



LAO PEOPLE'S DEMOCRATIC REPUBLIC
PEACE INDEPENDENCE DEMOCRACY UNITY PROSPERITY

LAO PDR SECTORAL ADAPTATION STRATEGY AND ACTION PLAN FOR WATER RESOURCES SECTOR

2026-2030

UNDER THE NATIONAL ADAPTATION PLANNING PROCESS

JUNE 2026

MINISTRY OF AGRICULTURE AND ENVIRONMENT

Lao PDR Sectoral Adaptation Strategy and Action Plan (SAP) for Water Resources Sector (2026–2030) under the National Adaptation Process.

Prepared under the guidance of:

Department of Environment (DoE), Ministry of Agriculture and Environment, Government of Lao PDR

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Acknowledgements

The Government of the Lao People's Democratic Republic recognizes the critical importance of addressing climate change and its far-reaching impacts on socio-economic development, natural resources, and the livelihoods of communities across the country. As a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, the country has reaffirmed its commitment to enhance climate resilience and transition towards sustainable development pathways. These commitments are supported by national frameworks such as the Decree on Climate Change and the National Strategy on Climate Change by 2030, which set the ambitious target of achieving net-zero emissions by 2050.

In this context, the Ministry of Agriculture and Environment (MAE), through the Department of Environment (DOE), is leading efforts to mainstream climate change adaptation across key sectors. Building on the National Adaptation Plan (NAP) finalized in 2025, this Sectoral Adaptation Strategy and Action Plan (SAP) for Water Resources (2026–2030) provides a focused roadmap to strengthen adaptive capacity and resilience within this climate-sensitive sector.

The SAP was developed under the Green Climate Fund (GCF)-funded Readiness titled “Support for Mainstreaming Climate Change Adaptation into Sectoral Planning in Lao PDR”, implemented by MAE with technical assistance from the Global Green Growth Institute (GGGI). It translates the NAP’s overarching priorities into actionable strategies, building upon the findings of the Sectoral Climate Risk and Vulnerability Assessment (SCRVA) and extensive consultations with sectoral focal points, development partners, and local stakeholders. This document translates the strategic direction of the NAP into actionable and measurable steps for the Water Resources Sector by setting out medium-term objectives, strategic adaptation actions, and an accompanying monitoring and evaluation framework for the period 2026–2030. It aims to guide national and subnational authorities in integrating climate adaptation measures into their respective policies, strategies, and investment plans to reduce vulnerability and safeguard livelihoods.

On behalf of the DOE, I would like to extend our appreciation to all ministries, agencies, and partners who contributed technical inputs and expertise throughout the development process. The DOE extends its sincere appreciation to GCF for its financial support and to GGGI for its technical assistance in facilitating the development of this SAP. The contribution of sectoral focal points, provincial departments, and all partners involved in consultations and technical discussions is gratefully acknowledged. Their expertise and engagement have been instrumental in shaping the priorities and proposed actions contained in this strategy.

The successful implementation of this SAP will require continued partnership, collaboration, and resource mobilization. We would like to emphasize the importance of sustained support in the form of finance, technology transfer, and capacity building from a broad range of domestic and international stakeholders. By strengthening cooperation and leveraging available resources, Lao PDR aims to enhance the resilience of its water resources sector, reduce vulnerability to climate impacts, and contribute to the country’s broader efforts to build a climate-resilient and sustainable future.

Yours Sincerely,



Mr. Aloune Sayavong

**Department of Environment,
Ministry of Agriculture and Environment.**

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Acronyms and Abbreviations

ADB	Asian Development Bank
AFD	Agence Française de Développement
AFoCO	Asian Forest Cooperation Organization
ASEAN	Association of Southeast Asian Nations
CECCAP	Implementation of Centric Evolving Climate Change Adaptation Process
CBA	Community-Based Adaptation
CEDAW	Convention on the Elimination of all Forms of Discrimination Against Women
CRVA	Climate Risk and Vulnerability Assessment
CSO	Civil Society Organization
DAE	District Office of Agriculture and Environment
DALAM	Department of Land Administration and Management
DCC	Department of Climate Change [former department merged into DoE]
DMH	Department of Meteorology and Hydrology
DOA	Department of Agricultural
DOE	Department of Environment
DOI	Department of Irrigation
DPC	Department of Planning and Cooperation
DPWT	District Office of Public Works and Transport
DRM	Disaster Risk Management
DWR	Department of Water Resources
EbA	Ecosystem-based adaptation
EGDP	Ethnic Group Development Plan
EU	European Union
FAO	Food and Agriculture Organization of the United Nation
FDI	Foreign Direct Investment
FPIC	Free Prior Informed Consent
GAAP	Gender Action and Action Plan
GBV	Gender Based Violence
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEDSI	Gender Equality Disability and Social Inclusion
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GIZ	Deutsche Gesellschaft für International Zusammenarbeit
GOL	Government of Land
GWP	Global Water Partnership – Southeast Asia
HDI	Human Development Index
IDA	International Development Association
IFC	International Finance Corporation
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
IWA	International Water Association
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
LAK	Lao Kip
LDC	Least Developed Country
LNFD	Lao National Development Front
LUIS	Land Use Information System
LWU	Lao Women Union
LYU	Lao Youth Union
M&E	Monitoring & Evaluation

MEL	Monitoring, Evaluation and Learning
MAE	Ministry of Agriculture and Environment
MAF	Ministry of Agriculture [former ministry merged into MAE]
MCA	Multi Criteria Analysis
MEM	Ministry of Energy and Mines [former ministry merged into MIC]
MIC	Ministry of Industry and Commerce
MIS	Management Information System
MONRE	Ministry of Natural Resources and Environment [former ministry merged into MAE]
MoU	Memorandum of Understanding
MPI	Ministry of Planning and Investment
MRC	Mekong River Commission
NAFRI	National Agriculture and Forestry Research Institute
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NBS	Nature-based solutions
NBCA	National Biodiversity Conservation Area
NCAWMC	National Commission for the Advancement of Women, Mothers and Children
NDC	Nationally Determined Contribution
NGO	Non-Government Organizations
NPA	National Protected Area
NPDS	National Power Development Strategy
NSEDP	National Socio-Economic Development Plan
NSCC	National Strategy on Climate Change
NUOL	National University of Laos
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
ODA	Official Development Assistance
PAE	Provincial Office of Agriculture and Environment
PDNA	Post Disaster Needs Assessments
PIU	Project Implementation Unit
PMU	Project Management Unit
PPP	Public Private Partnership
RCP	Representative Concentration Pathways
SAP	Sectoral Adaptation Plan
SAR	Situation Analysis Report
SAP	Sectoral Adaptation Strategy and Action Plan
SDG	Sustainable Development Goal
SFM	Sustainable Forest Management
SSP	Shared Socio-Economic Pathways
SWG	Sector Working Group
TWGCC	Technical Working Group for Climate Change
UN	United Nations
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNEP	United Nation Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
USDA	United States Department of Agriculture
UXO	Unexploded Ordinance
VPA	Voluntary Partnership Agreement
WASH	Water Sanitation and Hygiene
WB	World Bank
WFP	World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organization
WUA	Water User Associations
WUA	Water User Group

Terminology and Definition

Adaptive Capacity: The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damage, to take advantage of opportunities, or to cope with the consequences [1].

Climate Smart Agriculture (CSA): Climate-smart agriculture is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing and/or removing greenhouse gas emissions, where possible [1]

Climate Resilience: The capacity of social, economic, and environmental systems to cope with a hazardous event or trend, maintaining essential functions, identity, and structure while also adapting and transforming. [2].

Climate Scenario (SSP/RCP): Standardized projections used to describe possible climate futures based on greenhouse gas emission trajectories. Representative Concentration Pathway (RCP) represents climate modelling scenarios representing different greenhouse gas concentration trajectories adopted by the IPCC and Shared Socioeconomic Pathway (SSP) represents Scenarios describing possible societal futures used with RCPs to project climate impacts. [2]

Early Warning: Giving an early warning means to issue a notification and declaration of a surveillance area through media broadcasting and other means quickly, accurately and in a timely manner to allow the people, communities, organizations and all parties to have enough time to prepare in advance to respond to potential disasters [1]

Ecosystem-based Adaptation (EbA): Ecosystem-based adaptation is the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change [1]

Exposure: The nature and degree to which a system is exposed to significant historical and projection of climatic variations [1].

Flood: The overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas that are not normally submerged. Floods include river (fluvial) floods, flash floods, urban floods, pluvial floods, sewer floods, coastal floods, and glacial lake outburst floods. Climate change is projected to increase the rainfall in much of the Mekong Region as well as expected to increase rainfall intensity. Floods would therefore potentially become more frequent and more severe [1]

Greenhouse Effect: The process by which greenhouse gases in the earth's atmosphere absorb infrared radiation from the sun, reflect some of it back into space and emit some of it towards the earth. This natural process provides for relatively stable and mild temperatures on earth and in the atmosphere. However, human activity can change the concentration of greenhouse gases in the atmosphere, which can amplify the greenhouse effect [1].

Hazard: A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. [1].

Heatwave: A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage [1].

Heat Index (HI): Index that combines air temperature and relative humidity to represent the perceived temperature or how hot conditions feel to the human body. Although primarily developed for assessing human comfort and health risks, it is also relevant for agriculture and livestock management. High HI values indicate increased heat stress that can affect crop growth, reduce yields, and impair livestock performance. Days with a HI > 36°C during the growing season are considered critical thresholds, as they lead to declines

in feed intake, reduced animal productivity, and heightened heat-related stress in both plants and animals [3].

Impacts: Effects on natural and human systems. In this report, the term ‘impacts’ is used to refer to the effects on natural and human systems of physical events, of disasters, and of climate change. [1].

Mitigation: Mitigation means the process of reducing greenhouse gas emissions and enhancing carbon sinks. [1]

Nature-based Solutions (NbS): Actions that protect, sustainably manage, and restore natural or modified ecosystems to address societal challenges effectively and adaptively. [3]

Representative Concentration Pathways (RCPs): Scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases (GHGs) and aerosols and chemically active gases, as well as land use/land cover. The word representative signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics. The term pathway emphasizes the fact that not only the long-term concentration levels but also the trajectory taken over time to reach that outcome are of interest. RCPs were used to develop climate projections in CMIP5.

- RCP2.6: One pathway where radiative forcing peaks at approximately 3 W m^{-2} and then declines to be limited at 2.6 W m^{-2} in 2100 (the corresponding Extended Concentration Pathway, or ECP, has constant emissions after 2100)
- RCP4.5 and RCP6.0: Two intermediate stabilization pathways in which radiative forcing is limited at approximately 4.5 W m^{-2} and 6.0 W m^{-2} in 2100 (the corresponding ECPs have constant concentrations after 2150).
- RCP8.5: One high pathway which leads to $>8.5 \text{ W m}^{-2}$ in 2100 (the corresponding ECP has constant emissions after 2100 until 2150 and constant concentrations after 2250).

Risk: The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure, and hazard. In this report, the term risk is used primarily to refer to the risks of climate-change impacts [1].

Scenario: A plausible and often simplified description of how the future may develop based on a coherent and internally consistent set of assumptions about driving forces and key relationships. Scenarios may be derived from projections but are often based on additional information from other sources, sometimes combined with a narrative storyline [1].

Sensitivity: Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g., damage caused by an increase in the frequency of coastal flooding due to sea level rise).

Vulnerability: Vulnerability refers to sensitivity and inability to cope with the impacts of climate change; [1].

Executive summary

Climate Change Context in Lao PDR

Lao PDR faces mounting climate risks that increasingly threaten the country’s sustainable development trajectory and the resilience of its population. Its geographic diversity and socio-economic dependence on natural resources, particularly in agriculture, forestry, and water, make it highly vulnerable to climate variability and extremes. Observed trends include rising mean temperatures (approximately +1°C since 1950), shifting rainfall patterns, and increased incidence of floods, droughts, landslides, and heatwaves. Rainfall patterns are becoming more erratic, with historical declines of over 200 mm annually and future projections indicating more intense wet-season rainfall and prolonged dry periods. These changes are already translating into longer droughts, intensified heatwaves, and shifts in seasonal cycles, posing significant risks to food and water security, ecosystems, and human health. Riverine flooding is also exacerbated by altered rainfall-runoff dynamics and upstream hydropower development, while flash floods frequently impact urban centers and upland provinces face heightened exposure to prolonged dry spells, erosion, and landslides.

The economic toll of these hazards is growing rapidly. Between 2009 and 2018, annual losses from disaster events, particularly floods and droughts, nearly quadrupled, from USD 94 million in 2009 to USD 371.5 million in 2018 equivalent to 2.1% of the national GDP and 10.2% of the national budget in that year (NDC Implementation Plan, 2024).

Climate Change impact on Water Resources Sectors

Water resources lie at the crossroads of several key sectors in Lao PDR. They underpin agriculture, energy generation, industry, and domestic use, while sustaining ecosystems that provide critical services and livelihoods. However, the sector faces increasing pressures from climate change and human activities.

Extreme Heat Events 	Extreme heat events have risen sharply with southwestern provinces currently the most affected. Hotter temperatures will accelerate evaporation, intensify algal blooms in rivers and reservoirs, and degrade surface and groundwater quality, especially in fragile karst aquifers. These changes threaten irrigation, domestic supply, and rural water security, underscoring the need for strengthened water monitoring and climate-resilient water management.
Droughts 	Groundwater stress is a rising risk due to declining recharge and growing extraction pressures. Erratic rainfall and prolonged dry seasons reduce river flows, lower aquifer levels, and intensify competition for water across agriculture, energy, and households. Strengthening storage, irrigation efficiency, and integrated water resource management is increasingly urgent.
Floods 	Floods remain one of the most damaging hazards for water resources, with southern and central lowland provinces consistently facing the highest exposure. Extreme rainfall and storm events damage irrigation networks, contaminate drinking water sources, and disrupt hydropower systems. Expanding flood-resilient water systems, early-warning services, and watershed protection are essential to reduce these risks.
Landslides 	Landslides in mountainous northern and central regions can disrupt water systems by blocking waterways, damaging irrigation infrastructure, and accelerating sedimentation in rivers and reservoirs. Increased sediment loads reduce storage capacity, impair hydropower generation, and degrade water quality. These impacts threaten both service reliability and long-term watershed health.

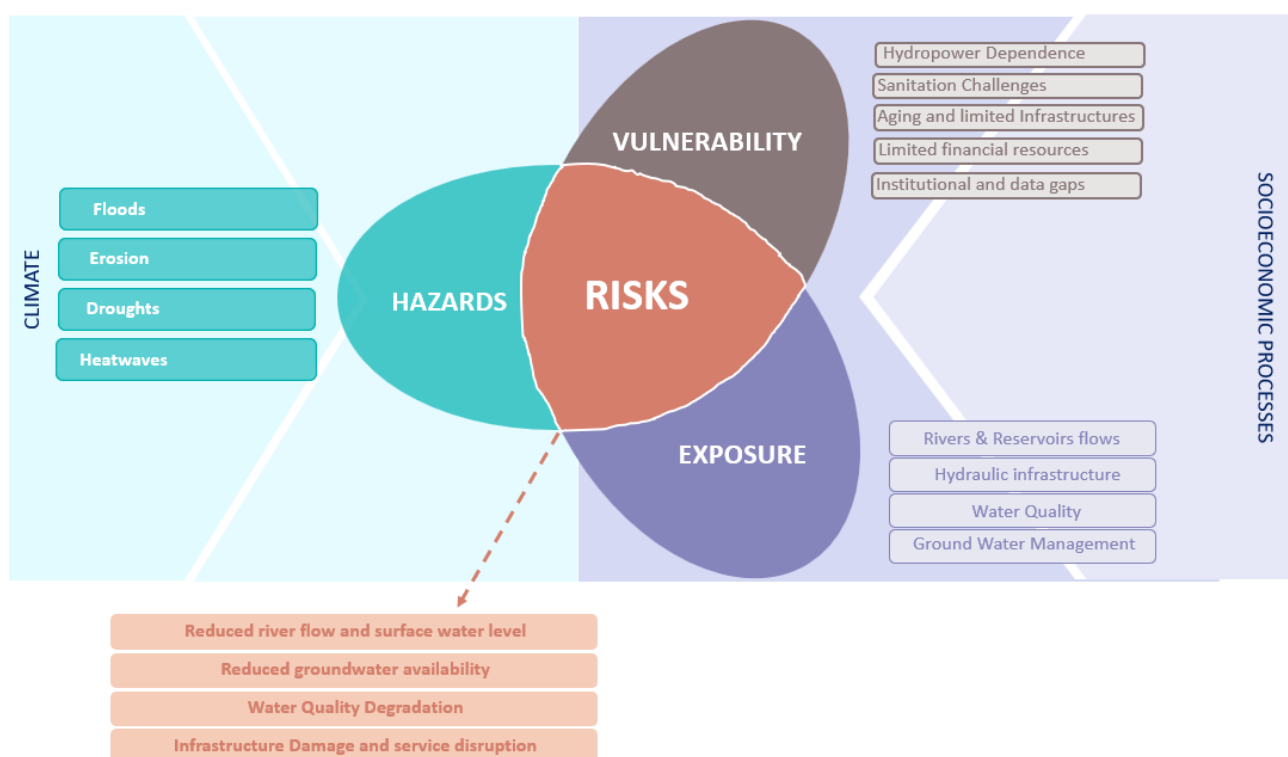


Figure 5: Climate Risk Synthesis for the Water Resources Sector

Government of Lao PDR Adaptation response

The Government of Lao PDR recognizes climate change as a critical challenge to sustainable development and poverty reduction. The National Adaptation Plan (NAP) provides the overarching framework for identifying priority vulnerabilities, setting adaptation objectives, and integrating resilience into national, subnational, and sectoral planning. Aligned with UNFCCC guidelines, the NAP aims to reduce exposure to climate risks while strengthening adaptive capacity across communities, ecosystems, and key economic sectors. It also serves as a central mechanism for coordinating development partners, mobilizing climate finance, and embedding adaptation within the 9th National Socio-Economic Development Plan (NSED) and related national strategies.

As part of these national efforts, and in alignment with the Nationally Determined Contribution (NDC) and the National Strategy on Climate Change (NSCC 2030), the Ministry of Agriculture and Environment (MAE) has developed the Sectoral Adaptation Strategy and Action Plan for Water Resources Sector (SAP-WR). It aims to translate the NAP's priorities into concrete adaptation measures and provide a coherent framework to strengthen climate resilience, improve water governance, and promote equitable, sustainable, and adaptive management of water resources across the country.

Lao PDR Water Resources Sectoral Adaptation Strategies and Action Plans

The SAP-WR emphasizes the integration of Gender Equality, Disability, and Social Inclusion (GEDSI) principles, promoting equitable access to resources and opportunities.

The strategy for the Water Resources Sector outlines three strategic outcomes, six strategic objectives, and fifteen priority actions for the period 2026–2030. These actions address technical, institutional, financial, and social barriers to adaptation and are structured around the following outcomes:

WATER RESOURCES SECTOR ACTION PLAN: BUILDING RESILIENT WATER RESOURCES MANAGEMENT SYSTEMS

Outcome 1: Ensure climate-resilient water supply systems for households, agriculture, and communities.

Strategic Objective 1.1: Strengthen Basic and Community Water Infrastructure

Strategic Objective 1.2: Mobilize Sustainable Financing for Water Infrastructure

Outcome 2: Protect and manage water resources against climate risks.

Strategic Objective 2.1: Strengthen Groundwater Management and Monitoring

Outcome 3: Strengthen integrated and adaptive water management systems

Strategic Objective 3.1: Promote Integrated Water Governance and Adaptive Basin Management

Strategic Objective 3.2: Strengthen Monitoring, Information Systems, and Risk Preparedness

Strategic Objective 3.3: Conserve Ecosystems and Natural Buffers for Water Resilience

Implementation of the Water Resources Sectoral Adaptation Strategy and Action Plan

Implementation of the SAP-WR will be led by the Ministry of Agriculture and Environment in coordination with line ministries and with provincial and district offices to support local delivery, monitoring, and mid-term reviews.

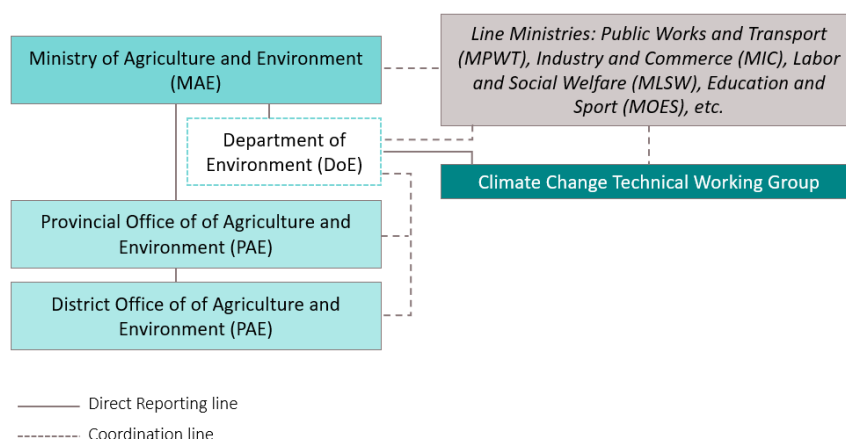


Figure 6: Institutional arrangement for the implementation of the SAP-WR

Implementation will span five years and rely on both government systems and development partner-funded projects. To strengthen effectiveness, the SAP recommends establishing a climate resilience unit within MAE, improving data-sharing, building subnational capacity (including GEDSI integration), and involving customary governance structures in planning and monitoring.

Financing will require a dual approach. While international climate funds (GCF, Adaptation Fund, GEF, LDCF, SCCF) and ongoing donor-supported projects remain essential for scaling and leveraging synergies, the SAP-WR must also be anchored in Government of Lao PDR budgetary processes. The action plan will therefore be aligned with the forthcoming 10th NSEDP (2026–2030) to ensure that priority adaptation measures are progressively integrated into national financing frameworks.

A dedicated monitoring framework, aligned with the NAP, NDC, and UNFCCC reporting systems, will guide progress tracking from 2026–2030. MAE/DoE and MAE/DWR will lead monitoring in collaboration with sectoral departments and provincial offices, using harmonized, sex-disaggregated indicators. Annual reviews and a

mid-term evaluation will assess achievements, identify bottlenecks, and inform adaptive management, ensuring that SAP-WR implementation remains responsive, inclusive, and results-oriented

PART I: CONTEXT AND GOVERNANCE

1. Introduction

Water resources are central to Lao PDR's development, supporting agriculture, energy, domestic use, and industry [4]. With approximately 80% of its territory lying within the Mekong River Basin [4], home to the Mekong River and 14 major tributaries, Lao PDR plays a vital role in regional water management. [2] Irrigation systems are essential for agricultural productivity, particularly in lowland rice areas, [5] while hydropower is a cornerstone of the national energy strategy [6]. As of 2021, hydropower accounted for 94% of domestic electricity supply, with installed capacity reaching 11,661 MW.[4] The government aims to expand this to 12 GW by 2025 and 20 GW by 2030, [5] positioning the country as the “battery of Southeast Asia” [6]

Water governance is guided by national policies such as the Law on Water and Water Resources and the National Water Resources Management Strategy 2030, supported by partnerships with international institutions, water user associations, and private investments. However, the sector faces mounting challenges. Pollution from industry, agriculture, and untreated wastewater threatens water quality and public health. [7] In rural areas, 82% of households lack access to safely managed water, and 39% lack safe sanitation, contributing to waterborne diseases [8]. Hydropower development has also raised regional concerns, with altered river flows causing unexpected floods and dry-season shortages downstream. [9] Climate change is intensifying these vulnerabilities. Hydrological extremes, floods, droughts, and heatwaves are becoming more frequent and severe. Between 2017 and 2021, a series of tropical storms (Son-Tinh, Bebinca, Noul) triggered widespread flooding, damaging thousands of hectares of farmland and critical infrastructure. Agriculture alone accounted for more than half of total economic losses during these events. Conversely, prolonged droughts, including the record-low Mekong flows in 2019, have disrupted irrigation, reduced hydropower generation, and undermined food security. Projections indicate that under high-emissions scenarios, the number of people exposed to river flooding could double by the 2030s, while rising temperatures and declining relative humidity will increase evapotranspiration, intensify dry-season water scarcity, and heighten competition for water across sectors. These trends threaten national development goals, hydropower reliability, agricultural productivity, public health, and the resilience of vulnerable communities. Without targeted adaptation, climate impacts will continue to erode livelihoods, strain infrastructure, and undermine the country's long-term economic aspirations.

In this context, adaptation -anticipating and addressing climate change impacts- is essential, as global warming will continue even under ambitious mitigation efforts. To response to these challenges, the Government of Lao PDR (GoL) is developing the *Sectoral Adaptation Strategy and Action Plan for Water Resources (SAP-WR)*. This strategy will prioritize adaptation actions, guide climate-resilient investments, and build local resilience, with a strong focus on gender equality and social inclusion (GEDSI).

The GoL recognizes the challenges that climate change poses to its population, natural resources and economy, and has taken considerable measures to identify and address, to the extent possible, current and future climate risks at the policy and operational level. Aligned with its international and global commitments, the GoL has developed a wide array of national (cross-)sectoral strategies and action plans which have been translated into the national legal framework, focusing on climate change adaptation, sustainable and green growth, and disaster management since the late 1990s [3]. These include:

- climate change national strategies (2010, 2023) [9]
- health adaptation national strategy (2023) [10]
- green growth national strategy (2019),
- disaster risk reduction strategy (2020) [11]

- national sectoral policies on forestry (2005), natural resources and environment (2015), water (2023), housing and urban development (2023), and gender equality (2021).

2. Lao PDR National Adaptation Planning Process

The policy efforts from the GoL towards climate change adaptation have translated into updating or creating transverse or sector-specific national legal frameworks on climate (2019) [12] and meteorology (2017) [13], environmental protection (2012) [14], natural resources (2017), disaster management (2017, 2019 [13], 2023), and gender equality (2019) [16].

In parallel of those legal framework, Action programmes and plans have emerged, including the National Adaptation Programmes of Actions (NAPA), approved by the government of Lao PDR in 2009, updated in 2024 under the NAP [15], and the 2013-2020 Climate Change Action Plan.

Adopted in January 2025, the National Adaptation Plan (NAP) provides Lao PDR with a long-term framework to strengthen resilience, sustainability, and inclusiveness in the face of climate change. It builds on the country's international and global commitments and also aligns with national development priorities and the 18 Sustainable Development Goals (SDGs) under the 2030 Agenda [15].



The NAP supports existing national frameworks on sustainable development and resilience such as the National Strategy on Climate Change (2030), NDC (2021), and the 9th Five-Year National Socio-Economic Development Plan (NSEDPP) [6]

The NAP outlines short-term (2025–2030) and medium-term (2030–2035) actions, aligned with national development strategies. Lao PDR NAP has two main objectives:

- “To reduce vulnerability to the impact of climate change by building adaptive capacity and resilience
- To facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate. [16]

Institutionally, climate action is coordinated through environmental committees at national, provincial, and district levels, and a forthcoming National Steering Committee for Climate Change, chaired by the Ministry of Agriculture and Environment (MAE) through the Department of Environment (DoE).

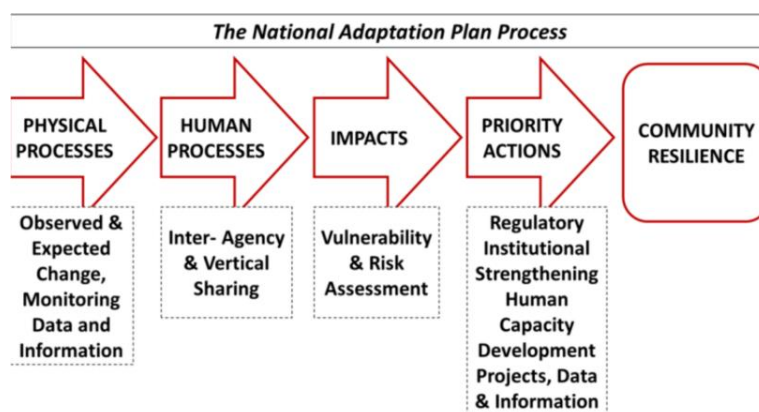


Figure 1. Overview of the Laotian NAP Process (source: Lao PDR NAP, p. 2)

3. Water Resources in the Framework of Lao PDR NAP

The Sectoral Adaptation Strategy and Action Plan for Water Resources (SAP-WR) seeks to address the policy, institutional, technical, financial, and social barriers that constrain effective climate change adaptation and sustainable water resources management in Lao PDR. Its overarching goal is to strengthen water security and resilience in the face of increasing climate variability and ensuring reliable access to safe water for domestic, agricultural, industrial, and ecological needs while supporting sustainable socio-economic development.

The SAP-WR forms part of Lao PDR's broader policy response to climate change and contributes directly to the achievement of national adaptation priorities under the National Adaptation Plan (NAP), the Nationally Determined Contribution (NDC), and the 9th National Socio-Economic Development Plan (NSED). Developed through a transparent and participatory process involving national, provincial, and local stakeholders, it reflects shared priorities and builds on previous initiatives and projects implemented by the Department of Water Resources (DWR) and partner agencies.

The SAP provides an overview of the key climate-related challenges facing Lao PDR's water sector, including increasing drought frequency, flooding, watershed degradation, and competing water demands, and outlines priority adaptation measures to be implemented between 2026 and 2030. These measures aim to enhance integrated water resources management (IWRM), strengthen institutional coordination and data systems, improve water infrastructure resilience, and promote ecosystem-based and community-driven water management approaches. In total, the SAP-WR presents a set of 15 prioritized adaptation measures responding to 6 strategic objectives and contributing to 3 major outcomes, all aligned with the NAP and the country's climate and development commitments.

3.1. Target audience

The SAP-WR is primarily designed for policymakers, technical departments, development partners, and private sectors involved in the management and governance of water resources in Lao PDR. However, it emphasizes the importance of cross-sectoral coordination with other sectors to ensure that adaptation measures are coherent, mutually reinforcing, and avoid duplication. Indeed, climate change impacts are interconnected and interdependent across sectors (water resources, agriculture, forestry, energy, infrastructure, and livelihoods) as well as across governance levels and actors. Water resources are at the core of agricultural productivity, energy generation, biodiversity conservation, land use planning, and both urban and rural development. As a result, inter-sectoral synergies would be enhanced, and the risk of conflicting policies would be reduced and promoted efficient use of

natural and financial resources. Cross-sectoral collaboration would improve results by sharing expertise and resources, aligning planning processes, reducing duplication, and ensuring better coordination among stakeholders.

Stakeholder Engagement Approach

The SAP implementation will rely on coordinated engagement of the following stakeholder groups presented in Figure 2.

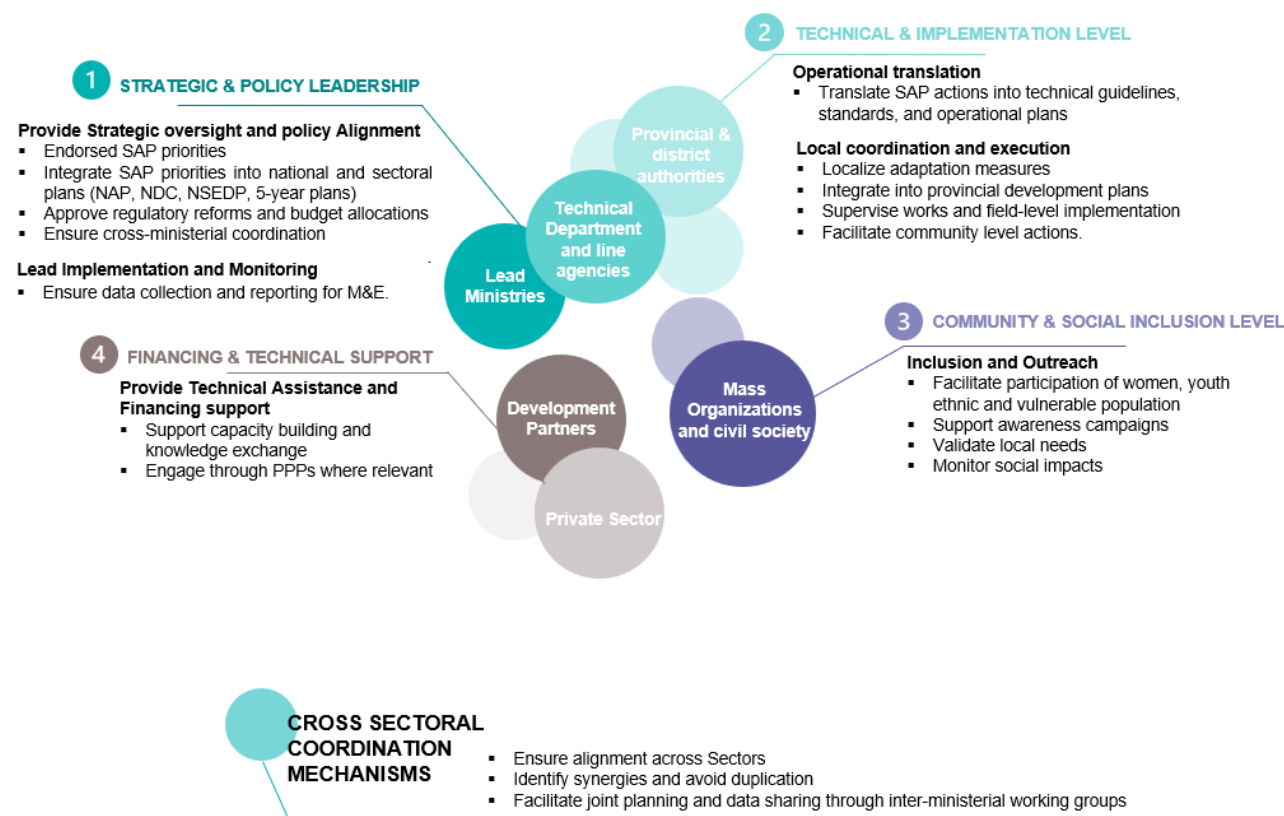


Figure 2: Stakeholder Engagement Approach for SAP implementation

This stakeholder engagement approach is structured across four complementary levels to ensure coherent and inclusive implementation of the SAPs.

