2025

ICFMS - Champhone District

Integrated Climate-Resilient Flood Management Strategy

Aluvium and Hydrotech Consulting

Table of Contents

Figures

Tables

Abbreviations

DAFO	District Agriculture and Forestry Office
DoNRE	District Office of Natural Resources and Environment
DWR	Department of Water Resources
DMH	Department of Meteorology and Hydrology
EbA	Ecosystem-based Adaptation
EWS	Early Warning System
GEDSI	Gender Equality, Disability, and Social Inclusion
ICFMS	Integrated Climate-Resilient Flood Management Strategy
ICM	Integrated Catchment Management
Lao PDR	Lao People's Democratic Republic
IWRM	Integrated Water Resources Management
LPC	Luang Prabang City
MoLSW	Ministry of Labour and Social Welfare
MoNRE	Ministry of Natural Resources and Environment
NDMC	National Disaster Management Committee
MTC	Ministry of Technology and Communications
MoICT	Ministry of Information, Culture and Tourism
MWPT	Ministry of Public Works and Transport
PoNRE	Provincial Office of Natural Resources and Environment
UNDP	United Nations Development Programme
XBH	Xe Bang Hieng River Basin

Definitions

Flood extent: Areas affected by flood water

Riverine Flooding: Riverine flooding, also known as fluvial flooding, happens when a river, stream, or other watercourse overflows its banks due to excessive rain. This leads to the inundation of surrounding land.

Hazard mapping: This is a map that highlights areas that are affected by or are vulnerable to a particular hazard

Representative Concentration Pathways (RCP): RCP are prescribed pathways for greenhouse gas concentrations, together with land use change, that are consistent with a set of broad climate outcomes used by the climate modelling community. Emissions in RCP 4.5 peak around 2040, then decline. In RCP 8.5 emissions continue to rise throughout the 21st century.

Other technical terms are described directly in the document.

Preface

The Integrated Climate-Resilient Flood Management Strategy (ICFMS) for Champhone District, Savannakhet Province, provides a detailed Action Plan to enhance the resilience of communities to the impacts of floods and droughts and ensure effective socio-economic development that achieve the best outcome for the economy, communities and the environment. The ICFMS aligns with the direction of the Law on Water and Water Resources (revised in 2017), the Strategic Plan for the Management and Use of Water and National Water Resources until 2030, the Plan of the Natural Resources and Environment Sector, and National to district level Socio-Economic Development Plans.

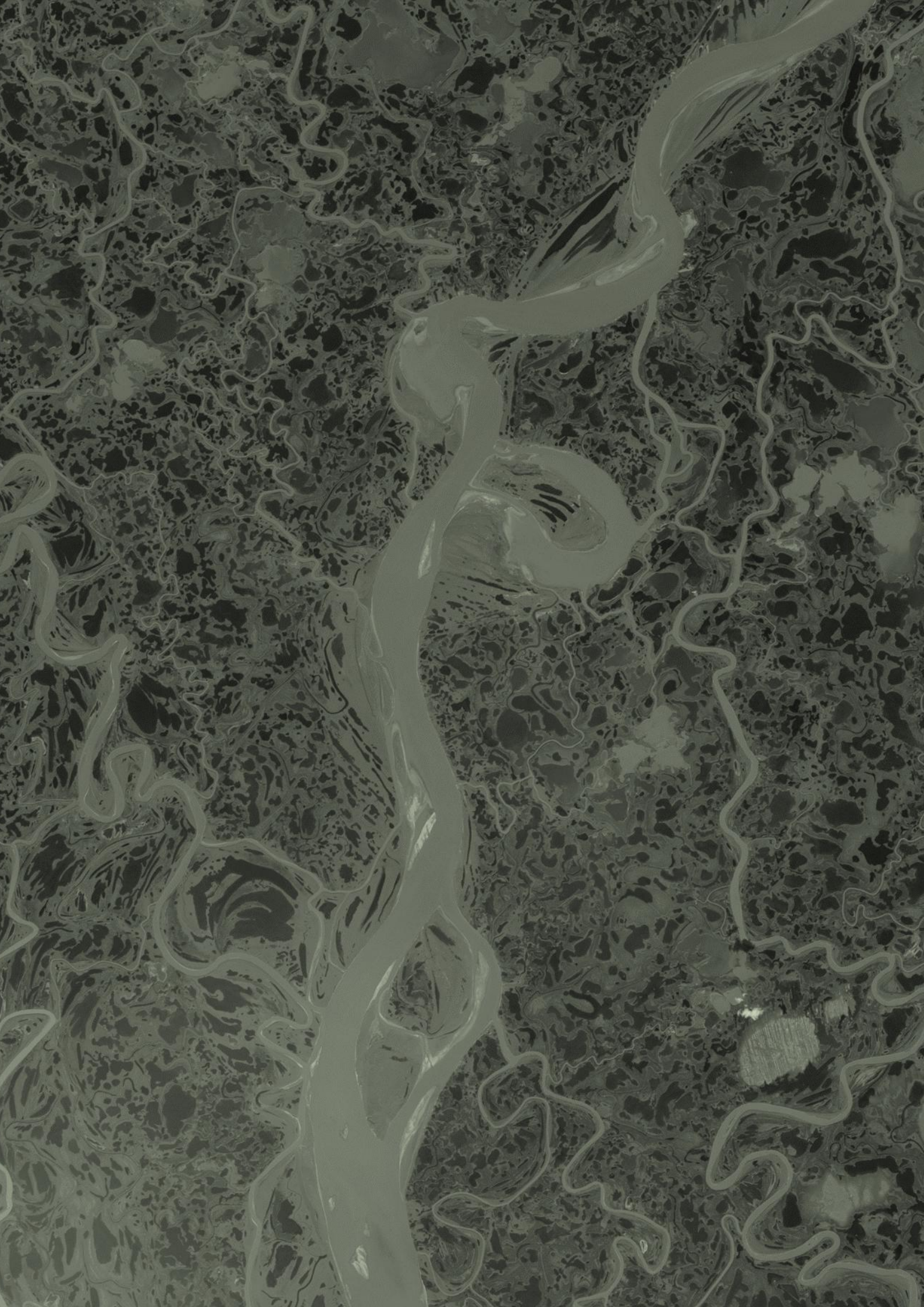
The ICFMS has been developed in cooperation with related sectors such as the Department of Water Resources, the Provincial Department of Natural Resources and the Environment and the Administration of Champhone District under the IWRM-EBA Project which is supported by the World Environment Fund (GEF) and the United Nations Development Organization (UNDP).

We on behalf of Champhone District Administration, the Natural Resources and Environment Department of Savannakhet Province and the Water Resources Department, Ministry of Natural Resources and Environment have coordinated harmoniously in developing this Strategy with support from central and local stakeholders. We will continue this close cooperation in implementing the Action Plan including with international organizations, private sector, project developers and the community in order to achieve the goal and objectives of the Strategy.

We would like to express our gratitude to the responsible committee for their hard work, conscientiousness and authority in creating this Strategy and its implementation. We also express our gratitude to the relevant parties who have contributed information and comments on this Strategy. In particular, I would like to express my gratitude to the donors who provided financial and technical support. The document will be implemented and integrated with the Socio-Economic Development Plan of the district, and relevant plans for other sectors. It will also be reviewed and updated periodically.

At Champhone District, December 20, 2024

Director of DWR | Head of the Savannakhet PoNRE | The Governor of Champhone District



1 Enhancing climate resilience of communities to floods and droughts

1.1 Background

Savannakhet Province consists of 15 districts (including Songkhone District) and 1,022 villages with a total population of about 1 million people (Lao Census, 2016). Agriculture is particularly important for the Province, with 75% of the population living in rural areas and relying on subsistence farming for livelihoods. Approximately 15,000 km^2 of the province area is used for agriculture. Rice paddy cultivation in the province supplies ~25% of the rice consumed in Lao PDR. Most of Savannakhet Province lies within the ~19,500 km^2 Xe Bang Hieng River Basin, with the river's headwaters located in the Annamite mountains along the Lao PDR–Vietnam border, in the north-eastern region of the province.

The Integrated Climate-Resilient Flood Management Strategy (ICFMS) for Champhone District aims to enhance the resilience of communities to the impacts of floods in the district, which are projected to become more intense and frequent with climate change. Flood hazard mapping for the Xe Bang Hieng River Basin shows that a large area of Champhone district is exposed to riverine flooding resulting in significant social and economic impacts. The western area of Savannakhet Province which includes Champhone District is also prone to more severe drought of longer duration. Together with the higher intensity of agriculture compared to the eastern area (upland region) of the province, the prolonged drought experienced in Champhone district is expected to pose significant economic loss to agriculture in Savannakhet Province.

The ICFMS for Champhone District outlines a strategy and set of actions over the next five years (2025-2029) to enhance the resilience of communities to the impacts of floods and droughts (including the effects of climate change) in the district. It serves as a blueprint for enhancing resilience by adopting Integrated Catchment Management (ICM), Integrated Water Resources Management (IWRM), Ecosystem-based Adaptation (EbA), and Early Warning approaches, while promoting sustainable, inclusive, and gender-responsive solutions. The ICFMS is also designed to strengthen both technical and institutional capacities, ensuring that communities can better plan for, respond to, and recover from flood and droughts.

The ICFMS covers the following key areas within its scope:

- Geographical Coverage: The strategy applies to the Champhone District within the Xe Bang Hieng River Basin, with a focus on the target rural communities in the villages of Dongmeuang, Phiaxa and Sivilai.
- Sectors: The strategy involves cross-sectoral collaboration, focusing on water resource management, land-use planning, ecosystem management, infrastructure implementation, early warning and preparedness to ensure a holistic approach to flood and drought resilience.
- Stakeholders: The project engages national and local government bodies, community organizations, civil society, and development partners to co-develop and implement the strategy. Attention is also given to involving vulnerable groups, such as ethnic minorities and women, in the planning and decision-making process.
- Timeframe: The proposed action plan spans five years, from 2025-2029, and includes short-term actions to build immediate resilience, as well as longer-term structural and non-structural actions, including infrastructure investments and ecosystem restoration initiatives.

1.2 Alignment with existing policies, plans and strategies

The ICFMS has been developed aligning with the existing policies, plans, strategies and initiatives as summarised below.

Socio-Economic Development

District

This ICFMS contributes to the goals and focus directions of the Social Economic Development Plan of Champhone District, in particular with regards to:

- Goal 1: To make the economy of the district grow with quality. Focus work plan 1: Macroeconomy is strong and stable. Focus work plan 2: Develop agriculture-forestry in a modern and sustainable direction.
- Goal 3: To improve and upgrade the material and mental living conditions of the people, especially in rural areas, to be able to do stable production, and gradually increase family income. Focus work plan 1: Develop rural areas and solve poverty so that people's lives are improved. Focus work plan 4: To promote the role and participation of women, youth, disadvantaged, disabled and senior citizens in socio-economic development.
- Goal 4: Focus on development within the province to be green and friendly to the environment, Focus Work Plan 1: Protect the environment to be balanced and prepare to deal with and respond to risks from natural disasters, Work Plan 2: Manage and use natural resources sustainably.

Province

The ICFMS contributes to the 5-year Socio-Economic Development Plan (2021-2025) of Savannakhet province by supporting the target economic growth rate, protection of nature and the environment, and use of natural resources effectively to benefit society.

National

The ICFMS contributes to the National Strategy on Socio-Economic Development (2016-2025) by supporting continuous economic growth in the direction of quality, balance, and sustainability. The ICFMS also aligns with the protection of nature and the environment and use of natural resources effectively in a sustainable, effective and green direction. Finally, it contributes to Goal 8 of the National Sustainable Development Goals (SDGs) to promote continuous, inclusive and sustainable economic growth.

Watershed Management

This ICFMS contributes to the Xe Bang Hiang Watershed Management Plan (2021-2025) six programs: (1) Create a management mechanism and participate in the management of the catchment area (2) Manage the use of water and water resources (3) Manage information on water and water resources (4) Protect and restore water and Water resources (5) reduce the effects of floods, droughts and climate change and (6) manage land, forests, environmental protection and pollution control.

Disaster Management

This ICFMS contributes to the “Disaster Risk Reduction Strategy in Savannakhet Province until 2035” in particular with regards to capacity building for disaster prevention and risk reduction, and disaster control.

Climate Change

The ICFMS contributes to the Actions Plans in the National Strategy for Climate Change By 2030 in particular: 1) Develop, manage information systems, report conditions, events and effects of climate change; 2) Strengthen the resilience and the ability to adapt to climate change for basic infrastructure, production systems, businesses, services, ecosystems and communities as well as all sectors that are vulnerable and affected; 3) Promote education, awareness and public participation on climate change; 4) Connect and create a favourable environment to manage the impacts of climate change; 5) Strengthen organisations and human resources to manage climate change. The ICFMS also contributes to Sustainable Development Goal 13 to take urgent measures to combat climate change and its impacts.

Anticipatory Actions

The Lao Government is currently collaborating with the Food and Agriculture Organisation (FAO) to develop Anticipatory Action Protocols for agricultural drought. It is an Early Warning System consisting of trigger points (risk level) informed by an Effective Drought Index (EDI) using rainfall observations and forecast data. Anticipatory Actions are proposed to reduce negative impacts of droughts including food security and farmers’ income due to crop and livestock damage and loss. The FAO is also working the Department of Meteorology and Hydrology (DMH) on flood trigger points and Anticipatory Actions for livestock evacuation. The trigger points are informed by rainfall observations and forecast which are in turn used to forecast river water levels. The system is being tested with the intent that it will be deployed to DMH.

Early Warning

Early Warnings For All (EW4ALL) 2024-27 is a special initiative of the United Nations (UN) Secretary General, which aims to spearhead action to ensure every person on Earth is protected by early warning systems by 2027. Under the umbrella of EW4ALL, Lao People's Democratic Republic (Lao PDR) aims to scale up prior efforts and strengthen national early warning systems

According to the EW4ALL Road Map for Lao PDR (United Nations, 2024), the DMH has undergone major upgrades in terms of their observation network and forecasting systems. However, there is now an increased demand for localized and actionable early warning information among agencies and end-users from different sectors, including agriculture and disaster risk management. This is important to help build trust in warning services amount communities. The report also outlines that communities lack of knowledge about risks and appropriate responses. Furthermore, the 9th National Socio-Economic Development Plan (NSEDP) emphasizes the need to strengthen the capacity of disaster management committees in central, provincial and district level in disaster risk reduction and preparedness. It also aims to improve the quality of reporting and effectiveness of news alerts related to temperature, weather, earthquakes, and water levels. Gaps and proposed activities in the Road Map that are relevant to addressing challenges at the district and village community levels for this project are outlined in Section 5.

