria and dengue fever.
- Structural Failures: Deterioration of infrastructure may result in failures such as well collapses or breaches in flood protection levees posing a risk of serious accidents and injuries to the community.
- Residential and Child Safety: They are particularly vulnerable to risks such as drowning if ponds, riverbanks and quarries/pits are not adequately fenced or secured.
- Animal safety: Improper technical infrastructure can lead to significant risks for animal safety, as inadequate facilities may fail to provide necessary protection and care.

Mitigation Measures

To address the community health and safety risks associated with waterborne diseases, structural failures, contamination and child safety, the following measures should be implemented:

- Ensure that all beneficiaries are adequately trained on the operational procedure of the pond, riverbank stabilization and flood protection levee to minimize risks during maintenance activities.
- Regularly monitor the quality of water in ponds, reservoirs, and wells to detect and address any contamination promptly.
- Conduct public health awareness campaigns to educate the community about the risks and prevention of waterborne diseases.
- Perform regular inspections and maintenance of infrastructure to prevent structural failures such as well collapses or breaches in flood protection levees
- Develop a maintenance plan that includes periodic assessments and repairs to ensure infrastructure
- Educate parents and guardians about the importance of supervising children near water bodies and also their animals.
- Enclose the ponds or specific sections of the ponds, quarries/ pits, riverbanks and flood levees to prevent children and animals from being exposed to the risk of drowning.
- Maintain an incident reporting register, including broken fence, to document and address any accidents or health issues promptly.
- Encourage the community to report any hazards or incidents to the authorities for timely intervention.
- Implement proper waste management practices, especially for wastewater from borehole or ponds to ensure the safe disposal of maintenance waste and prevent pollution of water sources.
- Conduct regular clean-up activities to maintain a healthy environment around the community infrastructure.

Impact Significance

The potential for impact on community health and safety will be local with medium sensitivity, and the overall impact on operation and maintenance with the implementation of mitigation measures is expected to be low.

Table53: Impact Significance on Health and Safety for Operational Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Health and Safety	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Low	Low

5.4.2.2 Community Conflict

Potential Impacts

This impact is applied to village with the following subprojects: evacuation shelters, ponds and water tank (see table 37)

The result of the project is the shared community infrastructures such as evacuation shelters, ponds and water tanks. These infrastructures play a crucial role in providing resources and safety for local populations. However, these facilities can become sources of conflict due to misuse, unequal access and share, or monopolisation by individuals or groups. These conflicts can undermine the intended benefits of the infrastructure and exacerbate pre-existing tensions within the community.

- Misuse of Resources: Shared facilities may be used for unintended purposes, leading to wear and tear or reduced functionality for their primary purpose. For example, water tanks intended for communal use may be exploited for private agricultural activities.
- Control by Specific Groups: Powerful individuals or communities may exert control over shared infrastructure, excluding others from equitable access. This can lead to resentment and a sense of marginalisation among underserved groups.
- Overuse and Resource Depletion: High demand and improper management of resources such as community ponds can lead to depletion or degradation, which can intensify disputes over remaining access.
- Lack of Maintenance: In cases where responsibility for upkeep is unclear, shared infrastructure may fall into disrepair, diminishing its utility and escalating complaints among users.

Mitigation Measures

- Establish committees representing diverse community groups to oversee the use and maintenance of shared infrastructure. These committees should enforce fair usage policies and mediate disputes.
- Develop transparent rules governing the use of community facilities. Post these guidelines in visible locations, and ensure they are communicated to all community members.
- Schedule inspections and upkeep activities to ensure infrastructure remains functional and safe for all users. Early identification of misuse or damage can help prevent larger issues.
- Introduce accessible and impartial dispute resolution processes to address community grievances swiftly and equitably. This can reduce tensions and build trust among users.
- Organise education initiatives to inform residents about the importance of shared infrastructure, its proper use, and the consequences of misuse.

Impact Significance

Community conflict related to shared infrastructure has low sensitivity, and mitigation measures are expected to make the impact on operation and maintenance negligible.

Table54: Impact Significance on Water Resource and Quality for Operational Phase

Aspect	Scenario	Magnitude	Sensitivity	Significance
Community conflict	Without Mitigation	Local	Low	Low
	With Mitigation	Local	Low	Negligible

5.4.2.3 Community Health and Safety in the Evacuation Shelter

Potential Impacts

This impact is applied to villages with the following sub-projects: evacuation centres (see Table 55).

Shared evacuation shelters may increase the risk of communicable diseases for both villagers and animals. These centres can compromise privacy for women and children, causing sexual harassment, and some lack reliable clean water raising the risk of water-borne diseases.

Mitigation Measures

To address these concerns, a comprehensive set of mitigation measures will be implemented:

- Communicable Disease Prevention: Implement regular disinfection protocols and provide adequate handwashing stations equipped with soap and sanitizers throughout the evacuation centres. Organize vaccination campaigns and facilitate access to basic healthcare for both villagers and their animals.
- Privacy and Protection for Vulnerable Groups: Designate separate, secure areas within shelters for women, children, and other vulnerable populations. Install physical partitions and ensure proper lighting in all communal spaces. Establish confidential reporting mechanisms and presence of trained personnel to monitor and respond to incidents of harassment or abuse.
- Water Supply and Sanitation: Ensure reliable provision of clean, potable water through regular supply checks, filtration units, or water purification tablets. Maintain sufficient and sanitary toilet and bathing facilities, with regular maintenance schedules to prevent contamination and outbreak of waterborne diseases.

- Awareness and Training: Conduct awareness campaigns on hygiene practices and community health within the centers. Train village committees, village heads and volunteers in safeguarding protocols, emergency response, and gender-sensitive approaches to shelter management.
- Follow national guideline on the operation of the evacuation shelters.

Impact Significance

The potential for impact on community health and safety due to the operation of the evacuation shelters will be local with medium sensitivity, and the overall impact on operation and maintenance with the implementation of mitigation measures is expected to be low.

Table55: Impact Significance on Community Health and Safety of the Evacuation shelters

Aspect	Scenario	Magnitude	Sensitivity	Significance
Community health and safety in evacuation shelter	Without Mitigation	Local	Medium	Moderate
	With Mitigation	Local	Low	Low

5.6 Cumulative Impacts

Cumulative impacts refer to the sequential, incremental, and/or compounded consequences of an action, project, or activity when aggregated with other current, planned, and/or reasonably anticipated future actions. These effects can frequently intensify environmental deterioration and societal issues, rendering it essential to evaluate them thoroughly during planning and decision-making. By comprehending cumulative repercussions, stakeholders may devise methods to alleviate adverse effects and foster sustainable growth. Cumulative impact assessment entails evaluating the prospective effects and hazards of planned developments on selected valued environmental and social components (VECs) and recommending specific steps to reduce these cumulative impacts and risks to the fullest degree practicable. Cumulative impact assessment and management is warranted anytime there is apprehension that a project or activity under evaluation may contribute to cumulative impacts on one or more valued ecosystem components (VECs).

Savannakhet Province concentrates on constructing protective infrastructure and enhancing the quality of people's lives. The province has selected five districts: Champhone, Nong, Sepone, Songkhone, and Xonnabouly. The province has provided the necessary infrastructure to all the target villages in these districts, located along the Xe Bang Hieng River Basin. Along the Xe Champhone and XBH River, the infrastructure is going to be constructed to protect the riverbank and biodiversity. This construction aims to prevent erosion and flooding while preserving the natural ecosystem.

By safeguarding the riverbank, the initiative supports both environmental sustainability and community resilience. However, some critics argue that extensive infrastructure development can disrupt local ecosystems and alter natural water flow, potentially harming the very biodiversity it seeks to protect. Additionally, there are concerns that such projects may prioritize short-term benefits over long-term ecological balance, leading to unforeseen consequences for both the environment and local communities.

Therefore, to maintain the ecological integrity of the area, we must carefully monitor and assess the cumulative impacts of the project. Engaging local stakeholders in the decision-making process may also help address these concerns and foster a more sustainable approach to development. Each construction site has its own cumulative impact on the surrounding ecosystem, which can vary significantly depending on factors such as location, scale, and the specific practices employed.

By evaluating these impacts comprehensively, we can ensure that development efforts align with environmental stewardship and community well-being, ultimately paving the way for a more harmonious coexistence between progress and nature.

However, some argue that the focus on cumulative impacts may lead to unnecessary delays in development projects, hindering economic growth and job creation. Additionally, there is a concern that overly stringent evaluations could stifle innovation and discourage investment in new construction technologies that could otherwise enhance sustainability.

The integration of VECs in development presents a complex landscape where environmental stewardship and community well-being are paramount. While these considerations can enhance the sustainability of projects, they also risk causing unnecessary delays that impede timely execution. Furthermore, the emphasis on such integrations may inadvertently stifle innovation, discouraging investment in new construction technologies that could otherwise drive efficiency and creativity in the industry. Ultimately, striking a balance between responsible

development and economic growth is crucial; without it, the potential for job creation and advancement may be significantly hindered, leaving communities caught in a paradox of progress versus preservation.

