



The Lao People's Democratic Republic
Ministry of Natural Resources and Environment

Drought Management Framework in Laos



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**WORLD
METEOROLOGICAL
ORGANIZATION**



**Global Water
Partnership**
Southeast Asia

Lao PDR Water Partnership

Foreword

As the Director General of the Department of Water Resources, I am honored to present this comprehensive Drought Framework for our nation. This document marks a significant milestone in our ongoing efforts to build a stronger and more sustainable Lao PDR in the face of increasing climate uncertainty and change.

Drought affects various sectors of society and the economy in complex ways. Its impacts are especially pronounced in agriculture, forestry, wildlife, water resources, and people's livelihoods. As drought events become more frequent and severe, our country faces a critical challenge - one that this framework is designed to address.

The development of this framework has been guided by thorough research, broad consultation, and close collaboration among government agencies, international partners, and local stakeholders. It reflects our proactive approach to drought management and our firm commitment to protecting our people and preserving our natural resources.

The strength of this framework lies in its comprehensive approach. It provides a clear understanding of the current drought situation, a robust system for assessing risks, and targeted measures for the most vulnerable sectors. It also establishes a structure to enhance coordination and effectiveness in our drought management efforts. Most importantly, it lays out a strategic action plan with both short- and long-term goals to strengthen the country's resilience to drought.

Implementing this strategy will require teamwork and unwavering commitment. Success depends on coordination across all levels of government, active engagement with local communities, and continued collaboration with international partners. Ongoing learning and adaptation will also be crucial as we confront the evolving challenges of climate change.

I believe this Drought Framework will serve as a vital tool in strengthening Lao PDR's capacity to monitor, prepare for, and mitigate drought impacts. It reflects our dedication to sustainable development and our resolve to meet environmental challenges head-on. As we move forward with implementation, I call on all stakeholders to play their part. Together, we can build a more drought-resilient Lao PDR, securing the well-being and prosperity of our people for generations to come.



Mr. Oudomsack Philavong

Director General

Department of Water Resources

Ministry of Natural Resources and Environment

Acknowledgement

The development of the *Drought Management Framework for Lao PDR* was made possible through the collaborative efforts of numerous individuals, institutions, and organizations. We extend our deepest gratitude to all who contributed their expertise, resources, and time to this critical initiative.

First and foremost, we acknowledge the leadership and guidance of the Department of Water Resources (DWR) under the Ministry of Natural Resources and Environment (MoNRE). Special thanks to Mr. Oudomsack Philavong, Director General, Department of Water Resources, Ministry of Natural Resources and Environment (MoNRE), Lao PDR and Mr. Bounteum Sisouphanthavong, Deputy Director General of the Department of Meteorology and Hydrology, MoNRE for their unwavering commitment to advancing drought resilience in Lao PDR. We also extend our sincere gratitude to Mr. Phonexay Simmalavong and Mrs. Sengphasouk Xayavong from Lao Water Partnership and Mr. Vilakone Maniphousay, National Expert on Drought Management in Lao PDR, whose technical expertise and commitment were critical in drafting and shaping the content of this report.

We are profoundly grateful to the Global Water Partnership (GWP) and the World Meteorological Organization (WMO) for their rigorous technical review and invaluable feedback, which significantly strengthened the framework's scientific and operational foundations.

This document reflects insights gathered through extensive consultations with national and international stakeholders. We thank representatives from government ministries, academic institutions, and development partners for their active participation in workshops, technical discussions, and validation sessions. Their practical experiences and sector-specific knowledge were instrumental in shaping the framework's priorities.

A special note of appreciation goes to the Mekong River Commission (MRC), Food and Agriculture Organization (FAO), Asian Disaster Preparedness Center (ADPC), and Lao Red Cross for their technical contributions, particularly in risk assessment methodologies, early warning systems, and community resilience strategies.

Acknowledgement

We recognize the critical role of international partners, including the World Bank, Asian Development Bank (ADB), and United Nations Development Programme (UNDP), whose financial and technical support enabled the integration of global best practices into this framework.

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Finally, we acknowledge the dedication of local communities and farmers across Lao PDR, whose resilience in the face of drought inspires this framework. Their voices and needs remain central to its implementation.

This collective effort embodies a shared vision for a drought-resilient Lao PDR. We hope this framework will serve as a cornerstone for sustainable development, safeguarding livelihoods and ecosystems for generations to come.

Cover image: Cracked ground, Desert, Dirt image

Source: www.pixabay.com

Photo by: www.pexels.com

Executive Summary

The objective of the drought framework in Lao PDR is to provide effective drought management by accounting for climate variability and change. A comprehensive strategy has been developed to strengthen the nation's resilience to droughts.