Conservation Strategy

This ICFMS contributes to the Wetland Management Plan of the Xe Champone wetland Ramsar area. The Wetland Management Plan promotes the process of management, protection, and development of land resources around the water, land, forests and other resources in a harmonious manner, appropriate to the site context, and closely coordinated to ensure the highest economic-social and environmental outcomes. Finally, the ICFMS contributes to the Sustainable Development Goal 15: To protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

1.3 Process for developing strategy

The ICFMS for Champhone District forms part of a larger project titled "Integrated Water Resource Management and Ecosystem-based Adaptation in the Xe Bang Hieng River Basin and Luang Prabang city" (referred to as the IWRM & EBA Project).

The IWRM & EBA Project is funded by the Global Environment Facility (GEF) and delivered by the United Nations Development Programme in the Lao People's Democratic Republic (Lao PDR). This project aims to support the government of Lao PDR to promote the integrated management of land and water resources for targeted rural and urban communities in the Xe Bang Hieng River Basin (XBH) and Luang Prabang City (LPC).

The IWRM & EBA Project has three Outcomes:

- Outcome 1: Enhanced national and provincial capacities for integrated catchment management and integrated water resource management in target rural and urban communities.
- Outcome 2: Reduced flood risk through headwater conservation, restoration and protective infrastructure, supported by climate-resilient and alternative livelihoods.
- Outcome 3: Effective knowledge management and Monitoring and Evaluation (M&E) through awareness/advocacy and monitoring of climate change impacts and adaptation opportunities in target rural and urban communities.

Outcome 1 consists of two Outputs:

- Output 1.1: An assessment of EbA and protective infrastructure options for XBH and LPC, flood- and drought-risk maps of XBH, and an economic evaluation of urban ecosystem services for LPC.
- Output 1.2: ICFMS developed for LPC and the XBH Basin, supported by an updated hydrometeorological monitoring network, early-warning systems (EWS) and revised emergency procedures for the XBH Basin.

This ICFMS is part of Outcome 1.2 and builds on the data gathered from previous risk mapping and hydrological models (from Output 1.1). These strategies will align with broader IWRM and ICM goals, ensuring that interventions are sustainable and support long-term climate resilience.

The development of the Champhone district ICFMS has been highly consultative, with multiple stakeholder consultations to seek inputs and review from village, district, provincial and central level stakeholders (Figure 1). The process was also guided by the key approaches outlined below – ICM, IWRM, EbA and Early Warning Systems.

Figure 1. *Process and timeline adopted in developing ICFMS*

Integrated Catchment Management

ICM is a process that recognises "catchment" as the organising unit for understanding and managing ecosystem processes in a context that includes social, economic and political considerations, and guides communities towards an agreed vision of sustainable natural resource management in their catchment.

Integrated Water Resource Management

IWRM is a process that promotes the coordinated development and management of water, land and related resources to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. The basis of IWRM is that the many different uses of finite water resources are interdependent, and that unregulated use of scarce water resources (surface and groundwater) is wasteful and inherently unsustainable.

Ecosystem based Adaptation

EbA, also referred to as Nature-based Solutions (NbS), harnesses biodiversity and ecosystem services to enhance the resilience and reduce the vulnerability of people and the environment to climate change (Figure 2). EbA involves the conservation, sustainable management and restoration of ecosystems (such as forests, floodplains, rivers and wetlands).

Figure 2. *Ecosystem-based Adaptation conceptualised in the Driving Forces-Pressures-State-Impacts-Responses framework (Source: UNEP-UNDP-IUCN (2010)*

Early Warning Systems

The Early Warning System (EWS) analysis presented in this strategy draws on the UNDP framework for Early Warning Systems (UNDP, 2018) (Figure 3). The framework provides expected elements of successful EWS across themes of i) risk knowledge; ii) monitoring and warning system service; iii) dissemination and communication; and iv) the response capability of agencies and communities.

Figure 3. *UNDP framework for early warning systems (Source: UNDP, 2018)*

2 Situation Assessment

2.1 Geography

Savannakhet Province, situated in the central region of Lao PDR, is the country's largest and most populous province (over 1 million people). The majority, more than 75%, reside in rural areas, relying on subsistence agriculture in small villages. The province's significance lies in its connection to the Xe Bang Hieng river basin, particularly the lowland region which is crucial for agriculture. These areas contribute approximately 25% of the rice consumed in Lao PDR, playing a pivotal role in the nation's food security.

Champhone District is located in the lowland of the Xe Bang Hieng River Basin (Figure 4). The district population of 115,915 is spread across 125 villages with 4 main ethnic groups living together: Lao, Thai, Makong and Katang. Among them, the Lao people account for 77.37%, the Thai people account for 4.85%; The Magong tribe accounts for 13.92% and the Katang tribe accounts for 3.58% (Champhone City Planning Office, 2018). There are fewer villages and smaller population to the east of the district. The median village population is about 975. There are notable built areas with higher population density in four neighbouring villages in the middle of the district along the Xe Champhone River – Dong nong khoun, Kaeng kok neua, Kae Kok kang, and Kaeng kok dong villages. There three main provincial roads run through the south, west and north of the districts. The proportion of the village population considered poor (poverty headcount) is higher on the eastern, northern and western sides of the district (including Sivilai village) where poverty headcount is generally >30% (Figure 5).

The gross domestic product (GDP) of the district in 2019 reached 2,146 billion kip, an increase of 479 billion kip compared to 2014, in which:

- Agricultural sector account for 67 % of GDP.
- The industrial sector account for 18 % of GDP
- The service sector account for 15% of GDP.

The average GDP per capita of the district is 18-30 million kip or equivalent to 2,206 US dollars.

2.2 Ecosystems

A considerable area of Savannakhet Province and Xe Bang Hieng River Basin, particularly the central and eastern region (which include the upland catchments), is highly forested. The ecosystem services provided by forested land in regulating the catchment hydrology and in protecting river water quality benefit communities across the basin. Forested land promotes infiltration of rainfall and reduces surface runoff, regulating baseflow in the dry season and floods in the wet season. Forested land also uses less water than agricultural land, protecting yield in surface water systems including springs, local watercourses and main river stems. The land cover in Champhone District is comprised largely of rice paddy fields (44.5%), mixed deciduous forests (26.7%) and dry dipterocarp forests (17.0%) (see Table 1 and Figure 6). There is also significant swamp area 13,323ha in the district in proximity of Xe Champhone River (Figure 4).

Table 1. Champhone District land cover

Land cover classification	Area (ha)	%
Rice Paddy	46689	44.50
Mixed Deciduous Forest	28031	26.70
Dry Dipterocarp Forest	17831	17.00
Water	4749	4.50
Regenerating Vegetation	2543	2.40
Forest Plantation	2297	2.20
Swamp	1218	1.20
Urban	946	0.90
Other Agriculture	281	0.30
Agriculture Plantation	345	0.30
Other Land	40	0.04
Savannah	1	0.00

The Champhone District is characterised by a multitude of rivers and streams, with the majority of its area situated within the Xe Champhone River catchment area. The Xe Champhone River – a tributary of the Xe Bang Hieng River – serves as the primary waterway, complemented by an array of ponds and smaller streams. The Xe Champhone River is a major natural resource for the communities (including Dongmeuang and Phiaka target villages) providing fertile banks for farming and irrigation water supply making the district an important agricultural hub in Laos (Lao National Land Management Authority, 2015). There are also three district protection forests – Nhot Houay Bak (2,988 ha), Nongthongbak (1,095 ha) and Houay Khen (6,639 ha).

The Xe Champhone River also supports important ecosystems including the Ramsar listed Xe Champhone Wetlands – a large plain consisting of marshes, swamps, and flooded woodland forest. The proposed enlarged core zone of the Ramsar site also includes the large Sui Lake (994 ha) (Figure 4). Phiaka village and part of Dongmeuang village fall within the proposed enlarged buffer zone of the Ramsar site. The Xe Champhone Wetlands supports the largest population of the critically endangered Siamese Crocodiles in the country, as well as other species such as the endangered Elongated Tortoise. In the dry season, they provide refuge for crocodiles and fish in permanently flooded deep ponds and marshes. In the wet season, fish use the site as a spawning area and as a migration path. Local people also use the site for farming, communal fishing, and livestock raising.

Key threats to watercourses include conversion of riparian buffers to agriculture resulting in degradation in water quality from higher sediment and pollutants entering the watercourses. Threats to the Ramsar site include conversion for agriculture and disturbance to crocodile habitats due to flooding caused by the construction of weirs. These findings highlight the need to protect, restore and manage ecosystems to ensure they are healthy and continue to provide important services and resources to the communities.

2.3 Climate and hydrology

The Champhone 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 Kengkok station weather data 1990-2020). The district receives an average annual rainfall of about 1,144 mm (based on Kengkok station weather data 2003-2022) with most of the rainfall occurring during the wet season. About 90% of the flow in the Xe Champhone River is therefore during the wet season with flow increasingly significantly from June until September (based on Kengkok station weather data 2011-2020). Groundwater also likely plays a role in the hydrology of the Xe Champhone River and surrounding natural depressions. The groundwater conceptual model by Wiszniewski et al. (2005) suggests groundwater flow path starting from the main recharge zones located in the weathered and fractured bedrock aquifers at the catchment's edges, with flow moving down the topographic slope through the shallow and narrow alluvial aquifer, ultimately reaching discharge areas in natural depressions and the Xe Champhone River.

While country specific data on climate change is limited, the average daily temperatures in Southeast Asia have already risen by 0.5 to 1.5°C between 1951 and 2000 (Mastrorillo, 2016). Additionally, a Lao PDR Government report of climate vulnerability assessment in Lao PDR illustrated that the average maximum temperature in Savannakhet Province is expected to rise (2021-2050) by 1.10°C for Representative Concentration Pathways (RCP) 4.5 and 1.36°C for RCP8.5 (MoNRE, 2020). MoNRE (2020) also indicated that from 2021-2050, the average maximum rainfall in Savannakhet province was expected to rise 12.32mm and 49.6mm for RCP 4.5 and RCP8.5 respectively. Southeast Asia is also expected to see significant increases in average annual economic losses between 2005 and 2050 due to flooding with impacts on freshwater availability, food security, human health and industrial outputs (IPCC Sixth Assessment Report, 2023). This is a significant issue for Lao PDR which depends heavily on natural resources.