6 Analysis of Alternatives

The Alternative Analysis aims to evaluate and compare various options for implementing the IWRM-EBA project to achieve its objectives of promoting climate resilience, EbA, and sustainable water resource management in the Xe Bang Hieng River Basin. This process ensures alignment with environmental, social, and economic considerations, addresses strategic environmental and social concerns, and maximizes project benefits. By incorporating the "no project" scenario, the analysis quantifies potential impacts, considers the feasibility of mitigation measures, and evaluates the institutional, training, and monitoring requirements for each alternative.[36]

6.2 Climate Change Scenario in Lao PDR

Laos is amongst the most vulnerable countries to projected climate change trends, as its communities face significant climate-related hazards that are exacerbated by poverty, malnourishment, and high exposure of poor and marginalized communities. Floods and droughts continue to be the most significant threats; between 2013 and 2019, in some provinces, flooding was experienced every year. Under the highest emissions pathway (RCP8.5), Laos faces projected warming of 3.6°C by the 2090s, against the baseline condition (1986-2005).[37]

The main data source for the World Banks' Climate Change Knowledge Portal (CCKP) is the Coupled Model Intercomparison Project Phase 5 (CMIP5) models, which are utilized within the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), providing estimates of future temperature and precipitation. Four Representative Concentration Pathways (i.e. RCP2.6, RCP4.5, RCP6.0, and RCP8.5) were selected and defined by their total radiative forcing (cumulative measure of GHG emissions from all sources) pathway and level by 2100. In this analysis RCP2.6 and RCP8.5, the extremes of low and high emissions pathways, are the primary focus RCP2.6 represents a very strong mitigation scenario, whereas RCP8.5 assumes business-as-usual scenario.

For Lao PDR, these models show a trend of consistent warming and an increase in the intensity of heavy precipitation periods and extreme events. Table 52 and 53 below, provide information on temperature projections and anomalies for the four RCPs over two distinct time horizons; presented against the reference period of 1986–2005.

Table56: Projected anomaly (changes °C) for maximum, minimum, and average daily temperatures in Lao PDR for 2040–2059 and 2080–2099, from the reference period of 1986–2005 for all RCPs. The table is showing the median of the CCKP model ensemble and the 10–90th percentiles in brackets[38]

	Average Daily Maximum Temperature		Average Daily Temperature		Average Daily Minimum Temperature	
Scenario	2040–2059	2080–2099	2040–2059	2080–2099	2040–2059	2080–2099
RCP2.6	1.2 (–0.5, 3.1)	1.2 (–0.5, 3.2)	1.6 (–0.3, 2.7)	1.3 (–0.2, 2.7)	1.1 (–0.2 2.5)	1.2 (–0.2, 2.6)
RCP4.5	1.5 (–0.3, 3.5)	2.0 (0.2, 4.3)	1.5 (–0.1, 3.1)	2.0 (0.4, 3.8)	1.5 (0.0, 2.9)	2.1 (0.5, 3.8)
RCP6.0	1.2 (–0.6, 3.0)	2.4 (0.4, 4.7)	1.2 (–0.4, 2.6)	2.4 (0.6, 4.3)	1.2 (–0.2, 2.5)	2.4 (0.6, 4.2)
RCP8.5	1.9 (0.1, 4.0)	3.9 (1.7, 6.6)	1.9 (0.3, 3.6)	3.9 (2.0, 6.3)	1.9 (0.3, 3.5)	4.1 (2.0, 6.2)

Table57: Projections of average temperature change (°C) in Lao PDR for different seasons (3-monthly time slices) over different time horizons and emissions pathways, showing the median estimates of the full CCKP model ensemble and the 10th and 90th percentiles in brackets

[36] Analysis of alternatives. SESA systematically compares feasible alternatives to the proposed policy, programme, or plan, technology, design, and operation – including the "without" situation – in terms of their potential environmental and social impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. For each of the alternatives, SESA quantifies the social and environmental impacts of each alternative to the extent possible and attaches economic values where feasible. States the basis for selecting the particular PPP design.

[37] https://dicf.unepgrid.ch/lao-peoples-democratic-republic/climate-change#section-states

[38] WBG Climate Change Knowledge Portal (CCKP, 2020). Climate Data: Projections. URL: https://climateknowledgeportal.worldbank.org/country/laos/climate-data-projections

Scenario	2040–2059		2080–2099	
	Jun–Aug	Dec–Feb	Jun–Aug	Dec–Feb
RCP2.6	1.0 (0.2, 2.4)	1.2 (–0.4, 2.5)	1.1 (0.1, 2.3)	1.3 (–0.1, 2.6)
RCP4.5	1.5 (0.5, 2.8)	1.4 (–0.3, 2.7)	1.9 (0.9, 3.4)	1.9 (0.3, 3.6)
RCP6.0	1.3 (0.3, 2.6)	1.0 (–0.5, 2.0)	2.5 (1.3, 4.0)	2.1 (0.4, 3.8)
RCP8.5	1.7 (0.6, 3.2)	2.0 (0.3, 3.4)	3.7 (2.4, 5.8)	3.9 (1.6, 6.2)

Located in the tropical monsoonal zone, Champhone district experiences both dry and wet seasons. It receives an average annual rainfall of 1,144 mm, with 90% of Xe Champhone River's flow occurring during the wet season. Climate projections suggest rising temperatures and rainfall could exacerbate water resource management challenges.

Nong District has a tropical monsoonal climate with a dry season from November to early May and a wet season from May to October. It receives 1,592 mm of annual rainfall and Xe Lanong River's strong seasonal flow. Climate models suggest 0.5 to 1.5°C temperature rise since the mid-20th century, posing risks to agriculture, freshwater availability, and biodiversity.

On the other hand, Sepone district experiences climate change with two seasons and a peak temperature of 42°C in April. It receives 1,680mm of rainfall annually, with 91.4% of Upper Xe Bang Hieng River's flow occurring in the wet season.

Songkhone District, located in a monsoonal zone, has a stable temperature pattern with peak temperatures around 42°C in April. The district receives 1,441 mm of annual rainfall, with most occurring in the wet season. Climate change poses significant risks, including temperature increases and more intense rainfall events. Historical trends show mean temperatures in the Mekong River Basin have already risen, requiring integrated water resource management approaches to enhance resilience against climate-induced hydrological shifts.

6.3 No Projection Scenario

Due to climate change, there is an increase in potential evapotranspiration which have led to increase in rice crop water requirements during all months (which are greater than increases in rainfall) leading to increases in irrigation water requirements. The DWR have practiced water management in the critical Xe Bang Hieng River basin to stave off excess flooding during the wet season and to ensure water availability during the dry season, using canals and regulators, including reservoir operations.

This Project aims to provide construct new infrastructure which will help strengthen the community water resources by providing flood pad and evacuation shelter, flood protection levee, riverbank stabilization, construction of new community pond, Improvement to community water supply and storage, modifications to existing water body and construction of flood evacuation shelter. No project scenario will lead to risk of floods in the area which might damage the agriculture field and crops. The 'do nothing' situation will prevent some of the environmental and social adverse impacts at the cost of isolation, difficulty in access, migration of community to other regions, malnutrition and severe poverty.

Table 22: List of Beneficiaries in Savannakhet Province

Beneficiary Areas			Number of Household and Population	
Province	District	Villages	Household	Population
Savannakhet	Champhone	Paika	104	689
		Dongmeuang	118	910
		Silivay	280	1683
	Nong	Nongvilai	~477	2385
		Tangalai Neua	~91	455
		Saveu	~132	657
	Sephone	Sopalou	~59	295
		Kanghoupa	~105	524
		Thamae	~115	577
	Songkhone	Kangdone	187	1255
		Songkhone	227	1264

Beneficiary Areas			Number of Household and Population	
Province	District	Villages	Household	Population
		Houaykor	110	674
	Xonnabouly	Nachanyai	223	1095
		Mueanghong	378	1115
		Nonesavang	545	3333
	Total		**~3,151**	**16,911**

6.4 Alternative Site Location and Routes

To mitigate environmental and social impacts, diverse site locations and routes for infrastructure development have been meticulously evaluated. Alternative sites for protective infrastructure were assessed, examining the viability of areas beyond the presently suggested settlements, including Phiaka, Dongmeuang, and Sivilay. The evaluations concentrated on elements such as flood risk exposure, land appropriateness, and socio-economic consequences to guarantee optimal site selection. The focus was on enhancing the efficiency of irrigation and drainage systems while minimizing environmental impact. This strategy sought to minimize interruptions to natural water courses and safeguard essential ecosystems. The evaluation procedure prominently included cost-benefit analysis. Each proposal was evaluated for its feasibility, durability, and alignment with community interests. The project aims to deploy infrastructure solutions that reconcile development requirements with environmental and social accountability by examining various possibilities.