1. At the **Strategic and Policy Leadership level**, Lead Ministries provide overall oversight, integrate SAP priorities into national and sectoral frameworks (NAP, NDC, NSEDP, 5-year plans), ensure cross-ministerial coordination, and oversee monitoring and reporting.
2. At the **Technical and Implementation level**, technical departments from lead agencies and provincial and district authorities translate SAP actions into operational guidelines, standards, and investment plans, while coordinating and supervising field implementation.
3. The **Community and Social Inclusion** level ensures that adaptation measures reflect local needs through the active engagement of mass organizations and civil society, promoting participation of women, youth, ethnic groups, and other vulnerable populations.

4. Finally, the **Financing and Technical Support level** mobilizes development partners and private sector actors to provide funding, capacity building, and knowledge exchange.

Together, these levels create a coordinated system that links policy direction, technical execution, social inclusion, and sustainable financing

Cross Sectoral Coordination

The parallel preparation of the SAPs for the Water Resources, Agriculture and Forestry, and Urban Development and Transport sectors has already provided a valuable opportunity for integrated planning and shared learning. Several adaptation measures have been identified as common priorities, particularly those related to watershed protection, sustainable water use, and climate-resilient infrastructure. This coordinated approach will continue to guide the preparation and implementation of future SAPs under the first National Adaptation Plan (NAP) cycle (2025–2035), fostering a unified pathway toward sustainable, inclusive, and climate-resilient water resources management in Lao PDR.

3.2. Principles of elaboration

The SAP-WR is grounded in a strong national policy and regulatory framework, including the Water Resource Strategy 2030 and Vision 2040, the Five-Year Plan of the DWR (2021–2025), the Law on Water and Water Resource Management (2017), the Law on Irrigation (2013), the Law on Dam Safety (2022), and the Law on Waterways (2023). These frameworks emphasize sustainable land and water use, balanced rural-urban development, improved environmental quality, and integrated, climate-responsive planning. The 2019 Decree on Climate Change further reinforces the institutional basis for adaptation and mainstreaming of climate resilience across sectors.

The SAP-WR is designed to complement the NAP by providing a roadmap for climate change adaptation with regards to Water Resources. Thus, the SAP-WR can be considered a sector-focused extension of the NAP, elaborated based on six main principles:

- **Investment priorities.** Identified investments must directly support overcoming barriers and scaling up climate-resilient agriculture;
- **Stakeholder participation.** All identified adaptation priorities must stem from transparent consultations with stakeholders from the public sector, private sector, and civil society;
- **Feasibility and operational viability.** Identified adaptation priorities must be designed to be realistic and operational for implementation;
- **GEDSI principles.** All identified adaptation priorities must benefit vulnerable groups and contribute to equitable and fair development;
- **Leadership and responsibility.** Implementation and monitoring will be carried out by identified and committed national institutions.
- **Policy and strategy alignment.** The SAP-WR, through its identified actions must align with and/or complement existing climate change-related national policy and (ongoing or planned) initiatives on to minimize duplication and increase efficiency;
- **Funding approach.** The SAP-WR encourages and catalyzes private-sector investments and promotes non-state participation in adaptation.

Designed as a five-year framework (2026–2030), the SAP-WR applies the same guiding principles and planning logic as the national NAP. It follows a structured cycle, from assessing climate risks and vulnerabilities to identifying, prioritizing, and implementing adaptation actions, and establishing a robust system for monitoring, evaluation, and learning. As a living document, it will be reviewed periodically and updated as needed to ensure continued alignment with evolving climate risks, technological advancements, and national development priorities.

4. Methodological Approach and SAP Formulation Process

The formulation of the SAP for the Water Resources sector followed a structured, participatory, and evidence-based process aligned with the guiding principles of the NAP. The approach ensured scientific rigor, inclusiveness, and alignment with national priorities and international climate commitments. The process was carried out in four main phases:

Phase 1 – Situation Analysis and Climate Risk and Vulnerability Assessment

The initial phase of the project focused on establishing the baseline necessary to guide the development of the SAP. Several preparatory activities were conducted, including gap and needs assessments. The two first activities under the ‘Output 3.2.1. Agriculture & Forestry, Urban Development, and Water Sectoral Adaptation Action Plans Develop and Disseminated’ of the GCF Readiness Project were:

- *Activity 3.2.1.1: Review and analysis of available climate information to identify the gaps and needs*
- *Activity 3.2.1.2: Conduct Climate Change Vulnerability and Risk Assessment*

The Situation Analysis Report (SAR) produced included a comprehensive review of regulations, policies, and institutional frameworks related to climate adaptation in the agriculture and forestry sectors, as well as an assessment of the socio-economic contexts. Data were collected to inform the subsequent CRVA, which analyzed climate hazards, exposure, sensitivity, and adaptive capacity at the sectoral level to identify key climate risks and vulnerabilities. SAR and CRVA provided the analytical foundation for the subsequent formulation of the SAP.

Phase 2 – Stakeholder Validation of CRVA and Identification of Initial Measures

The CRVA process was supported by extensive stakeholder engagement, including focus group discussions, technical presentations, and validation workshops. As a Water Resources sector-specific CRVA was being developed in parallel by the Department of Water Resources (DWR), additional discussions were held to ensure coherence and complementarity between the two studies and provide valuable insights and enhanced the overall understanding of climate risks and vulnerabilities in the water sector. During these sessions, stakeholders reviewed and validated the CRVA findings and were introduced to a preliminary list of adaptation measures drawn from the NAP, aligned with the sector’s identified vulnerabilities. This participatory process generated meaningful feedback, ensuring that the proposed adaptation measures reflected both local priorities and technical feasibility. A national validation workshop held in July 2025 further confirmed the relevance of the proposed measures, identified priority actions for implementation, and secured institutional ownership.

Phase 3 – Prioritization through Multi-Criteria Analysis

Why use a Multi-Criteria Analysis (MCA)?

The prioritization of adaptation measures was conducted using a Multi-Criteria Analysis approach, a widely applied decision-support tool in climate adaptation planning. MCA is particularly suitable in contexts where decisions must balance multiple environmental, social, institutional, and economic objectives under uncertainty. The approach has been extensively used in National Adaptation Plan processes and sectoral adaptation planning to support transparent, evidence-based, and participatory prioritization of adaptation options [51] [52].

An initial long list of adaptation measures was extracted from the NAP-UNEP adaptation catalogue and subsequently classified and prioritized using a Multi-Criteria Analysis (MCA). Building on the findings of the CRVA and stakeholder feedback, each proposed measure was evaluated against a set of nine criteria:

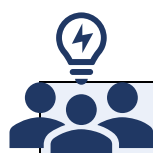
- Severity of climate change impacts,
- Poverty reduction potential,
- High value,
- Alignment with environmental and climate agreements,
- Contribution to livelihood security,

- Feasibility of implementation,
- Sustainability and long-term benefits,
- Institutional capacity,
- Financial operationalization,
- Urgency of action.

Each criterion was assigned a weight (ranging from 0.4 to 1) to reflect its relative importance, with higher weights given to feasibility, sustainability, institutional capacity, and financial viability, as these are critical for ensuring realistic and lasting implementation. Adaptation measures were then scored on a 1–10 scale for each criterion, and weighted scores were aggregated to produce a total composite score, which determined the sectoral priority ranking.

Evaluation criteria	Severity of CC Impacts			Poverty Reduction			High Value			Alignment with Env. & Climate agreements			Lives & Livelihood security			Feasibility of Implementation & availability of resources			Sustainability & long-term benefits			Institutional capacity to implement			Financial operationalization			Urgency of Action			TOTAL WEIGHTED SCORE
Proposed adaptation measures from NAP-UNEP	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	Score (1 to 10)	Weighting	Weighted score	
Adaptation measure 1	x	0,4	x* 0,4	x	0,6	x* 0,6	x	0,7	x* 0,7	x	0,8	x* 0,8	x	0,8	x* 0,8	x	1	x* 1	x	1	x* 1	x	1	x* 1	x	1	x* 1	x	0,4	x* 0,4	Σ weighted score
Adaptation measure 2	y	0,4	y* 0,4	y	0,6	y* 0,6	y	0,7	y* 0,7	y	0,8	y* 0,8	y	0,8	y* 0,8	y	1	y* 1	y	1	y* 1	y	1	y* 1	y	1	y* 1	y	0,4	y* 0,4	Σ weighted score
Adaptation measure ...	z	0,4	z* 0,4	z	0,6	z* 0,6	z	0,7	z* 0,7	z	0,8	z* 0,8	z	0,8	z* 0,8	z	1	z* 1	z	1	z* 1	z	1	z* 1	z	1	z* 1	z	0,4	z* 0,4	Σ weighted score

Figure 3: Multi-Criteria Analysis framework



Multi-Criteria Analysis and Consultation Process

Sector-specific consultations in October 2025 included 8 representatives from the DWR, Department of Meteorology and Hydrology (DMH), Department of Irrigation and Groundwater, and Department of Environment (DOE) under the MAE.

During these consultations, participants were invited to assess and discuss proposed adaptation measures using a scoring approach based on criteria such as feasibility, sustainability, institutional capacity, and financial viability. These discussions supported the refinement and validation of the preliminary assessment initially prepared and shared with stakeholders by the Consultant following the CRVA phase.

The weighting methodology itself was designed by the Consultant as part of the MCA framework, with the objective of prioritizing adaptation actions that are not only climatically relevant, but also institutionally feasible, financially realistic, and capable of delivering sustained resilience benefits within the Lao PDR context.

While the weighting coefficients were not subject to a dedicated validation exercise, the MCA framework and prioritization methodology were presented and shared progressively throughout the assignment, including in the Situation Analysis Report and subsequent CRVA consultations and workshops. The methodology therefore benefited from multiple opportunities for review and comment by the PMU and relevant sector government stakeholders throughout the process.

Table 1: MCA weighting approach

Weight category	Higher weights (Weight = 1.0)	Medium-High Weights (Weight = 0.8)	Medium Weights (Weight = 0.6–0.7)	Lower Weight (Weight = 0.4)
Criteria	Feasibility of implementation & availability of resources Sustainability & long-term benefits Institutional capacity to implement Financial operationalization	Alignment with environmental & climate agreements Lives & livelihood security	Poverty reduction High value (economic or ecosystem value)	Urgency of action
Rationale	These criteria were given the highest weighting since, based on findings from SAR and stakeholder consultations, the main barrier to adaptation is not the lack of identified measures, but rather limited implementation capacity, financing, and institutional sustainability. Therefore, the aim was to avoid prioritizing actions that were not judged technically feasible, financially realistic, institutionally supported or sustainable over time. This approach reflects lessons learned from NAP implementation globally, where feasibility and institutional	Alignment with national and international frameworks (NAP, NDC, SDGs) is essential to ensure policy coherence, facilitate resource mobilization, and strengthen reporting under UNFCCC mechanisms. Similarly, protecting lives and livelihoods is central to Lao PDR's development priorities, particularly in agriculture-dependent and vulnerable communities. These were weighted slightly below implementation criteria to ensure that strategic alignment is strong but not prioritized over feasibility and sustainability considerations.	Poverty reduction and economic value are core development objectives. However, not all high-value or poverty-targeting measures are necessarily climate-resilient or implementable on scale. These criteria were weighted moderately to recognize development co-benefits, ensure adaptation contributes to inclusive growth, while avoiding bias toward purely economic returns over resilience impact.	Urgency is important, especially in areas exposed to severe hazards. However, urgency alone does not guarantee feasibility, institutional readiness, or long-term sustainability. Assigning a lower weight prevents short-term reactive measures from displacing structurally transformative adaptation investments. This ensures the MCA balances immediate needs with strategic resilience-building.

	readiness are recognized as critical determinants of success [16].			
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Phase 4 – Drafting and Consultation of the Action Plan

From an initial long list of options drawn from the NAP-UNEP adaptation catalogue, 15 high-priority actions were identified and consolidated into a draft Sectoral Action Plan. This draft was then presented to sectoral stakeholders for discussion and refinement. Each of the 15 actions was assessed in terms of economic and institutional feasibility and sectoral prioritization by three key departments: the Department of Meteorology and Hydrology (DMH), the Department of Water Resources (DWR), and the Department of Irrigation (DOI). Importantly, the refinement process also incorporated inputs from cross-cutting institutions, including the Lao Women’s Union (LWU), Ministry of Labour and Social Welfare (MLSW), Lao Youth Union, and other mass organizations, to ensure gender equality, social inclusion, and community resilience considerations were fully integrated into the prioritization process.

In parallel, a complementary analysis of climate-related projects from the Lao PDR ODA-MIS Portal was undertaken to compare the MCA results with existing ODA project portfolios, helping to validate and refine sector priorities. And in order to ensure strategic alignment, all selected measures were mapped against Lao PDR’s national policy frameworks, including the NAP, the NDCs, the 9th NSEDP, the Water Resources Strategy to 2030 and Vision to 2040, and the DWR Action Plan 2021–2025.

Building on stakeholder consultations and that complementary analysis, the Action Plan was further refined to identify the five priority adaptation measures, for which detailed Concept Notes were developed.

In parallel, a Monitoring and Evaluation (M&E) framework was developed to support implementation and track progress toward sectoral adaptation objectives. Each priority action is linked to measurable indicators, baseline, target values, responsible institutions, and reporting frequency. GEDSI-responsive indicators are integrated throughout to ensure inclusive implementation tracking. The framework is structured to support both sector-level monitoring and aggregation into national climate reporting processes. This approach aims to ensure that implementation progress can be realistically assessed against available financial and institutional capacities.

Phase 5 – Finalization and Endorsement of the SAP

In parallel, a Monitoring and Evaluation (M&E) framework was developed to support implementation and track progress toward sectoral adaptation objectives. The consolidated draft SAP, combining the Action Plan, Concept Notes, and M&E framework, underwent internal and stakeholder review before being presented at a validation workshop in 14 and 15 January 2026 [see Workshop Report in Appendix 06]. The workshop gathered representatives from relevant ministries (MAF, MPWT and MLSW) and their technical departments and cross-cutting institutions to validate sectoral priorities and refine proposed actions. Through presentations, interactive exercises, and sector-based group discussions, participants reviewed draft strategies, prioritized Concept Notes, and provided detailed technical and institutional feedback. The outcomes of the workshop, together with written comments received subsequently, form the basis for final revisions and endorsement of the SAPs. This participatory validation process aims to strengthen national ownership and ensure alignment with sector mandates, existing planning frameworks, and implementation realities.

5. Gender Considerations

The UNFCCC calls for the mainstreaming of gender across all activities involved in the NAP process. In line with these guidelines, Lao PDR’s NAP process was intentionally designed to reduce gender-based vulnerabilities, promote equitable participation in decision-making, and ensure that adaptation measures implementation does not place additional burdens on women or reinforce existing power imbalances. The process emphasizes inclusiveness, with particular attention onto enhancing the adaptive capacity of vulnerable groups during both policy formulation and implementation, ensuring that resilience benefits are shared across all societal levels.

As highlighted in the NAP, gender equality remains a national priority for the Government of Lao PDR. This commitment is supported by robust institutional mechanisms such as the Lao Women's Union (LWU) and the National Commission for the Advancement of Women, Mothers and Children (NCAWMC), the MLSW, and Lao Youth Union. These institutions play a critical role in ensuring that gender equality, social protection, youth engagement, and community resilience are integrated into climate adaptation planning. Their contributions include policy advocacy, community outreach, and implementation of gender-related programs aligned with national frameworks such as the Law on Gender Equality (2019), the National Strategy for Gender Equality (2016–2025), the Strategy for Mothers and Children (2016–2025), and the National Plan of Action on Preventing and Eliminating Violence against Women and Children. Together, these frameworks aim to promote equal opportunities, strengthen women's participation in decision-making, and protect the rights and well-being of women and children across all sectors, including water resources sector. These cross-cutting institutions were actively engaged throughout that NAP refinement process, providing inputs to ensure that adaptation priorities reflect the needs of women, elderly people, persons with disabilities, and other vulnerable groups. Their involvement helps ensure that adaptation measures are socially inclusive, culturally appropriate and aligned with national commitments to gender equality and social protection.

Nationally, Lao PDR ranked 117th out of 189 countries in the 2023 UNDP Human Development Index (HDI) [17], reflecting steady progress in overall development and gender equality in recent years. However, significant gender disparities persist across education, employment, access to services, and representation in decision-making, particularly in rural and ethnic communities. These gaps underscore the importance of continued engagement of LWU, MLSW, the Youth Union, and other mass organizations to ensure that adaptation actions are equitable, accessible, and responsive to the diverse needs of the population.

Gender is a key consideration of NAP. The NAP emphasized the importance of a gender-responsive approach in order to increase the likelihood that adaptation investments will yield equitable benefits for people of all genders and social groups, including those who are particularly vulnerable. Adopting a gender-responsive approach to adaptation will also help to align climate policies and action with other commitments, including the Sustainable Development Goals (SDGs), the Beijing Declaration and Platform for Action and the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW).

The SAP-WR integrates GEDSI principles to ensure that adaptation actions are equitable, participatory, and responsive to the diverse needs of women, men, youth, ethnic minorities, and persons with disabilities. Recognizing that climate change and water insecurity affect these groups differently, the SAP-WR embeds GEDSI considerations throughout its planning, implementation, and monitoring stages.

Without deliberate GEDSI integration, climate hazards risk reinforcing existing inequalities in water access, decision-making, and health outcomes. Strengthening the resilience of water infrastructure and governance systems must therefore go hand in hand with measures that promote equity, representation, and protection for all. The integration of GEDSI principles into the SAP-WR ensures that the implementation phase will not only enhance climate resilience but also contribute to inclusive and sustainable water resource management in Lao PDR.

Key approaches in the strategy and actions proposed include:

- **Strategy and action that promotes equitable access to water and sanitation and participates to the reduction of gendered labor burdens:** Enhancing access to safe and reliable water and sanitation services while addressing the disproportionate workload on women and girls in water collection and household management through improved infrastructure and inclusive management practices.
- **Indicators and targets to ensure inclusive participation and governance:** Proposed to actively engage women, ethnic minority representatives, and persons with disabilities (PWDs) in the implementation of activities. It is important to ensure women's leadership within Water User Associations (WUAs) and local

water governance committees to strengthen representation in decision-making. Such structures are proposed to be supported by local LWUs and provided gender-sensitivity training.

- **Embedding GEDSI within the Monitoring and Evaluation framework:** Incorporating GEDSI-specific indicators to monitor progress on women's participation in governance structures, equitable access to water and sanitation, and gender-responsive capacity-building efforts.

6. Lao PDR Water Resources Sector

Lao PDR, a mountainous, landlocked country in the heart of the Mekong region, is endowed with abundant freshwater resources. Over 90% of its territory lies within the Mekong River Basin, contributing an estimated 270 billion cubic meters annually to the river's flow. Yet this hydrological wealth is marked by stark seasonal variability, more than 80% of annual rainfall occurs during the monsoon season, posing challenges for equitable access, drought resilience, and sustainable development [23].

The institutional framework for water governance is led by the Department of Water Resources (DWR) under the Ministry of Agriculture and Environment (formerly Ministry of Natural Resources and Environment – MoNRE) at its core. DWR oversees five technical divisions, Policy, River Basin Planning, Water Use Management, Groundwater, and Water Resource Assessment, and coordinates with PAE and DAE to manage 62 river basins of varying scales [23]. While most basins drain westward into the Mekong, six flow eastward into Vietnam, underscoring the importance of transboundary cooperation.

Lao PDR has made significant strides in adopting Integrated Water Resources Management (IWRM) as a national priority. The revised Water Law (2017) provides a legal foundation for participatory, multi-sectoral water governance, including provisions for water rights, environmental flows, and basin-level planning [24]. The National Water Strategy to 2030 and Vision to 2040 articulate a long-term commitment to sustainability, equity, and climate resilience. These ambitions are being operationalized through the Preliminary IWRM Action Plan 2026-2030, launched in June 2025 with support from NUEFP-DHI, WMO, and GWMP-SEA [25][26]. The action plan emphasizes inclusive governance, data harmonization, and adaptive planning, particularly in response to intensifying drought risks. Complementing this is the Drought Management Framework, developed under the Integrated Drought Management Programme, which integrates early warning systems and sector-specific contingency planning across agriculture, forestry, and rural water supply [25].

Despite progress, challenges remain. These include institutional fragmentation, limited data interoperability, and uneven capacity, especially at subnational levels [26]. Moreover, rural and ethnic group communities often face barriers to meaningful participation in water governance, highlighting the need for culturally sensitive, gender-equitable approaches.

Climate change directly affects water resources, which in turn influence energy and food security, forming the water–energy–food nexus. Effective policy and planning require integrated management across these sectors, as decisions such as dam operations impact both power generation and downstream irrigation. This underscores the importance of Integrated Water Resources Management (IWRM) and strong cross-sectoral coordination between meteorological, energy, and agriculture agencies.

As Lao PDR advances its water agenda, the sector stands at a critical juncture. Balancing hydropower development, food security, and community livelihoods with ecological integrity and regional diplomacy will require sustained investment in capacity building, inclusive policy design, and transparent monitoring systems. With its evolving legal frameworks and growing regional engagement, Lao PDR is poised to become a model for integrated, climate-smart water governance in the Mekong region.

PART II: THE HISTORICAL AND CLIMATE PROJECTION AND VULNERABILITY STORY

1. Climate Change Context

1.1. Observed climate trends for Lao PDR

Located in the heart of the Mekong Basin, Lao PDR experiences a tropical monsoon climate characterized by a distinct wet season (typically May-October) and a dry season (approximately November-April). Mean annual rainfall ranges broadly, often between about 1,300 mm to over 3,000 mm depending on region and elevation. Year-round temperatures in the lowlands are typically warm: monthly daytime highs often reach the low to mid-30 °C range.

Temperature



Over the past decades, Lao PDR has experienced a clear warming trend and growing climate variability. Mean surface air temperatures have increased by 0.2–0.3 °C per decade between 1971 and 2020 and an increase of +1 °C since 1950 [27]. Observations show more frequent and intense heatwaves, particularly in lowland and urban areas, and longer dry spells that strain rain-fed agriculture.

Climate models project that average annual temperatures in Lao PDR could increase by 1.5°C to 2.5°C by mid-century under moderate emissions scenarios and potentially exceed 3°C under high-emissions pathways (RCP8.5 / SSP5-8.5) [3]. These trends are already manifesting through more frequent and intense heatwaves, especially in lowland and urban areas, alongside longer and more severe dry spells that challenge rainfed agriculture. The observed changes already affect agricultural productivity, forest health, and water availability. The persistence of these trends underscores the need for strengthened adaptation and resilient resource management systems.

Precipitation



Historical records from 1950 to the present reveal a gradual decline in annual rainfall, from about 1,800 mm to 1,600 mm per year, a decrease of roughly 200 mm over the observed period. More importantly, rainfall in Lao PDR shows increasing variability and unpredictability. Analyses indicate fluctuations in the onset and cessation of the rainy season, as well as in rainfall intensity, reflecting a shift toward more erratic precipitation patterns [27].

Climate projections under both scenarios show similar trends. The observed decline in rainfall, combined with more intense rainfall events, indicates that climate variability rather than absolute rainfall shortage is becoming the main challenge. These shifts have direct implications for soil moisture, surface water availability, and crop productivity, heightening vulnerability in the predominantly rain-fed agricultural systems that sustain most rural livelihoods in Lao PDR.

Relative Humidity



Historical records indicate that relative humidity in Lao PDR has remained relatively stable over past decades, with minimal variation across regions and time. This stability has been consistent across both moderate and high emissions scenarios during the historical baseline period.

However, starting around 2025, projections show a gradual decline in relative humidity, with the rate and magnitude of change differing between scenarios. Under the moderate emissions pathway (SSP2-4.5), the decrease is slow and moderate, representing a manageable adaptation challenge. In contrast, the high emissions scenario (SSP5-8.5) projects a steeper decline after 2075, suggesting significantly drier atmospheric conditions by the end of the century. Lower relative humidity levels

would intensify evapotranspiration rates, heightening water stress for vegetation and crops and exacerbating the risk of drought, particularly in areas already vulnerable to seasonal water scarcity.

1.2. Climate related hazards impact on the Agriculture and Forestry Sectors

Over the past three decades, Lao PDR has experienced an increasingly diverse range of climate-related hazards. These events have not only caused widespread human and economic losses. This hazard screening synthesizes major historical events and scientific evidence across key hazard categories: droughts, heatwaves, floods and landslides.

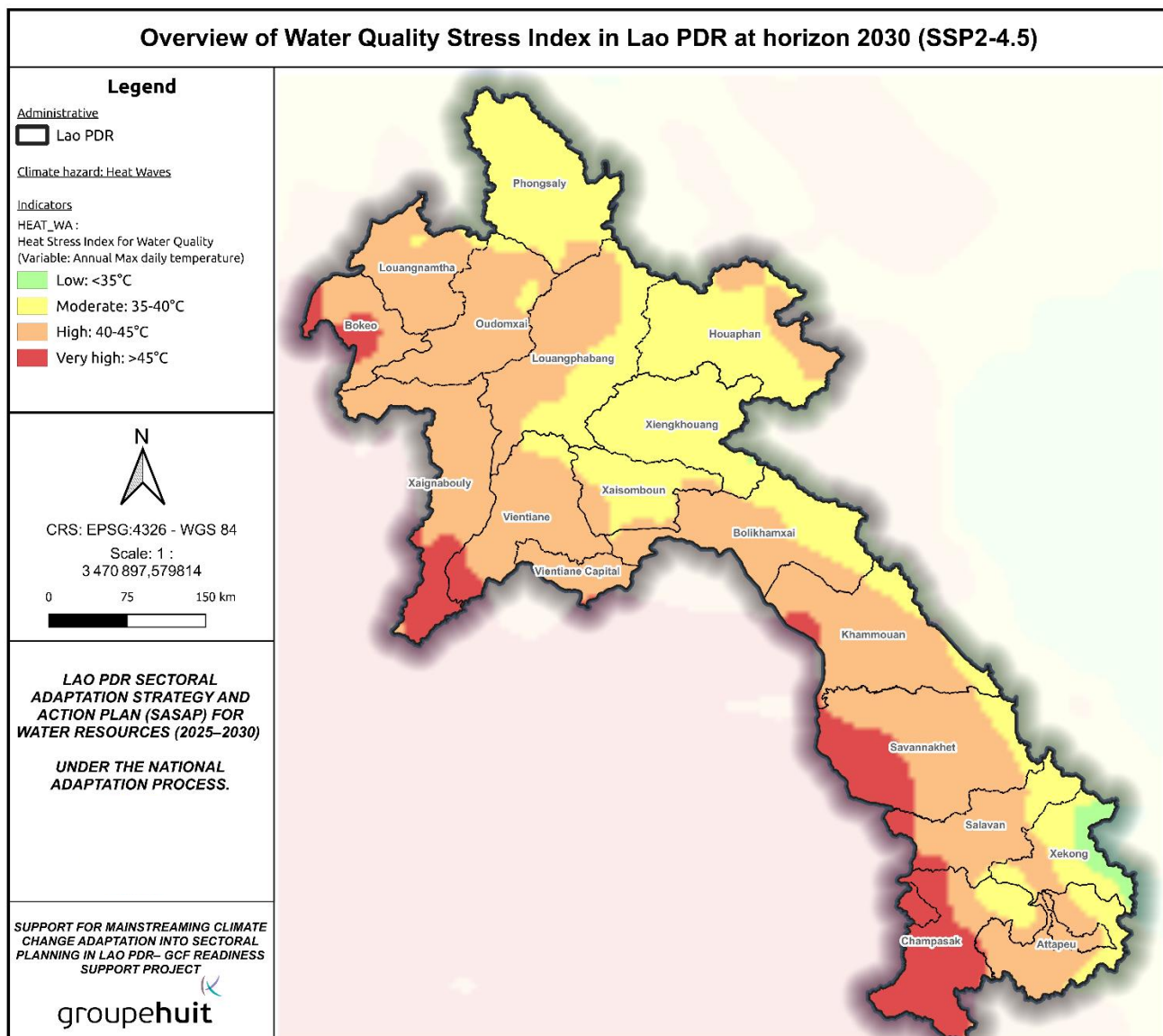
Overall, Lao PDR faces a complex climate future shaped by a convergence of slow-onset changes and sudden climate shocks. Over the last decade, annual economic loss and damage from disaster events, especially flood and drought, had almost quadrupled from about \$94 million in 2009, to \$200 million in 2011 and \$371.5 million in 2018, which was equivalent to 2.1% of the country's projected 2018 GDP, and 10.2% of its 2018 budget [28]. These risks necessitate transformative adaptation planning, a transition to sustainable land use, and climate-resilient infrastructure investments aligned with both mitigation and adaptation imperatives.

Climate change directly affects water resources, which in turn influence energy and food security, forming the water–energy–food nexus. Beyond surface water, groundwater faces increasing risks of depletion, pollution (e.g., arsenic contamination in Champasak), and unmonitored extraction. These issues demand prioritized groundwater management within IWRM through monitoring, regulation, and community awareness. Localized studies remain essential, as groundwater behavior varies by basin, some, like the Vientiane Basin, may even see increased recharge.

Climate hazards such as droughts, heatwaves, floods, and landslides further threaten water security. These events disrupt irrigation, energy supply, and infrastructure, degrade water quality, and cause widespread impacts on agriculture, ecosystems, livelihoods, and public health. Ensuring sustainable, coordinated management of water resources is therefore vital to building climate resilience across interconnected sectors.

1.1.1 Extreme heat events

Historical and recent data indicate a persistent southwest-to-northeast gradient of heat and water stress in Lao PDR, with southwestern provinces consistently facing the highest risk levels. This pattern is projected to intensify over the coming decades. By 2100, under the moderate emissions scenario (SSP2-4.5), very high-risk zones are expected to expand to cover nearly half of the country, while under the high emissions scenario (SSP5-8.5), almost the entire country is projected to experience very high heat and water stress exposure.



Map 1: Overview of Water Quality Stress Index in Lao PDR for Agriculture Sector at horizon 2030 (SSP2-4.5)

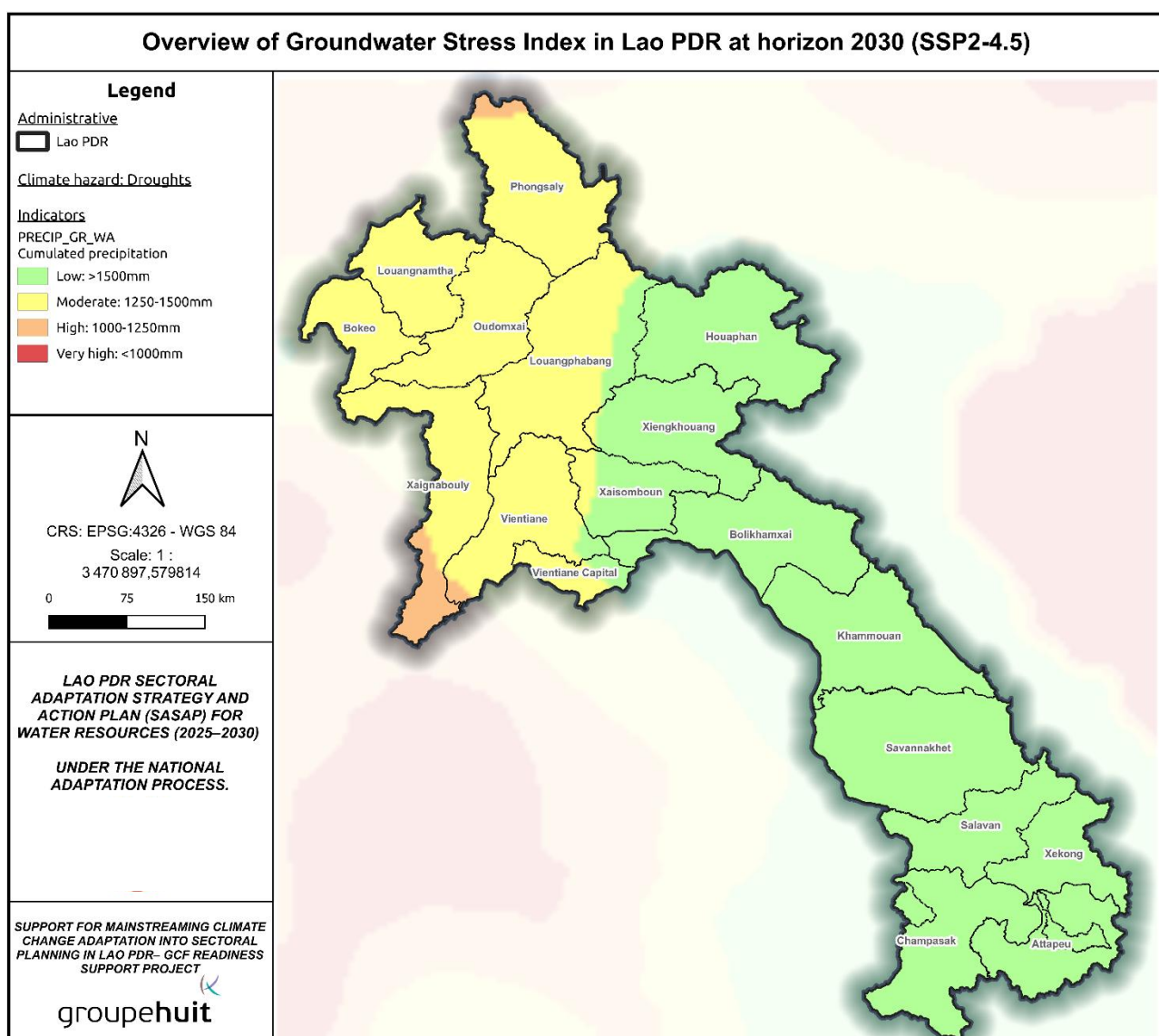
Rising temperatures will have far-reaching impacts on surface and groundwater resources, which are essential for agriculture, domestic use, and rural livelihoods. Higher temperatures and prolonged heatwaves are expected to increase evaporation rates and the frequency of algal blooms in rivers and reservoirs, particularly in the Mekong River and Nam Ngum Basin and other key reservoirs, reducing water quality and raising treatment costs for irrigation and urban supply. In addition, groundwater recharge is likely to decline, especially in the limestone karst regions of northern Lao PDR, where aquifers are already fragile. Increased heat may also elevate the concentration of naturally occurring contaminants such as arsenic and fluoride, threatening safe drinking water access in rural communities that rely on shallow wells.