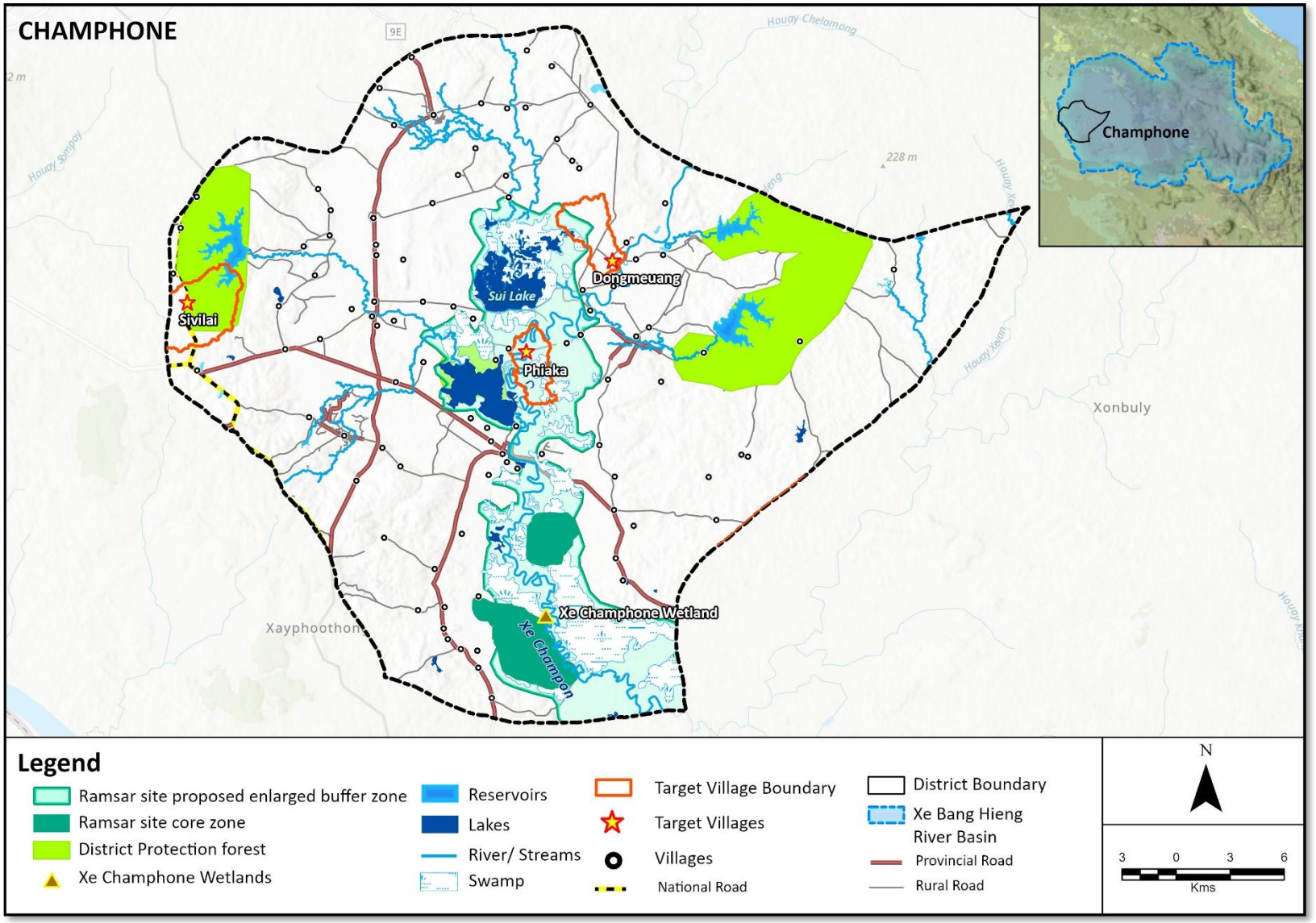


Figure 4. *Champhone District Geographic features*

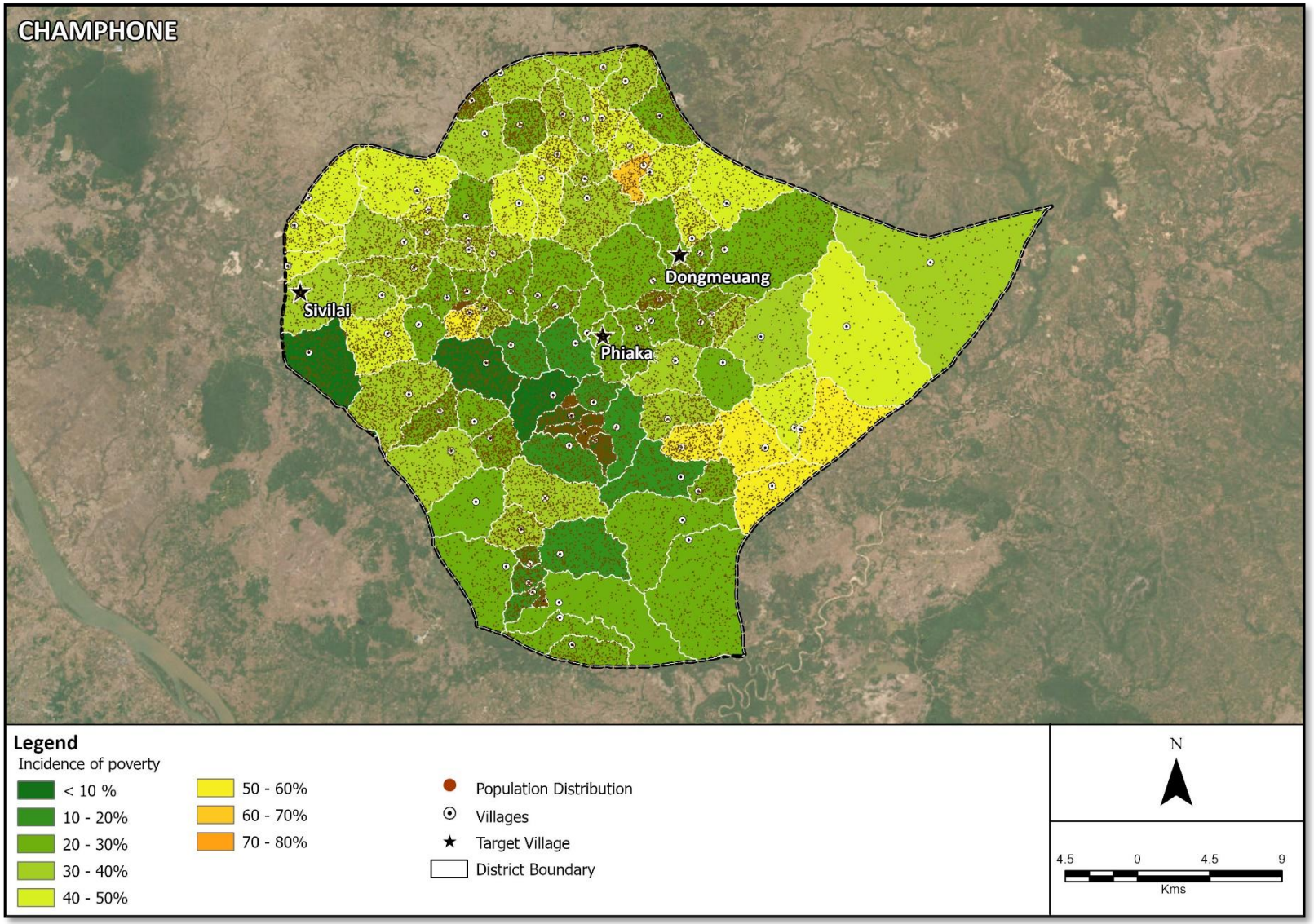


Figure 5. *Incidence poverty in Champhone District (Source: https://apps.k4d.la/analyst/)*

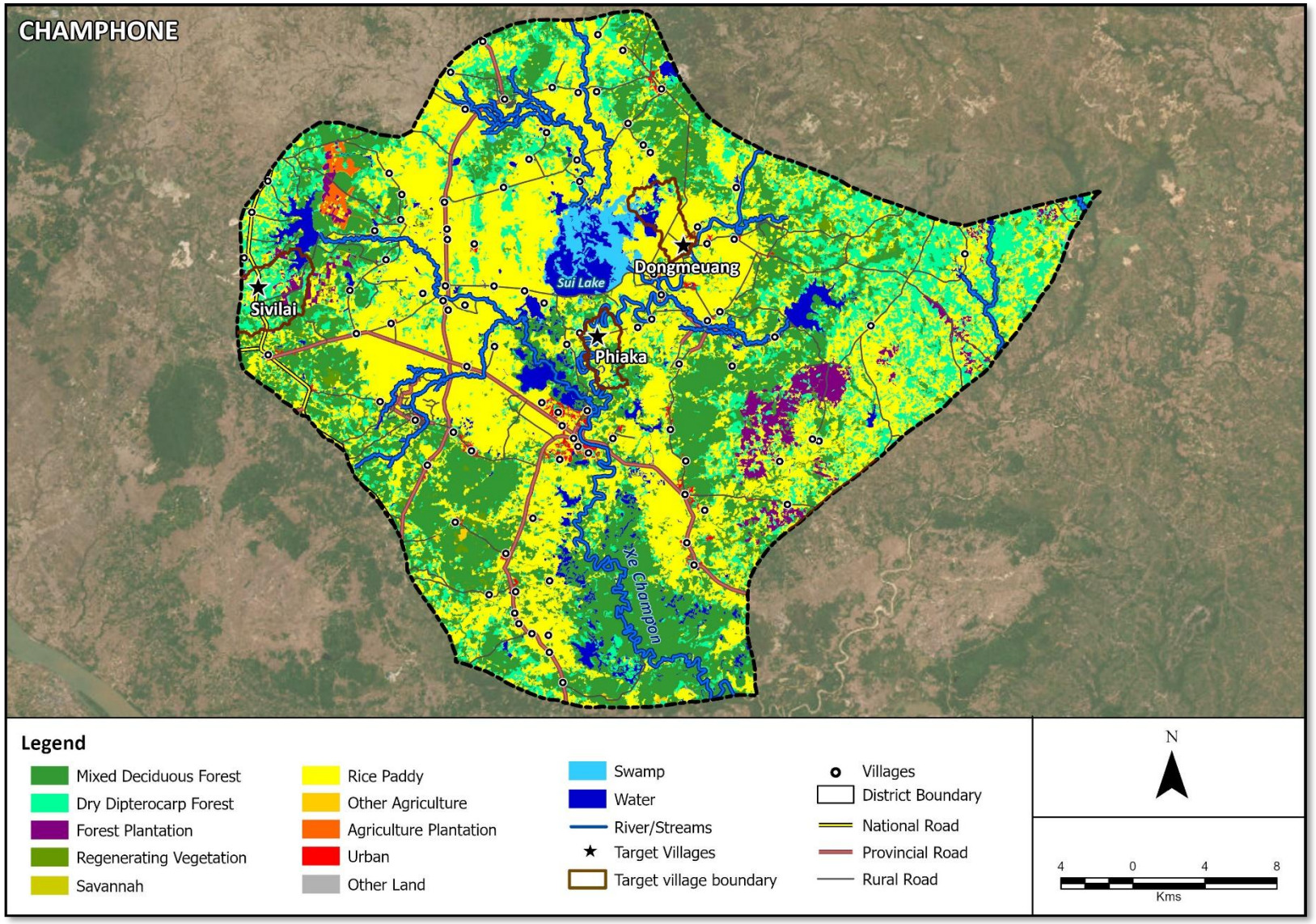


Figure 6. *Land cover in Champhone District (Source: https://apps.k4d.la/analyst/)*

2.4 Water resources

There are numerous irrigation schemes operating in Champhone District with extraction from Xe Champhone River to support rice production. According to the report on agriculture production planning for dry season (2024) from District office of Agriculture and Forest, there are 9 main reservoirs and 30 small reservoirs; 21 pumping stations; 10 irrigation systems; and 37 natural ponds in Champhone District.

There are aquifers over the Champhone District including Basement, Volcanic, Schists), Sedimentary Paleozoic, Karstic, Sedimentary, Mesozoic, and Alluvial. The groundwater potential in Savannakhet as well as Champhone District is approximately 0.1-6.0 L/s (MoNRE, 2022). Groundwater extraction via community wells or household tube wells is the predominant source of water supply for domestic use villages.

Dongmeuang village

Dongmeuang village is located along the Xe Champhone River more than 50 km from the confluence with the Bang Hieng River. The village is home to 910 people living in 118 households. The village has access to piped water supply. Water demand is not fully met during peak times (morning and evening) in the months of March, April and May as the pipe water supply pressure head is limited. Several villages including Dongmeuang rely on the nearby Sui Reservoir for irrigation water supply for dry season cropping. The RAMSAR listed wetland close to Sui Reservoir is not demarcated. It is assumed that the existing irrigation channel to the north of the village is extracting water from the wetland for irrigation of the rice paddy fields. It is understood that the District Agriculture and Forestry Office (DAFO) has a limit on water extraction from the wetland, but it is not enforced.

Phiaxa village

Phiaxa village is located along the Champhone River more than 40 km from the confluence with the Xe Bang Hieng River. The village is home to 689 people living in 104 households. Households rely on bottled water for drinking. There is a perception that river water is not fit for drinking. During wet season, access to the village is impacted which affects supply of bottled water with villagers shifting to rainwater for drinking. The village has a new pipe water supply (installed 3 months ago). Only 66 households have access to piped water. Piped water is used for cooking, washing, and livestock water supply. Households without piped water rely either on household ground water tube wells or Champhone River for cooking and washing (approx. 50 households). Community groundwater wells have also worked successfully in the past. There are large areas of irrigated rice paddy fields with water extracted from the Champhone River.

Sivilai village

Sivilai is situated in the western part of Champhone district about 25 km from Xe Champhone River. It consists of four clusters. The village is home to 1683 people living in 280 households. The villagers rely on household groundwater borewells for cooking and washing and bottled water for drinking. Only 93 households have borewells, but water is shared with all households. Groundwater supply is lowest March-May when 20 litres is collected every hour. Some groundwater wells have iron content. The area of rice paddy fields managed by the village is 575 ha. The village does not have an irrigation scheme for rice cultivation. The village has two community ponds built to capture rainfall and overland flow. The pond closest to the village is used for fishing and community events. The pond further away is used for fishing, livestock water supply and irrigation of crops on private land surrounding the pond (e.g. for cash crops such as watermelon). There are numerous farm storages present outside the village (fed by rainfall and overland flow) potentially supporting fishing and livestock water supply.

2.5 Flood and drought risks

Floods

Floods and droughts impact on communities in 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 show that riverine flooding occurs primarily in the western area of the basin in the lowland regions, particularly within Champhone, Songkhone and Xonbuly 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.

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 (Figure 7 to Figure 10). A summary of flood impacts - damage costs and population affected – is provided in Table 2 (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 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 (see Appendix A). 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 show no significant risk of riverine flooding in Sivilai 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 2. 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

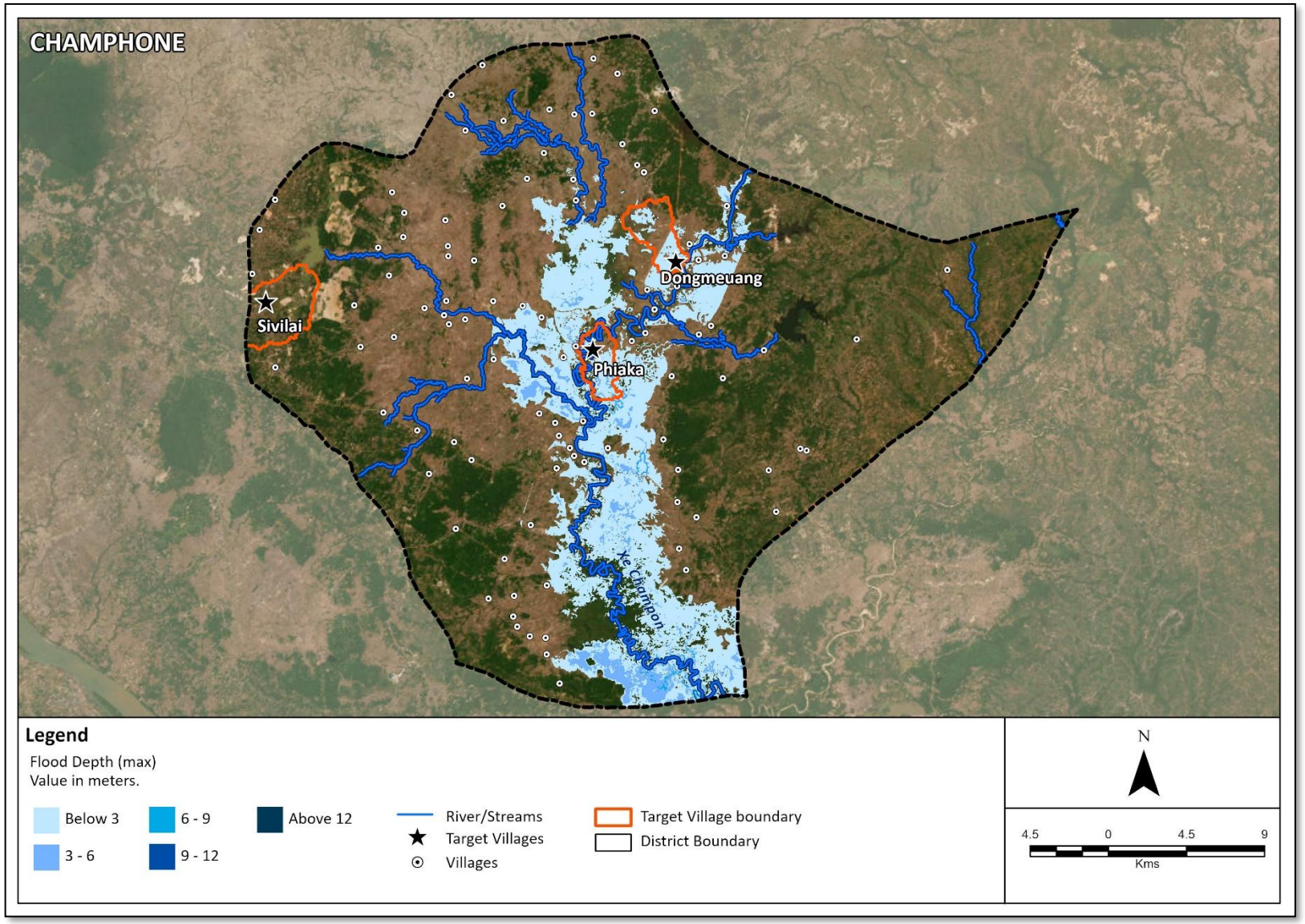


Figure 7. *Flood extent and depth for storm event with a 2-year return period (current climate)*