7 Summary of Mitigation Measures, Environmental and Social Management Plan

The mitigation measures suggested by this ESIA is summarized in the Environmental and Social Management and Monitoring Plan (ESMMP) in the table below. The ESMMP lists out the mitigation measures and management strategies for the construction and operation phases of the Project. Relevant management plans based on the impacts assessed have been developed as part of the ESMMP. The ESMMP covering various aspects of the construction and operation phase has been provided below. The detailed implementation of ESMMP is outlined in the Environmental and Social Management Plan (ESMP) in a stand-alone document.

Table 23: Environmental and Social Management and Monitoring Plan (ESMMP)

SN	Aspects	Mitigation Measures	Sites	Monitoring
Conservation of Xe Bang Hieng Basin Reion				
1	Conservation zone management and boundary management	• Conduct stakeholder engagement to initiate any activities with the communities involving protected area demarcation. The engagement will involve consulting affected communities about potential impacts and management measures, ensuring participatory mapping, planning, implementing, and monitoring conservation zone and forest boundary management. • Conduct Free, Prior and Informed Consent (FPIC) to allow local resource users to decide on their participation in an intervention and its continuation. • Develop and support alternative livelihood options for communities whose access to traditional resources is restricted. • Provide training to local communities in sustainable forest management techniques, alternative farming practices, and business developmen	Applied to project in 10 target village: Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Monthly
2	Impact on natural regeneration processes and enrichment planting	• Conduct thorough site assessments to identify and protect existing valuable habitats and species. • Avoid invasive species and select native species that are well adapted to the local environment and can coexist with existing vegetation. • Limit the disturbed area to the absolute minimum necessary for project activities • Immediately restore disturbed areas to a natural state after project completion, using native vegetation • Implement phased planting schedules to minimize disruption to local wildlife. • Regular monitoring and management of the planted areas to ensure the success of the regeneration and to prevent the invasion of non-native species. • Engage local communities in the process to ensure their support and involvement, and to address any concerns related to land use and livelihoods.	Protected areas in Sepond and Nong districts	Monthly
Protective Infrastructures				
		Pre-Construction and Construction Phases		
3	Air pollution	• Regular use of dust protection measures, such as water tank trucks with sprinklers, to reduce dust emissions during transportation, handling of construction materials, and movement of vehicles. • Trucks to be covered with tarpaulin sheets during transportation of construction materials. • Maintain construction vehicles and machinery to a high standard to minimize emissions and ensure compliance with the exhaust emission standards. All mobile equipment should be fitted with catalytic converters. • Enforce a speed limit of 20 km/h for construction related traffic through inhabited areas and on the access road • Prohibit unauthorized burning of waste or other materials. •	Applied to project in 10 target village: Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Monthly
4	Noise and Vibration	• Operation hours of construction activities to be restricted during nighttime. Consultation with nearby residents in advance of construction activities particularly if noise generating construction activities are to be carried out outside of 'daytime' hours: 7am-5.30pm.	Applied to project in 10 target village: Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou,	Weekly

SN	Aspects	Mitigation Measures	Sites	Monitoring
		• Minimise the need for and limit the emissions as far as practicable if noise generating construction works are to be carried out outside of the hours: 7am-5.30pm • The contractor should conduct employee and operator training to improve awareness of the need to minimize excessive noise in work practices through implementation of measures • Identify properties, structures and habitat locations that will be sensitive to vibration and noise impacts resulting from construction of the project. • Provide advance warning to the community on timing of noisy activities. Seek suggestions from community members to reduce noise annoyance and notify the communities about how to raise their concerns (if any) through the Grievance Redress Mechanism. • Enforce a speed limit of 20 km/h for construction related traffic through inhabited areas	Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	
5	Soil Erosion	• Confine all construction activities and disturbance to the absolute minimum area required for the works. Clearly delineate work areas with fencing or markers to prevent accidental disturbance. • Implement the project in small, manageable sections. Complete stabilization and revegetation of one section before moving to the next. This minimizes the total area of exposed soil at any given time • Implement erosion control measures such as silt fences, straw wattles, and check dams to minimize sediment runoff. • Apply straw, wood chips, or other organic mulches on newly graded or disturbed areas to protect soil from rain splash erosion and wind erosion. • Utilize vegetative cover, such as planting grass or shrubs, to stabilize soil and reduce exposure to erosive forces. • Sow fast-growing, non-invasive cover crops on disturbed areas that will remain exposed for an extended period. • As soon as a section of the riverbank, levees or dikes are completed, immediately prepare the soil and plant native, local vegetation (grasses, shrubs, trees) suitable for riverbank conditions. This is the most effective long-term erosion control. • Stockpiles should be located away from drainage paths, protected with temporary covers (tarpaulins, geotextiles), or immediately seeded with fast-growing cover crops if left for extended periods. • Apply hydroseeding techniques to disturbed soil areas promptly to promote quick revegetation. • Construct temporary drainage channels to redirect water flow and prevent pooling in vulnerable areas. • Schedule construction activities during dry periods to reduce the risk of erosion due to rainfall. •	Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Weekly
6	Water Quality	• The construction activities must be held during the dry season. • Where possible install silt fences, sediment traps, and retention ponds downstream of construction areas to capture sediment runoff. • Work in sections to minimize the exposed area at any given time. • Reduce, recycle, and reuse waste [e.g. plastic waste, electronic waste, agricultural waste (natural, animal faces for later use as manure, plant waste)] wherever and whenever possible. • Construction sites and camp sites must build latrines for appropriate domestic waste management. • Establish designated fuelling and maintenance areas at least 50 meters from the river, on impermeable surfaces. • Ensure readily available spill containment and clean-up kits on-site, and train personnel in their use. • Store all fuels, lubricants, and chemicals in secure, bunded areas	Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Weekly

SN	Aspects	Mitigation Measures	Sites	Monitoring
		• Hazardous waste, including any spills of chemicals or fuels, should be collected separately and disposed of following environmental regulations. • Strictly prohibit the disposal of any waste into the rivers or ponds • Promote clean living practices, reduce plastic usage, and improve waste management. •		
7	Hazardous Waste	• All vehicles/drivers will be provided with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of littering. • The Contractor will be required to train the workers in proper waste management. • Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum). • Safe temporary storage of hazardous waste as required. • Establish designated fuelling and maintenance areas at least 50 meters from the river, on impermeable surfaces. • Store all fuels, lubricants, and chemicals in secure, bunded areas. • Ensure readily available spill containment and clean-up kits on-site and train personnel in their use. • The Contractor will be required to train the workers in proper waste management. • Recyclables will be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum). • Safe temporary storage of hazardous waste as required • Storage facilities for fuels, oil, cement, and chemicals shall be within secured areas on impermeable surfaces, provided with bunds and cleanup installations	Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Weekly
8	Occupational Hazard and Safety	• Appoint an Environment, Health and Safety Officer who is a qualified engineer • The construction contractor and workers must be trained on safety practices as per the construction safety management plan before starting construction. • Ensure safety measures for all electrically driven machinery before and during construction. • Follow traffic norms and maintain safe speeds for vehicle movements on unpaved tracks. • Provide PPEs such as helmets, safety belts, welding masks, gloves, and shoes to workers handling welding and electricity. • Ensure fall protection for workers at heights. • Inspect PPE periodically and maintain a record. • Install signage and strong barriers to guard against danger to persons at work, pedestrians and traffic from falling or slipping into excavations; • Conduct excavation and dredging under the supervision of a Safety officer and provide proper signage at excavated areas. • Provide fire extinguishers onsite, monitor them regularly, and keep an accident report to minimize future incidents. • Display sign boards and safety signages in the regional language and install hard barricading at all active work sites. • A first aid kit must be on site at all times • Working in or near river/pond: o Identify construction work and sites that involve working in or near water and prepare site and work specific hazard assessments and include relevant control and mitigation measures in the ESMP. o Restrict work to the low flow season, and in any case not to carry out work during rain events; o Always work in teams consisting of minimum three workers within eyesight of each other; o Ensure that waterproofed communication devices are available; • Enforce safety rules with clear sanctions for repeat offenders.	Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Once in two weeks