An analysis of historical drought occurrences in Lao PDR reveals a significant increase in both frequency and intensity. Climate projections indicate that this trend is likely to continue, underscoring the need for robust drought management strategies.

A comprehensive assessment of drought risk has identified substantial vulnerabilities across various sectors and regions in Lao PDR.

This document presents a structured framework that clearly defines key national policies and institutional arrangements, thereby facilitating coordination among government entities and stakeholders and clarifying responsibilities for drought management.

The framework identifies three priority sectors for drought management: forestry and biodiversity, agriculture, and water resource management. Each sector proposes specific strategies and actions to enhance resilience and mitigate the impacts of drought. These proposed strategies and actions have been discussed and validated through consultations with relevant national-level stakeholders through series of multi-stakeholder consultation workshops.

The framework outlines a comprehensive implementation strategy, including immediate initiatives to be undertaken within the next three to five years as well as mid- to long-term strategies (spanning three to ten years). It also considers potential funding sources for both long-term and short-term initiatives.

The implementation of this drought framework is a substantial step forward in Lao PDR's endeavors to mitigate the risk of drought. The framework's goal is to improve our capacity to predict and respond to droughts by incorporating monitoring systems, risk evaluations, and targeted responses.

The framework's objectives can only be achieved through the effective collaboration and cooperation of government agencies, the corporate sector, and communities. It is essential to prioritize research, capacity development, and adaptive management to address climate change and drought in Lao PDR.

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1. Introduction



Nam Song river in Vang Vieng, Vientiane province, Laos

Source: www.Shutterstock.com

1.1 Background and Objectives

Background

Landlocked in Southeast Asia, the Lao People's Democratic Republic (Lao PDR) covers a total area of 236,800 km² and shares borders with China to the north, Vietnam to the east, Cambodia to the south, Thailand and Myanmar to the west. Lao PDR is administratively divided into 17 provinces and one capital. The country has a population of 7.123 million people (about 1.27 million households), with the majority living in rural areas and engaged in agriculture.

The terrain is largely mountainous and elevated, with much of the land lying over 500 meters above mean sea level (AMSL). Agricultural activities are concentrated on the plains, especially along riverbanks. The Mekong River, which flows from north to south, is the country's primary waterway.

Lao PDR experiences a tropical monsoon climate, characterized by two distinct seasons: rainy season (May to October) and dry season (November to April). Average annual rainfall ranges from 1,300-3,000 mm. Temperatures vary across regions, with average temperature in the north and east around 20 °C, and in the plains ranging from 25°C to 27°C.

Lao PDR faces significant challenges as a Developing Country. This classification reflects the nation's low-income levels, limited economic diversification, and constraints in human capital development, among other factors. These challenges are further exacerbated by Lao PDR's vulnerability to climatic extremes and variability.

The recurrent floods and droughts substantially undermine the country's food security, social well-being, and economic prosperity. Drought Management has become a pressing national issue, as climate change contributes to an increase in the frequency and severity of these events.

Irregular precipitation patterns are a well-known cause for droughts in Lao PDR. Moreover, climate change projection indicates that the country is likely to experience more severe droughts and prolonged dry seasons. These conditions are primarily driven by two interconnected factors:

1. Persistent precipitation deficits;
2. Below-average flow in the Mekong River and its tributaries.

Such droughts can significantly impact multiple sectors, including but not limited to:

- Agriculture practices;
- Ecosystems services and forestry;
- Water resource management;
- Energy production;
- socioeconomic stability.

For the purposes of this framework, drought is defined as "a deficiency of precipitation over an extended period (usually a season or more), resulting in a water shortage" (National Integrated Drought Information System (NIDIS), n.d.).

A thorough understanding of the historical drought trends and their underlying causes in Lao PDR is essential for developing sensible and effective management plans and policies. This understanding forms the foundation of the national drought strategy.

Objectives

This framework aims to address the escalating drought challenges in Lao PDR through a comprehensive drought management framework. The primary objective is to strengthen early warning and monitoring systems for droughts to:

- Enhance resilience in key sectors;
- Improve the effectiveness of preparedness and response strategies;
- Foster collaboration among relevant stakeholders;
- Integrate drought management into national development strategies.

Lao PDR seeks to strengthen its capacity to anticipate, prepare for, and mitigate the impact of drought events - safeguarding both its people's welfare and its path to sustainable development.