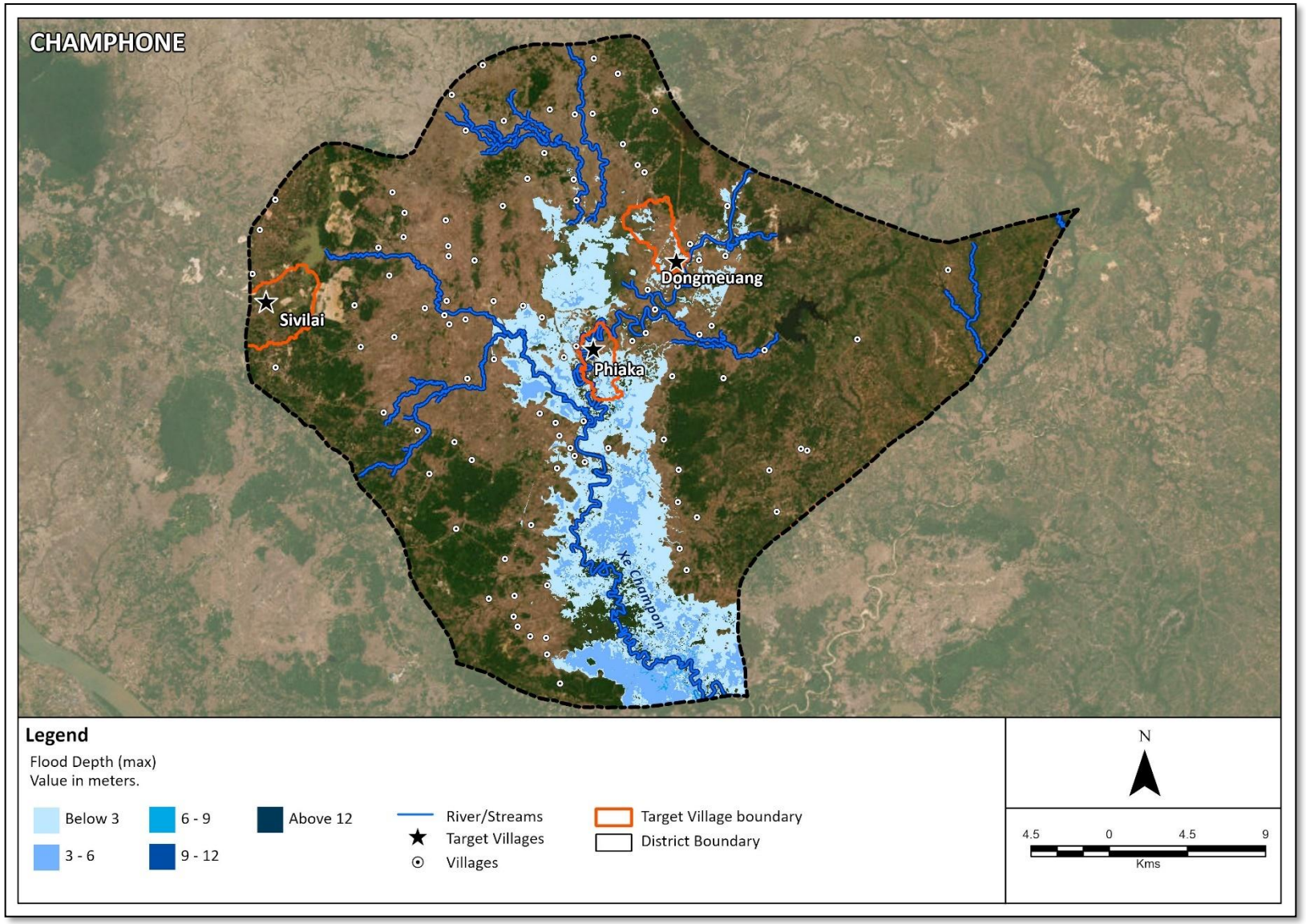


Figure 8. *Flood extent and depth for storm event with a 10-year return period (current climate)*

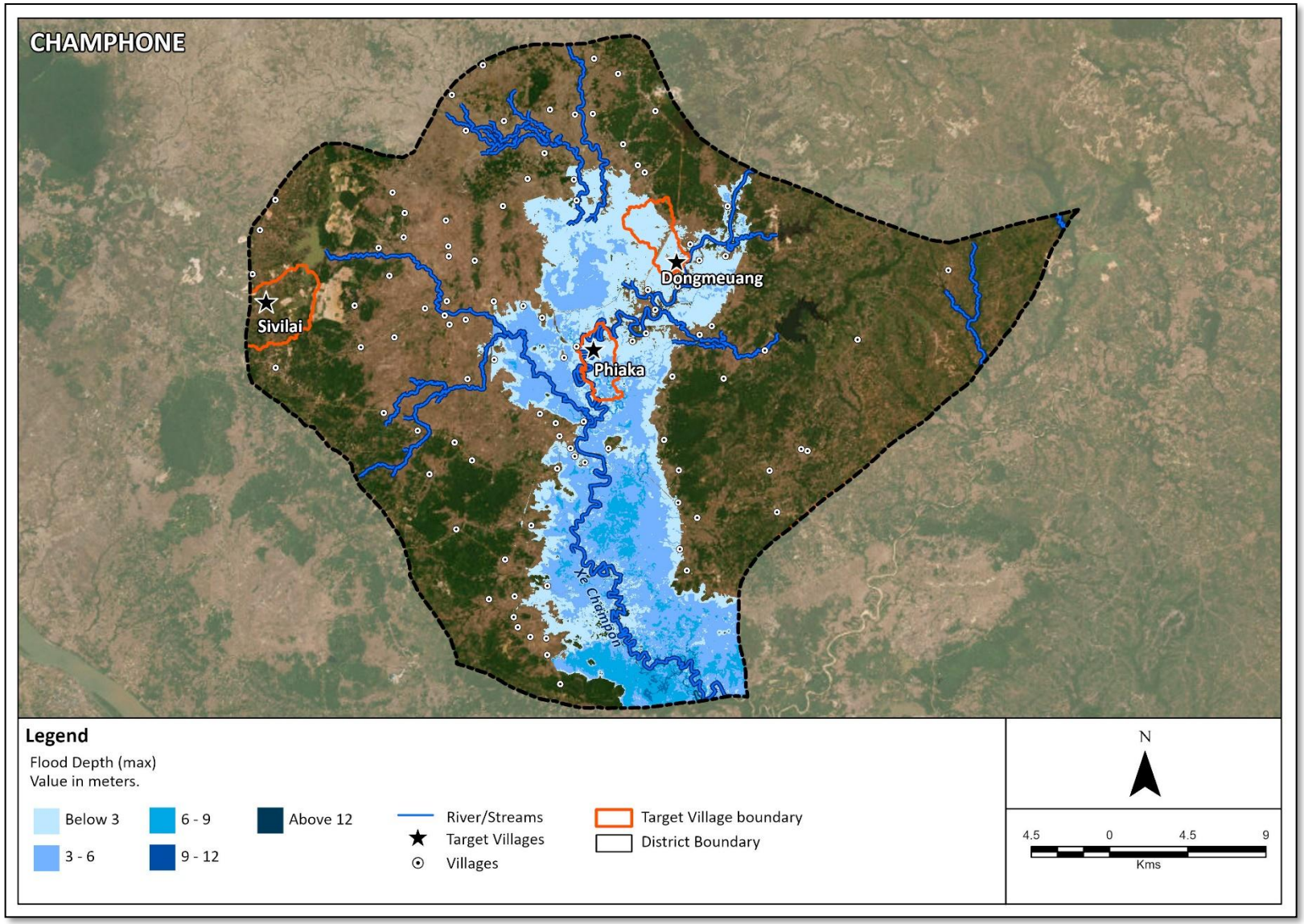


Figure 9. *Flood extent and depth for storm event with a 50-year return period (current climate)*

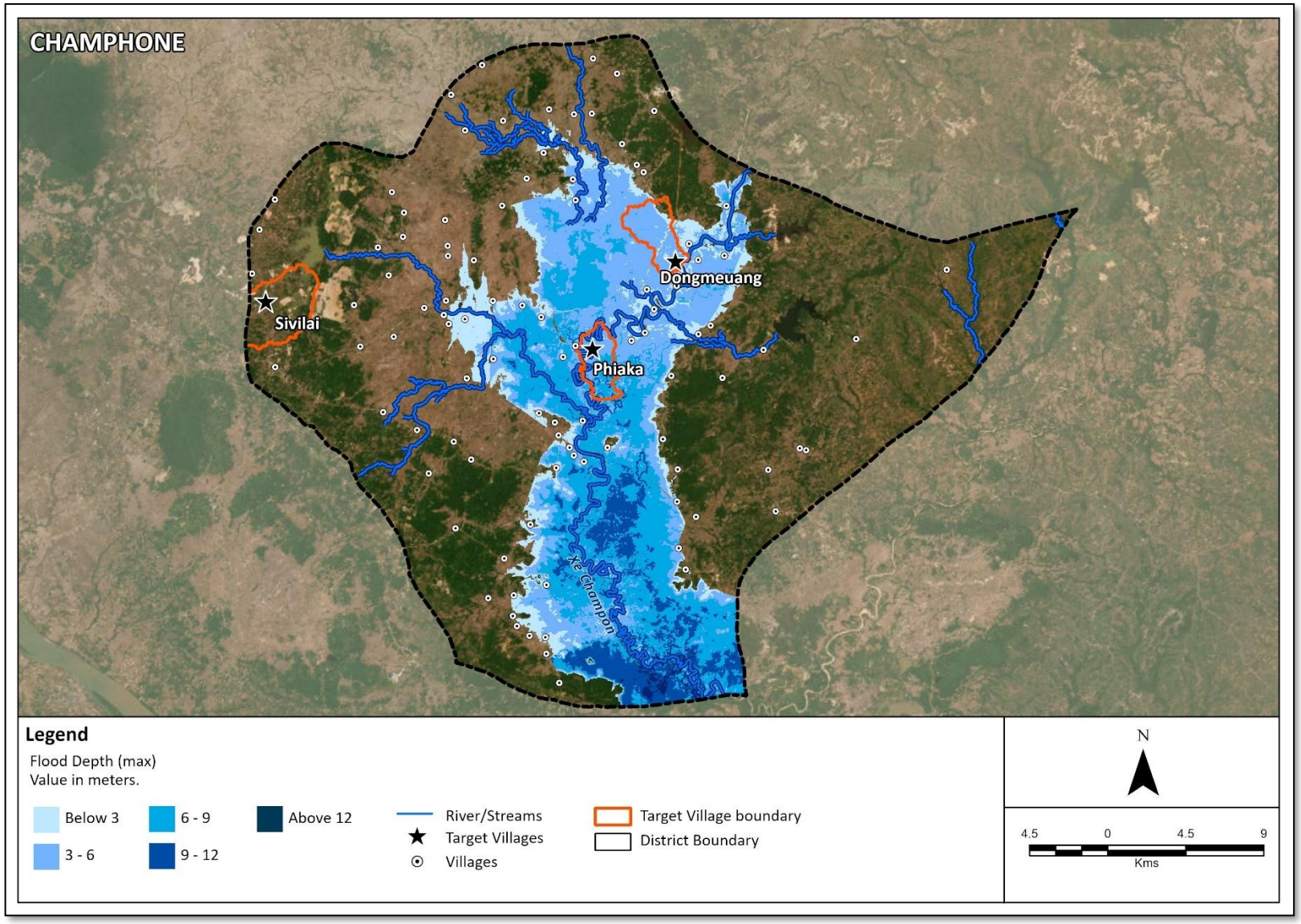


Figure 10. *Flood extent and depth for storm event with a 100-year return period (current climate)*

Droughts

The rainfall pattern in the west of the Xe Bang Hieng River Basin (lowland region) is different to the east (upland region), with longer duration of consecutive dry days (i.e. periods without any rainfall) in the west for the 5-, 10, 50- and 100-year return periods (Figure 11) (Antea, 2024). This suggests that the security of water supply from rainfall driven systems such as ponds, local watercourses, and shallow springs is more vulnerable in the lowland region (including Champhone District) with such systems drying up or ceasing to flow more regularly.

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 (including Champhone District) 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 (including Champhone District) 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 (including Champhone District) is likely to experience 'extremely dry' condition with a 50-year return period.

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. Sivilai village to the west for instance could incur damage cost to agriculture of about $ 500,000 USD 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 $ 330,000 USD and $210,000 USD respectively.

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.