SN	Aspects	Mitigation Measures	Sites	Monitoring
		• Conduct internal monthly audits by PMU of the Contractor and regular monitoring by the Contractor. • Collect and transport waste oils and lubricants to recyclers or designated disposal sites promptly. • Ensure no open fires within the project area and replenish first aid kits regularly. • Conduct ERW survey and clearance before construction activities commence •		
9	Labour and Working conditions	• Monitor the construction and civil works, a labour management procedure that includes the ESMP of the project. • Make sure that the project team and assigned UNDP staff perform regular, unannounced site visits and audits to observe compliance with the national labour law and UNDP health, safety, and working conditions standards. • Manage and implement any civil works with regard to labour and worker's safety that will be completed as required in accordance with the following: o Labour Law, 2013 (No. 43/NA) of the Lao People's Democratic Republic. o Ministerial Decision on Occupational Safety and Health on Construction Sites (No. 3006 of 2013). o Decree on the Labour Safety and Health 2019 (No. 22/GO), Ministry of Labour and Social Welfare. o United Nations Supplier "Code of Conduct" which provides the minimum standards expected of suppliers to the UN. The Code of Conduct, which includes principles on labour, human rights, environment, and ethical conduct. o UNDP Programme and Operations Policies and Procedures (POPP): Construction Works Policy	Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Once in two weeks
10	Community Health and Safety	• Prior to start of construction work, the contractor in cooperation with the PMU will consult with the local authorities and potentially affected residents/private landowner. Inform them about the upcoming construction work, safety precautions and how to raise concerns or file complaints (GRM). • The contractor shall fence off the construction area and control access to the site. • The contractor shall install traffic signage and fluorescent bollards and warning lights to direct traffic and prevent vehicles driving into the lanes with construction activities. • The contractor in cooperation with the local authorities shall implement traffic management to ensure a smooth traffic and prevent congestion. • Contractors shall install worker camps in order not to allow workers to stay or mingle with the communities • Consult with nearby communities to check if the sub-project site is known as ERW area and engage a specialist for ERW clearance. • The contractors must train workers to adhere to Worker Code of Conduct	Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Daily
11	Land Acquisition for construction projects	• Provide information to community on schedule of construction activities through billboard • Inform landowner and get agreement on construction schedule in advance 7 days • Avoid, minimize ground disturbance during peak cultivation period. • Treat landowners with respect. • Do not load material and wastes on the vegetated areas. • Create safety temporary path if access if disrupted. • Disturbance to the ground shall be kept minimal. • Actively involve the community, especially ethnic groups, in planning, implementation, and monitoring. • Ensure no ownership claims on the land through due diligence. • Survey to identify affected landowners for site access. • Negotiate access with landowners. • Avoid accessing or crossing land during harvest or plantation seasons. • Conduct FPIC if landowners or communities are ethnic groups.	8 target villages: Phiaka, Dongmeuang, Sivilay, Thamea, Songkhone, Nongsavang	Monthly

SN	Aspects	Mitigation Measures	Sites	Monitoring
		• Set up a grievance redress committee per UNDP SES guidelines. • Engage local authorities to ensure transparent land transfer to the project. • Contractors must lease the private land for worker camp constructions (if needed). •		
12	Cultural Heritage	• Implementing chance find procedure • Consult and check with the communities and village heads to identify any potential risks and impacts on cultural sites, such as altar, spiritual and worship sites, in the village. • Raise awareness about the cultural significance of the sites and the measures in place to protect them. • Engage with local communities throughout the project lifecycle, where appropriate implement FPIC. • Seek expert inputs specific cultural objects if found during the construction, and communities' opinion if relocation is needed • Organise ceremony based on local cultural and religious practices before commencing construction activities.	Phiaka, Dongmeuang, Sivilay, Tangalia Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai, and Nongsavang	Monthly
13	Quarries	• Apply the UNDP screening procedure to select soil extraction sites • Eclosed the pit/ quarries with fence or signpost to warn potential risk of drowning for human and animals • Endure that the quarries are voluntarily donated by the villagers or the responsible authorities • Ensure that accessing the quarries will not restrict livelihood activities of the villagers, and cause damage to the rice paddy field, crops and other plantation.	8 target villages: Phiaka, Dongmeuang, Sivilay, Tangalai Neua, Sopsalou, Thamea, Songkhone, and Nongsavang	Daily
14	Habitat loss, fragmentation and ecological disturbance	• Implementing measures such as habitat restoration, creating wildlife corridors, and ensuring that water management practices are sustainable and supportive of biodiversity. • Installing signage to restrict access and prohibit harmful activities. • Reporting illegal activities, such as hunting and logging, to the appropriate authorities. • Rescuing, relocating and properly handling wildlife encountered during land clearing and construction, including bird nests, • Restore habitats to counteract areas disturbed during construction, such as non-invasive tree plantation. • Educate the community on local wildlife behaviour, avoidance techniques, and deterrent methods. • Educate construction workers about the importance of wildlife conservation and the laws regarding hunting and trading of protected species. • Collaborate with local communities and protected forest offices to monitor wildlife populations and report any suspicious activities.	8 target villages: Phiaka, Dongmeuang, Sivilay, Tangalai Neua, Sopsalou, Thamea, Songkhone, and Nongsavang	Daily
15	Aquatic Resources	• Clearly mark the boundaries of the construction zone to prevent encroachment into sensitive aquatic or riparian areas outside the project footprint. • For natural pond improvement, design dike strengthening to minimise the footprint and disturbance to the natural pond edge. • Schedule construction activities to avoid critical breeding, spawning, migration periods for key aquatic and riparian species (e.g., fish spawning season, , crocodile breeding/hatching season). Consult with local fisheries and wildlife authorities for specific timings. • Use a phased approach for pond improvement by avoiding drying the entire pond. • Avoid blocking fish migratory channels • Carry out any required in-water or direct riverbank activities during the dry, low-flow season to reduce turbidity and minimise impacts on aquatic life. • Ensure all construction debris, domestic waste, and hazardous waste are properly collected, segregated, and disposed of at approved off-site facilities, never into the river or ponds. • Restrict noisy activities to daytime hours. • Move construction activities away from sensitive areas as quickly as possible	Pond improvement, riverbank stabilization and flood protection levees	Weekly

SN	Aspects	Mitigation Measures	Sites	Monitoring
15	Vegetation cover	• Avoid extracting soil from quarries in forested land • Avoid clearing large or old-growth trees—use alternative siting where possible • Replant native vegetation or grasses post-construction, especially around pond banks and levees • Maintain vegetative cover in buffer zones near sensitive areas • Replant trees, non-invasive species, to restore vegetation cover around the construction site.	8 target villages: Phiaka, Dongmeuang, Sivilay, Tangalai Neua, Sopsalou, Thamea, Songkhone, and Nongsavang	Daily
		Operational Phase		
16	Community, Health and Safety	• Ensure that all beneficiaries are adequately trained on the operational procedure of the pond, riverbank stabilization and flood protection levee to minimize risks during maintenance activities. • Regularly monitor the quality of water in ponds, reservoirs, and wells to detect and address any contamination promptly. • Conduct public health awareness campaigns to educate the community about the risks and prevention of waterborne diseases. • Perform regular inspections and maintenance of infrastructure to prevent structural failures such as well collapses or breaches in flood protection levees • Develop a maintenance plan that includes periodic assessments and repairs to ensure infrastructure • Educate parents and guardians about the importance of supervising children near water bodies and also their animals. • Enclose the ponds or specific sections of the ponds, riverbanks and flood levees to prevent children and animals from being exposed to the risk of drowning. • Maintain an incident reporting register, including broken fence, to document and address any accidents or health issues promptly. • Encourage the community to report any hazards or incidents to the authorities for timely intervention. • Implement proper waste management practices, especially for wastewater from borehole or ponds to ensure the safe disposal of maintenance waste and prevent pollution of water sources. • Conduct regular clean-up activities to maintain a healthy environment around the community infrastructure.	8 target villages: Phiaka, Dongmeuang, Sivilay, Tangalai Neua, Sopsalou, Thamea, Songkhone, and Nongsavang	Six monthly
17	Community Conflict	• Establish committees representing diverse community groups to oversee the use and maintenance of shared infrastructure. These committees should enforce fair usage policies and mediate disputes. • Develop transparent rules governing the use of community facilities. Post these guidelines in visible locations, and ensure they are communicated to all community members. • Schedule inspections and upkeep activities to ensure infrastructure remains functional and safe for all users. Early identification of misuse or damage can help prevent larger issues. • Introduce accessible and impartial dispute resolution processes to address community grievances swiftly and equitably. This can reduce tensions and build trust among users. • Organise education initiatives to inform residents about the importance of shared infrastructure, its proper use, and the consequences of misuse.	subprojects: evacuation shelter, pond and water tank: Phiaka, Sivilay, Tangalai Neua, Sopsalou, Thamea, Songkhone, Meuanghong, Nachanyai and Nongsavang villages	Six monthly
18	Community Health and Safety in the Evacuation Shelter	• Communicable Disease Prevention: Implement regular disinfection protocols and provide adequate handwashing stations equipped with soap and sanitizers throughout the evacuation centres. Organize vaccination campaigns and facilitate access to basic healthcare for both villagers and their animals. • Privacy and Protection for Vulnerable Groups: Designate separate, secure areas within shelters for women, children, and other vulnerable populations. Install physical partitions and ensure proper lighting in all communal spaces. Establish confidential reporting mechanisms and presence of trained personnel to monitor and respond to incidents of harassment or abuse.	evacuation shelter: Phiaka, Songkhone, Mueanghong, and Nachanyai villages	Six monthly

SN	Aspects	Mitigation Measures	Sites	Monitoring
		• Water Supply and Sanitation: Ensure reliable provision of clean, potable water through regular supply checks, filtration units, or water purification tablets. Maintain sufficient and sanitary toilet and bathing facilities, with regular maintenance schedules to prevent contamination and outbreak of waterborne diseases. • Awareness and Training: Conduct awareness campaigns on hygiene practices and community health within the centres. Train village committees, village heads and volunteers in safeguarding protocols, emergency response, and gender-sensitive approaches to shelter management. • Follow national guideline on the operation of the evacuation shelters.		