Overall, the intensification of heatwaves and high-temperature events presents a major challenge for Lao PDR's water security, highlighting the need for integrated water management, monitoring, and adaptive infrastructure to safeguard water resources under a warming climate.

1.1.2 Droughts and extended dry periods

Lao PDR has historically experienced low groundwater stress, but recent decades show a marked increase, particularly in the northern provinces, where reduced groundwater recharge and rising extraction pressures have diminished availability. Around 80% of groundwater recharge occurs during the wet season [30], making aquifers highly dependent on rainfall patterns. Declining recharge rates and erratic rainfall have already led to falling water tables, increased pumping costs, and growing pressure on domestic and agricultural water supplies.

Future projections indicate a moderate but persistent worsening of groundwater stress. Under the SSP2-4.5 scenario, most of the northern region is expected to face moderate to high stress, while under SSP5-8.5, areas of severe depletion expand southward [3]



Map 2: Overview of Groundwater Stress Index in Lao PDR at horizon 2030 (SSP2-4.5)

Droughts or extended dry seasons can have significant and multifaceted impacts on different sectors: agriculture, energy, and health; presenting both challenges and opportunities for water management.

Agriculture



Reduced recharge and over-extraction will particularly affect Lao PDR agriculture sector which is predominantly relying on rain-fed agricultural systems. Insufficient or erratic rainfall, as well as declining river flows and groundwater levels, can severely disrupt agricultural productivity, reduce yields, and heighten the risk of food insecurity especially for smallholder farmers reliant on groundwater for irrigation, leading to lower productivity and heightened economic vulnerability.

Energy



In Lao PDR hydropower generation supplies over 90% of Lao PDR's electricity and is therefore highly sensitive to low river flows [31]. During droughts or extended dry seasons, reduced river discharge leads to lower reservoir levels, directly impacting hydropower output. In 2024, rainfall shortages left reservoirs at only 30% capacity, cutting electricity output by 10% from the previous year [30]

Health

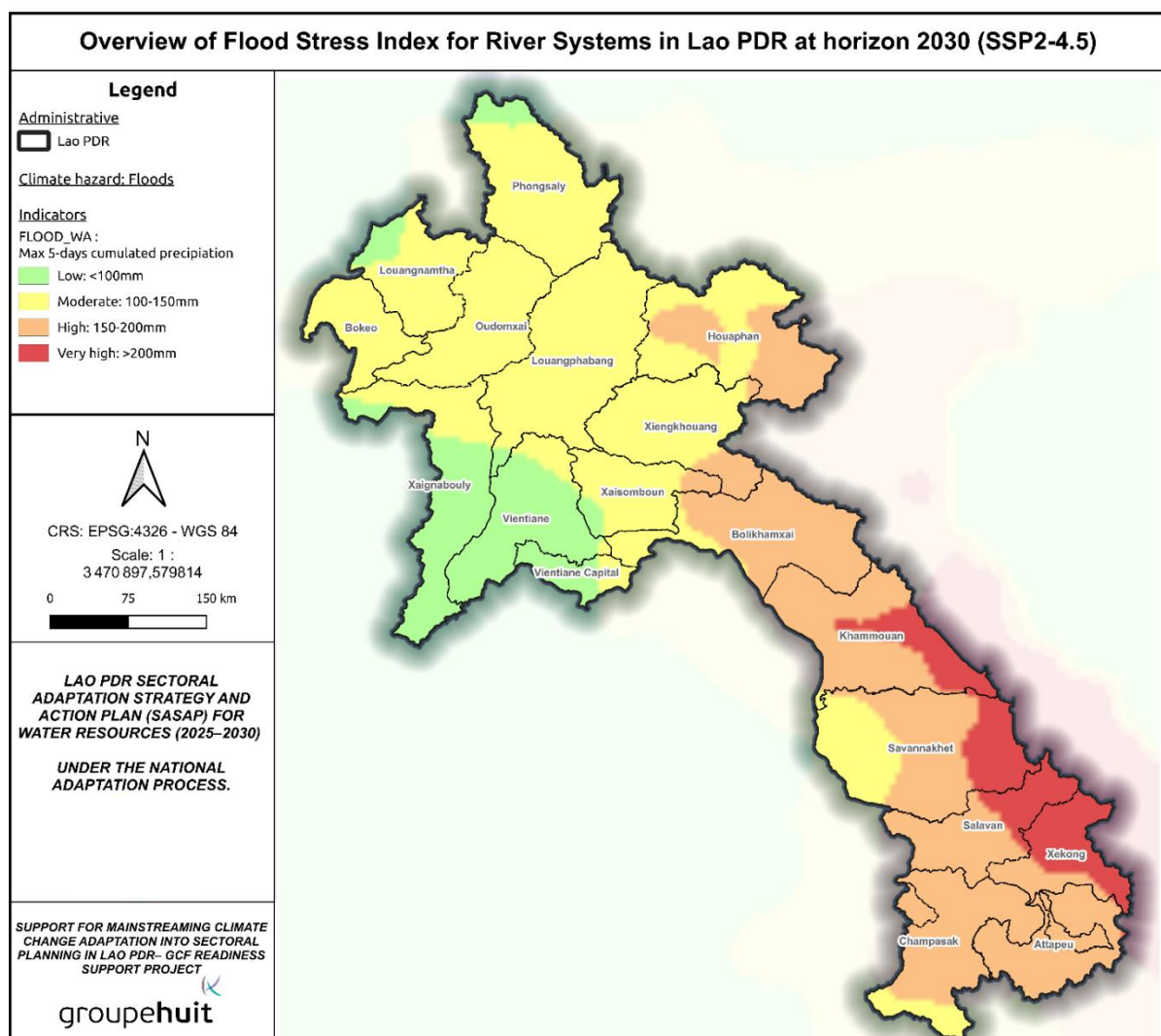


Drought also poses serious public health risks. As surface water volumes decline, pollutant concentrations rise, degrading water quality and increasing treatment costs. Although 84% of the population has access to basic water services, only 18% benefit from safely managed water, and 39% still lack safe sanitation [32]. The combination of water scarcity, declining quality, and inadequate sanitation amplifies health risks, particularly for marginalized rural populations.

In summary, the increasing frequency and severity of droughts, coupled with declining groundwater recharge, threatens water security, food production, energy supply, and public health. Strengthening integrated water resource management, modernizing irrigation infrastructure, and expanding climate-resilient water storage systems are therefore essential for safeguarding livelihoods and sustaining economic growth under changing climatic conditions.

1.1.3 Floods

Flooding represents one of the most recurrent and damaging climate-related hazards in Lao PDR. Historical data from 1950 to nowadays show that flood risk is geographically determined rather than temporally driven, with southern and central lowland areas, especially along the Mekong and its tributaries, consistently facing the highest exposure [3]. While projections under both SSP2-4.5 and SSP5-8.5 show similar spatial patterns, the intensity and frequency of extreme rainfall events are expected to increase, heightening both physical and socio-economic vulnerability.



Map 3: Overview of Flood Stress Index for River Systems in Lao PDR at horizon 2030 (SSP2-4.5)

Floods can have significant and multifaceted impacts on water resources, presenting both challenges and opportunities for water management. While floods are often associated with immediate dangers such as property damage and loss of life, their effects on water resources can be equally profound and long-lasting.

Agriculture



Flooding also poses major risks for agriculture, which depends heavily on small-scale irrigation networks. Floodwaters can destroy canals, pumps, and control structures, as seen in 2018, when heavy monsoon rains and the Xe Pian–Xe Namnoy dam failure inundated over 100,000 ha of farmland across 17 provinces, causing more than USD 11 million in irrigation system damages [33]. Waterlogging and sedimentation further degrade soil and water quality, delaying replanting and reducing yields in key rice-growing provinces such as Savannakhet, Champasak, and Attapeu.

Energy



The energy sector, where hydropower generates over 90 % of national electricity [31], also remains highly exposed. Flooding can damage hydropower dams and transmission systems, as exemplified by the 2018 Xe Pian–Xe Nam Noy dam collapse, which released over 5 billion m³ of water, caused 27 fatalities, and displaced hundreds [31]. This event highlighted the vulnerability of hydropower infrastructure to extreme rainfall and structural failure, emphasizing the need for stronger safety and monitoring standards.

Health

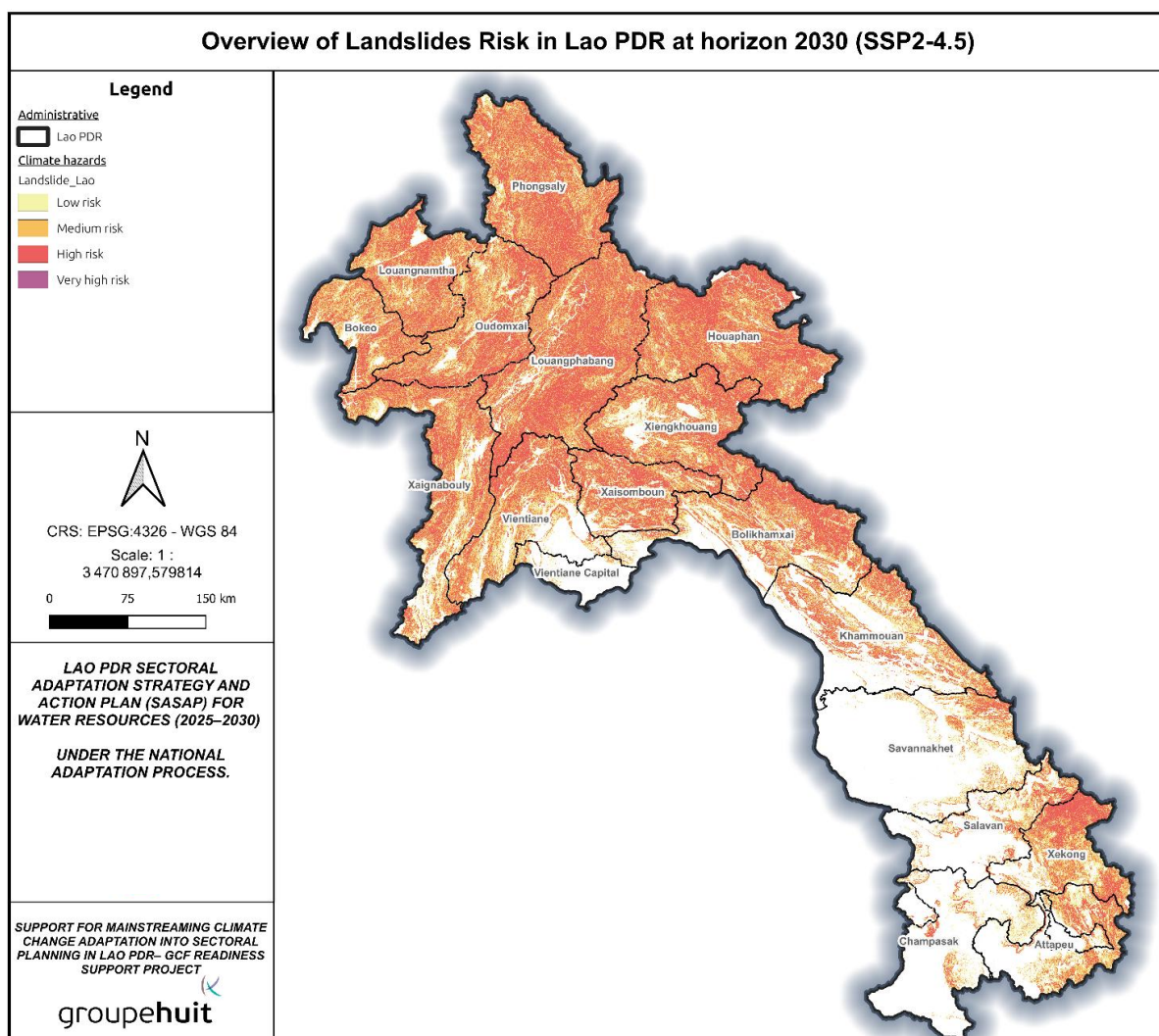


Floods have multifaceted impacts on water resources. They often lead to contamination of drinking water sources through runoff containing sewage, agricultural chemicals, and debris, as well as damage to water supply infrastructure. The 2018 Post-Disaster Needs Assessment (PDNA) estimated over 50 billion LAK in damage to water and sanitation systems, disrupting clean water access for more than 120,000 households [33]. These impacts exacerbate Lao PDR's existing water and sanitation challenges, while 84 % of the population has access to basic water services, only 18 % benefit from safely managed water, and 39 % still lack safe sanitation [32]

In summary, floods in Lao PDR simultaneously threaten water quality, agricultural productivity, and energy reliability. Strengthening flood-resilient water infrastructure, improving early-warning systems, and adopting integrated watershed management approaches are essential for reducing risks and sustaining livelihoods under intensifying climate variability.

1.1.4 Landslides

Landslides represent a growing concern in Lao PDR, particularly in the country's mountainous northern and central regions such as Phongsaly, Oudomxay, Attapeu, Khammouane and Savannakhet, where steep slopes, intense rainfall, and land-use changes increase exposure. These areas exhibit geological and topographical conditions that make them more susceptible to mass wasting events.



Map 4: Overview of Landslides Risk in Lao PDR at horizon 2030 (SSP2-4.5)

Landslides and sedimentation, exacerbated by shifting rainfall patterns, can block waterways, reduce reservoir lifespans, and increase infrastructure maintenance costs. As climate variability intensifies, ensuring the sustainable and resilient management of water resources is essential to safeguarding Lao PDR’s energy security and broader economic stability. While landslides can occasionally create temporary water bodies by blocking rivers, these formations are typically unstable and pose high risks of catastrophic failure. More commonly, landslides can lead to increased sediment loads in rivers and reservoirs, reducing water quality and storage capacity, and placing additional strain on hydropower and irrigation infrastructure.

Sedimentation is a major consequence, studies in the Nam Ou Basin of the Lower Mekong indicate that under a high-emissions scenario, reservoir storage capacity could decline by up to 26% by 2070, compared to 17% without climate change [34]. Such sediment accumulation disrupts irrigation systems, clogs canals and intakes, and can raise maintenance costs as well as affecting water availability for agriculture and service reliability for rural communities.

In addition, altered drainage patterns from landslides can exacerbate flooding in low-lying areas and cause water shortages upstream, further complicating watershed management. These cascading impacts underscore the need for integrated catchment management, erosion control, and slope stabilization measures to preserve water quality, ensure infrastructure resilience, and sustain the long-term functionality of Lao PDR’s water resource systems

Agriculture

Landslides contribute to sedimentation of reservoirs and disruption of irrigation systems. A study in the Nam Ou Basin of the Lower Mekong River Basin found that under a high-emissions scenario by 2070, sedimentation could reduce reservoir storage capacity by 26% compared to 17% without climate change [34]. This sediment build-up decreases available irrigation water and clogs canals and intakes, increasing system maintenance needs and disrupting service delivery.

Energy

Landslides also threaten energy security, given that hydropower accounts for over 90% of national electricity generation [31]. Blocked waterways and sedimentation reduce reservoir lifespan and generation capacity, while damage to hydropower facilities and access roads can interrupt power production and distribution.

1.1.5 Exposure assessment synthesis for Lao PDR Water Resources

Laos boasts abundant water resources with its tropical climate alternating wet (May to October) and dry (November to April) seasons. With significant annual rainfall (1800 mm), abundant internal freshwater resources (240 km³/y) and a relatively small population, Lao PDR has a very high volume of available water per capita (28,000 m³) [29]. Additionally, the Mekong River courses through its heartland with the basin area of the river covering 202,000 square kilometers in the country. For generations, the Mekong has sustained communities, providing essential resources for drinking, irrigation, fishing, and transportation. However, the effects of climate change are increasingly evident, with rising temperatures, erratic precipitation patterns, and the proliferation of hydropower dams threatening the delicate balance of ecosystems and livelihoods.

The exposure levels presented in [Table 2](#) are derived from the Climate Risk and Vulnerability Assessment conducted for Agriculture and Forestry, Water Resources and Urban Development and Transport sector in Lao PDR under the *Readiness Support for Mainstreaming Climate Change Adaptation into Sectoral Planning* project.

In the CRVA Hazard exposure was assessed using climate indicators developed through the consultant's modeling environment (Klim tool), based on historical data (1950–2020) and future projections under SSP2-4.5 and SSP5-8.5 scenarios. For each hazard (heatwaves, droughts, floods, landslides), sector-specific indicators were defined and thresholds were established to classify exposure into four categories: Low, Moderate, High, and Very High (see details in [Appendix 01](#)).

The synthesis table identifies, for each sector and hazard, (i) the level of hazard exposure -severity of hazard- and (ii) the provinces showing the highest severity, based on spatial analysis of the modeled indicators.

Table 2: Exposure Assessment Synthesis

Hazards	Categories	Severity of hazard	Provinces with the highest severity of hazards
Heatwaves	River & reservoir flows	Low/Moderate	Nothern provinces Phongsaly Oudomxay
	Hydraulic infrastructure	Low/Moderate	
	Water quality	Low/Moderate	
	Groundwater management	Low/Moderate	
Droughts	River & reservoir flows	High/Very High	Southern provinces Champasak Khammouane
	Hydraulic infrastructure	High	
	Water quality	High/Very High	
	Groundwater management	High/Very High	
Flooding	River & reservoir flows	Low/Moderate	Southern provinces
	Hydraulic infrastructure	Low/Moderate	

	Water quality	Low/Moderate	Xekong
	Groundwater management	Low/Moderate	Khammouane
Landslides	River & reservoir flows	High/Very High	Mountainous provinces
	Hydraulic infrastructure	High	Phongsaly
	Water quality	Very High	Oudomxay
	Groundwater management	Moderate/Very High	

2. Vulnerability Context

In addition to his exposure to climate variability, Lao PDR's vulnerability is compounded by socioeconomic fragility, with 80% of its 7.5 million inhabitants reliant on climate-sensitive agriculture [35]. The country ranks 142/181 on the ND-GAIN Index due to intersecting political, geographical, and developmental challenges [36].

Climate risks in the Water Resources sector are shaped by structural vulnerability stressors that affect exposure, sensitivity, and adaptive capacity. These stressors interact with climate hazards such as floods, droughts, extreme rainfall events, and rising temperatures, amplifying impacts on river basins, hydraulic infrastructure, groundwater systems, and water-dependent communities.

1.3. Who is most vulnerable and Why?

It is important to remember that vulnerability to climate change is not experienced equally across populations. Gender, disability, ethnicity, age, and socio-economic status all intersect to shape individuals' and groups' capacity to cope with and adapt to climate risks.

Climate-related disasters affect multiple aspects of human well-being, including agricultural production, food security, water management, and public health. The severity of impacts and the capacity to cope depend largely on socio-economic conditions, cultural norms, access to resources, poverty levels, and gender dynamics. Climate-induced hazards such as floods, droughts, heatwaves, and erosion have differentiated impacts on water resources that disproportionately affect vulnerable and marginalized populations in Lao PDR. These groups include women, persons with disabilities, ethnic minorities, the elderly, and low-income rural households, many of whom already face barriers to equitable access to safe and reliable water services.

In Lao PDR, women, persons with disabilities, ethnic minorities, and other marginalized groups often face structural barriers to accessing information, resources, and decision-making processes, which heightens their vulnerability. Limited participation in governance, lower income levels, and reduced mobility can restrict adaptive capacity and increase exposure to hazards. Research consistently highlights that climate impacts are not gender-neutral: women are often among the most vulnerable groups. Differences in vulnerability between women and men are shaped by unequal time burdens, limited access to land, assets and credit, institutional barriers, restricted participation in decision-making processes, and the persistent lack of sex-disaggregated data to inform responsive policies.

This is particularly true in poor rural areas, where women and girls, who are primarily responsible for water collection and household water management in many Lao communities, bear a disproportionate burden when water sources are disrupted. According to the World Bank Data, in Laos rural area 49 % of households water fetchers are adult females, and 12% are children under 15 years old mainly girls [21]. During droughts, for instance, the distance and time required to collect water often increase, exposing women and girls to physical hardship, time poverty, and protection risks. A study from World Vision [22] on Phongsaly and Salavane Province revealed that 74% of respondents viewed fetching water as the main responsibility of girls. The unequal distribution of water fetching responsibilities often falls upon daughters and daughters in law. School girls aged 7-11 years often start their day by fetching water before heading to school at 6 am. They repeat this task in the evening around 4-5 pm. The same study revealed that in Salavan Province, 52% of the residents consume over 70 liters per day from community boreholes for drinking and domestic uses, necessitating more than 4 water fetching trips daily and in Phongsaly province, women and young girls living within 50-100 meters of the water point have to fetch water three times daily (morning, afternoon, and evening) spending approximately 20-30 minutes per trip. When water sources are disrupted, it induces an increase in the time spent collecting water by women and girls, and therefore a reduction in

the time they would spend on other activities, whether social, educational, or income-generating. During dry season, water is collected from open dug wells near the river from which water quality is uncertain. When water quality deteriorates, whether due to sedimentation from erosion or contamination during floods, the health risks (e.g., diarrheal diseases) disproportionately affect children, elderly people, and individuals with limited mobility or access to healthcare. Additionally, limited participation in governance, lower income levels, and reduced mobility can restrict adaptive capacity and increase exposure to hazards.

Therefore, GEDSI considerations have been integrated into sensitive factors during the assessment of vulnerability to that adaptation strategies that will be developed at the latter stages of the project will be inclusive, equitable, and responsive to the differentiated needs of at-risk populations, ultimately contributing to more resilient communities.

1.4. Key Vulnerability Drivers

Multiple determinants of vulnerability are identified on national trends. Women, persons with disabilities, ethnic minorities, and other marginalized groups often face structural barriers to accessing information, resources, and decision-making processes, which heightens their vulnerability [20]. Limited participation in governance, lower income levels, and reduced mobility can restrict adaptive capacity and increase exposure to hazards.

Regarding Climate Change, climate-induced hazards have disproportionate impacts on marginalized groups in the agriculture and forestry sectors in Lao PDR. Women, people with disabilities, ethnic minorities, and low-income rural households often depend heavily on subsistence agriculture and natural resources for their livelihoods, yet have limited access to climate information, land rights, agricultural inputs, credit, or decision-making spaces that could increase their adaptive capacity.

In addition, limited availability of disaggregated and vulnerability specific data (e.g., income, land ownership, credit access, disaster losses) further constrains targeted adaptation planning.

Women vulnerability factors



Women's labor force participation has steadily increased since the 1990s, reaching 61.5% in 2024, yet remains 9.2 percentage points lower than men's participation rate of 70.7% [18]. Lao PDR ranks 36th among 156 countries, second in ASEAN after the Philippines [19], with particularly strong performance in economic participation and opportunity, where it ranked first globally. However, despite a gradual decline since 2010 (approximately 8 percentage points), vulnerable employment continues to affect women more than men (81.5% versus 72.5% in 2023) [17].



Women also carry a disproportionate share of unpaid care and domestic work, spending about 1.4 times more time on such activities than men [18]. In rural and peri-urban areas, this includes responsibility for water collection, water storage, sanitation management, and caregiving during climate-related illness outbreaks. During droughts or service disruptions, women's workload increases further. Women's high time allocation in unpaid productive and household work contributes to their non-empowerment



Gender gaps persist in education, as only 19.3% of women aged 25 and older have completed secondary education compared to 31% of men, and the gap widens beyond secondary level. Literacy rates are also lower among women in low-income households (66% compared to 81% for men) [18]. Lower literacy and technical training rates among women can limit their participation in hydrological monitoring, early warning dissemination, infrastructure management, and technical decision-making related to water systems.



Women in governance and leadership remains limited across scales, undergoing a setback since 2020. In 2024, women represented 2% of village chiefs, 17% of director generals in line ministries, and 22% of national parliament seats were held by women, against 27,55% in 2020 [18] This is also echoed by limited representation in river basin committees, water user associations, and infrastructure management bodies reduces women's influence over water allocation decisions, flood management planning, and disaster response strategies.



Women often face land tenure insecurity and without formal land titles, many cannot access credit or use land as collateral. Limited land tenure security and restricted access to credit and financial services constrain women's ability to invest in water storage, irrigation improvements, sanitation systems, or flood-resilient housing. Weak access to insurance mechanisms further reduces their capacity to recover after water-related climate shocks.

Persons with Disabilities (PWDs) and Elderly vulnerability factors

On one hand Lao PDR's population is gradually ageing. While Lao PDR is still considered a relatively young country with around 60% of its population under 30 years old, the share of older persons aged over 60 years old is steadily increasing [53]. The country is entering a demographic transition phase where the proportion of elderly is growing faster than institutional systems are adapting. Since Lao PDR does not yet have universal pension coverage -very few workers such as civil servant benefitting from structured pension schemes- many elderly depend on family support or continue to work at advanced aged [54].

On the other hand, persons with disabilities (PWDs) represent a significant but often under-documented segment of the population. According to the Lao Population and Housing Census and WHO estimates, disability prevalence may range between 2–5% depending on measurement definitions, though underreporting remains likely [55]. PWDs face multiple barriers that increase climate vulnerability such as limited mobility during extreme events and reduced access to evacuation infrastructure.



Mobility constraints, limited access to transport and infrastructure, rarely designed according to universal accessibility standards, increase exposure during extreme events. Access to emergency shelters, safe water distribution points, sanitation facilities, and early warning systems can be particularly challenging for individuals requiring assistive devices or regular medical care.



Elderly people are physiologically more sensitive to extreme heat, dehydration, and waterborne diseases, especially when flood events contaminate water sources, increasing incidence of waterborne diseases, particularly where wastewater treatment and sanitation systems are inadequate. In remote or mountainous areas where transport networks are fragile, water-related climate shocks can isolate communities and delay access to medical care and safe water services



Socio-economic disadvantages further reduce adaptive capacity. Limited formal employment, weak social protection coverage, and restricted access to credit or insurance mechanisms constrain the ability of elderly persons and PWDs to invest in flood-resilient housing, water storage systems, sanitation upgrades, or relocation. Without targeted inclusion measures, water resilience investments may unintentionally overlook these high-risk groups.

Ethnic Groups vulnerability factors

Lao PDR is a culturally diverse country, comprising of 50 ethnic groups, under 4 ethno-linguistic families, namely: the Lao-Tai, Mon-Khmer, Hmong-Mien, and Sino-Tibetan.

- Lao-Tai (majority group, largely concentrated in lowland areas and along the Mekong River)

- Mon-Khmer (primarily in upland and forested areas)
- Hmong-Mien (mainly in mountainous northern and central regions)
- Sino-Tibetan (smaller populations in remote highland areas)

The Lao-Tai group represents most of the population, while non-Lao-Tai ethnic groups are often located in remote, upland, and mountainous areas, where access to infrastructure, markets, education, and health services is more limited. Overall, most of ethnic groups belonging to Mon-Khmer, Hmong-Mien and Sino-Tibetan ethno-linguistic families live in upland, forested, or remote areas and are dependent on forest and natural resources for their livelihoods. Many of them have their own language or dialect and different religious beliefs. Many of them live in remote rural areas. Many ethnic communities rely on rain-fed agriculture, shifting cultivation, forest products, and natural resource-based livelihoods, making them particularly sensitive to climate variability, land degradation, and ecosystem changes.

Ethnic diversity is recognized in national development policies; however, disparities remain in terms of income levels, education attainment, land tenure security, access to services, and participation in decision-making processes. Language barriers and geographic isolation can further constrain access to government programs and climate adaptation support.



Geographical remoteness compounds vulnerability. Ethnic communities in upland and remote areas often rely on small streams, rain-fed systems, springs, and shallow groundwater sources that are highly sensitive to seasonal variability [57]. Steep slopes and degraded watersheds increase exposure to flash floods, landslides, sedimentation, and water quality deterioration. Limited infrastructure coverage further heightens exposure to climate-related water hazards.



Socio-economic constraints further limit adaptive capacity. Lower income levels, limited land tenure recognition (including customary land systems), and reduced participation in decision-making processes can restrict access to government water programs, infrastructure investments, and climate adaptation financing. These structural barriers may reduce the ability of ethnic communities to invest in water storage, flood-resilient housing, or improved sanitation systems.

1.5. When Vulnerability meets climate hazards

Vulnerable group concentration in labor-intensive, climate-sensitive activities (transplanting, water-dependent crops, manual harvesting) increases exposure to drought and heat stress. This is coupled with limited access to productive assets with important land tenure insecurity, limited access to irrigation, limited access to extension services and weak access to insurance mechanisms.



Floods and tropical storms disproportionately affect women-headed households, elderly persons, PWDs, and ethnic communities in remote or flood-prone areas. Limited access to evacuation routes, safe shelters, early warning dissemination, and transport increases exposure. Flood events can also damage water supply systems, contaminate surface and groundwater sources, disrupt sanitation infrastructure, and strain dam and reservoir operations. In rapidly urbanizing areas, insufficient drainage systems exacerbate waterlogging and infrastructure losses.



Droughts and prolonged dry seasons can intensify pressure on surface water and groundwater systems. In rural areas, declining water availability increases the time required for water collection, disproportionately affecting women and girls. In urban and peri-urban settings, reduced water supply can disrupt public services, schools, and health facilities.



Extreme rainfall and landslides can threaten riverbank stability, reservoir safety, and watershed integrity. Sedimentation can reduce dam efficiency and increase downstream flood risks. Communities located along steep slopes, or degraded watersheds face heightened exposure to flash floods and infrastructure failure.

It is important to remember that vulnerability to climate change is not experienced equally across populations. Gender, disability, ethnicity, age, and socio-economic status all intersect to shape individuals' and groups' capacity to cope with and adapt to climate risks. In Lao PDR, women, persons with disabilities, ethnic minorities, and other marginalized groups often face structural barriers to accessing information, resources, and decision-making processes, which heightens their vulnerability [17]. Limited participation in governance, lower income levels, and reduced mobility can restrict adaptive capacity and increase exposure to hazards. GEDSI considerations have been integrated into sensitive factors during the vulnerability assessment in order to that adaptation strategies that will be developed at the latter stages of the project will be inclusive, equitable, and responsive to the differentiated needs of at-risk populations, ultimately contributing to more resilient communities.

3. Climate Risk Synthesis

Climate risk centers on the interaction between hazard, vulnerability and exposure as per the IPCC risk framework. Risk is typically estimated as the product of the probability of hazard occurring and the impact it would have on the system if it did occur.



Figure 4: Interrelations between components of climate risk

[Source: Fourth Assessment Report (AR4), IPCC]

A Climate Risks Synthesis for the Water Resources Sectors is presented in [Figure 5](#).

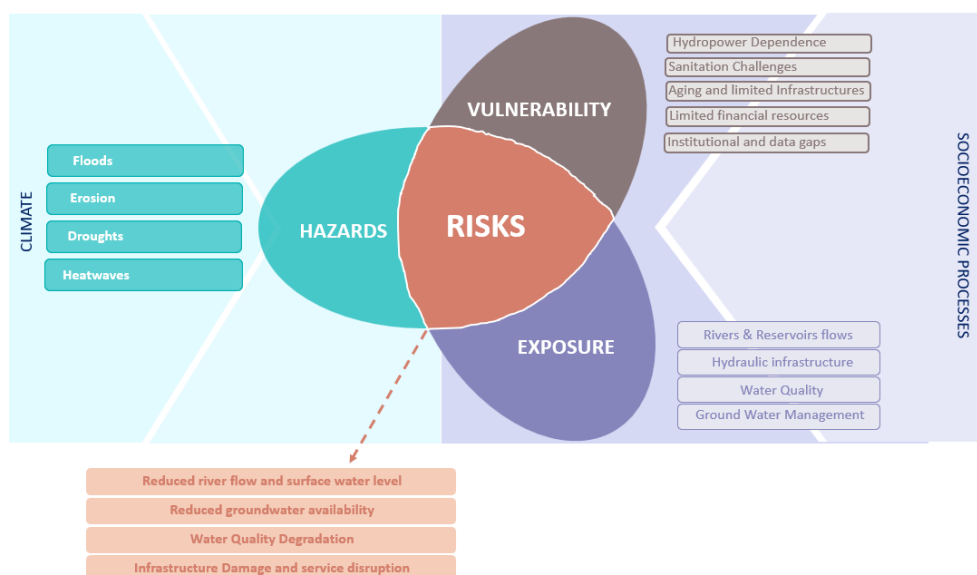


Figure 5: Climate Risk Synthesis for the Water Resources Sector

PART III: POLICY AND INSTITUTIONAL FRAMEWORK

1. Current institutional arrangements

Lao PDR's water resources sector is governed by a centralized yet increasingly decentralized framework, led by the MAE. Within MAE, the DWR serves as the lead technical body responsible for policy formulation, basin planning, water use regulation, and groundwater management. DWR's mandate includes overseeing the implementation of the Water Law (2017), coordinating IWRM, and managing the country's 62 river basins through national, provincial, and district levels. DWR also leads coordination with international partners, including the Mekong River Commission (MRC) and technical agencies such as the International Water Management Institute (IWMI). A recent MoU signed in April 2025 between DWR and IWMI formalizes joint efforts in groundwater monitoring, basin-level planning, and climate-resilient water governance [38] [39].

On the climate side, national coordination is spearheaded by the Department of Environment (DoE) under MAE. DoE is responsible for implementing Lao PDR's NAP and Nationally Determined Contributions (NDCs) under the Paris Agreement. It works closely with sectoral ministries – including Agriculture, Energy, and Public Works – to align climate adaptation strategies with sectoral development plans [28]. To integrate climate change into water resources policies and practices, Lao PDR is establishing a cross-sectoral coordination mechanism. This includes:

- NAP Technical Working Groups, which include representatives from DWR, DoE, and other line ministries.
- Sectoral Adaptation Strategies and Action Plans (SAPs), which embed climate resilience into water, agriculture, and infrastructure planning.
- Climate-water Integration Frameworks, currently under development, to harmonize basin-level IWRM plans with climate risk assessments and early warning systems.
- Capacity-building partnerships, such as those with UNEP-DHI and GWP-SEA, to support data harmonization, gender-sensitive planning, and adaptive monitoring.

These structures aim to overcome historical fragmentation between water and climate mandates, ensuring that climate risks – such as droughts, floods, and shifting rainfall patterns – are systematically addressed in water governance. The integration process is supported by donor-funded programs and regional platforms, including the GoAL-WaterS Initiative and the ASEAN Working Group on Water Resources Management [38].