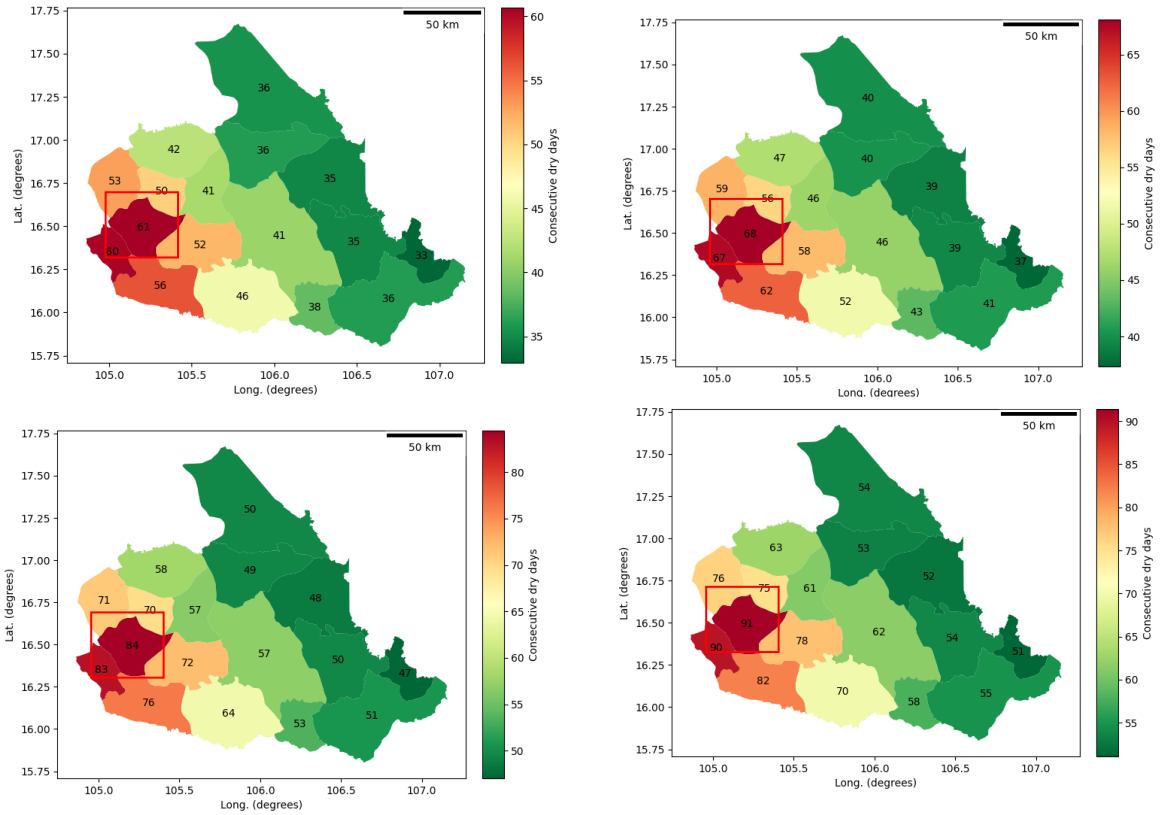


Figure 11. *Consecutive dry days (yearly mean per district) for a 5-year (left top), 10-year (right top), 50-year (left bottom), and 100-year (right bottom) return period (Source: Antea, 2024). Red Box indicates Champhone District*

Early Warning System (EWS)

The system for forecasting and warning for flood and drought in Savannakhet Province is presented in Figure 12. Under this system, the DMH of MoNRE is mandated to collect, evaluate, and disseminate information on hydrometeorological parameters including rainfall, evaporation, river water level, and flow. Monitoring and observation systems run by DMH consist of observation stations, data transmission and telecommunication networks, data processing and storage systems, and data management systems.

At provincial level, the "Water Resources" and "Meteorology and Hydrology" sectors of the Provincial Natural Resources and Environment (PoNRE) have direct responsibility for hydrometeorological data collection on daily weather data and daily water level change in each river, and provision of this data to DMH in Vientiane. At the district level, the DoNRE is responsible for compiling and collecting daily water level and rainfall data from stations installed in the district. This data is reported twice per day, except in emergency times, when they are reported more frequently depending on the level of emergency. It should be noted that the collection of hydrometeorological data is still mainly the responsibility of central agencies.

The "Meteorology and Hydrology" sector of PoNRE also has responsibility for receiving and disseminating weather forecasting from DMH to relevant agencies in the province and districts such as the Provincial Flood and Drought Steering Committee, and other line agencies including the district Office of Natural Resources and Environment (DoNRE). DoNRE in turn sends the information to District Governor and District line agencies. Information is then sent to village communities by phone. Warnings are issued to villagers through megaphones or other facilities that villages have. On a normal day, weather forecasting information from DMH is sent directly to Provincial Meteorology and Hydrology at 11 am. In the case of an emergency, DMH sends information twice per day depending on weather situation and water level, with average synoptic every 6-12 hours. It takes on average 24 hours for weather forecasting information from DMH to reach villages, but longer for remote communities that have limited communication and telecommunication services.

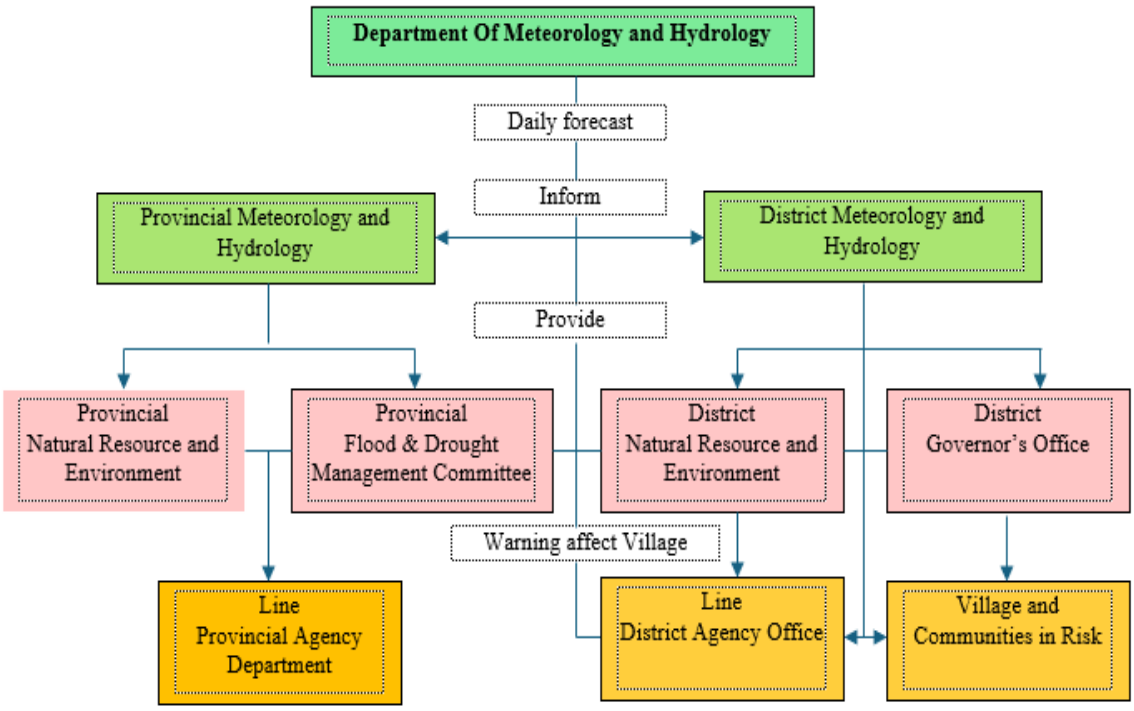


Figure 12. *The system of forecasting and warning for flood and drought in Savannakhet Province.*

Hydrometeorological infrastructure

Hydrometeorological data collection is needed for flood and drought forecasting. To improve collection of hydrometeorological data in Xe Bang Hieng River basin, the Department of Meteorology and Hydrology DMH under MONRE has recently collaborated with the Korea International Cooperation Agency (KOICA) to survey the hydrometeorological network and upgrade and install new infrastructure within several districts in the basin, including Champhone District as shown in Table 3 and Figure 13 (KOICA, 2024). In Champhone District, there is one automatic meteorological station in Dong Nok Khun village which has been established in 2022. The KOICA project has installed four automatic rain gauges including Lak 35, Lao Souriya, Dongkhammuen, and Houy Mak Yua villages. The KOICA project has also installed one automatic water level gauge at Champhone River Bridge in Kengkok Village, as well as one warning post near the water level gauge station. There is a groundwater monitoring station in Dongkhammeun and Kengkok villages. There are also 5 water level gauge stations along the rivers and irrigation systems (Table 3).

Table 3. List of Meteorology and hydrology station in Champhone District, Savannakhet Province

No	Station name	Location			Coordination		Installed Year
		Village	District	Province	Latutufe	Logitude	
I	**Meteorology station**	Dongnokkhoun	Champhone	Savannakhet	16.458056	105.185833	China 2021
I	**Warning Post**	Kengkok Nua	Champhone	Savannakhet	16.451807	105.198597	KOICA July 2024
II	**Rainfall stations**						
1	Km 35	Phonxay	Champhone	Savannakhet	16.484256	105.043136	KOICA July 2024
2	Laosouriya	Lao souriya	Champhone	Savannakhet	16.613889	105.149444	China 2023
4	Houymakyao	Houymakyao	Champhone	Savannakhet	16.536831	105.397864	KOICA July 2024
II	**Water level stations**						
1	Kengkok Bridge	Kengkok Nua	Champhone	Savannakhet	16.451944	105.198333	DMH 1988
2	Soui Irrigation	Donnyaeng	Champhone	Savannakhet	16.519928	105.19565	CAWA project, 2020
3	Bak Irrigation	Huamuang	Champhone	Savannakhet	16.463157	105.200521	CAWA project, 2020
4	Chieu Irrigation	Dongmakmi	Champhone	Savannakhet	16.323619	105.224466	CAWA project, 2020
5	Koutkhaen	Dondaeng	Champhone	Savannakhet	16.477057	105.22215	CAWA project, 2020
6	Nong kan	Kengkok dong	Champhone	Savannakhet	16.435271	105.198516	CAWA project, 2020
sources: Provincial Natural resources and Environment of Savannakhet							

Warning service

Early warning service is crucial for safeguarding communities and ensuring resilience against floods and droughts. However, the system of early warning in provinces and districts across the country is not well established. Early warning messaging as often advice is too broad, has a large geographic area and does not use easily understood language as to the expected timelines, impacts and actions communities should take. For instance, in Champhone District, flood warnings are issued via mobile phones or in the form of an official letter from the responsible agencies. However, these are generally issued during the storm event or when river water levels are already high. Furthermore, the early warning system information is not widely known among local people, despite government and project efforts to improve these systems in the Xe Bang Hieng River Basin. Specific gaps in early warning are outlined in Table 4. Addressing these gaps is essential for improving the overall effectiveness of flood and drought risk management systems and ensuring the safety and resilience of vulnerable communities.

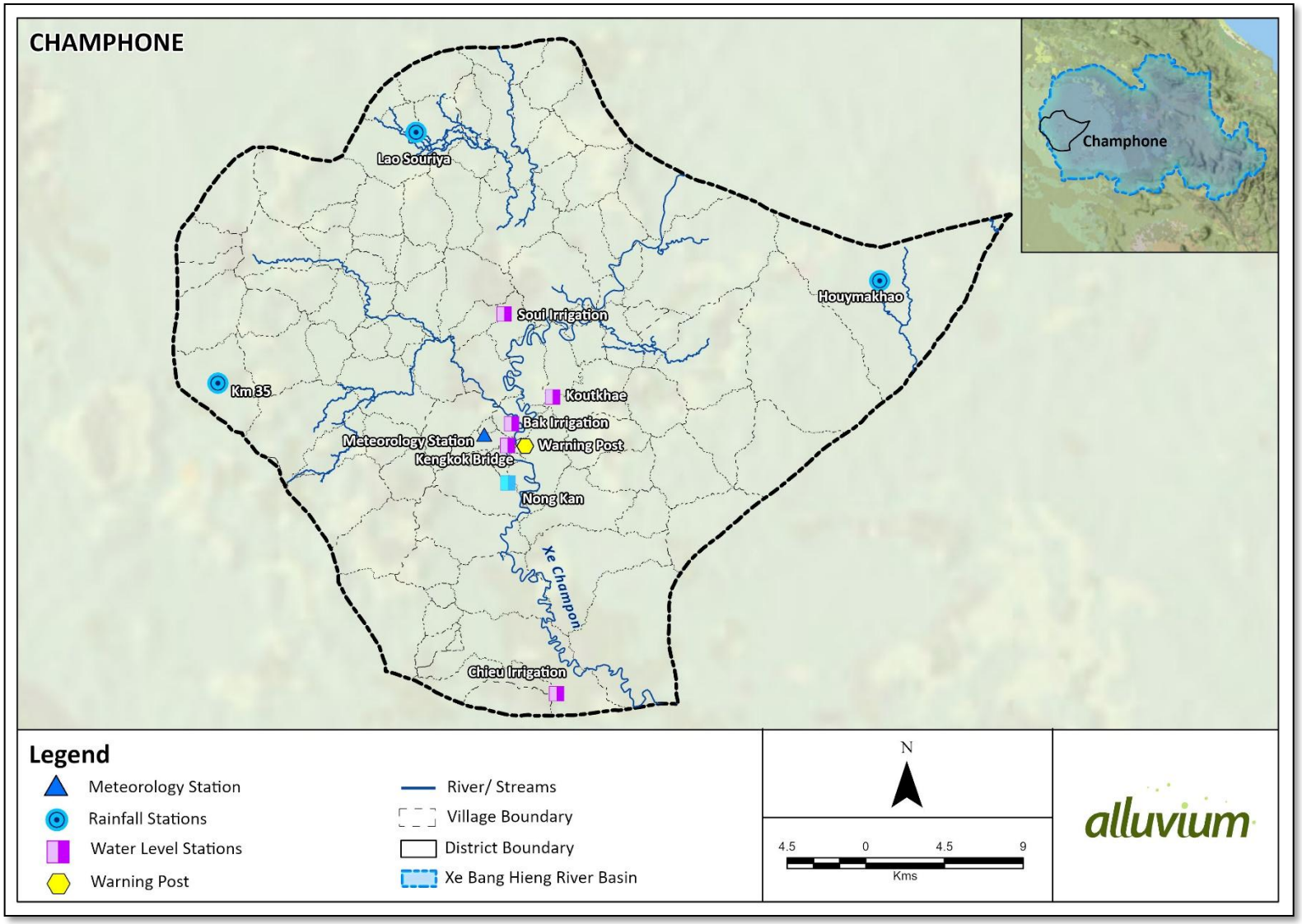


Figure 13. *Meteorology and hydrology station in Champhone District, Savannakhet Province*