8 Stakeholder Engagement and Consultation

Since 2020, the project has engaged stakeholders from the inception planning stage. Consultation meetings were conducted with provincial, city, and district authorities in Savannakhet province, as well as with community members, including village authorities, men, women, boys, and girls in all 15 proposed target villages. The objective was to provide information on the project's goals and various components and to gather their concerns about climate change, their participation in implementing project activities, and their needs for external support to mitigate risks and adapt to climate change impacts.

During the consultations in the 15 target villages, the villagers in Savannakhet have raised different concerns related to the problems they are facing in connection with climate change. The villagers in Savannakhet raised the issues of natural disasters such as flood, drought, extreme cold weather and pest that have affected their agricultural production and well as their livestock and thus their livelihoods. The detail of stakeholder engagement and consultation activities and record are provided in the stakeholder engagement plan in the ESMP.

During this ESIA, stakeholder consultation was carried out at the district and village level as demonstrated by conducting workshop and field site visited are conducted from 01—03 July 2025.

8.1 ESIA and ESMP Workshop

A consultative workshop on ESIA and ESMP was organized at Kaisone City, Savannakhet Province, on 01 July 2025. The workshop was organized to present and discuss the draft ESIA and ESMP reports with key stakeholders, including government agencies, local authorities, and community representatives. The participants provided constructive feedback on the potential environmental and social risks, mitigation measures, and implementation arrangements. After the workshop, a field verification of proposed infrastructure locations was also conducted in addition to assessing any unforeseen environmental and social risks. The workshop was successful in generating understanding and awareness about the importance of Free, Prior and Informed Consent (FPIC) and grievance redress mechanism and receiving consolidated feedback from stakeholders to finalize the draft ESIA and ESMP reports.

Altogether, 36 participants attended the workshop consisting of the representatives of the Ministry of Water Resources, MAE, PONRE, respective target districts and respective target villages. The discussions focused on integrating sustainable practices and stakeholder engagement to enhance mitigation measures for all subprojects. Participants also shared insights on local challenges and opportunities, fostering collaboration for effective implementation of the project's goals[39].

The participants' discussion addressed the following points.

Table60: Issues under discussion during the ESIA workshop

Components	Topics Discussed	Concerns
Representative of the Ministry of Water Resources	• The importance of infrastructure for flood and drought resilience in water resource management • Protection of high-risk areas vulnerable to extreme weather events • Mitigation of widespread damage from floods and droughts • Long-term protection for communities and ecosystems • Critical solutions: flood protection levees and riverbank stabilization • Identification of five high-risk districts for prioritized infrastructure development • Advantages of structural measures: immediate physical protection, erosion prevention, waterway stabilization • Importance of finalizing risk assessments for flood-prone zones • Need for securing funding for infrastructure projects • Integration of drought mitigation strategies, such as rainwater harvesting, into water management plans	**Negative Concerns:** - Requires significant funding and long-term maintenance. - Final risk assessments are still pending. - May overlook ecosystem-based or nature-based alternatives. **Positive Concerns:** - Provides immediate physical protection for vulnerable areas. - Supports long-term climate resilience and water stability. - Complement early warning systems and planning.

[39]List of participants is attached in ESMP separately.

Representative of MAE	• Landscape and social surveys to assess environmental conditions, terrain, and community needs • Ensuring alignment of infrastructure development with ecological and social requirements • Stakeholder concerns and feedback regarding design and implementation • Minimizing disruption to local livelihoods in infrastructure design • Incorporation of traditional water management knowledge • Ensuring long-term sustainability of infrastructure solutions • Potential displacement and changes in land use • Equitable distribution of project benefits • Significant environmental and social (E&S) impacts • Mitigation strategies, including eco-sensitive design and reforestation	**Negative Concerns:** - Risk of displacement and disruption of local livelihoods. - Potential environmental damage (e.g., altered water flow, erosion, habitat loss). - Unequal benefit sharing if not carefully managed. - Need for compensation and mitigation frameworks still pending. **Positive Concerns:** - Incorporates traditional knowledge and local needs. - Promotes long-term sustainability through inclusive design. - Raises awareness of environmental and social risks early on. - Encourages proactive community engagement.
Representative of UNDP project team	• The project aims to enhance flood and drought resilience infrastructure in Nong and Sepone districts. • Comprehensive landscape surveys are carried out to identify hydrological risks and vulnerabilities. • Detailed assessments confirm high-risk zones and facilitate engagement with local stakeholders to match infrastructure planning with community needs. • The design and engineering phase includes solutions like flood protection levees and riverbank stabilization. • Environmental and social (E&S) safeguards are incorporated to minimize habitat disruption or displacement. • An open bidding process is implemented to select contractors, ensuring transparency and competitive pricing. • The project consistently prioritizes site-specific conditions and integrates local feedback and traditional knowledge at every stage to maintain a balance between technical effectiveness and socio-environmental sustainability.	**Negative Concerns:** - Potential for habitat disruption or displacement if safeguards fail. - Risk of delays or inefficiencies if local input isn't fully integrated. - Bidding process may favour lowest cost over quality or local inclusion. - Requires careful oversight to maintain E&S integrity during construction. **Positive Concerns:** - Uses detailed risk assessments and local input for targeted planning. - Incorporates E&S safeguards from the design phase. - Promotes transparency through open bidding. - Balances engineering with traditional knowledge and community needs.
International Consultant	• The main goal of Environmental and Social (E&S) assessments is to proactively identify and mitigate negative impacts of infrastructure projects. • E&S assessments help maximize benefits for both ecosystems and communities. • These assessments involve systematic evaluation of risks such as habitat disruption, displacement, and resource inequities. • They guide the project team in designing specific safeguards, refining plans, and implementing corrective actions. • E&S assessments help minimize harm and can transform challenges into opportunities (e.g., landscape restoration, boosting community resilience, and creating local jobs). • Overall, E&S assessments are essential for balancing development with sustainability, transforming potential adversities into lasting positive outcomes for society and the environment.	**Negative Concerns:** - If poorly done, assessments may overlook key risks. - Mitigation measures may be underfunded or inadequately enforced. - Risk of tokenistic assessments without genuine community input. - May delay project timelines if findings require redesign. **Positive Concerns:** - Helps avoid or reduce negative impacts like displacement and habitat loss. - Enables more sustainable and socially inclusive project design. - Can lead to co-benefits like land restoration, resilience building, and local jobs. - Strengthens planning and accountability.
Representative of DWR of Songkhone District	• Shelters will be built on 5 hectares of public land in the village.	**Negative Concerns:** - Risk of temporary inconvenience to roadside residents during construction.