As Lao PDR moves toward its Vision 2040 for Water Resources, institutional arrangements are being refined to promote inclusive, climate-smart governance, with clear roles, shared data systems, and participatory planning at all levels.

2. Climate Change Policy Framework and Legislation

Lao PDR has made significant strides in establishing a comprehensive climate change policy framework that integrates resilience, mitigation, and inclusive development across sectors. The cornerstone of this framework is the National Strategy on Climate Change toward 2030 (NSCC 2030), endorsed in January 2023 [40]. This strategy outlines strategic priorities across eight sectors, including agriculture, forestry, water resources, energy, health, education, urban development, and tourism, and is built on three foundational pillars: resilience building, emissions reduction, and green growth. It updates the earlier 2010 strategy and aligns with Lao PDR's international commitments under the Paris Agreement, including its NDCs and NAP [16].

To support implementation, Lao PDR has adopted a suite of sectoral laws and decrees that embed climate change considerations into environmental governance and resources management. The Environmental Protection Law (2012, revised) provides the legal basis for environmental safeguards, mandating Environmental Impact Assessments (EIAs), pollution control, and climate-sensitive project screening [14]. The Forestry Law (2019) incorporates climate resilience and sustainable forest management principles, while the Water and Water Resources Law (1996) support watershed protection and equitable water allocation [24]. The Decree on Climate Change No. 09/PM (2019) formally mandates climate integration across ministries and establishes the Department of Climate Change [now Department of Environment] as the national coordinating body [12].

Institutionally, climate coordination is now housed within the MAE, following the merger of the former MAF and MONRE. MAE chairs the National Steering Committee on Climate Change, which oversees policy alignment, climate finance, and international reporting obligations under the UNFCCC [41]. The ministry also leads the development of sector-specific climate action plans, including for agriculture and forestry, and promotes community-based adaptation (CBA) and ecosystem-based approaches (EbA) to strengthen local resilience [42].

To operationalize these frameworks, Lao PDR has adopted the Green Growth Strategy (2019), which promotes low-carbon development, resources efficiency, and inclusive growth [43]. Climate indicators have been integrated into the 9th NSEDP, ensuring that adaptation and mitigation are tracked across national planning cycles. Additionally, SWGs under the Round Table Process facilitate stakeholder engagement, donor coordination, and technical alignment across climate-sensitive sectors [44]. These platforms enable inclusive dialogue between government agencies, development partners, civil society, and research institutions.

Table 3: International and National Framework for Climate Adaptation in Lao PDR

Framework	Key focus /contribution
Paris Agreement on Climate Change (2015)	Set global goal on adaptation to enhance adaptive capacity, strengthen resilience, and reduce vulnerability to climate change.
The first Biennial Update Report of the Lao PDR - 2020	Focuses primarily on greenhouse gas inventory and mitigation actions.
Green Growth Strategy (2019)	Promotes low-carbon development, resource efficiency, and inclusive growth.
9th National Socio-Economic Development Plan (NSEDP) 2021-2025	Integrates climate indicators into national planning and monitoring frameworks.
National Strategy on Climate Change toward 2030 (NSCC 2030)	Sets strategic direction across 8 sectors; built on resilience, mitigation, and green growth pillars.
National Adaptation Plan (2025)	Framework for sectoral adaptation strategies aligns with Paris Agreement commitments.
Nationally Determined Contributions (NDCs) 2020-2025	Emissions reduction and adaptation targets under the UNFCCC

Sectoral Adaptation Strategies and Action Plans (SAPs) 2021-2030	Operationalize NAP across agriculture, forestry, water, health, and infrastructure.
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Table 4: Legislation Framework for Climate Adaptation in Lao PDR

Legislation frameworks	Key focus /contribution
Environmental Protection Law (Revised, 2024)	Mandates EIAs, pollution control, and climate-sensitive project screening.
Decree on Climate Change No. 09/PM, 2019	Mandates climate integration across ministries; establishes Department of Climate Change (DCC) [now Department of Environment - DoE]
Law on Disaster Risk management (2019)	Establishment of Disaster Management Committees, Disaster Risk Reduction (DRR) Measures, and Emergency Response and Relief protocols

3. Water Resources Framework and Legislation

Lao PDR's water governance is anchored by the Law on Water and Water Resources (Amended 2017), which provides the legal foundation for sustainable water use, protection, and management. This law recognizes water as a national asset and outlines principles for equitable access, environmental protection, and multi-sectoral coordination. It includes provisions for wastewater discharge permits, wetland conservation, groundwater regulation, and river basin management, and introduces environmental flow requirements for hydropower and irrigation systems. The Law mandates the establishment of River Basin Committees, which are tasked with participatory planning and oversight across Lao PDR's 62 river basins. These committees are composed of representatives from government agencies, local communities, and civil society, ensuring that water governance reflects diverse stakeholder interests. MAE, through its DWR, serves as the lead implementing body, responsible for policy enforcement, technical coordination, and basin-level planning [24].

Complementing the Water Law is the National Strategy for Water Management, Water Use, and Water Resources to 2030, along with the Vision to 2040. These strategic documents outline long-term goals for water security, climate resilience, and regional cooperation. They emphasize the integration of water policy with national development plans, disaster risk reduction, and climate adaptation frameworks [45]. Lao PDR's water policy is also shaped by its commitments under the 1995 Mekong Agreement, which govern equitable and sustainable use of the Mekong River among member states. Through its engagement with the MRC, Lao PDR participates in basin-wide environmental monitoring, data sharing, and joint planning.

Table 5: Legislation Framework for Water Resources in Lao PDR

Legislation frameworks	Key focus /contribution
Water and Water Resources Law (1996 – Amended 2017)	Supports watershed protection, equitable water allocation, and basin-level planning.
Law on Meteorology and Hydrology (2017)	Establishes Meteorological and Hydrological Monitoring Systems and mandates the setup of stations to monitor weather and hydrological data for the development of Early Warning Systems for Disasters

Law on Irrigation 2013	Regulation of Water Resource Management to ensure efficient water distribution, prevent floods/droughts, and support agriculture. Define roles and responsibilities of Stakeholders to clarify accountability and promote participatory management and established penalties for Violations
Law on Dam Safety 2022	Establishes Dam Classification & Safety Standards and Emergency Preparedness framework.
Decree on Wetland 2023	Defines wetlands and their ecological importance, emphasizing protection of water resources, biodiversity, and ecosystem services. Outlines wetland restoration measures and penalties for violations Defines roles of stakeholders and assigns duties to authorities and communities for wetland monitoring, pollution control, and sustainable use.
Law on Water Way 2023	Regulation of Waterway Transport and establishment waterway zones and maintenance protocols.

To operationalize these frameworks, the government launched the Preliminary IWRM Action Plan 2026-2030, which translates legal mandates into actionable steps. This plan focuses on governance strengthening, capacity building, and climate adaptation and was developed through inclusive consultations with support from UNEP-DHI, GWP-SEA, and other partners. Despite these advances, implementation challenges remain. These include limited institutional capacity, fragmented data systems, and gaps in enforcement at subnational levels. Strengthening coordination between national and provincial authorities, investing in water-related infrastructure, and enhancing legal literacy among communities are critical next steps.

PART IV: LAO PDR SECTORAL ADAPTATION STRATEGY AND ACTION PLAN FOR THE WATER RESOURCES SECTORS 2026-2030

1. Introduction and Strategic goal

The SAP-WR provides sector-specific guidance necessary to operationalize commitments made under the NAP and NDC frameworks, thus complementing both policies. Grounded in comprehensive climate risk and vulnerability assessments, the SAP-WR identifies and prioritizes adaptation actions aligned with national development goals and tailored to the specific needs of vulnerable geographic areas. It outlines investment options and strengthen community resilience, with a strong emphasis on GEDSI to ensure equitable benefits for all population groups.

The overarching goal of the SAP-WR is to strengthen water security and resilience in Lao PDR by safeguarding watersheds and ecosystems, ensuring reliable and equitable water access for all users, and supporting sustainable, inclusive, and climate-resilient water management systems through adaptive and evidence-based planning and implementation.

As a strategic tool for resource mobilization, the SAP-WR provides a credible, evidence-based framework to attract domestic funding, international climate finance, and private sector investment in climate-resilient infrastructure, technologies, and practices. The strategy supports the Government's efforts to integrate climate change considerations into development policy and practice, reinforcing national resilience objectives.

The SAP is structured around three overarching outcomes that organize the 15 priority actions:

- **Outcome 1:** Secure resilient and equitable water supply through improved infrastructure and storage.
- **Outcome 2:** Strengthen irrigation efficiency and drought resilience for food and livelihood security.
- **Outcome 3:** Protect ecosystems, expand monitoring and governance, and ensure climate-proof water management.

2. Action Plan for the Water Resources sector

To address the growing impacts of climate change on Lao PDR's water systems, the SAP-WR outlines a comprehensive roadmap to build a resilient, inclusive, and sustainable water sector. The plan is structured around three key outcomes, each supported by strategic objectives and targeted actions designed to strengthen infrastructure, governance, and ecosystem protection.

Outcome 1: Ensure climate-resilient water supply systems for households, agriculture, and communities.

Strategic Objective 1.1: Strengthen Basic and Community Water Infrastructure

This objective ensures that water infrastructure upgrades—such as wells, boreholes, and irrigation systems—are not only climate-resilient but also socially inclusive. At least 40% of community water committees will include women, while irrigation management groups will actively engage youth. Water user associations will be structured to include at least 30% representation from women and ethnic minorities, ensuring that decision-making reflects diverse community needs.

Strategic Objective 1.2: Mobilize Sustainable Financing for Water Infrastructure

Financing strategies will be developed with a clear focus on equity. Investment planning will prioritize rural women and disadvantaged **groups** as key beneficiaries. Participatory budgeting sessions will be conducted to include women, youth, and low-income households, ensuring that financial decisions reflect local priorities and lived experiences.

Outcome 2: Protect and manage water resources against climate risks.

Strategic Objective 2.1: Strengthen Groundwater Management and Monitoring

Groundwater governance will be guided by transparent allocation mechanisms that prioritize vulnerable populations. Data collection efforts will include gender-disaggregated indicators on water access and shortages, while community engagement in identifying overexploited aquifers will ensure that local knowledge informs technical planning. Women will be actively involved in co-management committees for designated water protection zones.

Outcome 3: Strengthen integrated and adaptive water management systems

Strategic Objective 3.1: Promote Integrated Water Governance and Adaptive Basin Management

Integrated Water Resources Management (IWRM) plans will be developed with inclusive governance structures. Basin councils will include women and youth representatives, and water allocation decisions will be made with attention to the needs of marginalized users across sectors.

Strategic Objective 3.2: Strengthen Monitoring, Information Systems, and Risk Preparedness

Monitoring networks and data systems will be expanded with a focus on inclusive capacity-building. Young professionals and women technicians will be prioritized for training and staffing of meteorological and hydrological stations. The national water database will include gender-disaggregated indicators and ensure open access for all user groups. Emergency water supply protocols will be designed to guarantee equitable access for poor and marginalized households during climate shocks.

Strategic Objective 3.3: Conserve Ecosystems and Natural Buffers for Water Resilience

Wetland and peatland conservation efforts will be co-managed with local communities, ensuring meaningful participation from women and ethnic minorities. Restoration programs and alternative livelihood initiatives, such as ecotourism, will be designed to benefit vulnerable groups, linking environmental protection with inclusive economic development.

About the Sector Action Plan

The identification of priority actions under Water Resources SAP followed a structured and evidence-based process combining technical analysis, benchmarking, and stakeholder validation. An initial long list of adaptation measures was extracted from the NAP–UNEP adaptation catalogue and selected based on the MCA and findings from the CRVA and further refined through stakeholders’ consultation.

The cost estimates presented in the SAP are indicative and intended to support strategic planning and prioritization. They are not detailed engineering budgets but they provide realistic order-of-magnitude estimates to guide decision-making and resource mobilization. Costing was developed based on three main sources:

- Consultant experience: Cost estimates were informed by lessons learned and indicative budget ranges from similar climate adaptation, infrastructure, capacity-building, and institutional strengthening projects implemented in Lao PDR and comparable Southeast Asian contexts, including projects supported by ADB, World Bank, GCF and bilateral cooperation partners.
- Benchmarking and literature review: Review of cost data from comparable national and donor-funded projects (ADB, World Bank, GCF, UN agencies, bilateral cooperation), including infrastructure rehabilitation, ecosystem restoration, policy reform, and capacity development initiatives
- Market-based assumptions: Use of standard unit costs where available (e.g., km of drainage, number of monitoring stations, training workshops, technical studies), adjusted to reflect the Lao context, logistical constraints, and inflation trends.



These estimates should be further refined during detailed project preparation, feasibility studies, and engineering design phases.

Table 6: Water Resource Management Action Plan

Actions	Description	List of activities	GEDSI Integration	Stakeholders to support the implementation	Example of existing or under funding Projects	Cost	Schedule
OVERARCHING GOAL: BUILD A WATER RESOURCES SECTOR THAT ENSURES RELIABLE SUPPLY, SAFEGUARDS ECOSYSTEMS, AND STRENGTHENS RESILIENCE TO FLOODS AND DROUGHTS THROUGH INTEGRATED, SUSTAINABLE, AND INCLUSIVE MANAGEMENT.							
Outcome 1: Ensure climate-resilient water supply systems for households, agriculture, and communities							
Rationale: Water supply systems in Lao PDR are increasingly vulnerable to floods, droughts, and changing rainfall patterns. Communities in both urban and rural areas face seasonal shortages and water insecurity. Enhancing water infrastructure and supply planning is central to climate resilience and poverty reduction.							
Coherence with NAP & national strategies: NAP priorities on climate-resilient water management, the NDC commitments on improving water efficiency, and the water sector strategies on infrastructure and irrigation modernization. It also complements the Green & Sustainable Agriculture 2030 Strategy and the National Water Resources Strategy.							
Strategic objective 1.1: Strengthen basic and community water infrastructure							
Description: This objective focuses on expanding and upgrading safe water systems through resilient wells, boreholes, reservoirs, and distribution networks. The aim is to ensure continuous access to water in rural and urban areas, particularly during floods and droughts, while promoting community-based management.							
1. Build basic infrastructure and develop community water supply to cope with floods and droughts (Concept Note 1)	Develop resilient wells, boreholes, and piped distribution networks; rehabilitate damaged systems; integrate flood-resistant designs and redundant systems to ensure continuity during droughts or floods.	Map priority drought/flood-prone villages and identify 3 pilot districts (2026). Conduct vulnerability and need assessment in target communities (2026). Build/rehabilitate 30 community systems (2027-2029). Establish community water management committees and train operators (2029-2030).	At least 50% of women participants during consultation for vulnerability assessment Prioritize installation of water points in areas that reduce the time burden of women and girls Ensure at least 40% of community management committees include women;	MAE, Provincial Water Supply Enterprises, District authorities, NGOs.	WB “Scaling-Up Water Supply, Sanitation and Hygiene Project” (2019–2025)” [59].	\$12.5M	2026–2030

2. Improve irrigation systems to be more efficient and resilient (Concept Note 2)	Upgrade irrigation infrastructure with water-saving technologies and renewable energy, and train farmers in climate-smart irrigation to enhance reliability during floods and droughts.	Conduct irrigation audit in 6 provinces (2026). Rehabilitate 15 schemes (2027). Scale to 30 schemes (2030). Strengthen or establish WUAs and provide training (2030)	Ensure at least 30% of trained farmers are women. Involve women in irrigation management groups.	MAE (Dept. of Irrigation), Farmer Cooperatives, WUAs	<i>ADB “Northern Rural Infrastructure Development Project” (2011-2026) [60].</i>	\$4.5M	2026–2030
3. Build small, medium, and large-scale community water supply systems	Construct multipurpose storage tanks, reservoirs, and gravity-fed systems for both rural and peri-urban areas; design for climate variability; ensure operational plans for maintenance and community-based management.	Survey existing coverage and select priority sites (2026). Conduct Feasibility Studies with design of multipurpose storage systems (2026-2027) Construct 10 pilot systems (2027-2030). Strengthen or establish WUAs and provide training (2030) Develop O&M in collaboration with local communities and train local technicians (2030).	At least 30% of construction-related jobs reserved for local women At least 40% WUAs include women. At least 30% of trained local technicians are women.	MAE, Provincial authorities, WUAs	<i>IFAD “Sustainable Upland Agriculture Development Project” [61].</i>	\$25M	2026–2030
Strategic objective 1.2: Mobilize sustainable financing for water infrastructure							
Description: This objective ensures long-term sustainability of water supply systems by developing financing mechanisms, including climate finance, PPPs, and subsidies. It prioritizes vulnerable populations and aims to align investments with local development and national strategies.							
4. Create and implement an investment plan for water supply infrastructure	Develop financing strategies including climate finance, PPPs, and government subsidies; prioritize based on vulnerability mapping; integrate with local development plans.	Develop/Update financing framework (2026). Identify priority provinces (2026). Integrate into 11 th NSEDP (2029).	At least 50% of priority projects under the NSEDP include gender-responsive or social inclusion criteria.	MAE, Provincial Gov., Development Banks.	<i>ADB “Southeast Asia Resilient and Water Secure Cities Facility” (2024-2028) [62]</i>	\$0.25M	2026–2030

5. Create and implement an investment plan for infrastructure in urban and rural areas	Broaden investment planning to include sewerage treatment plants, sewage systems, and stormwater networks; secure funds through blended finance and local tax revenue; coordinate with urban development authorities.	Identify financing gaps for urban and rural water, sewage, and stormwater systems (2026) Prepare investment prospectus (2026). Pilot sewerage collection and treatment & drainage in Vientiane and 2 rural provinces (2027-2030)	100% of pilot projects display in M&E improved access to safe and affordable water for female-headed households and marginalized communities.	MPWT, MAE, Provincial Authorities.	<i>CDIA Secondary Cities Development Program (ongoing) [63]</i>	\$13M	2026–2031
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Outcome 2: Protect and manage water resources against climate risks

Rationale: Water resources in Lao PDR are highly exposed to droughts, floods, and over-extraction, threatening water security for agriculture, households, and industry. Strengthening groundwater regulation, data collection, and protection zones is critical to safeguard aquifers and ecological buffers.

Coherence with NAP & national strategies: This outcome is consistent with the NAP, which prioritizes sustainable water resource management and protection against climate variability. It aligns with the NDC and NSEDP commitments on water governance and supports MAE’s 5-year plan on water resources protection and legislation.

Strategic objective 2.1: Strengthen groundwater management and monitoring

Description: This objective addresses the growing risks of groundwater depletion and over-extraction. It focuses on creating legislation, monitoring aquifers, and designating protection zones, ensuring that water security is safeguarded for agriculture, households, and ecosystems.

6. Strengthening Groundwater Registration and Management (Concept Note 3)	Establish a strong legal framework for sustainable extraction, recharge, and pollution control, while building institutional capacity through the deployment of monitoring systems and training of provincial staff to ensure compliance and long-term aquifer sustainability.	Draft legislation (2026–2027). Establish groundwater monitoring units in 3 provinces by 2028. Train provincial officers and local authorities on enforcement and reporting (2027-2029) Conduct awareness campaigns for farmers and private users on responsible groundwater use (2027-2029).	At least 40% of trained officers are women.	MAE (Dept. of Water), Provincial authorities.	<i>FAO “Groundwater Governance Framework Project” (2011-2015) [64].</i>	\$3M	2026–2029
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7. Survey, collect data, and assess water shortages and suitable areas	Conduct hydrological surveys, household water demand assessments, and GIS-based vulnerability mapping; publish national atlas of water scarcity risks.	Conduct groundwater and surface water availability surveys in priority districts (2026). Assess households and agricultural water demand, disaggregated by gender and income group (2026). Develop GIS-based online platform (2027-2028).	100% of surveys include disaggregated data by gender and socio-economic status.	MAE, National University of Laos, Provincial Gov.	<i>WB “Lao PDR Southeast Asia Disaster Risk Management Project (SEADRM) – Hydromet Component” (2017–2024) [65]</i>	\$1.6M	2026–2028
8. Identify areas at climate risk for groundwater quantity	Use hydrogeological studies and modeling to identify aquifers most exposed to depletion; prioritize artificial recharge zones; monitor abstraction.	Identify 3 drought-prone districts for pilot studies (2026). Conduct hydrogeological modeling to assess climate risks to aquifers (2026-2027) Develop priority list for artificial recharge and protection measures (2027-2028) Integrate findings into national water management plans (2029)	Engage local communities in identifying over-exploited areas (Consultations conducted in 100% of target districts with at least 40% women’s participation.)	MAE, Dept. of Water Resources, Research Institutes.	<i>FAO “Groundwater Governance Framework Project” (2011-2015) [64].</i>	\$2M	2026–2029

9. Identify water and water resources protection zones (Concept Note 4)	Map and legally designate ecological buffer zones (wetlands, watersheds); introduce land-use restrictions; implement reforestation and soil conservation measures.	Conduct flood and drought risk assessments and identify additional sites to complement ongoing initiatives (2026) Legally designated ecological buffer zones and implement land-use restrictions, reforestation, and soil conservation (2027-2028) Develop and operationalize basin-level IWRM plan (2028) Establish co-management committees (2028-2029) Support the development of sustainable eco-tourism models (2028-2029)	At least 50% women's representation in all local monitoring/protection committees.	MAE (Dept of Forestry) Provincial Gov.	<i>IUCN "Wetlands Protection Initiative" [66].</i>	\$1.3M	2026–2029
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Outcome 3: Strengthen integrated and adaptive water management systems

Rationale: With increasing climate variability, water management in Lao PDR must integrate cross-sector needs (agriculture, energy, urban use) while ensuring adaptive operations of reservoirs, improved monitoring, and safeguarding water quality. Integrated water resources management (IWRM) is key to long-term resilience.

Coherence with NAP & national strategies: This outcome supports the NAP's focus on integrated and adaptive resource management, while reinforcing the NDC's emphasis on cross-sector resilience. It is also aligned with MAE's IWRM initiatives, MIC's hydropower management plans, and the NSEDP's priorities on climate-resilient infrastructure.

Strategic objective 3.1: Promote integrated water governance and adaptive basin management

Description: This objective emphasizes cross-sectoral planning and coordination at the basin level (agriculture, energy, environment). It seeks to strengthen water governance through IWRM, participatory management, and equitable decision-making, ensuring water security and resilience.

10. Create and implement an IWRM plan	Develop and implement basin-level IWRM plans promoting coordination across sectors such as agriculture, energy, and environment. Strengthen multi-stakeholder mechanisms and WUAs to ensure participatory, equitable, and gender-responsive water governance.	Draft IWRM framework (2026). Pilot in 2 major basins (2026-2029). Scale nationally by 2031.	Integration of gender and social inclusion criteria in the IWRM framework	MAE, MIC, River Basin Orgs.	<i>WB /MRC Mekong Integrated Water Resources Management Project" (ongoing) [67]</i>	\$3M	2026–2031
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11. Adjust dam and reservoir operations	Revise dam and reservoir operation procedures to optimize water storage and release in response to climate variability. Integrate hydrological forecasting, monitoring, and early warning systems, ensuring community participation in planning and risk management.	Review and revise operating procedures for major dams and reservoirs to optimize water use (2026). Identify 2 dams for pilot operations (2026) Conduct participatory consultations with affected communities (2026-2027) Pilot adaptive operations in 2 dams integrating hydrological forecasting and real-time systems and early warning systems (2027-2030) Train dam operators on adaptive management and safety protocols (2027-2030)	At least 40% female and 20% vulnerable group participation in dam operation consultations. At least 2 training sessions per target basin are organized for community representative on dam risk awareness and early warning response with 50% women participants.	MAE, MIC Hydropower Operators	<i>Nam Ngum Basin Hydropower Project (ongoing)</i> [68]	\$1.3M	2026–2030
Strategic objective 3.2: Strengthen monitoring, information systems, and risk preparedness							
Description: This objective improves hydrological and meteorological monitoring to anticipate climate impacts. It includes building databases, early warning systems, and capacity-building measures to enhance preparedness and support decision-making across institutions and communities.							
12. Expand meteorological and hydrological stations	Modernize and expand Lao PDR's network of meteorological and hydrological stations to improve data accuracy and early warning capacity. Strengthen local capacity for data management, maintenance, and real-time information sharing.	Install new climate and hydrological monitoring stations in 20 high-risk basins (2026–2028). Modernize existing stations with automated and solar-powered systems (2026-2028) Train provincial staff on data management and maintenance (2027-2028) Conduct community awareness sessions on the use of weather	At least 30% of provincial technicians trained are women At least 50% women's participation in all awareness sessions.	MAE, DHM, Universities	<i>ADB “Strengthening Integrated Flood Risk Management” (2018-2022)</i> [69]	\$1.2M	2026–2030

		and flood information (2027-2028) Scale installation of new station to 60 basins in next 5 years plan.					
13. Develop information system and database (Concept Note 5)	Establish a centralized, GIS-based national water information system integrating hydrological, infrastructure, and socio-economic data. Ensure public accessibility, regular updates, and integration with national climate and disaster management platforms.	Design a national GIS-based water database (2026-2028) Upgrade LaoWIS architecture to support real-time processing and interoperability (2026-2028) Provide training on data entry and usage for national and provincial staff (2026-2028) Launch prototype (2029).	100% of datasets include gender and vulnerability indicators. At least 40% of trained staff are women.	MAE, Universities, ICT Companies	" <i>Basin Development Strategy 2021-2030 and MRC Strategic Plan 2021-2025</i> " [70]	\$1,5M	2026–2029
14. Implement adaptation measures to ensure water quality	Reinforce water treatment and sanitation infrastructure to withstand climate hazards. Introduce mobile purification systems, establish emergency water supply plans, and strengthen community-based monitoring to maintain safe water quality during floods and droughts.	Develop water quality monitoring protocols in flood- and drought-prone areas. (2026). Prepare emergency water supply and sanitation response plans (2026) Identify 10 priority sites (2026) Rehabilitate 10 water treatment and sewage systems (2027-2030) Train community-based monitoring groups (2028-2030)	100% of emergency plans include gender and social-sensitive response protocols. At least 50% women participation in all local monitoring groups.	MAE, MH Provincial Gov., WHO, NGOs	DFAT " <i>Water for Women Climate Resilient Inclusive Water, Sanitation and Hygiene (WASH)</i> " (2018-2025) [71]	\$2M	2026–2030
Strategic objective 3.3: Conserve ecosystems and natural buffers for water resilience							
Description: This objective highlights the role of wetlands, peatlands, and watersheds as natural buffers against floods and droughts. It promotes legal protection, conservation measures, and community involvement to sustain ecological services that underpin water security.							
15. Protect wetlands and peatlands	Protect and restore critical wetlands and peatlands to enhance water retention, flood mitigation, and biodiversity. Implement legal protection, community-based	Conduct national inventory and mapping of wetlands and peatlands and identify critical sites (2026).	At least 5 pilots project co-managed with women-led community conservation committees.	MAE, DoF, IUCN, WWF	GEF " <i>Peatland Conservation Project</i> " (2021-2025) [72]	\$2M	2026–2030

	conservation, and livelihood diversification such as eco-tourism and sustainable harvesting.	Draft and enforce legal protection for priority ecosystems (2026-2027). Launch 10 pilots' programs and project to restore degraded areas with native vegetation and buffer zones (2027-2030) Establish community monitoring committees and training programs (2027-2030)	At least 40% representation of women in training programs and monitoring committees.				
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3. Concept notes for climate change adaptation projects

To complement the Sectoral Action Plan and support resource mobilization for implementation, five concept notes have been developed under the Agriculture and Forestry SAP. Each concept note translates a priority adaptation action into a potential investment-ready project proposal. The concept notes were formulated based on the results of the MCA, sectoral consultations (see [Appendix 02](#)), and alignment with Lao PDR's climate-related ODA projects. The concept notes provide a practical framework for future project development, capacity building, and funding engagement with national and international partners.

1 Action 1: Build basic infrastructure and develop community water supply to cope with floods and droughts

This action was prioritized across all departments due to its direct relevance to recurring hazards such as seasonal flooding and droughts. Department of Meteorology and Hydrology (DMH) and Department of Water Resources (DWR) emphasized its feasibility, citing existing infrastructure projects and the urgent need for community-level resilience. MAE noted that riverbank communities face annual inundation, and water scarcity affects agricultural productivity. The action aligns with national disaster response gaps and supports vulnerable populations, including farmers and low-income households.

2 Action 2: Improve irrigation systems to be more efficient and resilient

MAE and the Department of Irrigation and Groundwater (DIG) highlighted this as essential for agricultural resilience. Frequent droughts and outdated irrigation infrastructure hinder crop yields. Although not universally prioritized, it was ranked highly by DIG due to its relevance in provinces like Luan Prabang and Savannakhet. The action supports climate-resilient farming systems and aligns with Outcome 2 of SAP-AF.

3 Action 6: Strengthening Groundwater Registration and Management

The initial action proposed “Create and improve legislation and plans on groundwater management” was prioritized and reformulate as “Strengthening Groundwater Registration and Management in Lao PDR” by DIG and DWR due to increasing reliance on groundwater during droughts. Ongoing projects supported by AusAID and the development of operational procedures underscore its feasibility. Provinces such as Oudomxay and Phongsaly face groundwater stress, making this action vital for sustainable resource use.

4 Action 9: Identify Water and Water Resources Protection Zones

This action was prioritized by DMH and DWR due to its environmental and regulatory significance. It supports flood and drought risk assessments and wetland expansion. Provinces like Champasak and Attapeu were identified as key areas for implementation. The action also aligns with Ramsar commitments and biodiversity conservation.

5 Action 13: Develop Information System and Database on Water and Water Resources

DWR and DMH prioritized this action due to its role in centralizing climate and water data. Lao WIS and internal databases are being upgraded, but technical challenges persist. The action supports transparency, planning, and inter-agency coordination.

CONCEPT NOTE 1

Build Basic Infrastructure and Develop Community Water Supply to Cope with Floods and Droughts

Rationale

Climate change is intensifying water insecurity across Lao PDR, with rural and peri-urban communities increasingly affected by seasonal shortages, infrastructure damage, and declining water quality. According to the Lao PDR National Adaptation Plan (2021), the country faces rising temperatures, erratic rainfall, and more frequent floods and droughts, conditions that threaten both surface and groundwater availability, especially in upland and lowland districts.

The World Bank's Climate Risk Country Profile for Lao PDR (2021) highlights that over 70% of the population relies on climate-sensitive sectors, with water infrastructure particularly vulnerable to extreme weather. In 2019, the Mekong River reached its lowest level in over 100 years, severely impacting water access in provinces like Xiengkhouang, Khammouane, and Savannakhet. Meanwhile, flash floods in 2018 and 2022 damaged water systems in low-lying areas, disrupting services and exposing communities to waterborne diseases.

Many villages still depend on small-scale or community-managed water systems that lack flood-resistant design, backup storage, and inclusive maintenance plans. These systems are often poorly maintained, inaccessible to persons with disabilities and the elderly, and governed without meaningful participation from women, youth, or ethnic minorities.

The action could respond to these risks by expanding and upgrading climate-resilient water supply systems, including wells, boreholes, piped networks, and multipurpose reservoirs, designed to withstand hydrological shocks. Infrastructure will integrate flood-resistant engineering, emergency protocols, and community-led maintenance to ensure continuity and equity. Accessibility features and inclusive governance structures will be embedded from the outset, aligning with the GEDSI commitments outlined in Lao PDR's 9th Five-Year National Socio-Economic Development Plan (2021–2025).

Locations of potential implementation

Based on CRVA findings and stakeholder consultations, priority areas for implementation include:

- **Upland districts** such as Xiengkhouang and Sekong, where groundwater depletion and prolonged dry spells severely limit community water access.
- **Lowland zones** in Khammouane and Savannakhet, where flash floods and sedimentation frequently damage water infrastructure and disrupt services.

Objectives

This objective focuses on building climate-resilient water systems, wells, boreholes, and piped networks, that can withstand floods and droughts. Designs will include flood-resistant features, backup systems, and community-led maintenance to ensure reliable and equitable access.

Specific Objectives:

- **Develop and rehabilitate climate-resilient water systems**, including wells, boreholes, piped networks, reservoirs, and gravity-fed systems, in vulnerable rural and peri-urban areas, with designs adapted to seasonal floods, droughts, and local climate variability.
- **Ensure inclusive governance and planning** by establishing water management committees with at least 40% representation from women, youth, and persons with disabilities, and by institutionalizing GEDSI-responsive consultations with documented input and feedback mechanisms.
- **Improve water quality and emergency preparedness** through reinforced treatment plants, mobile purification units, and contingency protocols to maintain safe access during climate extremes.
- **Design infrastructure for universal access**, incorporating features such as ramps, hand pumps, and signage in local languages to accommodate persons with disabilities, the elderly, and ethnic minority groups.
- **Strengthen monitoring and accountability** by forming evaluation teams that include GEDSI representatives and regularly report on equity of access, affordability, and safety.

Schedule / Duration

5-years project 2026-2030

Climate Risks Addressed

Project could directly respond to Lao PDR's increasing exposure to floods and droughts by building climate-resilient community water systems. These include wells, boreholes, and piped networks designed to withstand extreme weather, ensure year-round access, and reduce service disruptions during emergencies.

In drought-prone areas like Xiengkhouang and Sekong, deeper boreholes and improved storage will secure supply during dry spells. In flood-prone lowlands such as Khammouane and Savannakhet, elevated and sealed systems will prevent contamination and infrastructure loss.

The action also strengthens community preparedness through local maintenance plans and emergency water protocols.

Cost estimate

With a budget of USD 12.3 million, it is feasible to implement approximately 30 small to medium-to medium-resilient water infrastructure across 3 high-risk districts (e.g., Xiengkhouang, Khammouane, Savannakhet, Sekong), focusing on vulnerable rural and peri-urban communities.

- Cost-Efficient Design such as Boreholes, gravity-fed systems, and mobile purification units offer adaptable, affordable solutions.
- Community water committees and local technician training to enhance sustainability.
- Integration with ADB, UNDP, and GCF initiatives could enable technical support and co-financing.
- At USD 50,000–150,000 per system, the project can serve 30–50 villages, including infrastructure, GEDSI integration, and emergency protocols.