Table 4. Gaps in Champhone District Early Warning System (EWS) for flood and drought hazards

Component of EWS	Gaps
Risk knowledge	• Communities lack knowledge about drought risks and appropriate responses • Insufficient assessment of areas vulnerable to flood risks
Monitoring and warning service	• Flood warning messages cover general weather forecast only are not specific enough to be an early warning for any particular area • Warnings are only cautionary and are not clear on what actions to take • No early warning system for drought • Lack of hydro information to support flood and drought forecasting. In Champhone District, consider installing new rain gauges and water level gauges in Phiaka, Dongmeuang and Sakuen Villages. • Lack of real-time data collection points • Hydrometeorological equipment is outdated • Fragmented monitoring responsibilities between central, provincial, and district levels. Responsibility is largely confined to DMH • Limited number of trained staffs for data collection and analysis (for forecasting) and limited annual budget for equipment maintenance. • Village leadership do not understand the need for hydrometeorological monitoring and do not play a role in maintaining infrastructure and in data collection.
Dissemination and communication	• Forecast and warning messages can be too technical for many users particularly community representatives • Lack of sufficient trained staff in interpreting forecast and warning messages at provincial and district level • There is limitation and lack clarity regarding the coverage and reach of forecast and warning messages in the district. Early warning system information is not widely known among local people • There is no mechanism to verify that warnings have been received at the village level, communicated to residents, and how and if the information has been used. • Gaps exist in the community's understanding of the specific roles of technical agencies in providing early warning alerts and messages.
Response capability	• No common procedure at village level to respond to floods and droughts. • There is a general lack of capacity and knowledge how to respond to droughts, including water conservation in agricultural production • Community awareness and preparedness to flood emergencies is limited in some villages. However, many flood-prone villages have experience in responding to and adapting to floods • Inadequate resources to assist in flood and drought response (e.g. evacuation zones, shelters and facilities, emergency supplies) • Insufficient capacity of district officials and village leaders to improve flood resilience through land use planning, infrastructure, and building practices.

3 Action Plan 2025-2029

3.1 Goal

A 5-year Action Plan (2025-2029) is proposed for Champhone District to strengthen the climate resilience of communities to flood and drought risks.

3.2 Objectives and actions

This Action Plan will achieve this goal by implementing actions under five objectives:

1. Raise awareness of flood and drought risks, and improve community preparedness and capability to respond
2. Improve hazard forecasting and early warning services
3. Protect, restore and manage ecosystem functions and services
4. Secure water for drought
5. Improve flood defence.

Infrastructure and non-infrastructure related actions have been developed for the district to address these five objectives. Table 5 provides a description of each objective together with an estimated budget for actions under each objective over the phase of this Action Plan i.e. 2025-2029. The actions are further detailed in Table 7. Infrastructure investment has been estimated for the district in Table 6. The Action Plan (2025-2029) proposes to cover part of the infrastructure investment need. The gap in infrastructure investment can either be covered through additional funding during this action plan phase or part of the next action plan beyond 2029.

The proposed actions and budget for this Action Plan have been informed by consultation with a range of stakeholders, as well as the following two studies:

1. Infrastructure investment recommendations for addressing flood and drought risks in target villages in the Xe Bang Hieng River Basin (Alluvium and Hydrotech consulting, 2024a). The recommended infrastructure investments for Dongmeuang, Phiaka and Sivilai villages are provided in Appendix B.
2. Investment recommendations for hydrometeorological network upgrades and Early Warning System updates for flood and drought (Alluvium and Hydrotech consulting, 2024b).

During implementation of the Action Plan, it is important that prioritisation of interventions in the district is guided by the flood and drought risk spatial mapping (Antea, 2024) as well as any interventions that already exist.

The proposed investment in the Action Plan do not cover personnel costs within the lead organizations which have been nominated to be responsible for delivering the actions. It is assumed that this delivery function is covered within existing resources and staffing of the lead organisations.

Table 5. Action Plan objectives and proposed investment for 2025-2029 phase

Objectives	Description	Proposed investment for 2025-2029 (USD)
Raise awareness of flood and drought risks, and improve community preparedness and capability to respond	• Raise awareness and understanding of flood and drought risks (and the effects of climate change on floods and droughts), including related information and warnings sent by responsible agencies • Improve public and institution preparedness to respond to floods and droughts, including access to essential equipment and facilities during emergencies	$680,000 ($500,000 in on infrastructure)
Improve hazard forecasting and early warning services	• Upgrade infrastructure that delivers forecasts and warnings • Improve dissemination of clear and actionable warning messages to those at risk	$334,000 ($180,000 in on infrastructure)
Protect, restore and manage ecosystem functions and services	• Actions to reduce threats to and improve management of ecosystems (such as floodplains, wetlands, swamps, rivers, riparian areas, forests, etc.) to sustain their hydrologic functions and reduce effects of floods and droughts (e.g. baseflow protection and peak flow buffering) • Includes capacity building on conservation and management of ecosystems and sustainable land use practices	$1,675,000 ($1,000,000 in on infrastructure)
Secure water for drought	• Implement village-scale infrastructure to secure water for drought targeting drinking water and domestic water needs, and local-scale gardens plots and livestock needs (e.g. community borewells, household rainwater tanks, water filters, community ponds and associated water supply infrastructure such as groundwater and river water pumps).	$1,545,000 ($1,000,000 in on infrastructure)
Improve flood defence	• Implement village-scale infrastructure to protect dwellings and infrastructure from flooding (e.g. village ring levees, flood channels and flood retardation basins).	$1,550,000 ($1,000,000 in on infrastructure)
	Total	**$5,794,000**

Table 6. District infrastructure investment estimates with proposed investment for 2025-2029 phase

Objective	Infrastructure examples	Estimated investment required per village (USD)	# villages	Estimated investment required in district (USD)	Proposed investment for 2025-2029
Improve community preparedness and capability to respond	Flood evacuation areas and transport	$30,000	24	$720,000	$500,000
Improve hazard forecasting and early warning services	Communication and hydrometeorological monitoring equipment	$15,000	24	$360,000	$180,000
Protect, restore and manage ecosystem functions and services	Works to protect or improve condition of floodplains, wetlands, riparian areas, forests, water supply catchments	$25,000 - $50,000	125	$3,125,000 - $6,250,000	$1,000,000
Secure water for drought	Community borewells, household rainwater tanks, water filters, community ponds etc.	$60,000 - $80,000	125	$7,500,000 - $10,000,000	$1,000,000
Improve flood defence	Village ring levees, flood channels and flood retardation basins	$225,000 - $500,000	24	$5,400,000 - $12,000,000	$1,000,000

Table 7. Champhone District Action Plan (2025-2029)

No.	Theme	Action	Scale D- District V - Village	Key Responsibility	Implementation timeline 2025-2029					Estimated budget ($)
					Y1	Y2	Y3	Y4	Y5	
Objective 1: Raise awareness of flood and drought risks, and improve community preparedness and capability to respond										
1	Risk awareness raising	Develop and disseminate awareness raising videos, audios, posters, pamphlets on flood and drought risks (including effects of climate change).	D/V	MoLSW, MoNRE		X	X	X	X	30,000
2		Conduct inclusive and accessible public awareness and education campaigns for target groups (e.g., Women, Children, Older People, Illiterate, and Persons with Disabilities).	V	MoLSW /MoNRE		X	X	X	X	30,000
3	Preparedness and capability to respond	Support establishment of District Disaster Preparedness and Response Plan and District Disaster Response and Recovery Fund. Conduct drills and simulation exercises periodically aligned with the District Disaster Preparedness and Response Plan.	D/V	MoLSW, NDMC, District Military		X		X		50,000
4		Develop Village level disaster response Standard Operating Procedures (SOP).	V	MoLSW, MoNRE, District Military		X	X	X		20,000
5		Inventory assessment and provision of essential infrastructure and resources including evacuation transport (e.g. motorboats).	V	MoNRE, District Military	X	X				50,000
6		Establish flood evacuation zones and temporary or permanent emergency shelters for people and livestock.	D/V	MoNRE, District Military			X	X	X	250,000
7		Undertake a pilot flood pad project (constructed higher than the flood water level for event with a 100-yr return interval) for flood emergency evacuation (e.g. Phiaka village).	V	MoNRE, District Military			X	X		250,000

No.	Theme	Action	Scale D- District V - Village	Key Responsibility	Implementation timeline 2025-2029					Estimated budget ($)
					Y1	Y2	Y3	Y4	Y5	
Objective 2: Improve hazard forecasting and early warning services										
8	Institutional set up and capacity	Set up clear mandates, roles, responsibilities and coordination mechanisms for all stakeholders involved in hydrometeorological data collection and dissemination of forecasts and hazard warnings (including a feedback mechanism for two-way community engagement and real time reporting to the national-level warning authorities).	D	MoNRE-DMH, MTC, MoLSW		X	X	X		30,000
9		Establish and operate a network of volunteers and the private sector to support early warning dissemination and communication.	D	MoNRE, MoLSW, MoICT		X	X	X		15,000
10		District staff allocation, training, and capacity building on hydrometeorological monitoring and data collection, understanding and relay of forecast and warning messages from central agencies.	D	MoNRE-DMH			X	X		30,000
11	Effectiveness of warning service including coverage and reach of early warning system	Undertake study to understand coverage and reach of warnings within district.	D	PoNRE	X					15,000
12		Develop and disseminate simplified standard early warnings messages.	D	MoNRE		X	X			15,000
13		Upgrade or supply new warning equipment/tools (e.g. including Information Communication and Technology (ICT) infrastructure, public loudspeakers, etc.).	D/V	MoNRE, MTC			X	X	X	120,000
14		Maintain early warning system infrastructure.	D/V	PoNRE			X	X	X	24,000
15		Conduct regular training and demonstration for local taskforces and villagers one per year.	D/V	MoNRE		X	X	X	X	20,000

No.	Theme	Action	Scale D- District V - Village	Key Responsibility	Implementation timeline 2025-2029					Estimated budget ($)
					Y1	Y2	Y3	Y4	Y5	
16	Upgrade hydrometeorological infrastructure	Develop guidelines for hydrometeorological and warning system.	D/V	MoNRE	X					15,000
17		Improve hydrometeorological monitoring coverage by installing new stations where gaps exist. Upgrade or repair hydrometeorological equipment where needed.	D	MoNRE		X		X		60,000
Objective 3: Protect, restore and manage ecosystem functions and services										
18	Prioritise restoration of high-value wetland areas critical for flood retention and other beneficial uses	Undertake baseline survey, mapping, inventory, biodiversity assessment, water balance monitoring, assessment of hydrologic functions (baseflow regulation and peak flow buffering), and economic assessment.	D	MoNRE	X					100,000
19		Research, identify and prioritize restoration efforts for wetland with high biodiversity value and provision of important hydrologic functions.	D	MoNRE	X					100,000
20		Develop protection and restoration plans tailored to the specific conditions and needs of each site.	D/V	MoNRE		X	X			100,000
21		Develop a water sharing plan to ensure best mix of social, economic and environmental outcomes at each site.	D/V	MoNRE		X	X			50,000
22	Implement reforestation and vegetation restoration	Protect and restore forested land (by planting native tree and shrub species and by demarcation works) to sustain hydrologic functions and ecosystem services.	D/V	DAFO		X	X	X	X	200,000
23		Utilize appropriate revegetation techniques, including seed dispersal, seedling planting, and natural regeneration.	D/V	DAFO		X	X	X	X	100,000

No.	Theme	Action	Scale D- District V - Village	Key Responsibility	Implementation timeline 2025-2029					Estimated budget ($)
					Y1	Y2	Y3	Y4	Y5	
24		Monitor and maintain restored vegetation to ensure long-term success.	D/V	DAFO			X	X	X	40,000
25	Protect village local water supply catchments and water sources	Implement river and stream riparian buffers in local catchments to protect water quality from impacts of land use change. Avoid deforestation in local water supply catchments.	V	MoNRE		X	X	X		100,000
26		Demarcation and establishment of buffer zones around village water sources to protect them from local disturbances.	V	MoNRE		X	X	X	X	100,000
27	Rehabilitate watercourses and waterbodies	Improve condition and retention capacity of waterbodies (including oxbow lakes, wetlands and ponds) sustaining village communities	D/V	MoNRE		X	X	X	X	250,000
28		Restore natural drainage patterns and condition of degraded watercourses.	D/V	MoNRE		X	X	X	X	250,000
29	Land use planning and regulations	Undertake project to integrate flood risks into land use planning by considering options for restricting land uses in flood prone areas, regulations for flood resilient building designs, relocation of infrastructure to higher grounds (e.g. homes, buildings and key village assets) and statutory protection for floodplain areas and flood buffers (e.g. swamps).	D	MoNRE		X		X		30,000
30		Undertake project to integrate drought risks into land use planning by considering options such as protection (and demarcation) of village water supply catchments (e.g. small streams and waterbodies).	D	MoNRE			X		X	30,000
31		Identify conservation zones via conducting participatory	V	MoNRE	X	X				30,000