	• Site selection was based on a collaborative socio-economic survey to minimize environmental and social impacts. • The site is located at a safe distance from residential areas to reduce community disturbance. • Material transport and road safety will be carefully managed during construction to protect workers and residents. • Operational phase includes riverbank stabilization and construction of a pond positioned away from the village. • All activities are coordinated and agreed upon with district stakeholders to ensure alignment with local regulations and needs. • Excavated soil will be reused to improve local access roads as a sustainable practice. • Special measures will be taken to minimize inconvenience for residents living along access roads during construction.	- Environmental disturbance from material transport and pond excavation. - Potential road safety risks if not properly managed. - Needs close monitoring to ensure compliance with safeguards. **Positive Concerns:** - Site selected to avoid major E&S impacts and community disruption. - Strong coordination with local authorities ensures local alignment. - Soil reuse supports sustainable construction practices. - Plans include road safety and construction-phase risk mitigation.
Xonnabouly District Governor	The project has garnered strong community support, with no major concerns raised regarding the ESMP impacts. Land acquisition involves public land, with fair compensation provided for affected paddy fields, and consultations have ensured local contributions to the project's development. Upgrading the village pond (a public asset) and constructing a 5km access road are key components, with minimal negative impacts and high enthusiasm from villagers, who are optimistic about the project's benefits. Post-implementation, the project's feasibility will be assessed to ensure sustainability. A key suggestion is to apply the ESMP framework to sub-project infrastructure to maintain consistent safeguards. For pond protection, measures vary by village: • Nongsavang Village prefers warning signs over fencing and agrees to planting plans but seeks clarity on dry-season maintenance. • Thamea Village supports bamboo fencing and has confirmed local contributions of materials, demonstrating community ownership. This collaborative approach ensures alignment with local needs while promoting long-term project success.	Negative Concerns: - Clarification needed for pond maintenance (e.g., dry-season roles). - Varying village preferences may complicate uniform implementation. - Need to ensure post-implementation monitoring for real sustainability. - Risk that enthusiasm may decline if tangible benefits are delayed. Positive Concerns: - Strong local support and participation. - Fair compensation for affected land. - Community-tailored solutions for pond protection. - ESMP integration proposed for long-term safeguard consistency. - Encourages local ownership and material contribution.
Representative of DONRE	• Regulatory gaps have been identified • Urgent review and alignment with current national standards are needed. • Potential negative impacts on aquatic resources—such as water flow disruption, sedimentation, and habitat degradation—require thorough assessment. • Mitigation measures (e.g., erosion control and sustainable drainage) will be integrated into project designs. • The UNDP team will collaborate directly with the Department of Natural Resources and Environment (DONRE) to address regulatory and environmental challenges. • Key actions include updating PPP guidelines, implementing ESIA recommendations for water protection, and improving coordination between UNDP and DONRE. • Overall aim is to achieve both development and environmental protection goals while maintaining regulatory compliance.	**Negative Concerns:** - Current policy gaps may delay or weaken project safeguards. - Aquatic systems remain vulnerable if ESIA findings are not implemented effectively. - Requires strong inter-agency coordination to ensure follow-through. **Positive Concerns:** - ESIA will assess and address key aquatic impacts (e.g., sedimentation, habitat loss). - Design improvements include erosion control and sustainable drainage. - Active collaboration with DONRE supports regulatory alignment. - Updating PPP frameworks will enhance long-term environmental governance.

The inspector of PONRE	• Flood levee construction in Champhone involves heavy material transport and related safety measures. • Traffic management and delivery scheduling are planned to mitigate community risks. • Budget and material quality concerns raised by contractors will be addressed through oversight and quality protocols. • The project aims to protect farmland, enhance local employment, and provide skills training opportunities.	**Negative Concerns:** - Health and safety risks from heavy transport near residential areas. - Contractor concerns about budget adequacy and material quality. - Risk of quality compromise if cost-saving measures are over-applied. - Requires close oversight to maintain structural and community safety. **Positive Concerns:** - Flood protection will safeguard farmland and reduce disaster losses. - Local employment and skills training opportunities expected. - Traffic safety measures planned to minimize community disruption. - Quality control and cost optimization strategies in place.
Nong District Governor	• Village management oversight of new infrastructure • Ensuring reliable post-implementation water access for agriculture • Commitment to transparency through official district notification and stakeholder alignment	**Negative Concerns:** - Risk of poor water access if post-implementation protocols are weak. - Oversight effectiveness depends on village management capacity. - Notification alone may not ensure full stakeholder coordination. **Positive Concerns:** - Commitment to addressing all community concerns. - Guarantees agricultural water access through proper design. - Strengthens transparency via formal district-level notification. - Promotes accountability and ongoing stakeholder engagement.
Sepone District Governor	• An official letter will be submitted to the District Authority to request delegated approval at the district level. • A comprehensive environmental impact assessment will be conducted with forest department officials. • Enhanced mitigation measures will be implemented, including reduced footprint construction and habitat protection buffers. • This strategy aims to balance water infrastructure needs with environmental conservation, while streamlining approval via district-level delegation.	**Negative Concerns:** - Location in a protected forest raises ecological sensitivity. - Risk of long-term habitat disturbance despite mitigation. - District-level approval must still align with national conservation laws. - Project feasibility may be challenged if stricter conservation standards are enforced. **Positive Concerns:** - Proactive stakeholder engagement and commitment to mitigation. - Environmental impact assessment with forest officials ensures transparency. - Reduced construction footprint and buffer zones protect habitat. - Delegating approval to the district supports locally informed decisions.
Sopsalou Village Head	• The water tank system is designed to collect headwater for 55 households, providing both domestic and partial irrigation use. • The infrastructure will utilise the existing pathway within a protected national forest area covering 60–70 hectares. • Villagers have given their consent, and the district has prepared a designated plot within the protected area. • Final project approval is pending formal authorization from the Ministry Agriculture and Environment (MAE). • The project team plans to: • Work with district authorities to complete and submit necessary documentation to MAE.	**Negative Concerns:** - Construction in a protected forest poses long-term conservation risks. - Delay risk due to MONRE's approval process. - Potential precedent for infrastructure encroachment in protected areas. - Needs strong monitoring to ensure compensatory measures are effective. **Positive Concerns:** - Supports domestic and irrigation needs for 55 households. - Community and district endorsement strengthens local ownership.

	• Emphasise the community's support for the water security initiative. • Propose compensatory conservation actions for the affected forest area.	- Commitment to full regulatory compliance with MAE. - Compensatory conservation measures proposed for ecological balance.
Meuanghong Village Head	• Villagers have given their consent to the project, and the district has prepared the designated plot for construction within the protected area. • Final approval for the project requires formal authorization from the Ministry of Agriculture and Environment (MAE). • The project team's next steps: • Collaborate with district authorities to prepare and submit all necessary documentation to MAE. • Emphasize the project's community-endorsed status as a water security solution. • Propose compensatory conservation measures to offset ecological impacts on the forest area. • The infrastructure will utilize an existing pathway within a protected national forest area covering approximately 60–70 hectares. • The proposed water tank system will collect headwater to supply 55 households with water for domestic use and partial irrigation. • Construction will begin only after receiving official written approval from MAE. • Full compliance with national environmental protection regulations will be ensured while addressing the community's critical water needs.	**Negative Concerns:** - Temporary nature means storage needs must be managed annually. - Future expansion depends on continued landowner cooperation. - Flood season limitations require careful timing and logistics. - Potential risk if future land use changes around the site. **Positive Concerns:** - Thorough site evaluation avoided unsafe or high-risk locations. - Strong community support from landowner and village leadership. - Seasonal, temporary use reduces land-use conflicts. - Location balances accessibility and safety from residential areas.
Nachanyai Village Head	• The project site is on village land with small, non-valuable trees. • Good access via nearby roads and proximity to deeper forest areas. • An ethnic group's burial ground is located to the west, which is of cultural significance. • Comprehensive assessments confirm the project will not impact or obstruct access to the burial ground. • An engineered pathway ensures ongoing access to the cultural site. • Minor vegetation clearance is needed, but environmental impact is negligible. • The local community strongly supports the project, with villagers happy and excited. • The location is considered ideal due to cultural site preservation, thoughtful engineering, and strong community endorsement, despite initial minor concerns about tree clearance. • The project site is on village land with small, non-valuable trees. • There is good access via nearby roads and proximity to deeper forest areas.	**Negative Concerns:** - Minor tree clearance may concern some stakeholders. - Proximity to deeper forest areas requires ongoing environmental caution. - Must ensure long-term protection of burial site access. - Potential for future conflicts if community expectations shift. **Positive Concerns:** - Cultural site access preserved through dedicated pathway design. - Minimal vegetation clearance with low environmental impact. - Strong local community enthusiasm and support. - Thoughtful engineering addressing cultural sensitivities.
Tangalianeu Village Head	• The project upgrades an existing 0.5 hectare public pond and wetland area. • Primary goals are to enhance water storage capacity and support household and gardening needs. • Small machinery will be used, with modifications completed in a short timeframe. • Minimal disturbance expected; no anticipated impacts on air quality, noise, or vibration. • Existing village access roads will be used; no new road construction required. • Emergency signboards will be installed around the work site for safety. • The project enjoys full community support and enthusiasm from villagers. • Benefits include improved water infrastructure for daily life and agriculture.	**Negative Concerns:** - Limited size of the pond may not address broader water storage needs. - Ongoing maintenance required to sustain benefits. - Potential unforeseen impacts during construction still possible. - Reliance on existing infrastructure may limit future expansion. **Positive Concerns:** - Small-scale, short-duration works minimize disturbance. - No new road construction required, limiting environmental footprint. - Emergency safety measures planned. - Full community support and enthusiasm.