1.2 Scope and Methodology

Scope

A comprehensive drought management strategy is currently lacking in the Lao PDR. During technical consultations with government ministries on July 15, 2024, and subsequent discussions between GWP Southeast Asia and the Department of Water Resources under the Ministry of Natural Resources and Environment Lao PDR on August 22, 2024, stakeholders agreed that developing a comprehensive strategy would require a minimum of three years. This timeline would significantly delay the formulation and implementation of any actionable measures.

To address drought challenges more urgently, stakeholders reached a consensus to prioritize the development of a Drought Management Framework. This framework is designed as a national policy document to guide drought management efforts across the entire territory of Lao PDR for the period 2025–2030. While adopting a multi-sectoral approach, the framework places particular emphasis on the three main sectors most affected by drought:

1. Agriculture;
2. Forestry;
3. Water Resources.

Methodology

a. Framework Development Approach and Methods

The development of this framework followed a comprehensive, multifaceted strategy to ensure its relevance, efficiency, and alignment with national priorities. The methodology comprised of the following main elements:

Data Analysis and Climate Projections

- Review of historical drought data;
- Analysis of Lao PDR specific climate projection.

Policy and Institutional Review

- Assessment of existing national policies for drought management;
- Evaluation of current institutional frameworks for drought response.

Stakeholder Consultations

- Engagement with a broad range of stakeholders, including:
 - Government agencies;
 - Academic institutions;
 - Community leaders.

Best Practice Assessment

- Review of regional and international drought management practices;
- Identification of best practices relevant to Lao PDR's context.

b. Framework Implementation Approach and Methods

The framework will be implemented through a structured five-stage method:

Drought Risk Assessment

A Drought Risk Assessment should be conducted to evaluate key indicators such as drought hazard, exposure, and vulnerability. This includes identifying drought hotspots for targeted management or adaptation, conducting assessments at both national and sub-national levels, and adjusting indicators based on national data accuracy and availability.

Identification of Affected Sectors and Areas

Involves collaboration with relevant national agencies to apply risk assessments and historical data in determining the most vulnerable sectors and regions at highest risk.

Selection of Adaptation/Response Measures

This stage requires choosing appropriate measures for drought based on available resources, financial conditions, and implementation feasibility. This includes a balanced mix of structural measures (e.g., infrastructure projects) and non-structural measures (e.g., policy reforms and water management programs).

Development and Implementation of Drought Management Plan (DMP)

This step entails creating a comprehensive national plan that integrates findings from the risk assessment and selected adaptation response measures and strategies. The plan should be embedded into existing government processes, clearly outlining specific actions, responsible stakeholders, and indicative resource allocations to ensure it is ready for immediate implementation.

Monitoring and Evaluation

Finally, Monitoring and Evaluation is essential to establish a robust system for ongoing assessment of the DMP's effectiveness in mitigating drought impacts and reducing community vulnerability. Active engagement and support from relevant national agencies are vital to ensuring successful monitoring efforts.

This framework's methodology ensures alignment with international best practices, grounding in empirical evidence, and incorporation of input from a diverse range of stakeholders. The implementation strategy provides a clear roadmap for translating the framework into actionable drought management measures across Lao PDR.

Approach for implementing the Drought Management Framework

Determine Drought Risks:

Begin by assessing national and subnational drought risk to identify hotspots requiring focused management or adaptation. This involves evaluating key indicators such as vulnerability, exposure, and drought hazard-adjusting them as necessary to reflect national-level data accuracy.

Identify Impacted Sectors and Areas:

Collaborate with national authorities to identify the most affected regions and sectors using historical data and risk assessments. This will help prioritize actions and inform targeted decision-making.

Select Adaptation Measures:

Choose appropriate drought adaptation strategies based on available resources, financial conditions, and implementation feasibility. Ensure a balanced mix of both structural measures (e.g., infrastructure projects) and non-structural measures (e.g., policy reforms and water management programs)

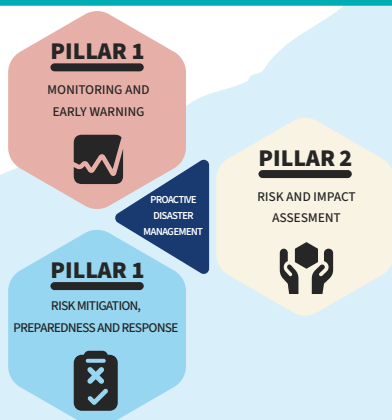
Prepare and Implement a Drought Management Plan (DMP):

Develop a comprehensive national DMP incorporating the results of the risk assessments and selected adaptation measures. The plan should be designed for readiness and rapid deployment when needed.