No.	Theme	Action	Scale D- District V - Village	Key Responsibility	Implementation timeline 2025-2029					Estimated budget ($)
					Y1	Y2	Y3	Y4	Y5	
		river/wetland/waterbody land-use planning with the local community.								
32	Capacity building	Develop and implement comprehensive capacity building plans on land use planning, ecosystem-based adaptation and ecosystem restoration	D/V	MoNRE	X					30,000
33		Develop and implement protocol for taskforce to implement plans.	D/V	PoNRE	X					15,000
34		Training/workshop for local taskforce.	D/V	MoNRE	X					15,000
35	Promote sustainable river basin management and raising awareness	Training, awareness campaign and exchange knowledge on basin management	D/V	MoNRE			X		X	20,000
36		Promotion and extension on by TV, Radio, U-tube, intervention in school lecture and other media channels.	D/V	MoNRE	X	X	X	X	X	10,000
37		Video, clip competition and drama show on sustainable river basin and local livelihoods.	V	MoNRE		X	X	X	X	10,000
38	Promote integration of socio-economic development and cultural elements in river basin management	Research and survey important natural sites for conservation in river catchments for recreation (trekking/nature trails) and to support minority cultures.	D/V	MoNRE		X				15,000
39		Strengthening permanent jobs for concern local communities.	V	MoNRE/ PoNRE			X		X	20,000
40		Exchange or lessons learnt excursion and study tour program for community leaders.	D/V	MoNRE				X		30,000
41		Demonstrate a circular economy plot for communities.	V	MoNRE		X	X			30,000
Objective 4: Secure water for drought										
42	Need assessment and survey of water sources	Survey and identify key elements of livelihood in communities affected by droughts across the district.	D/V	MoNRE	X					100,000

No.	Theme	Action	Scale D- District V - Village	Key Responsibility	Implementation timeline 2025-2029					Estimated budget ($)
					Y1	Y2	Y3	Y4	Y5	
43		Map and survey water resources including groundwater and surface water systems such as ponds and watercourses (including water quality and identifying water salinity issues).	D/V	MoNRE	X					100,000
44	Optioneering and infrastructure investments	Undertake infrastructure optioneering study to secure water for drought (drinking, domestic uses, livestock, and small-scale agriculture). Options can include community borewells, household rainwater tanks, water filters, community ponds/waterbodies and associated water supply infrastructure (e.g. groundwater or river water pumps). Where water salinity is an issue, identify potential options to manage this. Identify priority projects in the district.	D/V	MoNRE	X					100,000
45		Undertake a feasibility study for priority projects.	V	MoNRE		X				100,000
46		Based on above study, design and implement priority projects ensuring consultation and participation of local taskforces.	V	MoNRE		X	X	X	X	1,000,000
47		Monitoring of projects with local taskforces.	D/V	PoNRE			X	X	X	50,000
48	Collaboration and capacity building	Capacity building for local taskforces and engagement on key investments.	D/V	MoNRE		X	X	X	X	30,000
49		Undertake capacity building on operations and maintenance of water storage and supply systems (including household rainwater harvesting, and village-scale groundwater extraction	V	MoNRE/PoNRE			X	X		30,000

No.	Theme	Action	Scale D- District V - Village	Key Responsibility	Implementation timeline 2025-2029					Estimated budget ($)
					Y1	Y2	Y3	Y4	Y5	
		systems, waterbodies and irrigation systems)								
50		Undertake capacity building on water quality monitoring for household water uses including use of filtration devices.	V	MoNRE			X	X		15,000
51		Establish mechanisms for collaboration and information sharing (lessons learnt) among agencies and stakeholders.	D	MoNRE					X	20,000
Objective 5: Improve flood defence										
52	Optioneering and infrastructure investments	Undertake a Needs and Optioneering study (with prioritisation) for village flood defence infrastructure including village ring levees, flood channels and retardation systems. Identify priority projects in the district.	D/V	MoNRE	X					100,000
53		Undertake a Needs and Optioneering study (with prioritisation) for riverbank stabilisation works to protect village infrastructure from erosion. Identify priority projects in the district where risks are highest	D/V	MoNRE	X					100,000
54		Undertake a feasibility study for priority projects.	V	MoNRE	X	X				100,000
55		Based on above studies, undertake design and implementation of priority projects ensuring consultation and participation of local taskforces.	V	MoNRE		X	X	X	X	1,000,000
56		Monitoring of projects with local taskforces.	D/V	PoNRE			X	X	X	200,000
57	Collaboration and capacity building	Capacity building for local taskforces and engagement on key investments.	D/V	MoNRE		X	X	X	X	30,000

No.	Theme	Action	Scale D- District V - Village	Key Responsibility	Implementation timeline 2025-2029					Estimated budget ($)
					Y1	Y2	Y3	Y4	Y5	
58		Establish mechanisms for collaboration and information sharing (lessons learnt) among agencies and stakeholders.	D	MoNRE					X	20,000
									Total	$5,794,000

3.3 Implementation mechanism

The Champhone District ICFMS sets out actions for the district to strengthen the climate resilience of communities to flood and drought risks. Implementing these actions will require leadership and cooperation from Lao PDR Ministries at the central, provincial and district level.

MoNRE is responsible for multiple sectors related to the ICFMS including water resources, flood protection, hydrological monitoring and early warning, and environmental and land use planning. Therefore the success of the ICFMS rests on how effective MoNRE is in convening, engaging and coordinating all government and non-government stakeholders in the design, delivery and reporting on the proposed actions.

To avoid the risk of poor sectoral integration and coordination, a two-tiered coordination framework is proposed to provide the basis of coordination during the implementation of the ICFMS (Figure 14**Error! Reference source not found.**):

- A Coordination Team comprising representatives of central line agencies to provide high-level strategic oversight and advice to MoNRE.
- A Working Group comprising government stakeholders and non-government stakeholders in Savannakhet Province and target districts.

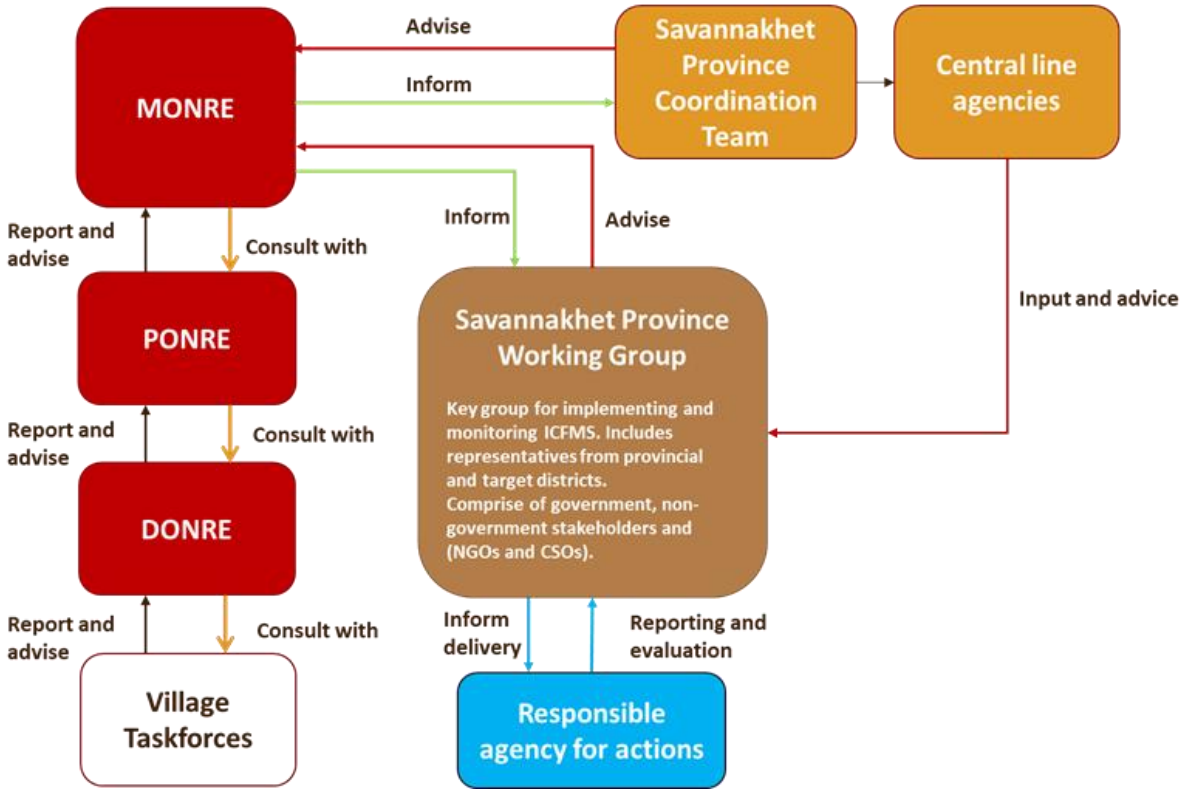


Figure 14. *Governance arrangement*

Coordination Team: The purpose of the coordination team is to involve other water-related sectors in the decision-making and implementation processes of the ICFMS. It is chaired by MoNRE and includes representatives from the central levels of water management and relevant line agencies (e.g. Ministry of Agriculture and Forestry, Ministry of Labour and Social Welfare, National Disaster Management Committee, Ministry of Technology and Communications, Ministry of Information, Culture and Tourism, and Ministry of Public Works and Transport). The Coordination Team makes decisions by consensus related to the implementation of the ICFMS.

Working Group: The purpose of the Savannakhet Province Working Group is to coordinate the on-ground activities, studies and analyses, and stakeholder collaboration which are needed to implement the Action Plan. This would include sharing of data, review of analysis and brainstorming discussion of implementation

challenges. The Working Group is chaired by PoNRE and would involve technical managers from relevant agencies (e.g. provincial agencies responsible for agriculture, forestry, water resources, public works, disaster management, and communications). The Working Group can be used as the main forum for reporting and evaluating the success of implementation for the Action Plan.

4 References

1. Agriculture and Forest District office (2024). Agriculture production planning for dry season for Champhone District

2. Alluvium and Hydrotech Consulting, June 2024 (Final), Optioneering Report for flood and drought risk reduction in Xe Bang Hieng River Basin, Report prepared for UNDP and DWR for the Project: Technical support for enhancing climate resilience through ICM and EbA (RFP-005-2023).

3. 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).

4. Antea Group (2024). Technical Support for modelling and development of risk maps in Lao PDR. Report prepared for UNDP.

5. Champhon district (2021) – 8th Expansion plan on social-economic development plan of Champhon district

6. Department of Planning and Investment, Savannakhet Province (2022) - The 8th 5-Year Socio-Economic Development Plan (2021-2025) of Savannakhet Province.

7. Hisao, F (ed) (1992). Application of Reforestation and Agro-Forestry to Soil Management and Khorat Plateau. Finalized Working Document, Prepared for the Mekong Secretariat.

8. IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115, doi: 10.59327/IPCC/AR6-9789291691647.

9. Korea International Cooperation Agency (KOICA), 2024. Manufacture & installation of climate change adaptive flood forecasting and warning system in Xe Bang Hieng River Basin, Lao PDR

10. Lao National Land Management Authority (2015) – Lao National Land Management Authority. "Land Use Planning and Management in Laos.

11. Mastrorillo, M., et al. (2016). Climate Change and its Impact on Southeast Asia. Regional Environmental Change, 16(2), 503-515.

12. Ministry of Natural Resources and Environment (2020). Climate Change Vulnerability Assessment in Lao PDR

13. Ministry of Natural Resources and Environment (2022) - Se Bang Hiang watershed management plan 2021-2025

14. Ministry of Natural Resources and Environment (2023) - National Strategy for Climate Change By 2030

15. Ministry of Natural Resources and Environment (2022) – Wetland management plan in Ramsa Se Champhon area

16. Ministry of Planning and Investment 2016) - National vision to 2030 and National Strategy on Social-Economic Development 10 year period (2016-2025)

17. MRC (2009) - Mekong River Commission. "Mekong Climate Change Adaptation Strategy."

18. MoNRE (2022). Xe Banghieng River Basin Management Plan 2021-2025

19. Savannakhet Province Disaster Management Committee (2024). Disaster Risk Reduction Strategy in Savannakhet Province until 2035

20. Rohan Last (2004). A Review of the Potential for Salinity in Lao PDR. National Centre for Groundwater Management, University of Technology, Sydney

21. United Nations Development Programme (UNDP), 2018. Five approaches to build functional early warning systems.

22. UNEP-UNDP-IUCN (2010) Making the Case for Ecosystem Based Adaptation: Building Resilience to Climate Change

23. Wiszniewski, M., Szymanek, M., & Żylicz, T. (2005). Groundwater modeling in salinized areas: Case study of the lower Xe Champhone catchment. Journal of Hydrology, 302(1-4), 114-128

5 Appendix A – Target village flood maps

Figure 15. *Flood extent and depth for storm event with a 10-year return period (current climate) for Phiaka Village*

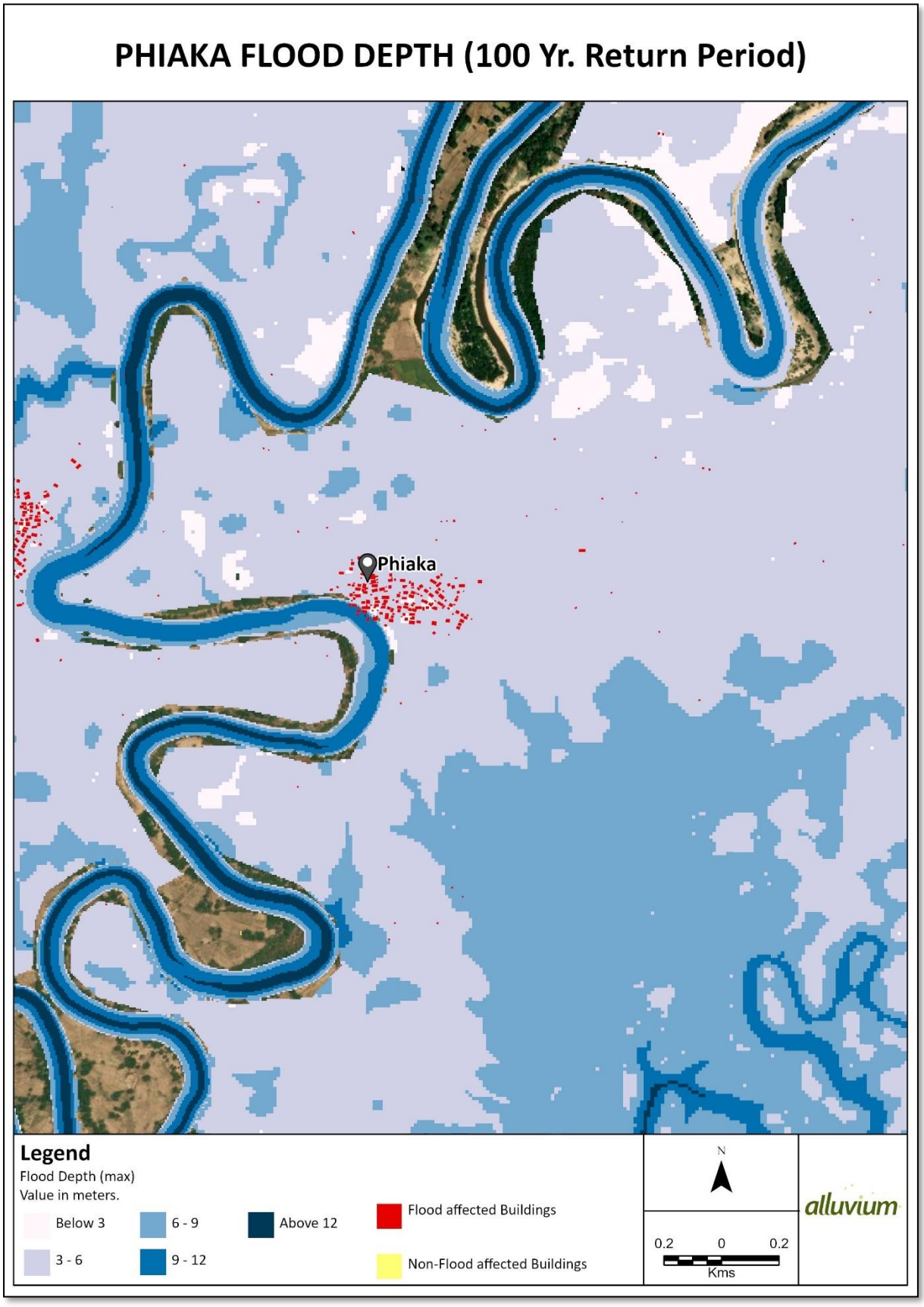


Figure 16. *Flood extent and depth for storm event with a 100-year return period (current climate) for Phiaka Viillage*