Social and Gender equity

While community-managed water systems offer a platform for inclusive governance, persistent GEDSI barriers must be addressed to ensure equitable outcomes. Women, youth, and persons with disabilities are often underrepresented in leadership roles, limiting their influence over infrastructure design and budgeting. Language, mobility constraints, and cultural norms can further exclude ethnic minorities and the elderly from planning processes and service access. Many systems lack basic accessibility features, and consultations rarely capture or respond to the needs of marginalized groups.

To address these gaps, Action 1 embeds GEDSI indicators throughout implementation. Water committees will include at least 40% representation from women, youth, and persons with disabilities. Planning will document and respond to GEDSI input, while infrastructure will incorporate ramps, hand pumps, and signage in local languages. Monitoring teams will assess equity in access, affordability, and safety.

Partnerships with key stakeholders (such as the LWUs, LYUs, Disabled People's Organizations, and ethnic community leaders) will be essential to ensure meaningful participation and oversight. Collaboration with NGOs, district authorities, and inclusive design experts will further strengthen the action's reach and impact, ensuring that water infrastructure is not only climate-resilient but also socially just.

Source of financing

- **ADB:** Funds climate-resilient water and sanitation projects (e.g., ongoing Water Supply and Sanitation Sector Project).
- **GCF:** Supports infrastructure and emergency preparedness (e.g., Climate Resilient Health and WASH Project – ongoing/submitted).
- **UNDP–MoF Climate Hub:** Coordinates blended finance under Lao PDR's INFF (submitted).
- **World Bank:** Invests in disaster-resilient infrastructure (e.g., Southeast Asia DRM Project – ongoing).
- **Bilateral Donors:** JICA, KOICA, and Luxembourg support inclusive rural infrastructure (ongoing/pipeline).

Potential Projects for Integration

- **CRRIP – Pipeline:** Targets water systems in climate-vulnerable districts.
- **CBDRR – Ongoing:** Supports emergency water protocols and inclusive planning.
- **Health & Education WASH Projects – Ongoing:** Funded by WHO, UNICEF, and Save the Children; relevant for expanding water access and purification.

Actions	Main activities	Timeline					Responsibility	Budget (USD)
		2026	2027	2028	2029	2030		
Action 1: Build Basic Infrastructure and Develop Community Water Supply to Cope with Flood and Droughts	1.1. Mapping & Site selection and climate risk screening in target districts (upland and lowland)	X					DOAE, PWT, District Planning Units	250,000
	1.2. Conduct vulnerability and needs assessment in target communities	X					DOAE, DPWT, Village authorities, LWUs, LFND, WUAs	200,000
	1.3. Design climate-resilient water systems (wells, boreholes, piped networks)	X	X				Provincial Water Supply Authority, Technical Consultants	500,000
	1.4. Construct small and medium-scale water systems in priority villages (20)		X	X	X		Contractors, Village Committees, ADB-supported teams	3,000,000
	1.5. Build multipurpose reservoirs and gravity-fed systems in peri-urban areas (10)			X	X		MAE, District Engineers, Community Water Boards	7,000,000

	1.6. Install backup systems (e.g., elevated tanks, solar pumps)			X	X		Local Technicians, Energy Department	300,000
	1.7. Supply mobile purification units		X	X			Ministry of Health, WHO, District Health Offices	500,000
	1.8. Develop emergency water supply protocols for floods and droughts		X	X			Disaster Management Committees, CBDRR Teams	150,000
	1.9. Establish GEDSI-inclusive water management committees and train local technicians	X	X	X	X		LWU, Youth Union, Disability Associations	250,000
	1.10. Conduct community consultations and feedback loops on water planning	X	X	X	X	X	Village Facilitators, UNDP, INGOs	200,000
	1.11. Monitor equity of access, affordability, and safety through GEDSI-led evaluation teams			X	X	X	MAE, LWU, Independent Auditors	150,000
	Required Budget for Action 1							12,500,000

Recommendations for implementation – Next Steps / Additional information

To move forward with Action 1, the next steps should begin with confirming priority sites based on CRVA findings and stakeholder consultations, particularly drought-prone upland districts like Xiengkhouang and Sekong, and flood-exposed lowland zones such as Khammouane and Savannakhet. These areas face the most acute water insecurity and infrastructure vulnerability.

Technical teams should be mobilized to develop detailed designs for climate-resilient water systems, including boreholes, piped networks, and multipurpose reservoirs. These designs must integrate flood-resistant engineering, backup systems, and accessibility features to ensure inclusive service delivery.

Establishing GEDSI-inclusive water management committees will be critical to long-term sustainability. Training local technicians and embedding community ownership will reduce operational costs and strengthen resilience.

Coordination with existing donor-funded projects, such as those led by ADB, UNDP, and GCF, will enable resource sharing, technical alignment, and potential co-financing. Community engagement should be prioritized through participatory planning and feedback loops to ensure local relevance and ownership.

Monitoring systems should be developed with GEDSI-sensitive indicators to track equity of access, affordability, and safety. Finally, budget allocation should be phased strategically to reach 30–50 villages over five years, ensuring that infrastructure, emergency protocols, and inclusive governance are delivered efficiently within the USD 5 million ceiling.

CONCEPT NOTE 2

Improve Irrigation Systems to Be more efficient and resilient

Rationale

Lao PDR's agriculture sector is highly vulnerable to climate change, with over 70% of the population relying on rainfed farming. Increasingly erratic rainfall, prolonged droughts, and flash floods are disrupting irrigation cycles and threatening food security. The Lao NDC identifies water resources as a priority sector for adaptation, emphasizing the need to modernize irrigation infrastructure to cope with climate variability (Ministry of Natural Resources and Environment, 2021).

Recent disasters (including the 2018 floods and 2019 tropical storms) damaged irrigation canals, reservoirs, and pumping stations, affecting over 1.3 million people and causing economic losses exceeding USD 370 million (UNDP Lao PDR, 2020). These impacts are compounded by aging infrastructure, inefficient water use, and limited technical capacity at the local level.

The Mekong River Commission's 2022 report on climate-resilient irrigation recommends upgrading distribution networks to reduce water loss, adopting solar-powered and gravity-fed systems, and embedding climate-smart scheduling and water-saving technologies. These approaches are particularly relevant for Lao PDR, where many irrigation schemes lack inclusive governance and technical safeguards.

Improving irrigation systems also presents an opportunity to strengthen GEDSI-sensitive planning. Ethnic minority farmers, women, and persons with disabilities are often excluded from irrigation decision-making and access. Integrating inclusive management structures and community-led maintenance will ensure equitable benefits and long-term sustainability.

This concept note aligns with Lao PDR's Climate Change Action Plan (2021–2030), the Green Growth Strategy, and the Water Resources Sector Adaptation Plan. By enhancing efficiency, resilience, and inclusivity, the initiative supports SDGs 2 (Zero Hunger), 6 (Clean Water and Sanitation), and 13 (Climate Action), while contributing to national food security and sustainable water resource management.

Objectives

To enhance irrigation efficiency and strengthen resilience to drought, contributing to food security and climate-proof water resource management in Lao PDR.

Specific objectives:

Locations of potential implementation

The selection of potential implementation sites is informed by findings from SAP focus group discussions, the CRVA, and lessons from ongoing climate-related projects.

Vientiane Capital faces increasing dry season water shortages and urban–rural competition for water resources. Upgrading peri-urban irrigation systems with energy-efficient pumps and digital monitoring will strengthen food security and complement UNEP's urban ecosystem-based adaptation (EbA) initiative.

Savannakhet Province, a key agricultural zone, is highly exposed to floods, droughts, and sedimentation. The aging irrigation infrastructure in the Xe Bang Hieng Basin requires climate-resilient upgrades, aligning with UNDP's Integrated Water Resource Management and EbA project.

Luang Prabang Province experiences recurrent urban flooding and dry season stress. As a focal site for UNEP-GCF's wetland restoration and water retention efforts, it offers strong potential for gravity-fed and water-saving irrigation systems to enhance climate resilience.

Schedule / Duration

5-years project (2026-2030)

- Upgrade irrigation infrastructure using water-saving technologies (e.g., drip and sprinkler systems), energy-efficient pumps, and digital monitoring tools.
- Train farmers in climate-smart irrigation practices, ensuring that at least 30% of participants are women and actively involving youth in irrigation management groups.
- Integrate improved irrigation systems into broader water supply and climate adaptation planning frameworks at district and provincial levels.
- Develop and implement investment plans for water supply infrastructure in both urban and rural areas, aligned with national climate and development strategies.

Climate Risks Addressed

With increasing frequency and intensity of droughts, floods, and seasonal variability, traditional irrigation systems are no longer sufficient to sustain crop production or ensure reliable water access. Many rural and peri-urban communities, particularly in provinces like Savannakhet, Luang Prabang, and Vientiane Capital, are experiencing water insecurity, infrastructure damage, and reduced agricultural yields due to these climate pressures.

By upgrading irrigation infrastructure with water-saving technologies, energy-efficient pumps, and digital monitoring tools, the project enhances both efficiency and resilience. These systems reduce water loss, optimize usage during dry spells, and withstand flood-related disruptions. Integrating gravity-fed and solar-powered options also ensures functionality in remote or off-grid areas.

The project further embeds climate-smart irrigation practices through farmer training and inclusive water governance. This empowers communities to adapt to shifting rainfall patterns, manage water equitably, and maintain systems locally.

Finally, by aligning with existing climate adaptation initiatives (e.g., UNDP's IWRM-EbA in Savannakhet, UNEP-GCF's wetland restoration in Luang Prabang, and urban EbA in Vientiane), the project leverages technical expertise and co-financing opportunities. Together, these interventions reduce vulnerability, safeguard livelihoods, and contribute to Lao PDR's national climate goals under the NDC and Sectoral Adaptation Plan for Water Resources.

Adaptation Finance and Innovation

Cost estimates: USD 4.43 million

Potential financing could leverage GCF, IFAD, ADB, and climate-smart agriculture programmes. Innovative approaches may include micro-irrigation financing schemes, climate-resilient agricultural credit lines, and PPPs for solar-powered irrigation systems. Digital irrigation monitoring, smart water allocation tools, and NbS-based water retention systems could further strengthen resilience and efficiency.

GEDSI

This project places Gender Equality, Disability, and Social Inclusion (GEDSI) at the core of its design and implementation, recognizing that climate impacts disproportionately affect women, ethnic minorities, persons with disabilities, and youth, especially in rural and peri-urban farming communities.

By embedding GEDSI principles throughout the irrigation upgrade process, the project ensures that marginalized groups are not only beneficiaries but active decision-makers. At least 30% of farmers trained in climate-smart irrigation practices will be women, with targeted outreach to female-headed households and ethnic minority women who often face barriers to participation. Youth will be engaged through irrigation management groups, fostering intergenerational knowledge transfer and long-term sustainability.

Inclusive infrastructure design will prioritize accessibility—such as low-height controls, visual signage in local languages, and safe pathways for persons with mobility challenges. Community consultations will be conducted in culturally appropriate formats, using bilingual facilitation and visual tools to ensure meaningful participation across literacy levels.

The project also supports the formation of GEDSI-sensitive water user committees, with quotas for representation and capacity-building tailored to diverse needs. These structures will help institutionalize inclusive water governance and ensure that irrigation investments reflect the priorities of all community members.

Source of financing

This project can be financed through a mix of international climate funds, development partners, and government co-financing:

- **Green Climate Fund (GCF) and Adaptation Fund (AF):** could support large-scale climate adaptation and irrigation upgrades.
- **World Bank, ADB, IFAD:** could provide loans and grants for rural infrastructure and climate-smart agriculture.
- **UNDP, UNEP, FAO** could offer technical support and co-financing through ongoing water and ecosystem-based adaptation projects.
- **Government of Lao PDR:** Through MAE and MoF, with alignment to the NAP, Green Growth Strategy, and Agriculture Development Strategy.

Action	Main activities	Timeline					Responsibility	Budget (USD)
		2026	2027	2028	2029	2030		
Action 2: Improve Irrigation Systems to be more efficient and resilient	2.1 Irrigation audit for 6 Provinces. Baseline assessment and site selection	X					MAE, PAE, DAE	300,000
	2.2 UXO clearance coordination in target districts (Savannakhet site)	X	X				NRA, UXO Lao	120,000
	2.3 Engineering design of 30 irrigation systems	X	X				MAE, PAE, DAE	200,000
	2.4 Rehab – esrthworks*(30 schemes)		X	X			MAE, District Offices	1500000
	2.5 Procurement of water-saving technologies (30 schemes)		X	X			MAE, District Offices	200,000
	2.6 Installation of energy-efficient pumps (30 schemes)		X	X			Contractors, DAE	500,000
	2.7 Digital monitoring system setup			X			MAE, ICT Unit	500,000
	2.8 Farmer training (GEDSI-sensitive modules)		X	X	X		LWU, DAE, LYU	100,000
	2.9 Formation of irrigation management groups		X	X			DAE, Village Committees	80,000
	2.10 GEDSI-inclusive water governance workshops			X	X		LWU, Disability Associations	90,000

2.11 Integration into district/provincial adaptation plans			X	X		MAE, Provincial Gov't	80,000
2.12 Investment plan for rural water infrastructure				X		MPI, MAE	100,000
2.13 Investment plan for urban water infrastructure				X		MPWT, Vientiane Capital Gov't	100,000
2.14 Midterm review and adaptive planning			X			MAE, Donors	60,000
2.15 Community feedback and participatory evaluation				X		DAE, Village Committees	60,000
2.16 Final infrastructure upgrades				X	X	Contractors, DAE	120,000
2.17 Institutionalization of GEDSI water governance					X	LWU, MAE	80,000
2.18 Sustainability and financing roadmap					X	MPI, MAE	60,000
2.19 Knowledge dissemination and learning exchange					X	MAE, UNDP, MAF	60,000
2.20 Final evaluation and reporting					X	MAE, Donors	60,000
2.21 Project closure and handover					X	MAE, Provincial Gov't	60,000
Required Budget for Action 2							4,430,000

Recommendations for implementation – Next Steps / Additional information

This project can operate in synergy with **Action 1: Improve irrigation and rainfall storage** under SAP-AF (Concept Note 1), reinforcing institutional capacity across DMH, DWR, DOI, and DOA.

To achieve targets and ensure sustainability:

- Coordinate closely with Action 1 teams to align sites, share data, and streamline implementation.
- Leverage existing climate projects (UNDP IWRM-EbA, UNEP-GCF Urban EbA) for technical support and co-financing.
- Build capacity through joint training on climate-smart irrigation and inclusive water governance.
- Align investment plans with national strategies (NAP, Green Growth, Agriculture Development Strategy).
- Monitor and scale using shared indicators and cross-provincial learning exchanges.

CONCEPT NOTE 3

Strengthening Groundwater Registration and Management

Rationale

Groundwater is increasingly vital for water security in Lao PDR, particularly in drought-prone upland and peri-urban areas. However, it remains largely unregulated, poorly documented, and absent from formal water governance systems. This poses risks of over-extraction, contamination, and inequitable access, especially for marginalized communities.

Groundwater can act as a critical buffer against seasonal water shortages. Provinces such as Xiengkhouang, Luang Prabang, and Savannakhet are identified as high-risk zones where groundwater could play a strategic role in climate adaptation. Yet the CRVA also notes that institutional capacity, data availability, and regulatory mechanisms for groundwater are severely limited, making it difficult to integrate groundwater into climate planning and disaster preparedness.

A policy brief by the Australian Centre for International Agricultural Research (ACIAR) further reinforces this need, stating that only 20% of Lao farming households have access to irrigation, and that groundwater, if properly governed, could significantly improve food security and drought resilience. The brief calls for improved mapping, licensing, and community engagement to ensure sustainable use.

This concept note proposes the development of a national groundwater registration system and provincial-level management plans, aligned with Lao PDR's Water Law (2017), NAP, and the SAP-WR. The initiative will support the DWR, DMH, and provincial authorities in:

- Mapping and registering groundwater sources for domestic, agricultural, and industrial use
- Monitoring groundwater levels and quality using digital tools and community-based reporting
- Developing inclusive groundwater management plans that integrate climate risks, land use, and GEDSI-sensitive access
- Strengthening institutional capacity for licensing, enforcement, and cross-sector data sharing

This initiative complements ongoing efforts under UNDP's IWRM-EbA, ADB's water security programs, and GCF-funded adaptation projects, offering a strategic entry point for climate-proof water governance and long-term resilience.

Locations of potential implementation

The selection of target provinces is guided by both climate vulnerability data and existing groundwater initiatives. According to the CRVA, provinces such as Xiengkhouang, Luang Prabang, and Savannakhet face high exposure to seasonal water shortages and drought-related stress, making them priority areas for groundwater registration and management planning.

In parallel, the DWR has identified active [Groundwater resource management in Lao PDR](#) in Oudomxay, Xayabouly, Phongsaly, Bokeo, Luangnamtha, and Attapeu, supported by DFAT through the Australian Water Partnership and IWMI. These provinces offer valuable technical baselines and institutional partnerships for scaling up groundwater governance.

Building on lessons from existing groundwater-related projects in six provinces (Oudomxay, Xayabouly, Phongsaly, Bokeo, Luangnamtha, and Attapeu) three additional provinces will be selected as pilot sites to scale up groundwater registration and management systems. These pilots will serve as models for refining legal frameworks, operational procedures, and community engagement prior to nationwide rollout.

Objectives

To strengthen groundwater governance in Lao PDR by establishing legal frameworks for sustainable extraction, recharge, and pollution control, while building institutional capacity through the deployment of monitoring systems and training of provincial staff to ensure compliance and long-term aquifer sustainability.

Specific objectives:

- Conduct hydrological surveys and GIS-based mapping to support groundwater registration, usage planning, and integration into provincial water resource strategies.
- Apply aquifer modelling techniques to identify vulnerable groundwater zones and prioritize recharge areas for protection and restoration.
- Establish community-based groundwater management plans and monitoring groups, ensuring at least 50% GEDSI representation. These groups will be empowered to report violations, contribute to decision-making, and support enforcement.
- Develop Operational Procedures for Groundwater Management, incorporating provisions for equitable access, with priority given to vulnerable households, ethnic minorities, and small-scale users.

Schedule / Duration

3-year project: 2026-2028

- **Phase 1:** Foundation & Planning (Q1-Q4 2026)
- **Phase 2:** Pilot Implementation (Q1 2027-Q2 2028)
- **Phase 3:** Evaluation & Scale-Up Preparation (Q3-A4 2028)

Climate Risks Addressed

Lao PDR faces increasing droughts and erratic rainfall, especially in upland provinces. The CRVA identifies Xiengkhouang, Luang Prabang, and Savannakhet as high-risk areas where groundwater is essential for buffering seasonal water shortages. Yet, groundwater remains largely unregulated and poorly monitored.

This project tackles those risks by establishing a national registration system, mapping aquifers, and developing provincial management plans. It strengthens institutional capacity through training and monitoring, while empowering community-based groups with GEDSI representation to support enforcement and equitable access.

Building on DFAT-supported pilots in six provinces, the project will scale up to three new sites before expanding nationwide—aligning with Lao PDR's NAP and contributing to long-term water resilience.

Adaptation Finance and Innovation

Cost estimates: USD 1.5 million

Potential financing could build on support from Australian-funded water governance programmes, IWMI, and GCF readiness initiatives. Innovative approaches may include digital groundwater governance systems, GIS-based aquifer monitoring, and results-based financing linked to groundwater registration and monitoring coverage. Community-based monitoring platforms could support inclusive and climate-responsive groundwater management.

Gender and Social Inclusion

Groundwater governance in Lao PDR often overlooks the needs of women, ethnic minorities, and persons with disabilities, despite their central roles in water access and use. In rural areas, women and girls

Source of financing

This groundwater governance project builds on existing support from the Australian Government, primarily through DFAT, the Australian Water

are primarily responsible for collecting water, yet they are rarely involved in decisions about water resource management. Ethnic communities frequently face language and cultural barriers that limit their participation, while persons with disabilities encounter both physical and institutional obstacles to accessing water services and governance processes.

These challenges were highlighted during a 2024 workshop hosted by the Gender Development Association (GDA), where representatives from the DWR, MAE, and district officials emphasized the lack of inclusive monitoring systems and the need for equitable participation in groundwater planning. Similarly, the Sustainable Groundwater Management Plan developed by IWMI and DWR in Luang Prabang in 2025 called for equitable access to groundwater “regardless of gender, disability, or socio-economic status,” and recommended community-based monitoring as a key strategy for inclusive enforcement.

The Water for Women program, supported by SNV and Australia’s Department of Foreign Affairs and Trade (DFAT), further reinforces that inclusive water governance leads to more sustainable outcomes. Their Lao PDR country summary stresses the importance of universal access and the inclusion of marginalized groups in water, sanitation, and hygiene (WASH) planning, particularly in underserved districts such as Champhone and Xonbuli.

In response, this project will embed GEDSI principles throughout its design and implementation. Community-based groundwater monitoring groups will be established with at least 50% representation from women, ethnic minorities, and persons with disabilities. Operational procedures will include provisions to prioritize vulnerable households and small-scale users, especially during periods of water scarcity. Outreach materials will be developed in local languages and accessible formats, including visual and audio tools. Provincial and district staff will receive training on inclusive water governance, equipping them to identify and address social barriers in groundwater planning and enforcement.

Partnership (AWP), and technical partners like IWMI and ACIAR. These agencies have already funded groundwater mapping and management pilots in six Lao provinces, providing a strong foundation for scale-up.

Future financing may combine bilateral support from Australia with co-financing from climate funds such as GCF or Adaptation Fund, given the project’s alignment with Lao PDR’s NAP and SDG targets.

Actions	Main activities	Timeline			Responsibility	Budget (USD)
		2026	2027	2028		
Action 6: Strengthening Groundwater Registration and Management	6.1 Finalize project design and stakeholder consultations	X			DWR, MAE, Provincial Offices	100,000
	6.2 Review existing DFAT-supported pilots and lessons learned	X			DWR, IWMI, AWP	50,000
	6.3 Select 3 pilot provinces based on CRVA and readiness	X			DWR, MAE	30,000

6.4 Develop national framework for groundwater registration	X	X	X	DWR Legal Division, MAE	150,000
6.5 Conduct hydrological surveys in pilot provinces	X	X		DWR, DMH, Technical Consultants	200,000
6.6 GIS-based aquifer mapping and recharge zone modelling	X	X		DWR, IWMI	100,000
6.7 Establish groundwater registration system and database		X	X	DWR, MAE	150,000
6.8 Form community-based monitoring groups		X	X	Provincial Offices, GEDSI Focal Points	100,000
6.9 Train provincial staff on inclusive water governance		X	X	DWR, MAE, GEDSI Advisors	80,000
6.10 Develop operational procedures for equitable access and pollution control		X	X	DWR, Legal Advisors, Provincial Task Forces	120,000
6.1 Pilot groundwater management plans in selected provinces		X	X	DWR, Provincial Offices	120,000
6.12 Integrate groundwater plans into provincial climate adaptation strategies		X	X	MAE, Provincial Planning Units	80,000
6.13 Monitor and document pilot implementation outcomes			X	DWR, MAE, IWMI	80,000
6.14 Host national validation workshop and stakeholder review			X	MAE, DWR, Development Partners	70,000
6.15 Prepare national rollout strategy and financing plan			X	DWR, MAE, Donor Coordination Unit	70,000
Required Budget for Action 6					1,510,000

Recommendations for implementation – Next Steps / Additional information

To ensure successful implementation of the groundwater registration and management initiative from 2026 to 2028, the project should begin by strengthening institutional coordination. A joint implementation committee, comprising DWR, MAE, DMH, and provincial offices, should be formalized to oversee planning, execution, and monitoring. GEDSI focal points must be appointed at both national and provincial levels to embed inclusive practices throughout the process.

Technically, the project should consolidate lessons from DFAT-supported pilots and initiate hydrological surveys and GIS-based aquifer mapping in the three selected provinces. These activities will inform the development of a centralized groundwater database and support the design of legal and operational frameworks for registration, equitable access, and pollution control.

Community engagement will be critical. The project should establish monitoring groups with at least 50% GEDSI representation and develop bilingual, culturally appropriate outreach materials. FPIC-aligned consultations must be conducted to ensure informed participation and local ownership.

Capacity building will follow, with targeted training for provincial staff on inclusive water governance, enforcement, and data collection. Cross-provincial learning exchanges should be facilitated to share insights between pilot and legacy provinces.

Finally, the project should develop a robust evaluation framework with GEDSI-sensitive indicators and climate resilience metrics. A national validation workshop in late 2028 will serve to review pilot outcomes and refine the strategy for nationwide

rollout. A financing proposal should be prepared in parallel, targeting DFAT, the Green Climate Fund, and other climate adaptation partners.

CONCEPT NOTE 4

Identify Water and Water Resources Protection Zones

Rationale

Lao PDR's freshwater ecosystems (wetlands, watersheds, riparian corridors, and peatlands) are vital to sustaining biodiversity, regulating climate, and supporting rural livelihoods. Yet these ecological buffer zones are increasingly threatened by land conversion, unsustainable agriculture, infrastructure development, and climate-induced degradation. Without formal protection, these areas risk irreversible loss, undermining both environmental integrity and community resilience.

Currently, Lao PDR lacks a comprehensive legal framework to designate and manage water resource protection zones. While the Water and Water Resources Law provide a foundation, implementation remains fragmented and reactive. Many wetlands and headwaters remain unregistered, and land-use decisions often proceed without adequate E&S safeguards.

This concept note proposes a strategic intervention to legally identify and protect critical water resource zones through a combination of ecological mapping, inclusive social impact assessments, and integrated land-use planning. By embedding protection zones within basin-level governance and cross-sector coordination, the initiative will help operationalize IWRM in line with Lao PDR's NAP and SDG targets.

The approach prioritizes restoration of degraded wetlands and peatlands, promotion of eco-tourism, and establishment of community co-management structures. It also ensures that zoning decisions are informed by the lived realities of women, ethnic groups, and persons with disabilities, groups often excluded from formal planning but disproportionately affected by environmental change.

Locations of potential implementation

The project will be further strengthened through the development of flood and drought risk assessments.

The project could also be the expansion of wetland sites in Champasak and Attapeu provinces.

Objectives

To legally designate ecological buffer zones and implement land-use restrictions, reforestation, and soil conservation measures to safeguard water resources and biodiversity.

Specific Objectives:

- Conduct inclusive social impact assessments that explicitly identify and measure potential effects on GEDSI groups prior to any zoning or land-use decisions.
- Protect wetlands and peatlands through legislative action and ecological restoration, while promoting sustainable eco-tourism and establishing community-led co-management structures.
- Develop and operationalize an IWRM plan that embeds protection zones within basin-level governance frameworks and ensures cross-sectoral coordination.

Schedule / Duration

3 years project: 2026-2028

Climate Risks Addressed

To address escalating climate risks, particularly those linked to hydrological extremes and ecosystem degradation, the project will legally designate ecological buffer zones encompassing wetlands, watersheds, and riparian corridors. These zones will be safeguarded through land-use restrictions, reforestation, and soil conservation measures that enhance water retention, reduce erosion, and preserve biodiversity. Inclusive social impact assessments will be conducted prior to any zoning or land-use decisions to ensure that potential effects on GEDSI groups are explicitly identified, measured, and mitigated.

Legislative protection and ecological restoration of wetlands and peatlands will be prioritized, alongside the promotion of sustainable eco-tourism and the establishment of community-led co-management structures that reinforce local stewardship. An IWRM plan will be developed and operationalized to embed these protection zones within basin-level governance frameworks, ensuring cross-sectoral coordination and long-term resilience across Champasak and Attapeu provinces.

GEDSI

The project should embed GEDSI safeguards across all phases of implementation. Inclusive social impact assessments should be conducted prior to any zoning or land-use decisions, ensuring that potential effects on marginalized groups are explicitly identified and mitigated. These assessments should be designed to capture the lived realities of ethnic women, persons with disabilities, and youth, whose customary land use and ecological knowledge are often overlooked in formal planning.

The project should also prioritize the legislative protection and ecological restoration of wetlands and peatlands, which are vital to the livelihoods and cultural practices of local communities. Rather than imposing top-down conservation models, it should promote sustainable eco-tourism and established community-led co-management structures that elevate local voices and foster shared stewardship.

Adaptation Finance and Innovation

Cost estimates: USD 1.5 million

Potential financing could combine GEF, FAO, biodiversity, and ecosystem-based adaptation funds. Innovative mechanisms may include Payments for Ecosystem Services (PES), eco-tourism revenue-sharing models, and blended climate-biodiversity financing. Nature-based solutions such as wetland restoration, riparian buffers, and community-led watershed rehabilitation could enhance long-term ecosystem resilience.

Source of financing

FAO, GEF8, GOL

Actions	Main activities	Timeline			Responsibility	Budget (USD)
		2026	2027	2028		
Action 9: Identify Water and Water Resources Protection Zones	9.1 Conduct flood and drought risk assessments and facilitate participatory mapping	X	X		PAE; Environment; Hydrology Unit	150,000
	9.2 Legally designated ecological buffer zones (wetlands, watersheds, riparian areas)	X	X	X	MAE; Provincial Land Management Office	180,000
	9.3 Implement land-use restrictions, reforestation, and soil conservation		X	X	DAE; Community Forestry Groups	200,000
	9.6 Restore wetlands and peatlands (native species, hydrology, invasive removal)		X	X	Wetland Restoration Taskforce; LYUs	180,000

	9.7 Develop sustainable eco-tourism models		X	X	Tourism Dept.; LWUs, Women's Cooperatives	120,000
	9.8 Establish co-management committees	X	X	X	District Governors; LFND	90,000
	9.9 Deliver targeted training		X	X	Vocational Training Centers;	120,000
	9.10 Develop and operationalize basin-level IWRM plan	X	X	X	MAE, MPWT, DPWT.; IWRM Consultant;	150,000
	9.12 Monitor and evaluate		X	X	MAE, DAE, PAE	40,000
	Required Budget for Action 9					1,230,000

Recommendations for implementation – Next Steps / Additional information

This project should build existing efforts to enhance a comprehensive legal framework to designate and manage water resource protection zones.

Next steps should include the set up of institutional arrangement with the nomination of a lead Implementing Agency (potentially DWR under MAE). To ensure effective coordination effort and that Policies and plans across these sectors are mutually reinforcing, not conflicting, it is highly recommended to establish a multi-Stakeholder management unit, including representatives from MAE, MIC, MPWT. Additionally, it is recommended that the lead agency integrate early coordination with the existing Basin Committees such as the Xedone Basin Committees to ensure that planned protection zones align with basin-level governance mechanisms and IWRM frameworks.

CONCEPT NOTE 5

Develop Information System and Database on Water Resources

Rationale

Lao PDR faces mounting challenges in managing its water resources amid climate variability, rapid development, and increasing demand across sectors. Although 90% of the country lies within the Mekong Basin and contributes approximately 32% of the Mekong's annual flow, water governance remains constrained by fragmented data systems, limited basin-level coordination, and insufficient integration of social and ecological indicators. According to the DWR under MAE, Lao PDR has 62 river basins, 14 large, 19 medium, and 29 small, yet lacks a unified platform to consolidate hydrological, ecological, and usage data across these basins [46]

The absence of a centralized water information system undermines the country's ability to implement IWRM, monitor seasonal flows, and respond to droughts, floods, and pollution risks. Moreover, without disaggregated data on water access and use, national strategies risk reinforcing exclusion and inequity. The Asian Development Bank and SIWI have emphasized that water governance must be data-driven and inclusive, particularly in contexts where indigenous and rural communities depend on fragile ecosystems for livelihoods and cultural continuity [47]

In Champasak and Attapeu, where ecological buffer zones are being designated and community-led restoration is underway, the lack of real-time, spatially disaggregated data impedes adaptive management. Authorities often rely on outdated or siloed datasets, making it difficult to coordinate across sectors or validate community knowledge. The FutureWater initiative further highlights that water scarcity and competing uses in Southeast Asia demand robust data systems to support equitable allocation and climate adaptation [48]

- Developing a national water information system and database will:
- Enable basin-level planning and monitoring by integrating hydrological, ecological, and socio-economic data.
- Support GEDSI-sensitive decision-making through disaggregated indicators and participatory data collection.
- Improve coordination across ministries and provinces, aligning with Lao PDR's National Water Strategy 2030 and Vision 2040.
- Provide early warning data and supporting scenario modelling for droughts, floods, and land-use change.
- Facilitate donor alignment and reporting, ensuring transparency and accountability in water-related investments.

This concept note proposes a phased development of the system, beginning with priority basins in southern Lao PDR, and scaling nationally through capacity building, digital infrastructure, and policy integration. The initiative will be anchored in MAE's DWR, with technical support from regional partners and inclusive engagement of local stakeholders.

Locations of potential implementation

National

Objectives

The overarching objective is to enhance the Lao Water Resources Information System (Lao WIS) and upgrade the DWR' digital platform to support integrated, transparent, and inclusive water governance. This includes the systematic collection, validation, and integration of hydrological, usage, and socio-economic data into a centralized, GIS-based national water database. The system will be designed to ensure open access, real-time updates, and full interoperability with early warning systems to support climate resilience and disaster preparedness.

Specific Objectives

- Expand and modernize meteorological and hydrological stations nationwide, enabling real-time data flow into the central database and strengthening forecasting capabilities.
- Optimize dam and reservoir operations by using data systems to simulate hydroclimatic scenarios and guide adaptive water releases for drought and flood management.
- Integrate GEDSI-specific dashboards into [LaoSIS](#) and Lao Water Resources Information System (LaoWIS) that track water access, usage patterns, and vulnerability indicators disaggregated by gender, disability, ethnicity, and age.

Schedule / Duration

4 years project: 2026-2029

- **Year 1:** Conduct flood and drought risk assessments and identify additional sites to complement ongoing initiatives
- **Year 2:** Legally designated ecological buffer zones and implement land-use restrictions, reforestation, and soil conservation
- **Year 3:** Develop and operationalize basin-level IWRM plan
- **Year 4:** Establish co-management committees

Climate Risks Addressed

This project plays a strategic role in enhancing Lao PDR's resilience to climate risks, particularly floods, droughts, and ecosystem degradation, by strengthening national data systems and institutional coordination. As climate variability intensifies across the country, timely and accurate information is essential for safeguarding water security, agricultural productivity, and ecological integrity.