	• Modest scale of excavation and public land use means minimal environmental or social concerns. • The project is seen as an ideal opportunity to enhance water resources without negative impacts. • The project upgrades an existing 0.5 hectare public pond and wetland area. • Goal is to enhance water storage capacity and support household and gardening needs.	
Thamea Village Head	• Upgrade of the village's 0.669-hectare public pond to improve water storage and flood protection • Renovation of adjacent flood levees/dykes near the roadway • Modifications designed to enhance pond's role as a water source and aquatic habitat • No negative impact to water quality or aquatic life anticipated • Improvements expected to boost both water availability and biodiversity • Clearance of only small, non-valuable trees, with wood used for community purposes • Reinforced flood control infrastructure and expanded water resources for the village • Protection and enhancement of aquatic ecosystems, maintaining ecological balance • Minimal environmental disturbance from construction • Strong support from the local community for the project • Upgrade of the village's 0.669-hectare public pond to boost water storage and flood protection. • Renovation of adjacent flood levees/dykes near the roadway.	**Negative Concerns:** - Minor tree clearance may raise concerns for some. - Maintenance required to sustain ecological benefits. - Construction risks to water quality need careful management. - Ensuring long-term balance between infrastructure and ecosystem health. **Positive Concerns:** - Improves water availability and biodiversity simultaneously. - Flood levee upgrades reinforce community protection. - Wood clearance is reused for community benefit, avoiding waste. - Minimal environmental disturbance and strong local support.

Delivering his closing remarks, the chair of the meeting siad that all legal and regulatory requirements have been updated and duly registered. The ESMP has thoroughly outlined potential impacts and corresponding mitigation measures. The districts of Champhone, Xonnabouly, Songkhone, Nong, and Sepone have unanimously agreed to issue official letters to support the ESIA and the project, which will be submitted to the Department of Water Resources (DWR) for review. Following this submission, the Provincial Authority will expedite consultations with relevant stakeholders—including E&S experts, UNDP representatives, and district-level officials—to finalize the official approval letter and prioritize the implementation of protective infrastructure. This collaborative effort ensures compliance with environmental safeguards while addressing urgent resilience needs.

By responding to this, the international environmental and social consultant has the opportunity to emphasize the significance of the UNDP SES guideline, which mandates compliance with ESIA and ESMP to align with its requirements.

8.2 Field Visits

After the workshop, the project team and consultant conducted the field visit from 02 to 03 July 2025. The results of the meeting with beneficiaries and stakeholders are summarized in the table below.

Table61: The summary of field visits from 02—03 July 2025

Date	Consultation	Participants	Issued disccused	Concerns
02 July 2025	Songkhone village	#19	Three key protective infrastructure projects were evaluated during the village site visit. First, the riverbank stabilization project was identified as the top priority, addressing erosion risks while maintaining aquatic life and fishing production. Villagers confirmed the public land location would have no negative impacts on private properties, with no boundary or temporary access road issues. Notably, community members offered to contribute soil for reprofiling and expressed interest in developing adjacent fishing ponds.	**Negative Concerns:** - Maintenance and monitoring needed for riverbank and levee effectiveness. - Community contributions must be managed well to ensure fairness and safety. **Positive Concerns:**

			Second, the 5-hectare evacuation shelter site proved flood-resistant even during severe 2019 flooding, with no land boundary concerns or construction access issues. Third, the pond upgrade project will enhance existing levees and provide critical dry-season irrigation through a solar-powered pump system, improving agricultural water access. All three locations were confirmed to have no impact on indigenous groups. Based on community feedback, the village prioritized riverbank stabilization as most urgent, followed by the evacuation shelter, with both projects demonstrating strong local support through voluntary contributions and proven flood protection benefits.	- Riverbank stabilization prevents erosion and supports aquatic life. - Villagers are willing to donate land for soil excavation to support the construction. The pit/ quarries can be used as fish raising ponds. - Evacuation shelter site is flood-resistant with no land disputes. - No impacts on indigenous groups confirmed.
02 July 2025	Nonsavang village	#13	The proposed wetland modification and pond excavation project in Nongsavang village has received full support from local leadership and community representatives. The infrastructure development will include rehabilitation of a 600-meter canal and creation of a 0.6-hectare pond connected to modified wetlands, all to be constructed on public land. Village authorities have confirmed the site selection avoids any boundary issues with private plots and won't require temporary access roads that might disrupt surrounding areas. Key environmental considerations indicate minimal ecological impact, with only small, non-valuable trees affected and no wildlife habitats disturbed at the project site. The location has historically experienced significant flooding, with water levels exceeding 3 meters and floodwaters expanding over 1 kilometer, making the water management improvements particularly valuable for the community. The project offers multiple benefits for Nongsavang village, including enhanced water storage capacity, improved fish production, richer aquatic ecosystems, and reliable dry-season irrigation for 32 hectares of agricultural land. Community leaders emphasize that construction will cause no negative impacts while delivering these substantial improvements to local water resources and food security. This initiative represents an important step in flood mitigation and water resource management for the village, combining practical infrastructure with environmental sustainability. The strong local support and careful planning ensure the project will meet both immediate needs and long-term community benefits while preserving the area's ecological balance.	**Negative Concerns:** - Ongoing maintenance needed to sustainable benefits sharing. - Flood risk remains high, requiring adaptive management. - Potential unforeseen ecological effects during construction. - Success depends on continued local engagement and monitoring. **Positive Concerns:** - No boundary conflicts or disruptive access roads. - Minimal environmental impact with small, non-valuable tree clearance. - Enhances water storage, fish production, and aquatic biodiversity. - Supports reliable dry-season irrigation for 32 hectares. - Strong community and leadership backing.
03 July 2025	Phiaka	#29	**Flood Protection Levee Improvements** The existing flood protection levee requires critical upgrades to safeguard surrounding agricultural land from recurring flood damage. The improvement project will impact three households through boundary sharing (totaling 2,000 square meters of private land) and one additional household via a temporary 30-meter access road. Construction plans include utilizing excavated soil to expand and upgrade an access road to 4 meters wide and 300 meters long, providing both immediate project benefits and lasting infrastructure improvements for the village. **Wetland Modification and Pond Upgraded** A 4-hectare pond development forms the centerpiece of the wetland modification project. This initiative will affect two households through boundary impacts (100 square meters total) and three households via temporary construction access roads. While the area serves as a bird habitat, villagers confirm construction activities will	**Negative Concerns:** - Levee upgrades impact private land and require temporary access road use. - Pond construction affects some households and bird habitats, despite mitigation. - Evacuation shelter site is flood-prone, needing costly elevation or reconsideration. - Potential community resistance due to private land and flood risk concerns. **Positive Concerns:** - Levee improvements protect agricultural land

			cause only minimal disturbance, with strict protocols to relocate any discovered nests to nearby trees outside the project area. The enhanced pond is expected to significantly boost aquatic life and fish production, creating valuable long-term resources for the community. **Evacuation Shelter Relocation** The proposed evacuation shelter relocation near the primary school presents both opportunities and challenges. While the location provides convenient access, the site's history of 2-meter flood levels requires elevating the shelter by 2 meters for adequate protection. This flood vulnerability raises concerns about the location's long-term viability as sustainable protective infrastructure, suggesting the need for careful reconsideration of alternative sites.	and upgrade village access roads. - Pond enhancement boosts fish production and aquatic biodiversity. - Nest relocation protocols minimize ecological disturbance. - Evacuation shelter relocation provides accessible emergency infrastructure.
03 July 2025	Dongmeuang	#12	The Dongmeuang Village Flood Protection Project involves constructing a 900-meter flood protection levee and riverbank stabilization system on public land, expanded from an initial 300-meter design due to severe local flooding risks. The project has strong community support, with villagers enthusiastically welcoming the infrastructure that will enhance flood protection, reduce soil erosion, and provide a new access road along the levee. Notably, community members plan to use excavated soil from the riverbank reprofiling to create fish ponds, boosting local aquaculture opportunities. While 8 houses near the access road may experience temporary construction impacts and some villagers expressed concerns about potential delays, the overall benefits of flood mitigation and economic development through aquaculture demonstrate the project's significant value. The village's willingness to contribute soil highlights their strong engagement and ownership of this critical infrastructure initiative that will provide long-term protection against severe flooding events.	**Negative Concerns:** - Temporary disruptions for five nearby households during construction. - Some concerns over possible project delays. - Need to manage construction impacts carefully to maintain community support. - Long-term maintenance of levee and ponds must be ensured. **Positive Concerns:** - Strong local enthusiasm and ownership of the project. - Flood protection and soil erosion control improve safety and environment. - Creation of fish ponds from excavated soil enhances livelihoods. - New access road adds lasting community benefit.
03 July 2025	Sivilay	#19	The proposed upgrade of two ponds in Sivilay village aims to reinforce failing flood levees while creating water storage for dry-season agriculture, addressing the current extreme fluctuations between flood-level waters covering rice fields and complete dry-season depletion. The project has garnered strong community support, with surrounding landowners recognizing the dual benefits of flood protection for their fields and reliable irrigation during droughts - one northern landowner unable to farm currently has even volunteered to provide excavated soil for levee reprofiling. Notably, the upgrades will proceed without land boundary conflicts or construction access issues, as all affected parties understand the shared advantages. While requiring careful technical design to regulate water levels and temporary construction coordination, this community-driven initiative presents a sustainable solution to the village's water management challenges, combining flood mitigation with agricultural security through voluntary landowner participation and no private property impacts. The project exemplifies how infrastructure improvements can simultaneously solve opposing water-related problems while maintaining strong local engagement.	**Negative Concerns:** - Requires careful technical water level regulation. - Temporary construction coordination needed to avoid disruption. - Success depends on ongoing community participation. - Potential challenges in balancing flood and irrigation needs. **Positive Concerns:** - Strong community support and voluntary contributions of excavated soil. - No land boundary conflicts or access issues. - Dual benefits: flood protection and drought irrigation. - Sustainable, locally driven water management solution.