Figure 17. *Flood extent and depth for storm event with a 10-year return period (current climate) for Dongmeuang Village*

Figure 18. *Flood extent and depth for storm event with a 100-year return period (current climate) for Dongmeuang Village*

6 Appendix B – Target village infrastructure proposals

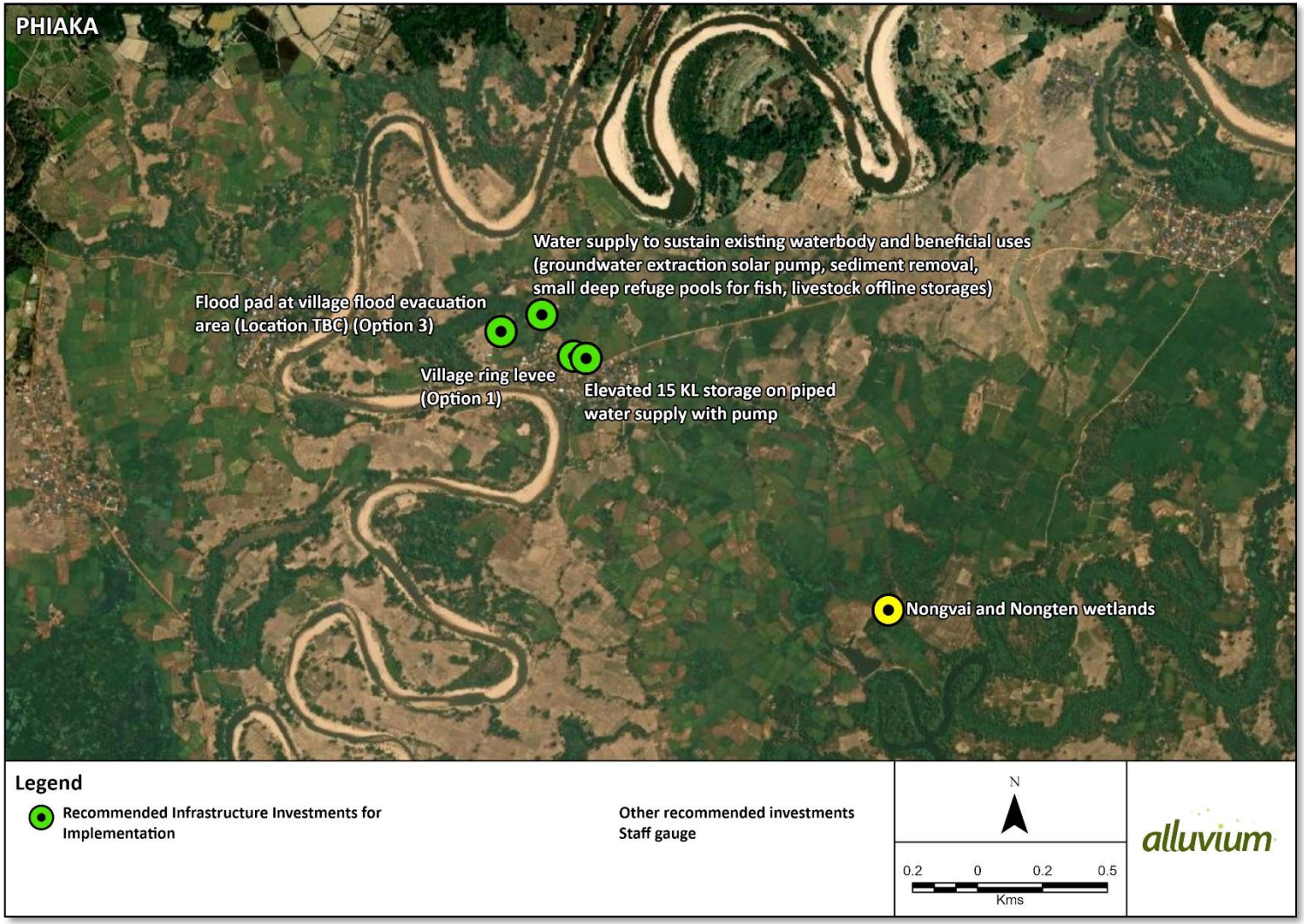


Figure 19. *Phiaka Village Recommended infrastructure investments for enhancing resilience to floods and droughts*

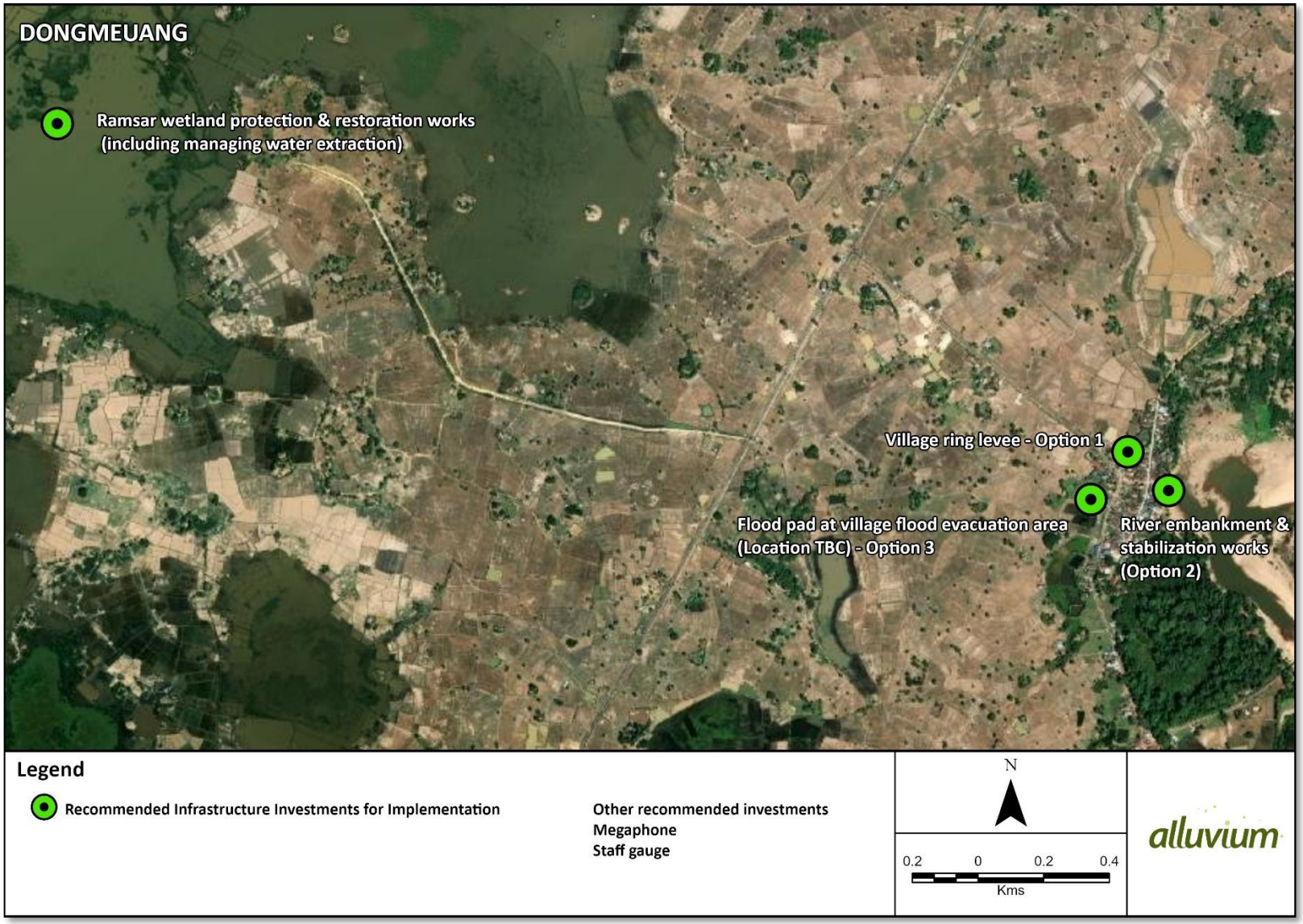


Figure 20. *Dongmeuang Village Recommended infrastructure investments for enhancing resilience to floods and droughts*

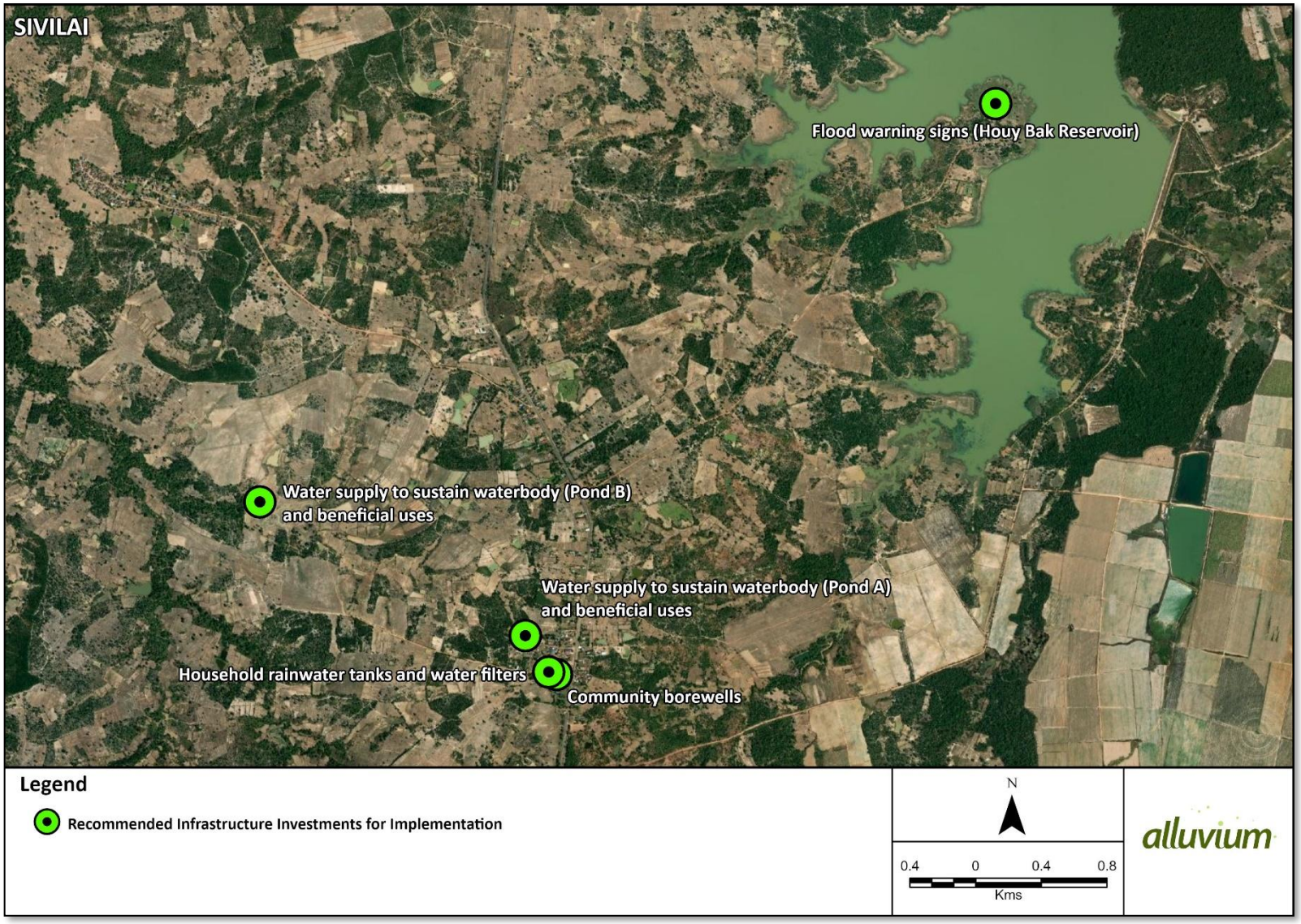


Figure 21. *Sivilai Village Recommended infrastructure investments for enhancing resilience to floods and droughts*

IWRM-EbA Project

Project Management Unit

Department of Water and Resources (DWR)

Ministry of Natural Resources and Environment (MONRE)

laoiwrm-eba.com

iwrm.eba@gmail.com

IWRM-EbA Project

IWRM - EbA Project