At the core of the initiative is the enhancement of LaoWIS and its integration into LaoSIS. This includes the development of a GIS-based national water database that consolidates hydrological, usage, and socio-economic data. By expanding and modernizing meteorological and hydrological stations, the system will enable real-time monitoring and forecasting, allowing national authorities to anticipate and respond to hydroclimatic scenarios with greater precision.

The improved data infrastructure will also support adaptive dam and reservoir operations, using scenario modeling to optimize water releases and reduce risks of flooding or water shortages. Interoperability with early warning systems will enhance disaster preparedness and cross-sectoral coordination.

Adaptation Finance and Innovation

Cost estimates: USD 1,5 million

Potential financing could mobilize support from AFD, ADB, UNDP, and regional water governance programmes. Innovative approaches may include digital public infrastructure financing, regional data-sharing partnerships, and performance-based financing linked to interoperability and early warning integration. Real-time hydrological monitoring, GIS dashboards, and AI-supported forecasting tools could strengthen climate-informed water governance.

GEDSI

To ensure that climate adaptation is equitable and inclusive, the project embeds GEDSI-sensitive safeguards at the system design level. This includes the development of GEDSI-specific dashboards that track water access, usage, and vulnerability indicators disaggregated by gender, disability, ethnicity, and age. User interfaces will be designed for low-literacy and multilingual users, ensuring accessibility across diverse administrative and technical levels. Capacity-building efforts will focus on training national staff in data

Source of financing

The LaoWIS is currently supported by the AFD, which funds technical upgrades and institutional capacity building under MAE. The UNDP Water Governance Data Project complements this by improving transparency, GEDSI-sensitive indicators,

management, GIS applications, and digital literacy to support long-term institutional ownership.

By consolidating water-related data into a unified, accessible platform, the project enables evidence-based planning, strengthens climate resilience, and promotes inclusive governance at the national level.

and integration with national planning systems.

Additional support is available through the ADB, which recently approved a \$50.3 million package for water infrastructure and governance, including technical assistance from the Japan Fund for Prosperous and Resilient Asia and Pacific. The SIWI, via its GoAL-WaterS programme, also supports integrated water governance in Lao PDR.

Meanwhile, UNICEF, with funding from the Australian Government, implements climate-resilient WASH programs that emphasize digital monitoring and data systems, offering potential synergies with LaoWIS and LaoSIS integration.

Action	Main activities	Timeline			Responsibility	Budget (USD)
		2026	2027	2028		
Action 13: Develop Information System and Database on Water Resources	13.1 Develop GIS national water database integrating hydrological, usage, and socio-economic data	X	X	X	DWR, ICT Companies	300,000
	13.2 Upgrade LaoWIS architecture to support real-time processing and interoperability and integrate multilingual dashboard and low-literacy user interfaces	X	X	X	DWR, DPIC, Lao Statistics Bureau	400,000
	13.3 Conduct GIS and digital literacy training for national and provincial staff	X	X		DOI, DWR	100,000
	13.4 Launch public-facing LaoWIS website with open access datasets and interactive maps		X	X	DWR and Lao Statistics Bureau	200,000
	13.5 Enable database integration into Lao Statistics Information System (LaoSIS)		X	X	DWR, DHM, DPIC, and Lao Statistics Bureau	300,000
	13.6 Develop GEDSI-sensitive M&E framework and conduct annual system audits		X	X	DWR and Lao Statistics Bureau, ICT Companies	100,000
	13.7 Establish feedback and validation mechanisms for public and institutional users		X	X	DWR, LFND	100,000
Required Budget for Action 13						1,500,000

Recommendations for implementation – Next Steps / Additional information

Next steps should include the setup of institutional arrangement with the nomination of a lead Implementing Agency (potentially DWR under MAE). To ensure effective coordination and data sharing it is highly recommended to establish a Technical Steering Committee composed of DWR, the DMH, and the Lao Statistics Bureau; and cooperate with the LaoSIS of the Ministry of Finance.

This project should build existing efforts to develop Information System and Database on Water Resources such as the GEF/UNDP/ASEAN Project, a 5-year project (2023-2027) on the Implementation of Integrated River Basin Management

(IRBM) in priority river basins/sub-basins/watersheds to improve governance and management arrangements. It is important that the project seeks to leverage existing donor synergies.

PART V: MEASURE FOR IMPLEMENTATION, MONITORING AND EVALUATION, AND REPORTING

1. Implementation

1.1. Institutional arrangements

The Ministry of Agriculture and Environment (MAE), through its Department of Water Resources (DWR), is the lead agency responsible for guiding and overseeing the implementation of the SAP-WR. As the national authority on water resources management, MAE will use the SAP-WR as a strategic framework to inform and coordinate sectoral activities related to climate adaptation.

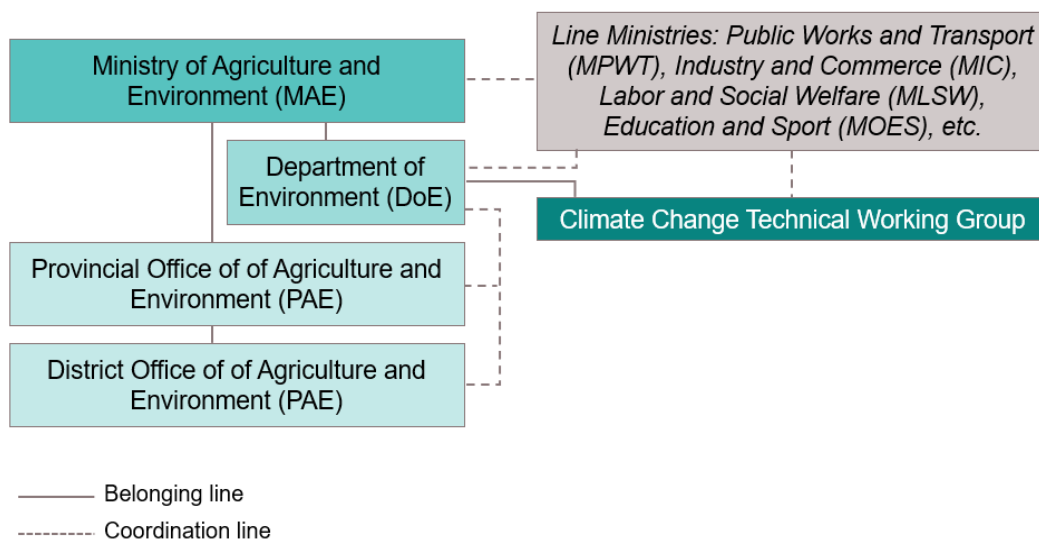


Figure 6: Institutional arrangement for the implementation of the SAP-WR

As the lead institution, MAE will support, collaborate, and coordinate with other ministries and agencies involved in the management of climate-related water issues, including the Ministry of Public Works and Transport (MPWT), the Ministry of Industry and Commerce (MIC). These ministries oversee sectors, such as irrigation, hydropower, and water supply, that are directly dependent on, and influential in, water resources management.

At the subnational level, Provincial and District Offices (PAE and DAE) will play a central role in the implementation, annual monitoring, and mid-term review of SAP-WR actions. Their involvement will help ensure responsiveness to local needs, evolving climate risks, and stakeholder priorities. Coordination with River Basin Committees will also be essential to align watershed-based planning with national strategies.

It will be important to ensure close and strong collaboration and communication between the MAE and the Environmental Committees, overseeing the NAP implementation, to ensure alignment in the SAP-WR implementation. The latter document must be shared and discussed with partner stakeholders while raising

awareness regarding its objectives and actions to facilitate appropriation and inclusion of its priorities at both national and sectoral levels in policy making.

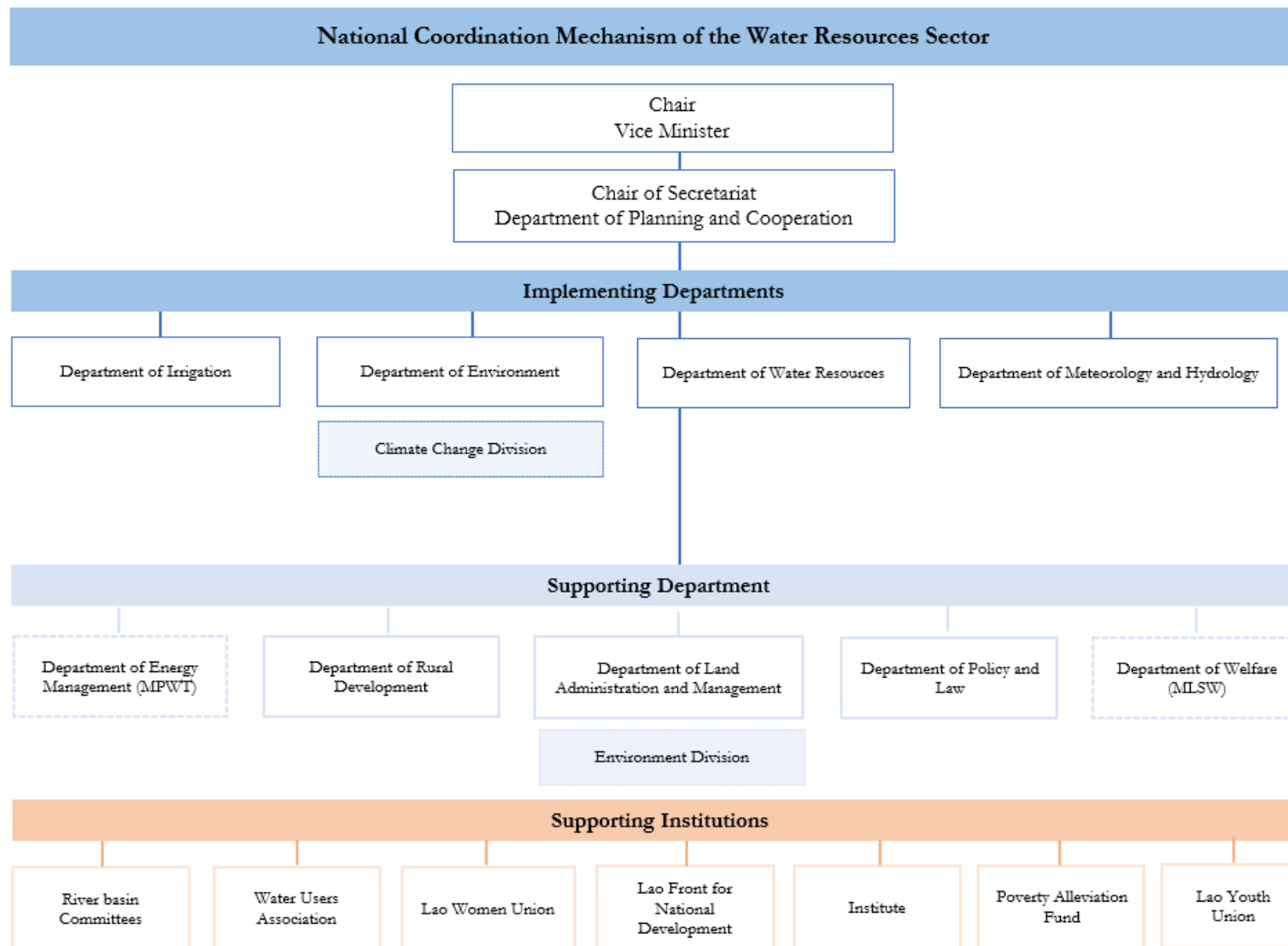


Figure 7: Proposed Coordination Mechanism of Water Resources Sector

Table 7: Roles and Responsibilities of participating institutions

Entity	Mandate	Roles in SAP-WR Implementation
Prime Minister Office (PMO)	- Centrally and uniformly screens and provides no objections for all development projects financing from the private and ODA including climate change projects accepted by GOL (Ministry of Finance and line ministries) throughout the country. - Review and approve a Prime Minister's Decree which assign MAE the authority on behalf of the Lao government of direct responsibility on climate change and coordination with line ministries, organizations, and local authorities accordingly.	- Oversee the implementation of the SAP-WR in close coordination with MAE, National Committee on Environment and line ministries. - Consider and adopt sectoral policies, strategic plans, regulations which contribute to the achievement of SAP-WR targets.
MAE	- Develop policies, strategic plans, laws and regulations related to climate change and submit to GOL for approval. - Develop and maintain data and information systems on climate change in a reliable, accurate and timely manner.	- Act as focal ministry to provide oversight and advisory support to stakeholders including Technical Working Group for Climate Change (TWGCC) on the SAP-WR implementation, including maintenance of data and information. - Develop policies, guidelines and regulations to support relevant ministries in setting sectoral priorities in line with SAP- WR implementation. - Disseminate the SAP- WR targets and priority actions to relevant sectors in central and local levels.
DOE	Coordinate SAP-WR activities on behalf of MAE with other relevant ministries and local authorities.	- Coordinate SAP- WR activities including MRV. - Act as Secretariat of the TWGCC. - Take minutes of the TWGCC, endorsed SAP- WR and priority action information to relevant sectors in central and local levels. - Lead in tracking progress of the SAP-WR implementation plan and inform and advise the TWGCC and MAE.
Line Ministries	- Mainstream climate change into sectoral activities. - Conduct studies, research and promoting the use of environmentally friendly technologies that mitigate GHG emissions and/or increase resilience to climate change.	- Mainstream priorities for SAP- WR implementation into its sectoral strategic and development plans. - Identify and execute sectoral climate actions that support the SAP-WR implementation to MAE

Entity	Mandate	Roles in SAP-WR Implementation
	Coordinate and provide data and information on climate change from their sectors to the MAE.	Support MRV of the SAP sector-related activities.
LWU	Representing Lao women in their development, protection of their rights and benefits including children's, promoting gender equality and involvement of women in the national development	- Ensure engagement of women in the project design and implementation, evaluation. - Provide perspectives on how the proposed projects may impact different genders of various ethnic groups.
Lao Front for National Development	- Responsible for conducting studies and research as well as making records on each ethnic group profile. - Developing and monitoring policies related to all 52 ethnic groups in Lao PDR	- Participating in the project design, implementation and monitoring/reporting to ensure the inclusion of vulnerable and ethnic groups who may be impacted by the proposed project. - Support the ethnic language translation or communication with the elders according to the participating ethnic group's unique cultures.
PAE	- Implement and disseminate strategic plans, decrees and regulations related to climate change. - Monitor and inspect the implementation of climate change activities, and report to MAE. - Direct the district office for implementation of climate change adaptation activities.	- Disseminate the importance of SAP and its implementation plan at the provincial, district, and sub-district level. - Support the monitoring and reporting to MAE on activities related to SAP implementation.
DAE	- Implement and disseminate strategic plans, decrees and regulations related to climate change. - Advise and coordinate with sub-district for implementation and assessment of climate change activities and report to MAE. - Report to the PAE and district governors on climate change adaptation activities.	- Disseminate and advise the sub-district for awareness raising on SAP implementation. - Participate in activities related to climate change adaptation. - Monitoring and reporting to PAE on activities related to climate change adaptation and progress of SAP implementation.
Sub-district	- Implement and disseminate strategic plans, decrees and regulations related to climate change. - Advise and coordinate with sub-district for implementation and assessment of climate change activities and report to DAE.	- Disseminate and advise the sub-district for awareness raising on SAP implementation. - Participate in activities related to climate change adaptation. - Monitoring and reporting to DAE on activities related to climate change adaptation and progress of SAP implementation.

Entity	Mandate	Roles in SAP-WR Implementation
	Report to the DAE and district governors on climate change adaptation activities.	
Village Authority	- Implement and disseminate strategic plans, decrees and regulations related to climate change. - Monitor and inspect the implementation of climate change activities. - Coordinate and report to the sub-district on climate change adaptation activities.	- Monitor and inspect climate change adaptation activities in its own area at the village level. - Implement community level activities that contribute the SAP implementation. - Coordinate with sub-district for updates and reporting. - Beneficiaries of community level activities.
Technical Working Group for Climate Change (TWGCC)	- Support MAE through the DoE on reviewing and providing technical inputs to policies, strategic plans and regulations related to climate change adaptation. - Coordinate with relevant sectors at central and local levels on the execution and dissemination of related policies and regulations. - Identify and propose effective actions to the government on climate mitigation and adaptation.	- Provide technical review of sectoral policies, development projects and activities related to climate change and ensure the alignment with contribution to SAP implementation and report to PMO for consideration. - Invite and assign ad-hoc technical focal points to review particular reports for reporting to TWGCC. - Provide technical inputs and advice to DOE on the progress and results of SAP implementation. - Coordinate with line Ministries and development partners for information and knowledge sharing. - Propose priority actions for the achievement of SAP implementation. - Submit recommendations for approval or on SAP reports and updates.

The National Environment Committee (NEC) could play a critical role in ensuring cross-sector coordination and high-level policy alignment in Lao PDR. Mobilizing the NEC for the implementation of the SAPs would help provide an institutional platform to integrate sectoral adaptation priorities into national planning frameworks and facilitate inter-ministerial dialogue, reduce duplication, and support coherent budgeting and regulatory reforms. Its oversight function also strengthens accountability and helps elevate adaptation from sector-specific initiatives to a coordinated national priority.

What is the National Environment Committee?

The National Environment Committee (NEC) in Lao PDR is a high-level inter-ministerial body responsible for coordinating and overseeing national environmental policy and management. It was established under the Environmental Protection Law, 2009 (revised 2012 and 2019). NEC functions as the central policy coordination platform for environmental protection and sustainable natural resource management across sectors. It ensures that environmental considerations are integrated into national development planning. The NEC typically:

- Provides strategic direction on environmental and climate-related policies
- Oversees implementation of the Environmental Protection Law
- Coordinates across ministries on environmental matters
- Reviews and approves key environmental strategies and regulations
- Supports implementation of international environmental agreements
- Guides environmental impact assessment (EIA) frameworks and compliance

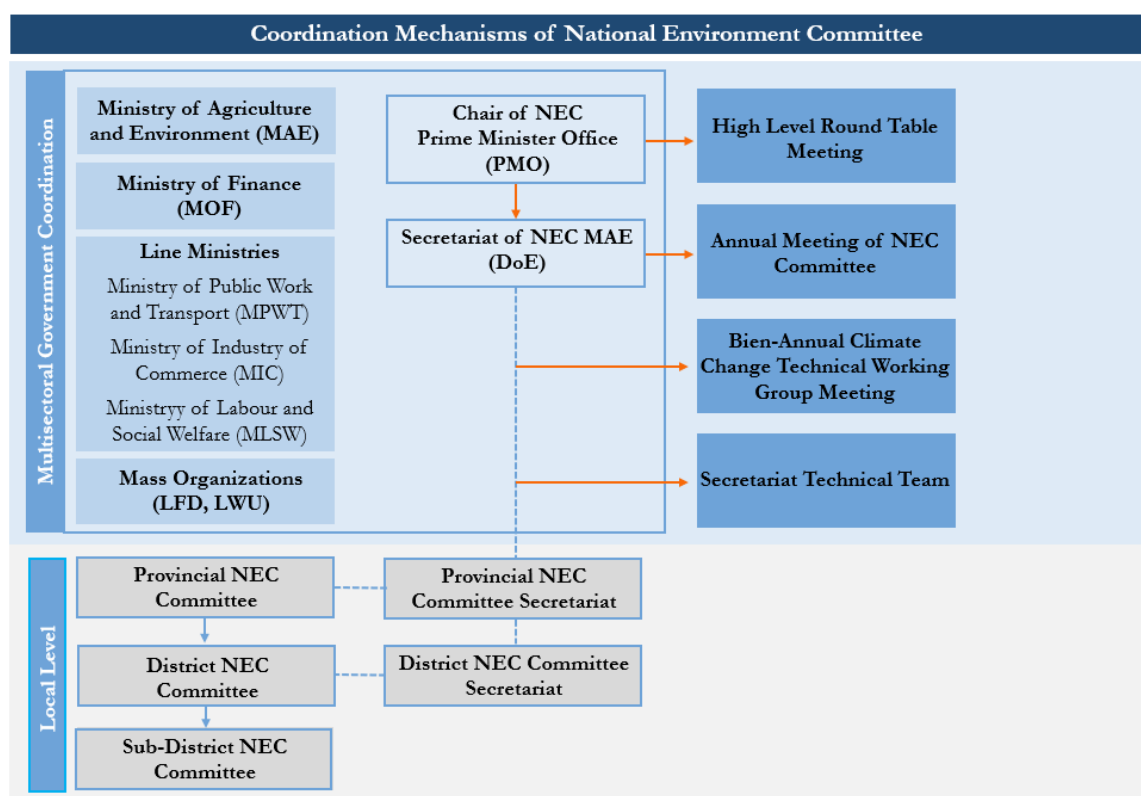


Figure 8: National and sub-national coordination mechanisms for National Environment Committee

Source: Adapted Lao National Determined Contribution Implementation [58]

Close and continuous collaboration between MAE, the National Environmental Committee, and the National Steering Committee on Climate Change, which oversees the overall NAP implementation, will ensure that the SAP-WR remains aligned with national adaptation priorities. The SAP-WR should be shared and discussed widely among government institutions, development partners, and civil-society stakeholders to foster awareness, ownership, and integration of its objectives and actions across planning and policy frameworks at all levels.

Implementation will be carried out over a five-year period (2026–2030), based on the degree of urgency, available funding, and opportunities for coordination within national and international programs. Given the cross-cutting nature of water management, many actions are expected to be implemented through projects supported by both domestic budgets and Official Development Assistance (ODA).

Despite notable institutional progress, further strengthening is required to ensure effective implementation and coordination of the SAP-WR. Key recommendations include:

- Establishing a Water Resources and Climate Resilience Unit within MAE/DWR to provide dedicated technical support, oversee inter-ministerial coordination, and monitor progress of adaptation measures.
- Enhancing data-sharing protocols and hydrological monitoring systems across ministries, provincial offices, and development partners to improve early warning systems, drought and flood risk assessment, and decision-making.
- Building technical and institutional capacity at the provincial and district levels (PAE and DAE) to enable localized implementation, stakeholder engagement, and GEDSI-sensitive delivery of adaptation measures.
- Promoting integrated basin governance by strengthening River Basin Committees and ensuring representation of local authorities, communities, and water user groups in planning and monitoring processes.

Together, these institutional mechanisms will form the backbone of Lao PDR's climate-resilient water resources management system, fostering coordinated, inclusive, and adaptive responses to the growing challenges posed by climate change

1.2. Funding

Lao PDR 10th National Socio-Economic Development Plan (NSED) prioritizes infrastructure expansion, industrial growth, and public–private partnership (PPP) development as key drivers of economic transformation. However, while water supply, flood control, and environmental sustainability are recognized as important components of national development, the Plan does not establish a dedicated financing mechanism for climate-resilient water systems [49]. At the same time, constrained fiscal space and high public debt limit the government’s ability to fully finance large-scale hydrological infrastructure through public budgets alone. This creates a financing gap between growing water-related investment needs and available public resources.

Effective implementation of SAP-WR will therefore depend on mobilizing a diversified mix of domestic public resources, international development finance, private sector investment, and blended financing mechanisms.

Table 8: Indicative Financing sources for SAP-WR Action

Action Type	Likely Main source of Funding	Complementary sources
Policy Reform	Government Budget	Technical assistance from ODA
Infrastructure	Public Investment	Complementary Funds from PPPs Technical assistance from ODA
Capacity Building	Government Budget	Technical assistance from ODA
Data Systems	Government Budget	PPPs

1.5.1. Domestic Public Financing

Water infrastructure remains partly dependent on public budget allocations [49]. The GoL remains the primary financier of sectoral investments through:

- Annual national budget allocations
- Provincial budget envelopes
- Sector ministry capital expenditure programs

Mainstreaming SAP priorities into these instruments is critical for long-term sustainability. However, fiscal constraints limit large-scale state-funded expansion.

1.5.2. International Development Finance

International climate funding

1. The Green Climate Fund is a new global fund within the UNFCCC mechanisms, created to support the efforts of developing countries to respond to the challenge of climate change with both mitigation and adaptation actions. The GCF has funded 22 projects, completed 8 projects, being implemented 13 projects and in the pipeline 1 projects. As specific Lao PDR has 17 financial projects for 262.6 million USD and 10 readiness projects around 9.1 million USD ([Lao People's Democratic Republic \(the\) | Green Climate Fund](#))

2. The Adaptation Fund was established by the parties to the Kyoto Protocol of the UNFCCC to finance concrete adaptation projects and programs in 45 developing countries that are parties to the Kyoto Protocol. Lao

PDR has received fund from the adaptation fund for three grant projects with total cost 17,561,131 USD. ([Country – Adaptation Fund](#))

3. The Global Environment Facility is an international partnership of 183 countries, international institutions, civil society organizations, and the private sector that aims to address global environmental issues. The active portfolio has 5 national project for GET and 27 for regional and global projects including Laos ([Lao PDR | GEF](#)).

4. Two funds under the Global Environment Facility are the Least Developed Country Fund and the Special Climate Change Fund.

4.1. The Least Developed Country Fund was established to assist least developed countries to take quick actions including implementing projects identified under the National Adaptation Programme of Action to Climate Change [11].

4.2. The Special Climate Change Fund supports adaptation and technology transfer in all developing countries party to the UNFCCC. The Fund supports both long- and short-term adaptation activities in water resources management, land management, agriculture, health, infrastructure development, fragile ecosystems (including mountainous ecosystems), and integrated coastal zone management.

These funds are particularly relevant for large-scale transformational projects, readiness and institutional strengthening and innovation pilots. However, they typically require co-financing and cannot be the sole funding source.

Multilateral and Bilateral Development Coordination (Beyond Climate Funding)



Figure 9: Key international funding institutions active in Lao PDR Water Resources sector

1.2.3. Non-ODA Regional Investment and Private Sector

Lao PDR is deeply integrated into regional economic corridors and hydropower networks, positioning water resources at the center of its development trajectory. Beyond Official Development Assistance (ODA), significant capital flows originate from foreign direct investment (FDI), regional infrastructure financing, and private sector participation in water-related infrastructure.

One of the most significant sources of non-ODA investment is the hydropower sector. Lao PDR's strategy as the "Battery of Southeast Asia" [6] has attracted substantial investment, primarily from China, Thailand, Vietnam, and other ASEAN partners, into large dams, reservoir systems, and cross-border electricity transmission infrastructure. These investments have direct implications for water allocation, sediment transport, flood regulation, and downstream ecosystem health. Integrating climate-resilient reservoir operations, dam safety standards, and basin-level coordination mechanisms into concession agreements represents a major opportunity for strengthening adaptive water governance.

In addition, regional infrastructure corridors, including rail, roads, and logistics hubs, also influence watershed stability and hydrological flows. Integrating water-sensitive urban design, flood mitigation standards, and environmental safeguards into infrastructure investment frameworks is therefore critical to prevent maladaptation.

Furthermore, private sector participation is growing through different mechanisms with around 21 Special economic zones (SEZs) established across seven provinces attracting over USD 26 billion in private investment, industrial water use, wastewater management, and site drainage requirements are expanding alongside economic zone development. Under the 10th NSEDP, GoL continues to promote SEZs as key engines of industrialization and private sector-led growth to attract FDI [49]. Ensuring that SEZ development integrates water resource planning, environmental safeguards, and climate-resilient design standard could help to prevent localized water stress, pollution risks, and downstream hydrological impacts.

Public-Private Partnerships are increasingly relevant for financing urban drainage, wastewater treatment plants, and climate-resilient water supply systems, particularly in rapidly urbanizing areas such as Vientiane Capital and secondary cities. Although private sector participation in rural water supply and sanitation has historically been limited, pilot PPP models are under implementation. As an example, the water supply and sanitation project implemented through a PPP model in Thabok, Bolikhamxay Province under the GRET "Mini Drinking Water Network" (MIREP) program, that involve private equity and consumer investment in small town water systems. The evaluation of the project has demonstrated that PPPs, when structured with strong community involvement and clear roles for local authorities and private operators, can unlock finance for water service infrastructure beyond conventional ODA models [50]. The MIREP pilot combined local government leadership, private contractors and blended funding from development partners, indicating that similar PPP frameworks could be adapted for climate-resilient water systems in rural and peri-urban areas. The 10th NSEDP promotes PPPs as a key instrument to mobilize private investment in infrastructure, including water supply and urban services, creating opportunities for blended financing models in climate-resilient water systems [49].

Overall, non-ODA regional and private investments represent substantial capital flows that will shape water security outcomes. Strengthening regulatory oversight, water allocation frameworks, and basin-level governance mechanisms is essential to ensure that private investment contributes to long-term climate resilience rather than increasing hydrological vulnerability.

1.2.4. Community Level and Decentralized Financing

At the local level, water resource management often depends on decentralized financing mechanisms and community-based management systems. In rural Lao PDR, small-scale water supply systems, irrigation schemes, and watershed protection initiatives are frequently co-financed through a combination of local government budgets, village contributions, revolving funds, and user-fee systems.

Village Water User Groups (WUGs) and Water User Associations (WUAs), irrigation associations, and community-based forest and watershed committees play a central role in maintaining small dams, gravity-fed systems, pumps,

and drainage channels. These decentralized arrangements are particularly important in upland and remote areas where national infrastructure investment remains limited.

However, access to finance for water infrastructure remains uneven. Many rural communities lack sufficient financial resources to invest in climate-resilient upgrades such as:

- Reinforced intake structures;
- Flood-resilient storage systems;
- Drought-resistant pumping technologies;
- Improved drainage systems.

User-fee collection mechanisms are often weak, and maintenance funds may be insufficient to ensure long-term system sustainability.

Women, ethnic communities, and persons with disabilities may face additional barriers in accessing decision-making processes related to water management and fee structures. Ensuring inclusive representation within WUAs and village committees is therefore essential for equitable resource allocation and maintenance planning.

Strengthening decentralized financing for water resilience may involve:

- Expanding community-managed revolving funds for water infrastructure;
- Linking village water committees to district-level budget allocations;
- Establishing matching grant schemes for climate-resilient upgrades;
- Supporting microfinance access for small-scale water technologies (e.g., pumps, drip irrigation, rainwater harvesting);
- Enhancing financial management capacity of Water User Groups.

Improving the sustainability of community-level water financing mechanisms is critical to ensure that local systems remain functional under increasing climate stress and hydrological variability.

1.5.5. Strengthening financing pathways: the next steps

In the following stage of implementation of SAP, an important focus should be made on the strengthening of financing pathways. This includes embedding priorities into public investment planning processes, improving project bankability, promoting blended finance approaches, strengthening domestic resource mobilization, and facilitating structured engagement with the private sector.

1.3. Leveraging existing initiatives and projects for implementation

Beyond its role as a planning document, the SAP aims to serve as a strategic instrument for mobilizing and coordinating investments. It aims to function as a project pipeline development tool, a coordination framework for development partners, a prioritization reference for budget negotiations, and a foundation for climate finance proposals.

To ensure effective implementation of the SAP–WR, it is essential to build on and coordinate with existing and pipeline projects that share complementary objectives. These initiatives represent significant ongoing investments by development partners in climate-resilient agriculture, sustainable forest management, watershed protection, and community-based livelihood programs.

Aligning SAP-WR actions with these projects will help avoid duplication of efforts, leverage existing institutional and financial mechanisms, and create operational synergies for scaling up adaptation outcomes. Coordination with

ODA-funded programs provides opportunities to integrate climate adaptation priorities into already funded interventions, ensuring continuity beyond the SAP's implementation period.

The SAP therefore encourages line ministries, provincial authorities, and development partners to establish structured coordination channels, through joint steering committees, shared monitoring frameworks, or harmonized work plans, to strengthen alignment between national adaptation priorities and donor-funded activities. This collaborative approach will maximize resource efficiency, enhance institutional learning, and accelerate the achievement of Lao PDR's climate-resilient development objectives.

2. Monitoring, Evaluation and Learning framework

A robust Monitoring, Evaluation and Learning (MEL) framework is essential to ensure effective implementation of the SAP-WR support evidence-based decision-making and enable adaptive management over the 2026–2030 implementation period. Transparent reporting, monitoring and review are necessary to ensure adequate progress of the SAP-WR and potentially propose corrective action if deemed necessary.

The SAP-WR MEL framework is designed in alignment with the Lao PDR National Adaptation Plan (NAP) Monitoring, Evaluation and Learning system, which adopts a sectoral approach and establishes institutional coordination mechanisms led by the Ministry of Agriculture and Environment (MAE). The SAP-WR monitoring system therefore complements and operationalizes the national NAP MEL system within the Water Resources sector.

Objectives of the SAP-WR MEL Framework

The MEL framework aims to:

- Monitor implementation progress of priority adaptation actions at national and provincial levels;
- Assess effectiveness and resilience outcomes in reducing climate risks identified in the CRVA;
- Ensure alignment with NAP objectives, NDC commitments and sectoral development plans;
- Track the integration of gender equality, disability and social inclusion (GEDSI) considerations;
- Support continuous learning and adaptive management across implementing institutions.

Institutional Arrangements and Coordination

In line with the NAP MEL system, the overall coordination of SAP-WR monitoring will fall under MAE, with the Department of Environment serving as the national focal point for adaptation reporting.

Within the Water Resources sector:

- The Department of Water Resources (DWR) will be responsible for sector-specific data collection and technical reporting;
- The Department of Planning and Cooperation (DPC) will consolidate sectoral data and ensure alignment with national planning and budgeting systems;
- Provincial Agriculture and Environment Offices (PAEs) will collect disaggregated implementation data using harmonized templates;
- Sectoral focal points will coordinate with MAE for integration into national NAP reporting.

This structure ensures vertical integration (provincial–national) and horizontal coordination (across ministries), consistent with the national MEL institutional framework.

Measurement Approach and Indicator Structure

The SAP-WR MEL indicators are presented with baselines and targets. Data should be collected through:

- Administrative reporting systems within MAE;
- Provincial implementation reports;
- Project-level M&E systems of externally financed adaptation programs;
- National statistics (where applicable);
- Periodic surveys and vulnerability assessments.

Annual progress reviews should be conducted in coordination with MAE and sectoral focal points. A mid-term review (2028) and final evaluation (2031) should assess effectiveness, efficiency, coherence, and sustainability of SAP-WR implementation, consistent with national NAP review timelines.