Source: Site visit on 02-03 July 2025

9 Conclusion and Recommendations

Based on the assessment undertaken, there are potential marginal social or environmental impacts present due to the project activities which are largely reversible and can be addressed through relevant mitigation measures as provided in the Environmental and Social Management and Monitoring Plan (ESMMP).

The ESIA report has assessed the overall environmental and social impacts that are likely to arise because of the pre construction, construction and operation phases of the project. The project will result in moderate adverse environmental and social impacts requiring implementation of suggested mitigation measures. The ESMP provided in the report describes the implementation mechanism for recommended mitigation measures together with post project monitoring to verify overall project performance. This ESIA study, together with mitigation measures and follow up of recommendations on management actions, will help the Project Team in complying with the environmental and social standards, as part of national regulatory and UNDP SES requirements.

Annex

Annex 1: List of households whose land is impacted by the subprojects in the target villages

Phaika Village

Head of Household name	Land use type	Areas (m2 or ha)	Permanence	Temporary		At site
				Left	Rights	
Ms. Thevee	abandoned rice field	NA	✓	✓	✓	Flood protection levee
Mr. Air and Ms. Nee	abandoned rice field	NA	✓	✓	✓	
Ms. Suen	abandoned rice field	NA	✓	✓	✓	
Mr. Noukao	Agriculture	NA		✓	✓	Access Road

Dongmeuang village

Head of Household name	Land use type	Areas (m2 or ha)	Left	Rights	At site
Mr Sisunan	House land		✓		Leree, river bank, and forest
Mrs Vanhdee	House land	Housing	✓		
Mr Khampang	House land	housing	✓		
Mrs Kheownaipo	House land		✓		
Mrs Kewudom	House land	housing	✓		
Mr Kaison	House land	housing	✓		
Mr Vilaxay	House land		✓		
Mrs Thing Thong					
Mr Phongsavanh					

Sivilay village

Head of Household name	Land use type	Areas (m2 or ha)	Left	Rights	At site
Mr. Ler Vongphachan	Garden	854 **m2**	✓		
Ms. Pahxaykhorn	Bare land	1,5 **ha**	✓		
Ms. Nou	Ricefield	2 **ha**		✓	
Mr. Phet	House land	415 **m2**		✓	
Mr. Lai	Ricefield	1,5 **ha**		✓	
Ms. Pey	Ricefield	1 **ha**		✓	
Ms. Kaisorn	Ricefield	1 **ha**	✓		
Mr. Bountherng (Yong). Ms. Noy + Mr. Som	Ricefield	1,2 **ha**	✓		

Thamae village

Private land plot will have impact by the temporary access road to construction site

Head of Household name	Land use type	Areas (m^2 or ha)	Left	Rights	At site
Mr Kongma	House land	600 m^2		✓	
Mr Kadoaung	House land	600 m^2		✓	
Mr Khan	House land	600 m^2	✓		
Mr Khamboun	Garden	1200 m^2		✓	

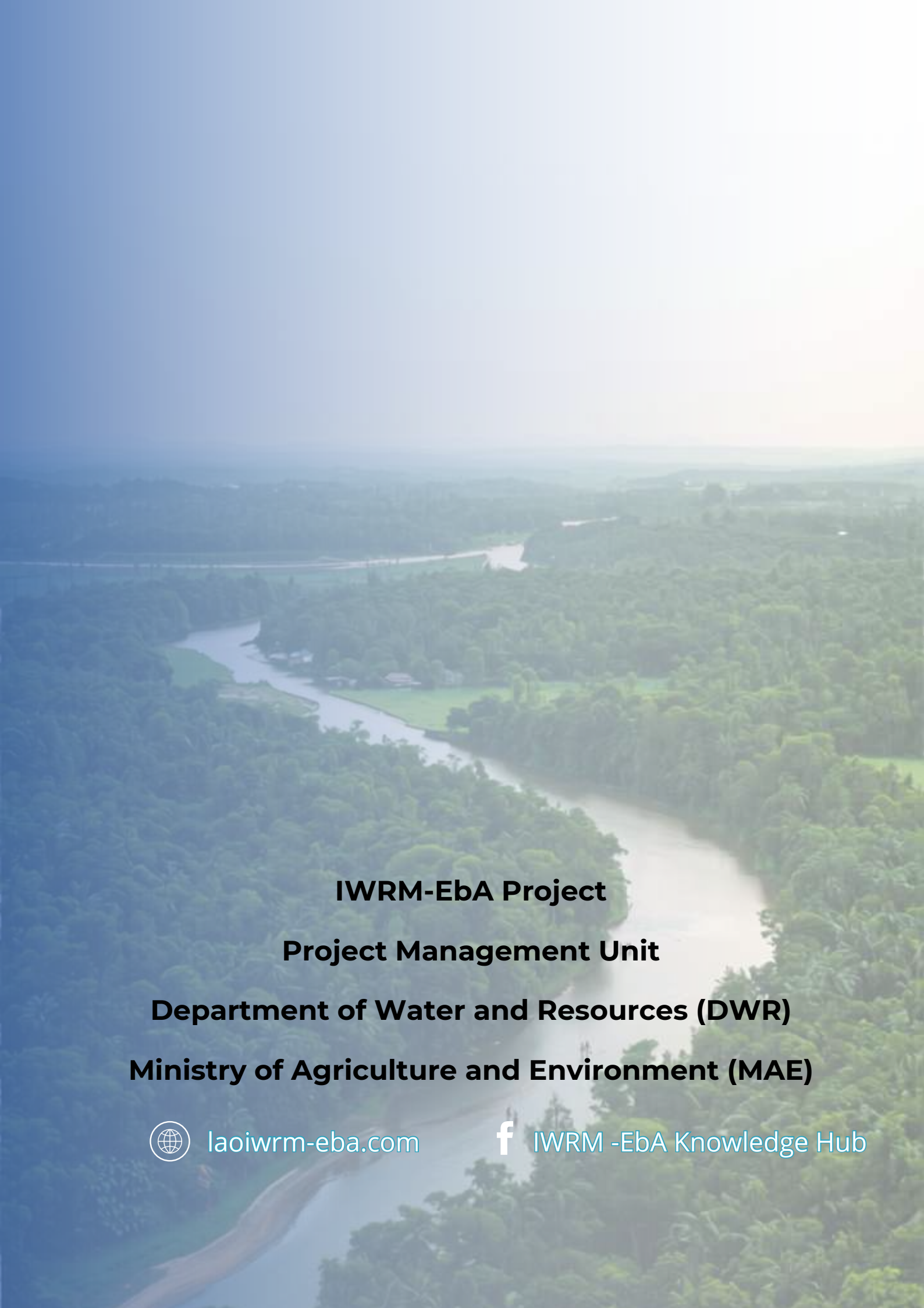
Nonsavang village

Private land plot sharing a boundary with the construction site

Head of Household name	Land use type	Areas (m2 or ha)	Left	Rights	At site
Ms. Phoutphonexay	Naseang	5,00		✓	
Ms. Khum	Naseang	3,00		✓	
Mr. Kornjun	Naseang	7,53		✓	
Mr. Phon	Naseang	5,4	✓		
Ms. Sa	Naseang	3,7	✓		
Mr. Nah	Naseang	6,03	✓		
Mr. Khumlar	Naseang	3,05		✓	

Private land plot will have impact by the temporary access road to construction site

Head of Household name	Land use type	Areas (m^2 or ha)	Left	Rights	At site
Mr. Morn		10,5		✓	
Ms. Phouy		4,00	✓		
Phi liang		2,7	✓		
Ms. Yin		1,5		✓	
Ms. Seam		3,6		✓	
Mr. Vang		5,2		✓	
Mr. Thaiy		3,7		✓	
Ms. Vela		3,00		✓	
Mr. Thon		1,00	✓		
Mr. Khong		2,00		✓	
Ms. Shai		1,00		✓	
Ms. Moh		1,5		✓	
Mr. Khumbor		0,6		✓	
Mr. Phoukhong		1,00	✓		
Mr. Mouan		1,00		✓	
Mr. Vanh		2,00		✓	



IWRM-EbA Project

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