Linkages to National and International Reporting

The monitoring framework integrates sector-specific indicators and aims to align them with the UNFCCC and NAP adaptation monitoring framework. Link with related NAP (listed in details in [Appendix 5](#)) and UNFCCC indicators (listed in detail in [Appendix 4](#)) have been added in order for the SAP-WR MEL framework to contribute to National NAP annual progress reporting and National Communications under the UNFCCC. By structuring sectoral data according to nationally harmonized formats, the SAP-WR strengthens Lao PDR's capacity to provide robust adaptation evidence for the Global Stocktake and future GGA assessment processes.

Learning and Adaptive Management

Beyond compliance reporting, the SAP-WR MEL framework emphasizes learning. Lessons learned, good practices, and implementation bottlenecks will be systematically documented and fed back into sectoral planning, budgeting cycles, and future revisions of the SAP and NAP.

Particular attention should be paid to:

- Effectiveness of climate-resilient agriculture technologies;
- Community-based forest management approaches;
- Gender-responsive adaptation interventions;
- Institutional coordination mechanisms.

The M&E framework presented in this SAP is proposed as a structured and practical foundation to guide implementation and reporting. It is intended to support clarity on indicators, responsibilities, and tracking mechanisms at this stage. However, final validation, refinement of baselines and targets, and confirmation of reporting arrangements should be led by the ministries responsible during detailed implementation planning. This will ensure that the framework remains realistic, aligned with sector capacities and national systems, and fully owned by the lead agencies, while retaining the flexibility needed to adapt over time.

Table 9: Monitoring Framework for the Water Resources Sectorial Plan

Objectives & actions		Responsibility	Indicators		Progress			GEDSI	
Adaptation actions	Activities	Department Responsible	Indicators	Data Collection Tools	Base-line	Mid-term review	End review	GEDSI indicator	GEDSI target
Strategic objective 1.1: Strengthen basic and community water infrastructure									
1. Build basic infrastructure and develop community water supply to cope with floods and droughts	Map priority drought/flood-prone villages and identify 3 pilot districts	DWR (Lead) -DMH, PAE / DAE -	No. of pilot districts identified and validated for intervention	GIS-based hazard mapping Official district validation meeting minutes	0	3	3	% of prioritized districts selected based on gender and social inclusion criteria	Existence of a documented gender and social inclusive methodology for risk mapping and pilot selection At least 1 of 3 pilot districts selected includes communities with high representation of vulnerable and/or female-headed households
	Conduct vulnerability and need assessment in target communities	DWR (Lead) -PAE / DAE -	No of community-level assessments completed and validated with stakeholders	Vulnerability assessment report Signed consultation attendance lists	0	3	3	% of households surveyed led by women	At least 50% of women led households consulted during vulnerability assessment
	Build/rehabilitate 30 community systems	DWR (Lead) -DPWT, PAE / DAE -	No. of climate-resilient water supply systems constructed or rehabilitated	Construction supervision reports	0	15	30	% of households headed by women with improved access to safe water	At least 40 % of beneficiary households are women-headed households
	Establish community water management committees and train operators	DWR (Lead) -DPWT, PAE / DAE -	No. of established and trained water management committees	Official membership lists Training attendance sheets	0	15	30	% of committee members who are women or ethnic minorities	100% of training includes gender sensitive modules. At least 40% of management committees members are women At least 30% of leadership positions held by women.
Related NAP Indictors: 3.1 / 3.2 / 3.3 / 3.12 / 3.19									

Related UNFCCC Indicators: 9a01 / 9a03 / 9a07									
2. Improve irrigation systems to be more efficient and resilient	Conduct irrigation audit in 6 provinces	DoI (Lead) -PAE / DAE -	No. of irrigation audit conducted	Field inspection reports	0	6	6	% of women in assessment teams	At least 40 % of field teams include women
	Rehabilitate 15 schemes	DoI (Lead) -DPWT, PAE / DAE -	No. of irrigation systems modernized with climate-resilient technologies	Construction supervision reports	0	15	30	% of households headed by women with improved access to safe water	At least 40 % of beneficiary households are women-headed households
	Scale to 30 schemes								
	Strengthen or establish WUAs and provide training	DoI (Lead) -PAE / DAE	No. of established ed WUAs with community members trained on system management and climate resilience	WUA registration records/official membership list Training attendance sheets	0	15	30	% of women representatives in WUA leadership	100% of training includes gender sensitive modules. At least 40% of WUA members are women At least 30% of leadership positions held by women.
Related NAP Indicators: 3.1 / 3.2 / 3.3 / 3.9/ 3.19									
Related UNFCCC Indicators: 9a02 / 9a03									
3. Build small, medium, and large-scale community water supply systems	Survey existing coverage and select priority sites	DWR (Lead) - PAE / DAE -	No. of survey on the existing coverage	GIS service coverage mapping / Site validation workshop reports	0	1	1	% of prioritized sites selected based on gender and social inclusion criteria	At least 50 % of prioritized sites demonstrate direct benefits for women and disadvantaged households
	Conduct Feasibility Studies with design of multipurpose storage systems	DWR (Lead) - PAE / DAE-	No. of feasibility studies and site assessments completed and validated	Feasibility Study reports	0	10	10	% of feasibility studies incorporating gender and social inclusion criteria in design	100 % of feasibility studies include GEDSI analysis and reflect women's and community input in system design
	Construct 10 pilot systems	DWR (Lead) - DPWT, PAE / DAE -	No. of multipurpose water supply systems	Construction progress reports	0	5	10	% of laborers and site workers from local communities and vulnerable groups	At least 30% of construction workforce are local community members, with 20% women employed in non-manual roles

			constructed and operational						
Strengthen or establish WUAs and provide training	DWR (Lead) -DPWT, PAE / DAE -	No. of established ed WUAs with community members trained on system management and climate resilience	WUA registration record /official membership list / Training attendance sheets	0	5	10	% of women representatives in WUA leadership	100% of training includes gender sensitive modules. At least 40% of WUA members are women At least 30% of leadership positions held by women.	
Develop O&M in collaboration with local communities and train local technicians	DWR (Lead) -DPWT, PAE / DAE -	No. of community-led O&M plans adopted	O&M plan adoption approval records	0	0	10	% of women representatives in O&M committees	At least 40% of O&M committees’ members are women At least 30% of leadership positions held by women.	
Related NAP Indictors: 3.1 / 3.2 / 3.3 / 3.8 / 3.19									
Related UNFCCC Indictors: 9a01 / 9a03 / 9a07									
Strategic objective 1.2. Mobilize sustainable financing for water infrastructure									
4. Create and implement an investment plan for water supply infrastructure	Develop/Update financing framework	DWR (Lead) -MPI	Financing framework for water infrastructure developed and validated by MAE and MPI	Financing framework / Approval decree or endorsement letter (MAE/MPI)	0	1	1	Financing framework includes provisions targeting rural women and vulnerable groups	GEDSI priorities explicitly integrated in 100 % of financing framework sections
	Identify priority provinces	DWR (Lead) -MPI	No. of priority provinces identified	Validation Workshop report	0	5	5	% of prioritized provinces selected based on gender and social inclusion criteria	Existence of a documented gender and social inclusive methodology for prioritization process. All priority provinces selected includes communities with high representation of vulnerable and/or female-headed households
	Integrate into 11 th NSEDP	MPI (Lead) -DWR	Water infrastructure investment plan	11 th NSEDP	0	0	1	National plan includes gender-responsive	11 th NSEDP includes at least three gender- and inclusion-sensitive targets

			incorporated into 11 th NSEDP					objectives and indicators	or policy measures for water resources sector.
Related NAP Indictors: 3.20 / 4.1									
Related UNFCCC Indictors: 10a09 / 10a10									
5. Create and implement an investment plan for infrastructure in urban and rural areas	Identify financing gaps for urban and rural water, sewage, and stormwater systems	MPI (Lead) -DWR	National gap assessment completed and validated	National water infrastructure gap assessment report	0	1	1	% of assessment addressing access issues for women and vulnerable households	GEDSI dimensions integrated in 100% of analysis sections
	Prepare investment prospectus	MPI (Lead) -DWR	Prospectus finalized and presented to development partners	Official investment prospectus document	0	1	1	% of proposed investments targeting high benefits for women and vulnerable groups	At least 40 % of identified projects benefit women and vulnerable groups
	Secure financing commitments from public, private, and climate sources	MPI (Lead) -DWR	Amount of financing committed for priority projects (million USD)	Signed financing agreements / Budget allocation records	0	15	30	% of financing proposals including gender-responsive budgeting	100% of proposal include gender-responsive budgeting
	Pilot sewerage collection and treatment & drainage in Vientiane and 2 rural provinces	DWR (Lead) -DPWT, PAE / DAE -	No. of pilot projects completed and operational	Construction supervision reports	0	0	2	% of beneficiaries from women-led or vulnerable households	At least 40 % of direct beneficiaries are women or vulnerable groups
Related NAP Indictors: 3.20 / 4.1									
Related UNFCCC Indictors: 9a10 / 10a10									
Strategic objective 2.1: Strengthen groundwater management and monitoring									
6. Strengthening Groundwater Registration	Draft legislation	DWR (Lead) -DPL -	Revision of the “Water and Water Resources Law” (1996 – revised 2017)	Official endorsement decree	0	1	1	Integration of gender and equity consideration	The revised law includes provisions for equitable access and participation

and Management	Establish groundwater monitoring units in 3 provinces	DWR (Lead) -DMH, PAE/ DAE -	No. of provincial monitoring units operational and reporting to national database	Reporting submission records to national database	0	2	3	% of women representatives in monitoring units	At least 40% of monitoring units members are women At least 30% of leadership positions held by women.
	Train provincial officers and local authorities on enforcement and reporting	DWR (Lead) -DMH, PAE/ DAE -	No. of officers trained on groundwater enforcement and data reporting	Training attendance sheets	0	50	100	% of training participants who are women	At least 40% of trained officers are women.
	Conduct awareness campaigns for farmers and private users on responsible groundwater use	DWR (Lead) -DMH, PAE/ DAE -	No. of campaigns conducted, and participants reached	Campaign report with participant attendance sheets and Communication materials archive	0	3	9	% of campaign participants who are women farmers or vulnerable users	At least 50 % of participants are women farmers or vulnerable groups
					0	90	270		
Related NAP Indictors: 1.8 / 1.11 / 1.12 / 1.13 / 2.8 / 2.9 / 2.11 / 2.12 / 2.13 / 3.8 / 2.12									
Related UNFCCC Indictors: 9a10 / 10a09									
7. Survey, collect data, and assess water shortages and suitable areas	Conduct groundwater and surface water availability surveys in priority districts	DWR (Lead) -DMH, PAE/ DAE -	No. of surveys completed with validated datasets	Survey questionnaires and Hydrological measurement sheets	0	10	10	% of survey data disaggregated by gender and community water usage patterns	100% of surveys include disaggregated data by gender and socio-economic status.
	Assess households and agricultural water demand.	DWR (Lead) - PAE/ DAE -	Comprehensive water demand assessment report produced and validated	Water assessment report including attendance sheets	0	1	1	% of consultations involving women headed households	At least 40 % of consultation participants are women and ethnic groups
	Develop GIS-based online platform	DWR (Lead)	Functional GIS platform	Annual system performance report	0	0	1	% of maps including gender-disaggregated data	100 % of maps include gender disaggregated data

		-DMH, PAE/ DAE -	operational and accessible						
Related NAP Indictors: 1.11 / 1.12 / 1.13 / 2.11									
Related UNFCCC Indictors: 10a02 / 10a09									
8. Identify areas at climate risk for groundwater quantity	Identify 3 drought-prone districts for pilot studies	DWR (Lead) -DMH, PAE/ DAE -	No. of districts selected for groundwater risk assessment	Site validation official approval	0	3	3	% of prioritized districts selected based on gender and social inclusion criteria	Existence of a documented gender and social inclusive methodology for risk mapping and pilot selection At least 1 of 3 pilot districts selected includes communities with high representation of vulnerable and/or female-headed households
	Conduct hydrogeological modeling to assess climate risks to aquifers	DWR (Lead) -DMH, PAE/ DAE -	No. of Hydrogeological risk maps and models completed	Hydrogeological modeling reports	0	3	3	Degree of integration of social and gender-disaggregated data on water access and use.	Risk maps incorporate gender-disaggregated water-use data and social vulnerability layers to identify priority risks for women, ethnic groups, and persons with disabilities.
	Develop priority list for artificial recharge and protection measures	DWR (Lead) -DMH, PAE/ DAE -	Priority list of aquifers and recharge zones approved	Official approval note of priority list	0	0	1	% of listed sites assessed for social inclusion benefits	100 % of listed sites assessed for gender/social impacts
	Integrate findings into national water management plans	DWR (Lead) -DMH, PAE/ DAE -	Updated national water plan including groundwater CRVA section	National water plan	0	0	1	% of updated water-management plans that consider GEDSI	100% of updated water-management plans include GEDSI considerations and recommendations
Related NAP Indictors: 2.9 / 2.10 / 2.11 / 2.12									
Related UNFCCC Indictors: 9a04 / 10a02									
9. Identify water and water resources protection zones	Conduct flood and drought risk assessments and identify additional sites to complement ongoing initiatives	DWR (Lead) -DMH, PAE/ DAE -	No. of new protection sites identified and validated through risk assessment	Flood/drought assessment reports	0	5	5	% of risk-assessment consultations with local communities and women	FPIC is systematically collected and reported from local communities in each site At least 50% of consultation participants are women

	Legally designated ecological buffer zones and implement land-use restrictions, reforestation, and soil conservation	DWR (Lead) - DPL -	No. of buffer zones legally designated	Official legal designation decrees	0	5	5	% of households in affected areas receiving inclusive consultation and compensation where applicable	100 % of affected households consulted and compensated fairly
	Develop and operationalize basin-level IWRM plan	DWR (Lead)	No. of basin IWRM plans developed and operational	Basin IWRM plan documents	0	1	2	% of women in basin management committees	At least 30 % women in basin management committees
	Establish co-management committees	DWR (Lead) -PAE/ DAE -	No. of co-management committees functioning at protection sites	Official membership registry	0	2	5	% of women representatives in co-management committees	At least 40% of co-management committees' members are women At least 30% of leadership positions held by women.
	Support the development of sustainable eco-tourism models	DWR (Lead) -PAE/ DAE	No. of eco-tourism initiatives launched in protected zones	Project approval documentation	0	0	2	% of eco-tourism business beneficiaries who are women entrepreneurs	100 % of participants to the initiatives are women entrepreneurs
Related NAP Indictors: 1.6 / 2.3 / 3.18 / 3.19 / 3.20 / 4.2									
Related UNFCCC Indictors: 9a04 / 9a10 / 9d02 /9d03 /9d04 / 9d05									
Strategic objective 3.1: Promote integrated water governance and adaptive basin management									
10. Create and implement an IWRM plan	Draft IWRM framework	DWR (Lead)	National IWRM framework developed and validated	Official endorsement	0	1	1	% of participants in IWRM framework consultations who are women	The IWRM framework is developed and validated through multi-stakeholder consultations, including at least 40 % women and representation.
	Pilot in 2 major basins	DWR (Lead)	No. of basin IWRM plans developed and operational	Basin pilot implementation reports	0	1	2	% of women in basin management committees	At least 30 % women in basin management committees
Related NAP Indictors: 3.18 / 3.19 / 3.20 / 4.2									
Related UNFCCC Indictors: 9a04 / 9a10									

11. Adjust dam and reservoir operations	Review and revise operating procedures for major dams and reservoirs to optimize water use	DWR (Lead) -Department of Energy (MEM)	No. of dam operation manuals reviewed and updated	Revised operation manuals	0	2	5	Integration of gender and social safeguards	GEDSI provisions (e.g., equitable water allocation, gender-responsive early warning communication, community participation) incorporated into at least two revised dam operation manuals.
	Identify 2 dams for pilot operations	DWR (Lead) -Department of Energy (MEM)	No. of pilot dams selected and validated	Approval documentation	0	2	2	% of prioritized sites selected based on gender and social inclusion criteria	100% of prioritized sites demonstrate direct benefits for women and vulnerable households
	Conduct participatory consultations with affected communities	DWR (Lead) -PAE/ DAE	No. of consultations held and documented	FPIC documentation / Consultation attendance lists / Minutes	0	10	10	% of participants in consultations who are women or members of vulnerable groups	At least 40% female and 20% vulnerable group participation in dam operation consultations.
	Pilot adaptive operations in 2 dams integrating hydrological forecasting and real-time systems and early warning systems	DWR (Lead) -Department of Energy (MEM) , DMH	No. of dams implementing adaptive operation protocols and monitoring systems	Operational monitoring reports Adaptive protocol documentation	0	0	2	No. of training session organized with community representative on dam risk awareness and early warning response	At least 2 training sessions per target basin are organized for community representative on dam risk awareness and early warning response with 50% women participants.
	Train dam operators on adaptive management and safety protocols	DWR (Lead) -Department of Energy (MEM)	No. of operators trained and certified in adaptive management	Training attendance sheets	0	25	50	% of female trainees	At least 30% of trained operators are women
Related NAP Indictors: 3.1 / 3.3 / 3.5 / 3.6									
Related UNFCCC Indictors: 9a04 / 9a09 / 10a01 / 10a02									
Strategic objective 3.2. Strengthen monitoring, information systems, and risk preparedness									
12. Expand meteorological and	Install new climate and hydrological monitoring stations	DMH (Lead) - PAE/ DAE	No. of new stations installed and operational	Station installation	0	10	20	% of laborers and site workers from local	At least 30% of construction workforce are local community members, with

hydrological stations	in 20 high-risk basins			completion reports				communities and vulnerable groups	20% women employed in non-manual roles
	Modernize existing stations with automated and solar-powered systems	DMH (Lead) - PAE/ DAE	No. of upgraded stations with real-time data transmission	System performance reports	0	10	20	% of laborers and site workers from local communities and vulnerable groups	At least 30% of construction workforce are local community members, with 20% women employed in non-manual roles
	Train provincial staff on data management and maintenance	DMH (Lead) - PAE/ DAE	No. of staff trained and using new data platforms	Training attendance sheets	0	100	200	% of female technicians trained on automated systems	At least 30% of trained technicians are women
	Conduct community awareness sessions on the use of weather and flood information	DMH (Lead) - PAE/ DAE	No. of awareness sessions conducted	Participant attendance sheets / Communication materials	0	50	100	% of participants from vulnerable groups	100% of training includes gender sensitive modules. At least 40% of participants are women and 20% from vulnerable groups
Related NAP Indicators: 1.8 / 1.9 / 1.10 / 3.19									
Related UNFCCC Indicators: 9a04 / 10a02 / 10a03 / 10a04 / 10a05									
13. Develop information system and database	Design a national GIS-based water database	DWR (Lead) - DMH -	National GIS-based database designed and validated	GIS architecture blueprint / Validation workshop minutes	0	1	1	% of datasets that include gender and vulnerability indicators.	100% of datasets include gender and vulnerability indicators.
	Upgrade LaoWIS architecture to support real-time processing and interoperability	DWR (Lead) - DMH -	LaoWIS upgraded	Interface	0	1	1	Degree of accessibility of the interfaces	Architecture integrates multilingual dashboard and low-literacy user interfaces
	Provide training on data entry and usage for national and provincial staff	DWR (Lead)	No. of staff trained on system use and data standards	Training attendance sheets	0	50	100	% of women among trained staff	At least 40% of trained staff are women.

	Launch prototype	DWR (Lead) - DMH -	Prototype launched and operational	Accessibility compliance checklist	0	0	1	Degree to which prototype meets GEDSI accessibility criteria	Architecture integrates multilingual dashboard and low-literacy user interfaces
Related NAP Indictors: 1.11 / 1.12									
Related UNFCCC Indictors: 10a02 / 10a08									
14. Implement adaptation measures to ensure water quality	Identify 5 priority districts	DWR (Lead)	No. of priority districts identified	Approval documentation	0	5	5	No. of prioritized districts selected based on gender and social inclusion criteria	Existence of a documented gender and social inclusive methodology for district selection and at least 3 of 5 pilot districts selected includes communities with high representation of vulnerable and/or female-headed households
	Develop water quality monitoring protocols in the 10 identified flood- and drought-prone districts.	DWR (Lead) - PAE/ DAE	No. of district with Water quality monitoring protocol developed and approved	Approved monitoring protocol document	0	2	5	% of water quality monitoring protocols developed with GEDSI indicators	100% of water quality monitoring protocols developed with GEDSI indicators integrated
	Prepare emergency water supply and sanitation response plans	DWR (Lead) - PAE/ DAE	No. of district with of provinces with emergency response plans approved	Approved emergency response plans	0	2	5	% of emergency plans including gender and social-sensitive response protocols.	100% of emergency plans include gender and social-sensitive response protocols.
	Rehabilitate 10 water treatment and sewage systems	DWR (Lead) - DPWT, PAE/ DAE	No. of treatment and sewage systems rehabilitated	Construction supervision reports	0	5	10	% of beneficiaries from women-led or vulnerable households	At least 50 % of direct beneficiaries are women or vulnerable groups
	Train community-based monitoring groups	DWR (Lead) - PAE/ DAE	No. of community groups established and trained	Training attendance sheets	0	5	10	% of women in local monitoring groups	At least 50% women participation in all local monitoring groups.
Related NAP Indictors: 3.1 / 3.3 / 3.10 / 3.19									

Related UNFCCC Indicators: 9a05 / 9a06 / 9a07 / 9a09 / 10a02

Strategic objective 3.3: Conserve ecosystems and natural buffers for water resilience

15. Protect wetlands and peatlands	Conduct national inventory and mapping of wetlands and peatlands and identify critical sites	DOE (Lead) - DWR, DLAM	National inventory and GIS maps completed and validated	National GIS wetland inventory / validation workshop minutes	0	1	1	Degree of integration of social and gender consideration in the inventory	Existence of a documented gender and social inclusive methodology for inventory and mapping process
	Draft and enforce legal protection for priority ecosystems	DPL (Lead) - DOE, DWR, DLAM	National decree adopted and enforced	Official legal designation decrees	0	0	1	No. of consultation with LWU and CSOs during drafting	At least 1 consultation with LWU and CSOs during legal drafting
	Launch 10 pilots' programs and project to restore degraded areas with native vegetation and buffer zones	DOE (Lead) - DWR, DLAM, PAE / DAE	No. of pilot restoration sites implemented	Restoration project reports including monitoring indicators and community participation records	0	5	10	No. of pilot project co-managed by women-led community conservation committees.	At least 5 pilots project co-managed with women-led community conservation committees.
	Establish community monitoring committees and training programs	DOE (Lead) - DWR, DLAM, PAE / DAE	No. of community monitoring committees operational	Committee registration documents / Training attendance sheets	0	5	10	% of women participants	At least 40% representation of women in training programs and monitoring committees.

Related NAP Indicators: 2.1 / 2.3 / 2.4 / 2.5 / 2.6 / 3.19

Related UNFCCC Indicators: 9a04 / 9d02 / 9d03 / 9d04 / 9d05

Appendix

[Appendix 01](#): CRVA indicators and thresholds

[Appendix 02](#): MCA Matrix for the Water Resources Sector

[Appendix 03](#): Ranked Adaptation Action during Sectoral Consultation

[Appendix 04](#): List and description of M&E related UNFCCC indicators

[Appendix 05](#): List and description of M&E related UNFCCC indicators

[Appendix 06](#): SAP Workshop Report

Appendix 01: CRVA indicators and thresholds presentation

Table 10: Identified indicators and derived variables

Sectors	Sub-categories	Indicators	Definition	Variable
Agriculture & Forestry	Agriculture yields	Heat Stress Index	Annual number of days when HeatIndex exceeds a critical threshold the crop during the growing season	HeatIndex (derived from maximum daily temperature and mean daily relative humidity)
		Drought Stress Index	Annual maximum number of consecutive dry days (precipitation < 1mm)	Daily precipitation
	Livestock	Heat Stress Index	Annual number of days THI exceeds critical limits for animal	Temperature Humidity Index (derived from max daily t° and mean daily relative humidity)
	Fish stock	Heat Stress Index	Annual number of days with Tmax > 30°C (proxy for hot water)	Maximum daily temperature
	Soil Quality	Soil Quality Index	Annual number of days with climatic water deficit (PET – Precipitation > 0)	Potential Evapotranspiration (derived from max daily t°) and daily precipitation
	Forest & Biodiversity	Heat Stress	Events/Years where Tmax > threshold for ≥ 3 consecutive days	Maximum daily temperature
Water resources management	Water Quality	Heat stress index	Annual max temperature	Maximum daily temperature
	River & Reservoir flows	Flood stress Index	Maximum 5-day cumulated precipitation	Daily precipitation
	Groundwater management	Precipitation groundwater index	Cumulated precipitation	Daily precipitation
Urban Development & Transport	Infrastructures Urban ecosystems Urban clean up Water infrastructure Hydraulic infra	Flood stress Index	Maximum 5-day cumulated precipitation	Daily precipitation
		Run off stress Index	Maximum daily precipitation	Daily precipitation
		Urban clean up stress	Number of days with precipitation >25mm	Daily precipitation
		Night heat stress	Number of nights with Tmin > 25°C	Minimum daily temperature

Table 11: Indicators context specific daily thresholds

		Daily threshold	Low	Moderate	High	Very high
Heat Stress Index for agriculture crops	Annual number of days when HeatIndex exceeds a critical threshold the crop during the growing season	HI > 36°C	< 5 days	5-10 days	10-20 days	>20 days
Drought Stress Index	Annual maximum number of consecutive dry days (precipitation < 1mm)	Precipitation <1mm	< 7 days	7-14 days	14-21 days	>21 days
Heat Stress Index for Livestock	Annual number of days THI exceeds critical limits for animal	THI >28°C	<10 days	10-20 days	20-30 days	>30 days
Heat Stress for fish stock	Annual number of days with Tmax >30°C (proxy for hot water)	Max T° >32°C	<10 days	10-20 days	20-30 days	>30 days
Soil Quality Index	Annual number of days with climatic water deficit (PET – Precipitation >0)	CWD > 0	<20%	20-30%	30-40%	>40%
Heat Stress Index (forest biodiversity)	Events/Years where Tmax > threshold for ≥ 3 consecutive days	Max T° > 35°C	0-1 events	2-3 events	4-5 events	>5 events
Run off stress Index	Maximum daily precipitation		<25mm	25-50mm	50-75mm	>75 mm
River Flooding stress Index	Maximum 5-day cumulated precipitation		<100mm	100-150 mm	150-200 mm	>200mm
Precipitation groundwater index	Cumulated precipitation		>1500mm	1250-1500 mm	1000-1250mm	<1000mm
Heat Stress Index (Water quality)	Annual max temperature		<35°C	35-40°C	40-45°C	>45°C
Urban clean up stress	Number of days with precipitation >25mm		<2days	2-5days	5-10 days	>10 days
Night heat stress	Number of nights with Tmin > 25°C	Min T°>25°C	<5 nights	5-10 nights	10-20 nights	>20 nights

Appendix 02: Multi-Criteria Analysis Matrix for the Water Resources Sector

Evaluation criteria:	Severity of CC Impacts			Poverty Reduction			High Value			Alignment with Environmental & Climate			Lives & Livelihood security			Feasibility of Implementation & availability of resources			Sustainability & long term benefits			Institutional capacity to implement			Financial operationalization			Urgency of Action			TOTAL WEIGHT
	Score	Weighting	Weighted score	Score	Weighting	Weighted score	Score	Weighting	Weighted score	Score	Weighting	Weighted score	Score	Weighting	Weighted score	Score	Weighting	Weighted score	Score	Weighting	Weighted score	Score	Weighting	Weighted score	Score	Weighting	Weighted score	Score	Weighting	Weighted score	
Build basic infrastructure and develop community water supply to cope with floods and droughts	9	0,4	3,6	9	0,6	5,4	9	0,7	6,3	9	0,8	7,2	9	0,8	7,2	8	1	8	8	1	8	8	0,6	4,8	9	1	9	7	0,4	2,8	62,3
1 Improve the irrigation systems to be more efficient and resilient to the climate change and disasters.	8	0,4	3,2	7	0,6	4,2	7	0,7	4,9	8	0,8	6,4	8	0,8	6,4	8	1	8	8	1	8	8	0,6	4,8	9	1	9	7	0,4	2,8	57,7
2 Build small, medium and large-scale community water supply systems in drought-prone and water-scarce areas in both urban and rural areas to be able to provide water during the dry season	3	0,4	1,2	6	0,6	3,6	6	0,7	4,2	6	0,8	4,8	8	0,8	6,4	9	1	9	9	1	9	9	0,6	5,4	10	1	10	8	0,4	3,2	56,8
3 Create and improve legislation and plans on groundwater management and protection, including the implementation of such legislation and plans	8	0,4	3,2	8	0,6	4,8	8	0,7	5,6	10	0,8	8	8	0,8	6,4	7	1	7	6	1	6	7	0,6	4,2	2	1	2	5	0,4	2	49,2
4 Survey, collect data and assess water shortages and suitable areas for building water supply infrastructure.	3	0,4	1,2	5	0,6	3	4	0,7	2,8	6	0,8	4,8	8	0,8	6,4	9	1	9	9	1	9	9	0,6	5,4	4	1	4	8	0,4	3,2	48,8
5 Expand meteorological and hydrological stations across the country	8	0,4	3,2	4	0,6	2,4	3	0,7	2,1	8	0,8	6,4	5	0,8	4	7	1	7	7	1	7	7	0,6	4,2	9	1	9	7	0,4	2,8	48,1
6 Implement the adaptation measures against natural disasters to ensure the quality of water resources in the face of floods and droughts, such as investing in water treatment facilities and sewage networks.	3	0,4	1,2	6	0,6	3,6	6	0,7	4,2	6	0,8	4,8	8	0,8	6,4	9	1	9	9	1	9	9	0,6	5,4	1	1	1	8	0,4	3,2	47,8
7 Identify areas at climate risk for groundwater quantity.	8	0,4	3,2	6	0,6	3,6	4	0,7	2,8	8	0,8	6,4	6	0,8	4,8	7	1	7	7	1	7	7	0,6	4,2	6	1	6	5	0,4	2	47
8 Identify water and water resources protection zones.	5	0,4	2	6	0,6	3,6	5	0,7	3,5	6	0,8	4,8	8	0,8	6,4	6	1	6	9	1	9	5	0,6	3	5	1	5	8	0,4	3,2	46,5
9 Create and implement an integrated water resources management plan to adapt and be resilient to climate change by managing and protecting water catchments, water sources, water gathering areas, ponds, water reservoirs, water area soils, aquatic biodiversity, ecosystem services, water quantity, ensuring supply and access to water sources for all sectors and communities, and women group.	8	0,4	3,2	4	0,6	2,4	5	0,7	3,5	10	0,8	8	8	0,8	6,4	6	1	6	5	1	5	5	0,6	3	6	1	6	6	0,4	2,4	45,9
10 Create and implement an investment plan for water supply infrastructure.	3	0,4	1,2	5	0,6	3	4	0,7	2,8	6	0,8	4,8	8	0,8	6,4	9	1	9	9	1	9	9	0,6	5,4	1	1	1	8	0,4	3,2	45,8
11 Create and implement an investment plan for infrastructure that collects and supplies water in urban and rural areas.	3	0,4	1,2	5	0,6	3	4	0,7	2,8	6	0,8	4,8	8	0,8	6,4	9	1	9	9	1	9	9	0,6	5,4	1	1	1	8	0,4	3,2	45,8
12 Adjust dams and reservoir operations to cope with future hydroclimatic scenarios, such as modifying water release schedules and storage capacities to ensure a fair share of the resources across sectors and communities.	8	0,4	3,2	8	0,6	4,8	5	0,7	3,5	9	0,8	7,2	8	0,8	6,4	4	1	4	8	1	8	4	0,6	2,4	2	1	2	7	0,4	2,8	44,3
13 Develop information system and database on water and water resources across the country to ensure that all parties have access to information related to water resources including gender equality	5	0,4	2	3	0,6	1,8	3	0,7	2,1	6	0,8	4,8	5	0,8	4	8	1	8	8	1	8	8	0,6	4,8	6	1	6	6	0,4	2,4	43,9
14 Protect the water areas, high-value wetlands and peatlands by creating legislation on the management of wetlands and peatlands.	5	0,4	2	6	0,6	3,6	5	0,7	3,5	6	0,8	4,8	8	0,8	6,4	6	1	6	9	1	9	5	0,6	3	2	1	2	8	0,4	3,2	43,5
15 Assess the risk of floods and droughts in the lower part of the river basin.	7	0,4	2,8	3	0,6	1,8	3	0,7	2,1	8	0,8	6,4	8	0,8	6,4	7	1	7	8	1	8	5	0,6	3	3	1	3	6	0,4	2,4	42,9

Appendix 03: Ranked Adaptation Actions during Sectoral Consultation

Table 12: Ranked Adaptation Actions with Justification

Rank	Adaptation Action	Justification Summary
1	Build basic infrastructure and develop community water supply to cope with floods and droughts	Universally prioritized by DWR, DIG, and DMH. High feasibility (3/3). Directly addresses recurring hazards and supports vulnerable communities.
2	Create and improve legislation and plans on groundwater management	Prioritized by DIG and DWR. Strong feasibility (3/3). Supported by AusAID and relevant for drought-prone provinces.
3	Identify water and water resources protection zones	Prioritized by DMH and DWR. High feasibility (3/3). Supports flood/drought risk reduction and wetland conservation.
4	Develop information system and database on water and water resources	Prioritized by DWR and DMH. Institutional feasibility (3/3). Supports Lao WIS upgrades and centralized planning.
5	Protect wetlands and peatlands through legislation and conservation	Prioritized by DWR. Supports Ramsar obligations and biodiversity resilience. Backed by FAO, ROK, and IUCN.
6	Identify areas at climate risk for groundwater quantity	Ranked by DIG. Supports meteorological drought assessments and proactive planning.
7	Expand meteorological and hydrological stations across the country	Ranked by DMH. Addresses data gaps and improves forecasting accuracy.
8	Implement adaptation measures against disasters to ensure water quality	Ranked by DWR. Supports health and environmental co-benefits. Coordinates with Department of Environment.
9	Create and implement an Integrated Water Resources Management (IWRM) plan	Emphasized by DWR. Supports catchment coordination and long-term resilience.
10	Adjust dam and reservoir operations to cope with hydroclimatic scenarios	Ranked by DMH. Relevant for flood control and downstream impact mitigation.
11	Improve irrigation systems to be more efficient and resilient	Ranked by DIG. Critical for agricultural productivity but limited prioritization.
12	Survey, collect data, and assess water shortages and suitable areas	Foundational for planning but not prioritized. Supports mapping and drought response.
13	Build small, medium, and large-scale community water supply systems	Complements Action 1 but not prioritized. Feasible but covered by existing projects.
14	Create and implement an investment plan for water supply infrastructure	Important for long-term planning but not ranked due to funding constraints.
15	Create and implement an investment plan for infrastructure in urban and rural areas	Acknowledged but not prioritized. Focus remains on immediate hazard mitigation.

Table 13: Summaries of Scores and Ranked adaptation Actions by department

Actions	Economic feasibility (from 1 – 3)				Institutional feasibility (from 1-3)				Prioritization (indicate with a cross 5 actions to prioritize)			
	DWR	DIG	DMH	Total	DWR	DIG	DMH	Total	DWR	DIG	DMH	Total
1. Build basic infrastructure and develop community water supply to cope with floods and droughts	3	1	3	2	2	2	2	2	5	3	0	3
2. Improve irrigation systems to be more efficient and resilient	0	1	1	1	2	2	2	2	0	2	0	1
3. Build small, medium, and large-scale community water supply systems	0	0	0	0	0	0	0	0	0	0	0	0
4. Create and implement an investment plan for water supply infrastructure	0	0	0	0	0	0	0	0	0	0	0	0
5. Create and implement an investment plan for infrastructure in urban and rural areas	0	0	0	0	0	0	0	0	0	0	0	0
6. Create and improve legislation and plans on groundwater management	3	0	0	1	0	0	0	0	2	5	0	2
7. Survey, collect data, and assess water shortages and suitable areas	0	0	0	0	0	0	0	0	0	0	0	0
8. Identify areas at climate risk for groundwater quantity	0	1	0	0	2	2	0	1	0	4	0	1
9. Identify water and water resources protection zones	3	1	1	2	2	2	2	2	0	1	5	2
10. Create and implement an Integrated Water Resources Management (IWRM) plan	0	0	3	1	0	0	2	1	1	0	4	2

Actions	Economic feasibility (from 1 – 3)				Institutional feasibility (from 1-3)				Prioritization (indicate with a cross 5 actions to prioritize)			
	DWR	DIG	DMH	Total	DWR	DIG	DMH	Total	DWR	DIG	DMH	Total
11. Adjust dam and reservoir operations to cope with hydroclimatic scenarios	0	0	3	1	0	0	2	1	0	0	3	1
12. Expand meteorological and hydrological stations across the country	0	0	3	1	0	0	2	1	0	0	1	0
13. Implement adaptation measures against disasters to ensure water quality	1	0	0	0	0	0	0	0	0	0	0	0
14. Develop information system and database on water and water resources	2	0	3	2	0	0	2	1	3	0	2	2
15. Protect wetlands and peatlands through legislation and conservation	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 04: List and description of M&E related UNFCCC indicators

ID	Indicator Name	Description
9(a) Significantly reducing climate-induced water scarcity and enhancing climate resilience to water-related hazards towards a climate-resilient water supply, climate-resilient sanitation and access to safe and affordable potable water for all		
9a01	Change in water stress levels over time	This indicator measures change in the level of water stress over time. It is calculated as the ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after taking into account environmental flow requirements. Main sectors, as defined by ISIC standards, include agriculture; forestry and fishing; manufacturing; electricity industry; and services. Data on water withdrawals and total water resources available are commonly collected by national line ministries and institutions (e.g. for Water, Agriculture and Environment) and the National Statistical Office and can be used to assess current status and trends over time.
9a02	Change in water-use efficiency over time	The indicator tracks the value added in monetary value (e.g. US dollars) per volume of water used in cubic meters, by a given economic activity over time. It considers water use by all economic activities, with a focus on agriculture, industry and the service sector. Data on water use are commonly available from the records of national line ministries and institutions (e.g. for Water, Agriculture and Environment), and data on value generation in different sectors are commonly available from the National Statistical Office and can be used to assess current status and trends over time.
9a03	Proportion of critical water and sanitation infrastructure systems that are built or retrofitted to withstand climate-related hazards	This indicator measures proportion of critical water and sanitation infrastructure systems that are built or retrofitted to conform with national regulations and standards for climate resilience. Critical water infrastructure refers to essential water-related systems and facilities that have the ability to prevent, protect against, or recover from disasters. This ensures that services essential for the maintenance of vital societal functions, economic activities, public health and safety, or the environment (essential services) are constantly available. Critical water related infrastructure could include among others (and it is not limited to) drinking water suppliers and distributor networks, reservoirs, dams, wastewater collection and treatment plants, electricity production like hydropower, transport on water and flood protection systems, irrigation systems and supporting assets like pumps and control centers. Water and sanitation infrastructure may be considered critical for health, education, agriculture, industry or other purposes. Data on the number and proportion of critical water and sanitation infrastructure systems that are designed, built or retrofitted to withstand climate-related hazards is typically available from National Adaptation Plans, or equivalent policy instruments, and from relevant national line ministries and institutions (e.g. for Water, Agriculture and Environment).

ID	Indicator Name	Description
9a04	Proportion of total area of basins (river, lake or aquifer) and cryosphere (glacier, snow and ice) for which a climate adaptation plan is developed and implemented as part of an integrated water resources management approach	This indicator builds on and combines two established process indicators – SDG 6.5.1 and SDG 6.5.2 – and includes climate risk assessment and adaptation planning and implementation across entire basins (wholly within a country or transboundary) as part of an integrated water resource management approach, and also extends to the cryosphere as an important source of freshwater resources. The goal is to eventually reach 100% of the total area of a basin (lake, river or aquifer) for which a climate risk assessment is conducted/updated and an adaptation plan developed and implemented under an integrated water resources management approach. Data on the number and proportion of basins (including transboundary basins) that have developed and implemented climate adaptation plans as part of an integrated water resources management approach are typically available from national line ministries and institutions (e.g. for Water, Agriculture and Environment).
9a05	Proportion of population using drinking water services that are safely managed and climate resilient	This indicator builds on the established SDG indicator 6.1.1 which tracks the proportion of the population using safely managed drinking water services (an improved drinking water source that is accessible on premises, available when needed and free of faecal and priority chemical contamination) and integrates additional information on climate resilience. A standardized definition and methodology for assessing "climate resilient" drinking water services is currently being developed by the WHO/UNICEF JMP which is responsible for global monitoring of drinking water, sanitation and hygiene.
9a06	Proportion of population using sanitation services that are safely managed and climate resilient	This indicator builds on the established SDG indicator 6.2.1a which tracks the proportion of the population using safely managed sanitation services (an improved sanitation facility that is not share with other households and where excreta are safely disposed of in situ or removed and treated off-site) and integrates additional information on climate resilience. A standardized definition and methodology for assessing "climate resilient" sanitation services is currently being developed by the WHO/UNICEF JMP which is responsible for global monitoring of drinking water, sanitation and hygiene.
9a07	Proportion of Parties taking measures to improve and extend WASH services to populations disproportionately affected by climate change and to vulnerable groups	This builds on an established indicator which tracks the extent to which national policies and plans for drinking water, sanitation and hygiene (WASH) include measures to improve and extend WASH services to populations disproportionately affected by climate change. The populations disproportionately affected by climate change vary by Party. Measures to improve and extend services include extending services to unserved populations, upgrading existing services, provision of alternative services, and measures to ensure affordability and equitable access to WASH services for all including vulnerable groups.
9a09	Percentage of people assisted with the planned relocation in a safe, voluntary,	This indicator assesses the extent to which populations who are displaced as a result of water-related hazards and extreme events are supported with planned relocation in a safe, voluntary and dignified way.

ID	Indicator Name	Description
	and dignified way among those displaced as a result of water related hazards and extreme events such as floods, droughts, tropical cyclones and storm surges, sea level rise and other water induced disasters	Planned relocation in the context of disasters or environmental degradation, including when due to the effects of climate change, is a planned process in which persons or groups of persons move or are assisted to move away from their homes or place of temporary residence, are settled in a new location and provided with the conditions for rebuilding their lives (adapted from Brookings, Georgetown, and UNHCR, 2015). See glossary of the UNFCCC 'Technical Guide on integrating Human Mobility and Climate Change Linkages into Relevant National Climate Change Processes' (pages 9-11)
9a10	Number of Parties that integrate climate adaptation measures in their national plans for water resources management and water supply and sanitation plans	This indicator assesses the extent to which national plans for water resources management and water supply and sanitation integrate climate adaptation measures. It builds on established process indicators with existing guidance and system of reporting on progress towards SDG targets. SDG 6.5.1 country survey assesses the degree of integrated water resources management implementation at national level (0-100) and could be expanded to include implementation of climate adaptation measures. The UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) survey assesses the extent to national water, sanitation and hygiene (WASH) plans include climate risk assessment. Adaptation measures are country specific but there are established methods for assessing degrees of implementation.
9(d) Reducing climate impacts on ecosystems and biodiversity, and accelerating the use of ecosystem-based adaptation and nature-based solutions, including through their management, enhancement, restoration and conservation and the protection of terrestrial, inland water, mountain, marine and coastal ecosystems;		
9d02	Extent and capacity of regulating ecosystem services that reduce exposure and vulnerability to climate risks/impacts	This indicator measures (a) the extent (area, distribution) of ecosystems that provide regulating services critical for climate risk reduction, and (b) their capacity (biophysical ability) to sustain those services under current conditions and climate change scenarios. It reflects both the spatial coverage of regulating ecosystems and their functional ability to reduce climate risks and impacts.
9d03	Proportion of populations benefiting from nature- and biodiversity-based cultural services that enhance adaptive capacity	This indicator measures the proportion of people benefiting from cultural, spiritual, recreational, relational, reciprocal, and knowledge services provided by nature and biodiversity that directly support adaptive capacity. Defined as the percentage of people in communities reporting access to or reliance on nature- and biodiversity-based cultural and knowledge services, it emphasizes the non-material but essential role of ecosystems in sustaining adaptive capacity.

ID	Indicator Name	Description
9d04	Area under restoration for enhancing ecosystem resilience and services	This indicator measures the area of degraded terrestrial, inland water, mountain, marine and coastal ecosystems restored to enhance resilience and the availability of ecosystem services. Restoration is defined to include: (a) restoring converted areas back to natural states; (b) improving the ecological integrity of degraded natural areas; and (c) rehabilitating converted and degraded areas (e.g. degraded agricultural lands) to improve both productivity and integrity.
9d05	Extent of ecosystems that contribute to climate resilience covered by protected areas and other effective area-based conservation measures	This indicator measures the extent of terrestrial, inland water, mountain, marine, and coastal ecosystems that contribute to climate resilience and that are under formal protection, conservation, and sustainable management, including protected areas (PAs) and other effective area-based conservation measures (OECMs). It is defined to measure the percentage area of these ecosystems covered by protected areas or OECMs
10(a) Impact, vulnerability and risk assessment: by 2030 all Parties have conducted up-to-date assessments of climate hazards, climate change impacts and exposure to risks and vulnerabilities and have used the outcomes of these assessments to inform their formulation of national adaptation plans, policy instruments, and planning processes and/or strategies, and by 2027 all Parties have established multi-hazard early warning systems, climate information services for risk reduction and systematic observation to support improved climate-related data, information and services		
10a01	Number of Parties that have established multi-hazard early warning systems	Total count of Parties that have reported to have established multi-hazard, end-to-end, and people-centered early warning systems disaggregated by sector and GGA targets. The indicator will be informed by other indicators in this target, based on the standard four pillars of early warning systems (1) disaster risk knowledge based on the systematic collection of data and disaster risk assessments; (2) detection, monitoring, analysis and forecasting of the hazards and possible consequences; (3) dissemination and communication, by an official source, of authoritative, timely, accurate and actionable warnings and associated information on likelihood and impact; and (4) preparedness at all levels to respond to the warnings received.
10a02	Number of Parties that have accessible, understandable, usable, relevant and up to date climate risk information and comprehensive risk assessment	Total count of Parties that have reported to have climate risk information and comprehensive risk assessments that are accessible, understandable, usable, relevant, and up-to-date. Such risk information generated from comprehensive assessments that address all dimensions of climate-related disaster risk, including hazards, exposure, vulnerability, and capacity, and are based on qualitative and/or quantitative analysis to determine the nature and extent of risk. include the identification of hazards, review of their technical characteristics (such as location, intensity, frequency, and probability), analysis of physical, social, health, environmental, and economic

ID	Indicator Name	Description
		vulnerabilities, evaluation of coping capacities with respect to likely risk scenarios, and analysis of risk drivers and underlying risk factors. [Adapted from SFM Technical Guidance]
10a03	Number of Parties that have multi-hazard monitoring and impact-based forecasting systems, including monitoring stations	Total count of Parties that have reported to have multi-hazard monitoring and forecasting system for each of the major hazards determined by each Party. Where there is higher quality reporting, this indicator may also capture the quality of such systems. [Adapted from SFM Technical Guidance]
10a04	Number of people per 100,000 that are covered by early warning information through local governments or through national dissemination mechanisms	Total number of people per 100,000 population that are covered by multi-hazard early warning systems. This indicates the degree of progress being made in communication, dissemination, and outreach to populations. At the minimum, this is determined by the reporting of the primary media/mode for early warning information through local governments or through national dissemination mechanisms, such as recognized authorities, mass media (radio,TV, internet, website, email, SMS ,social media, app) and local communication systems (siren, public board, phone). If any of these information modes are available, the population are considered covered. [Adapted from SFM Technical Guidance]
10a05	Number of National Meteorological and Hydrological Services that have adopted and sustained the use of Common Alerting Protocol	Total count of National Meteorological and Hydrological Services (NMHS) that have formally adopted and are sustaining the operational use of the Common Alerting Protocol (CAP) for the dissemination of hazard alerts and warnings. Adoption implies integration of CAP — an international standard format for all-hazard emergency alerts — into national or sectoral warning systems to enable consistent, secure, and interoperable messaging across multiple communication platforms and agencies. Sustained use indicates that CAP-based alerts are routinely generated, updated, and disseminated for relevant hazards, ensuring timely, accessible, and actionable warning information to stakeholders and the public.
10a08	Number of Parties that have established climate information services for risk reduction and systematic observation to support improved climate-related data, information and services	Total count of Parties that have established and maintain operational climate information services for risk reduction, supported by systematic observation networks and processes that generate improved climate-related data, information, and services. Such services provide reliable, accessible, and usable climate information tailored to support different productive sectors and various segments of society.
10a09	Number of Parties that have used up-to-date climate risk information and comprehensive risk assessment to inform their formulation of national adaptation plans, policy instruments,	Total count of Parties that have established and maintain operational climate information services for adaptation and risk reduction, supported by systematic observation networks and processes that generate improved climate-related data, information, and services. Such services provide reliable, accessible, and usable climate information tailored to support different productive sectors and various segments of society to inform adaptation planning.

ID	Indicator Name	Description
	and planning processes and/or strategies	
10a10	Amount of finance for climate change adaptation for the design, development and operationalization of climate information services and multi-hazard early warning systems	The indicator captures the amount of finance from international sources, particularly for the design, development and operationalization of multi-hazard early warning systems, inclusive of all its pillars and elements, and climate information services. This indicator should use the approach and methodologies agreed under the Standing Committee on Finance
10(c) Implementation: by 2030 all Parties have progressed in implementing their national adaptation plans, policies and strategies and, as a result, have reduced the social and economic impacts of the key climate hazards identified in the assessments referred to in paragraph 10(a) above		
10c01	Degree of implementation of national adaptation plans, policies and strategies	This indicator measures the degree to which national adaptation plans, including the measurable targets/goals and adaptation measures/actions listed in the national adaptation plans, policies and strategies are implemented. It is proposed to measure two parts: a) the share of measurable targets/goals on track of being achieved; b) proportion of adaptation actions at different levels of implementation (e.g. not started, under implementation, completed)
10c03	Number of people who experienced direct social and economic impacts associated with climate-related hazards per 100,000 people	The first part of the indicator is modified from Sendai Framework Target B, and SDG targets 1.5, 11.5 and 13.1. The specific elements of disaggregation provide information on other targets, e.g. (a) Number of injured or ill people - provides information for Target 9c on health, (b) Number of people with damaged dwellings and (c) Number of people with destroyed dwellings - provide information for Target 9e on IHS, (d) Number of people whose livelihoods were disrupted or destroyed - provides information for Target 9f on poverty and livelihoods. The second part of the indicator is a Gender-Environment Indicator managed by UN Women and components of it are part of the Global Set of Climate Change Statistics and Indicators managed by UNSD. All sub-categories (from A to L) can be disaggregated by climate-related hazard. This indicator also contributes to Target 9c (climate-related injured and ill people), 9e (damaged and destroyed dwellings), and 9f (livelihoods lost due to climate-related hazards). While the indicator captures the absolute number, the analysis is recommended to be done over years to capture change over time to understand and track adaptation effectiveness.
10c11	Extent of capacity-building interventions enhancing adaptive	This indicator measures the extent to which capacity building interventions have increased the adaptive capacity of vulnerable people/communities to climate change impacts and hazards. Measured through:

ID	Indicator Name	Description
	capacity of vulnerable communities/people	(a) Qualitative information on (i) nature of strategies employed for capacity building of the vulnerable people, (ii) existence of a national and subnational policy(ies) that promote the integration of climate change adaptation in school curriculum, including professional training institutes and colleges, (iii) level of engagement of vulnerable people in capacity building interventions and (iv) level of the measures implemented to address the capacity building needs, priorities, and gaps identified in CNAs; and (b) Quantitative data on (i) proportion of vulnerable people reached by capacity building interventions, (ii) proportion of vulnerable people with improved skills to adapt including diversifying livelihoods away from climate sensitive sectors, (iii) number of adaptation-related research and development programs integrating indigenous and traditional knowledge in various levels of education (from primary, secondary, high school and post-school such as vocational training colleges and universities).

Source: United Nation Climate Change. Accessed October 22, 2025. [Final list of potential indicators, UAE–Belém work programme on indicators | UNFCCC](#)

Appendix 05: List and description of M&E related NAP indicators

ID	Indicators
STRATEGY 1: INTEGRATED WATER RESOURCES & RIVER BASIN MANAGEMENT	
<i>Planning & Legislation</i>	
1.1	At least 1 integrated water resources management plan aligned with 5-year national and provincial plans
1.2	14 large river basin plans developed
1.3	14 medium river basin plans developed
1.4	At least 4 legislations improved or developed (Water Law, Hydrology Law, etc.)
1.5	At least 1 technical guideline for river basin management plan
1.6	At least 1 coordinating mechanism & committee on integrated river basin management established
1.7	At least 20 dissemination events on legislation and guidelines
<i>Monitoring & Information Systems</i>	
1.8	Build 126 automatic monitoring stations / 147 ordinary stations / 119 rain level measuring stations
1.9	Expand meteorological network from 52 to 147 stations
1.10	Expand meteorological & hydrological stations to 148 stations (1 per district)
1.11	Develop at least 1 national water information system

ID	Indicators
1.12	Develop at least 1 online database system for water resources
1.13	Develop water inventories covering 18 provinces
STRATEGY 2: PROTECTION & RESTORATION	
<i>Wetlands & Water Protection</i>	
2.1	At least 1 regulation on identifying fertile/degraded river basins
2.2	At least 1 national CRVA report for water sector
2.3	At least 10 water protection zones identified
2.4	At least 1 legislation on wetlands/peatland management
2.5	At least 1 management plan for peatlands
2.6	At least 3 EbA projects implemented
<i>Wetlands & Groundwater</i>	
2.7	Survey forest protection areas covering 14 river basins
2.8	At least 1 groundwater management legislation developed
2.9	At least 1 groundwater technical guidance manual
2.10	Identify at least 4 groundwater areas at climate risk
2.11	At least 20 awareness activities on groundwater management
2.12	Develop 1 national groundwater status report
2.13	Provide local groundwater monitoring equipment (quantitative indicator)
STRATEGY 3: PROTECTION & RESTORATION	
<i>Infrastructure Resilience</i>	
3.1	Number of water infrastructures improved nationwide
3.2	At least 5 reservoir multi-use water plans
3.3	Number of infrastructures upgraded for extreme weather
3.4	At least 1 hydropower coordination network established
3.5	Number of dams with effective water management
3.6	At least 2 forecasting systems improved
3.7	At least 1 water supply investment plan
3.8	Assess water shortages in 18 provinces
3.9	Develop at least 10 infrastructure water storage plans

ID	Indicators
3.10	Build community water supply systems in 18 provinces
3.11	At least 10 climate adaptation projects related to water management
<i>Infrastructure Risk & Safety</i>	
3.12	Conduct CRVA for 14 large & medium reservoirs
3.13	Train 1000 personnel nationwide on CRVA
3.14	Develop at least 2 hydropower reservoir safety standards
3.15	Assess flood/drought risk in 14 river basins
3.16	Develop at least 1 dam safety standard or 1 national water management centre
3.17	Publish water-related laws at least twice per year
<i>Community Participation</i>	
3.18	Number of model communities implementing IWRM
3.19	Number of local populations engaged
3.20	Amount of financial support for integrated water management
STRATEGY 4: HUMAN RESOURCES	
4.1	At least 1 personnel development plan
4.2	Bi-annual training on IWRM
4.3	Bi-annual training on disaster boundary determination
4.4	Bi-annual training on infrastructure CRVA
4.5	Quarterly training on river basin planning
4.6	At least 5 research topics studied

Source: Lao People's Democratic Republic. (2025). *National Adaptation Plan of the Lao PDR* [PDF]. Ministry of Agriculture and Environment (MAE). Retrieved from: <https://naplaos.com/nap>

References

- [1] MAF (2021), *Glossary on Climate Change*. Lao PDR
- [2] CBD, 2009. *Connecting Biodiversity and Climate Change Mitigation and Adaptation*. Technical Series No. 41.
- [3] Global Green Growth Institute (GGGI). (2025). *Climate Risk and Vulnerability Assessment (CRVA) – Agriculture, Forestry, Urban Development, and Water Resources Sectors, Lao PDR*. Prepared for the Department of Environment, Ministry of Agriculture and Environment (MAE), Lao PDR.
- [4] Xinhua. (2025, June 5). Laos takes steps to enhance irrigation development. Retrieved from <https://english.news.cn/20250605/be78923e28e0447190aaf01959d09532/c.html>
- [5] Asian Power. (2025, June 2). Laos' large hydropower to reach 16 GW in 2035. Retrieved from: <https://asian-power.com/news/laos-large-hydropower-reach-16-gw-in-2035>
- [6] GoL (2021). 9th National Socio-Economic Development Plan (2021-2025)
- [7] United Nations in Lao PDR. (2024, November). Flood Needs and Early Recovery Assessment Report_Luangnamtha_October 2024. Retrieved from https://laopdr.un.org/sites/default/files/2024-11/Flood%20Needs%20and%20Early%20Recovery%20Assessment%20Report_Luangnamtha_October%202024.pdf
- [8] Planet Water Foundation. (n.d.). *Where we operate: Laos*. Retrieved July 8, 2025, from <https://planet-water.org/where-we-operate/laos>
- [9] GoL (2010). Lao PDR National Strategy on Climate Change and GoL (2023). National Strategy on Climate Change (Revised)
- [10] GoL, et al. (2023). Health National Adaptation Plan (H-NAP) for building climate resilient health systems in Lao People's Democratic Republic 2025–2030. [h-nap-for-building-climate-resilient-health-systems-in-lao-pdr-2025-2030.pdf](https://www.adaptation-undp.org/sites/default/files/downloads/Lao_pdr_napa.pdf)
- [11] GoL (2020). National Disaster Risk Reduction Strategy to 2030: MLSW
- [12] GoL (2019). Climate Change Decree. <https://data.Lao.opendatacommons.org/dataset/decreed-on-climate-change-lao-pdr-2019>
- [13] GoL (2019). Law on Disaster Management.
- [14] GoL (2012). Law on Environmental Protection
- [15] GoL(2009). Lao PDR National Adaptation Programme of Action (NAPA). https://www.adaptation-undp.org/sites/default/files/downloads/Lao_pdr_napa.pdf
- [16] Lao People's Democratic Republic. (2025). *National Adaptation Plan of the Lao PDR* [PDF]. Ministry of Agriculture and Environment (MAE). Retrieved from: <https://naplaos.com/nap>

- [17] United Nations Development Programme (UNDP). *Human Development Reports—Data Center: Gender Inequality Index (GII)*. Accessed October 27, 2025. <https://hdr.undp.org/data-center/thematic-composite-indices/gender-inequality-index#/indicies/GII>
- [18] World Bank. (n.d.). *Lao PDR – Gender Data Portal*. Gender Data. Retrieved from: [Lao PDR | World Bank Gender Data Portal](#)
- [19] World Economic Forum (2021). *Global Gender Gap Report 2021*. Geneva: World Economic Forum. Available at: <https://www.weforum.org/reports/global-gender-gap-report-2021>
- [20] Asian Development Bank. (2024). *Lao People’s Democratic Republic: Country Partnership Strategy 2024–2028 – Strengthening Foundations for an Inclusive, Sustainable, and Resilient Economy* [PDF]. Retrieved from: <https://www.adb.org/sites/default/files/linked-documents/cps-lao-2024-2028-gp.pdf>
- [21] CARE International in Lao PDR. (2023). *Impact of climate change on gender in Phongsaly Province*. Scaling-Up Nutrition Civil Society Alliance (SUN CSA). Retrieved from https://suncsalaos.org/wp-content/uploads/2024/08/CARE-Impact-of-CC-on-Gender-on-PSL_SK-2.pdf
- [22] World Vision International. (2014, December 10). “My home got clean water!” | Laos. Retrieved from <https://www.wvi.org/laos/article/my-home-got-clean-water>
- [23] LaoFAB Repository – Water Resources Management in Lao PDR
- [24] UNEP PAOLEX – Law on Water and Water Resources (Amended) 2017.
- [25] GWP Southeast Asia – Charting a Resilient Future.
- [26] UNEP-DHI – Preliminary IWRM Action Plan 2026-2030.
- [27] World Bank. (n.d.). *Historical trends and variability – Lao PDR*. Climate Knowledge Portal. Retrieved from: [Lao PDRLAO - Trends & Variability \(ERA5\) | Climate Change Knowledge Portal](#)
- [28] Ministry of Natural Resources and Environment (MONRE). & Global Green Growth Institute (2024). *Implementation Plan for the Nationally Determined Contributions of Lao PDR*. Vientiane Capital.
- [29] World Bank. (2017). Lao PDR systematic country diagnostic. Retrieved 22 August 2019 from <http://documents.worldbank.org/curated/en/983001490107755004/pdf/Lao-PDR-SCD-03-09-2017-03162017.pdf>
- [30] Viossanges, M., Pavelic, P., Rebelo, L.-M., Lacombe, G., & Sotoukee, T. (2018). Regional Mapping of Groundwater Resources in Data-Scarce Regions: The Case of Laos. *Hydrology*, 5(1), 2. <https://doi.org/10.3390/hydrology5010002>
- [31] Lapuekou, C., 2024. Laos: electricity consumption surges 45 percent in three years. *The Laotian Times*. [online] 1 July. Available at: <https://laotiantimes.com/2024/07/01/laos-electricity-consumption-surges-45-percent-in-three-years> [Accessed 3 Oct. 2025].
- [32] Planet Water Foundation. (n.d.). *Where we operate: Laos*. Retrieved July 8, 2025, from <https://planet-water.org/where-we-operate/laos>

- [33] Government of Lao PDR, *Post-Disaster Needs Assessment: Floods 2018*, Vientiane: Ministry of Planning and Investment, February 2019. Available at: https://laopdr.un.org/sites/default/files/2019-08/2018%20PDNA_English.pdf
- [34] Shrestha, B. & Maskey, Shreedhar & Babel, Mukand & van Griensven, Ann & Uhlenbrook, Stefan. (2018). Sediment related impacts of climate change and reservoir development in the Lower Mekong River Basin: a case study of the Nam Ou Basin, Lao PDR. *Climatic Change*. 149. 10.1007/s10584-016-1874-z.
- [35] World Bank. (2021). *Climate Risk Country Profile: Lao PDR*. Retrieved from <https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15505-Lao%20PDR%20Country%20Profile-WEB.pdf>
- [36] Notre Dame Global Adaptation Initiative. (2020). *ND-GAIN Country Index: Laos*. Retrieved from <https://gain-new.crc.nd.edu/country/laos>
- [37] *Gender Analysis: Lao People's Democratic Republic (PDR)*. Washington, DC: USAID. Available at: <https://banyanglobal.com/wp-content/uploads/2022/06/USAID-Laos-Country-Level-Gender-Analysis.pdf>
- [38] SIWI – GoAL-WaterS Guidelines for IWRM in Lao PDR.
- [39] IWRM – MoU with Department of Water Resources of Lao PDR.
- [40] Lao PDR. Ministry of Natural Resources and Environment (2023). *National Strategy on Climate Change toward 2030*.
- [41] Lao PDR. Ministry of Agriculture and Environment (2024). *Institutional Framework for Climate Coordination*.
- [42] GoL (2010). Lao PDR National Strategy on Climate Change and GoL (2023). National Strategy on Climate Change (Revised)
- [43] Lao PDR. Ministry of Planning and Investment (2019). *Green Growth Strategy*.
- [44] Round Table Meeting Secretariat (2024). *Sector Working Group Guidelines and Coordination Framework*.
- [45] Lao PDR. National Strategy for Water Management to 2030 and vision to 2040.
- [46] LaoFAB. MONRE. *Water Resources Management in Lao PDR* (October 2023). Retrieved from: <https://www.laofab.org/document/download/5490>
- [47] Stockholm International Water Institute. (n.d.). *Laos | SIWI – Leading expert in water governance*. Retrieved from: <https://siwi.org/goal-wash/laos/>
- [48] FutureWater. (n.d.). *Laos – Project country profile*. Retrieved from: <https://www.futurewater.eu/projectcountry/laos/>
- [49] GoL. (2025). *Draft 10th National Socio-Economic Development Plan (2026–2030)*. Retrieved from: [10th NSEDP 10112025_Eng.CLN1 .pdf](#)

- [50] Le Texier, M. (2012). *Lessons on public-private partnership disseminated from the pilot project: Building water service in small towns with PPP (Thaboke project)*. GRET & UN-Habitat. Retrieved from: [Lessons on public-private partnership disseminated from the pilot project](#)
- [51] UNFCCC (2012). *Technical Guidelines for the National Adaptation Plan Process*.
- [52] UNEP (2025). *NAP Technical Guidelines*. [NAP Technical Guidelines | NAP Central](#).
- [53] ESCAP (2023). Lao PDR Demographic Indicators. Lao People's Democratic Republic (the) | Demographic Changes in Asia and the Pacific
- [54] International Labour Organization. (2024). Report of the Mid-Term Review of the National Social Protection Strategy in the Lao People's Democratic Republic. ILO. Retrieved from ilo.org/sites/default/files/2024-07/report-of-the-mid-term-2024-en_0.pdf
- [55] United Nations Population Fund, Disability Monograph — Lao People's Democratic Republic (Vientiane: UNFPA, November 2020)
- [56] IPCC, 2014. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*.
- [57] UNEP GRID. (n.d.). *Water / Lao People's Democratic Republic*. Retrieved from <https://dicf.unepgrid.ch/lao-peoples-democratic-republic/water>
- [58] Department of Climate Change (DCC), Lao PDR. *Lao PDR's Nationally Determined Contribution (NDC) Platform*. Available at: [NDC LAO | Lao PDR's Nationally Determined Contribution \(LND\)](#)
- [59] World Bank (2019). *Lao PDR – Scaling-Up Water Supply, Sanitation and Hygiene Project: Project Appraisal Document*. <https://documents1.worldbank.org/curated/en/184911552874466320/pdf/LAO-PDR-PAD-02252019-636884568509975910.pdf>
- [60] Asian Development Bank (ADB). *Northern Rural Infrastructure Development Sector Project (42203-022)*. <https://www.adb.org/projects/42203-022/main>
- [61] International Fund for Agricultural Development (IFAD). *IFAD in Lao People's Democratic Republic*. <https://www.ifad.org/en/w/countries/laos>
- [62] Asian Development Bank (ADB). *Climate-Resilient Agriculture and Water Management Project (58284-001)*. <https://www.adb.org/projects/58284-001/main>
- [63] Asian Development Bank (ADB). *Cities Development Initiative for Asia (CDIA)*. <https://www.adb.org/what-we-do/funds/cities-development-initiative-asia>
- [64] UNEvaluation. *Final Evaluation: Groundwater Governance – A Global Framework for Action*. https://unevaluation.org/member_publications/final-evaluation-groundwater-governance-global-framework-action
- [65] World Bank. *Lao PDR Southeast Asia Disaster Risk Management Project (SEADRM) – Hydromet Component*. <https://projects.worldbank.org/en/projects-operations/project-detail/P160930>

- [66] International Union for Conservation of Nature (IUCN). *Protecting Our Wetlands – IUCN Oceania and KIWA Initiative*.
<https://iucn.org/story/202501/protecting-our-wetlands-iucn-oceania-and-kiwa-initiative>
- [67] Mekong River Commission (MRC). *Mekong Integrated Water Resources Management Project*.
<https://www.mrcmekong.org/mekong-integrated-water-resources-management-project>
- [68] Power Technology. *Nam Ngum 3 Hydroelectric Power Project, Laos*.
<https://www.power-technology.com/marketdata/power-plant-profile-nam-ngum-3-hydroelectric-power-project-laos/>
- [69] Asian Development Bank (ADB). *Sustainable Rural Infrastructure and Watershed Management Sector Project (52014-001)*.
<https://www.adb.org/projects/52014-001/main>
- [70] Mekong River Commission (MRC). *Basin Development Strategy 2021–2030 and MRC Strategic Plan 2021–2025*.
<https://www.mrcmekong.org/publications/basin-development-strategy-2021-2030-and-mrc-strategic-plan-2021-2025/>
- [71] Australian Department of Foreign Affairs and Trade (DFAT). *Australia Mekong Water Facility Investment*.
<https://adp.dfat.gov.au/investments/Investment?id=AU-5-INM136>
- [72] UNESCO World Heritage Centre. *Integrated Natural Resources Management Project in Hin Nam No Landscape*.
<https://whc.unesco.org/document/218103>