Monitoring and Evaluation:

Establish a robust framework for the continuous monitoring and evaluation of the DMP. This should assess the plan's effectiveness in reducing community vulnerability and mitigating drought impacts, with the support and participation of relevant national agencies.

Drought Pillars for Integrated Drought Management Programme



Risk and Impact Assessment:

Focuses on assessing the past, present, and future consequences of drought in risk and impact sense. Examining hazard, exposure, and susceptibility helps one create a risk profile for different industries and communities. Although past drought impact data could be limited, current effects are probably more well recorded. The IDMP is striving to enhance worldwide impact reporting and assessment guidance.

Monitoring and Early warning:

Drought early warning systems (DEWS) are absolutely crucial for good control of a drought. About the approaching drought conditions, they provide governments and people early warnings. DEWS can accurately predict future drought as well as the degree of present intensity by combining climate and water supply data. This so promotes informed decisions and timely use of mitigating and responding techniques.

Risk Mitigation, Preparedness & Response:

Among the tools supposed to manage drought vulnerability and impacts are those related to drought reducing, preparedness, and response. Clearly defined explicit activities for risk reduction and identification of triggers for beginning and stopping mitigating actions help to guarantee appropriate reactions. Depending on their capacity to sufficiently meet present needs and concurrently support long-term resilience and development goals, these projects could have a short-, medium-, or long-term existence.

2. Drought Context in Lao PDR



Cornfield, Dry, Field image
Source: www.pixabay.com
Photo By: Couleur

2.1 Historical Drought Events and Future Projections

Droughts in Lao PDR have great impact on agriculture, forestry, water resources, public health, and economic development, therefore affecting the way of life of the people. The frequency and degree of droughts have increased over the past few decades; with major events recorded in 1996, 1998, and 2003^[1]. A large drop in crop production followed damage in 18% of the northern rice crops in 2019^[7].

Rice is the primary staple food and a major source of income for much of the population. The country produces 1.5-2.7 million metric tons annually², with yields varying by type: lowland rainy-season rice averages 3.5 tons per hectare, irrigated dry-season rice yields 4.5 tons per hectare, and upland rice produces 1.8 tons per hectare. Over 80% of farmers cultivate rice on 60% of the country's farmland³. Most small-scale farmers rely on rain-fed agriculture, making them particularly vulnerable to excessive rainfall. Insufficient rainfall disrupts crop development, resulting in lower yields or even total crop failure. In extreme cases, this loss of income forces farmers to leave their villages in search of alternative livelihoods.

Beyond agriculture, droughts also constrain water availability for drinking, sanitation, industry, and public transport, thereby impacting public health and economic productivity.

- Hydropower reduction: Lowering water levels in the Mekong River reduces hydropower generation, an essential energy source for the country.
- Environmental degradation: Deforestation and soil erosion are among the already existing environmental problems that droughts aggravate, therefore contributing to environmental degradation.

To address these challenges, the government of Lao PDR in collaboration with international agencies, is implementing proactive measures to enhance farmers drought resilience. These initiatives focus on early warning systems and proactive measures with social protection schemes to assist vulnerable people before expected drought events occur. With the intention of enabling farmers to better resist droughts, steps are also being taken to support climate-smart agricultural practices including the development of drought-tolerant crop types and the acceptance of conservation agriculture.

¹ National Risk Profile of Lao PDR, National Disaster Management Committee, Government of Lao PDR, 2010

² SHIMAZAKI, K. & Overseas Consulting Administration, Nippon Koei Co., Ltd., Pro-net 21. (2011). SRI in Laos. In SRI in Laos.

³ <https://www.devdiscourse.com/article/technology/1415627-iaea-helps-lao-pdr-to-increase-rice-yields-using-stable-isotope-techniques?amp>

Drought has a significant impact on disaster management and the ability to ensure food security. As a result, it is critical to evaluate and continuously monitor drought condition to secure the safety of residents in this region. Lao PDR may experience two main categories of drought, namely meteorological drought (typically caused by insufficient rainfall or when dry weather patterns dominate an area) and hydrological drought (typically caused by inadequate surface and subsurface water flow, often stemming from the larger river basins in the region or when low water supply becomes evident in the water system). While Agricultural drought (when crops become affected by drought) is becoming more frequent in central and southern part of Lao PDR.

Accurately defining, forecasting and monitoring droughts remains a complex task—especially when determining the start and end of a drought period. Scientists have developed various drought indices to aid in the identification of drought impacts and to determine suitable actions for various types of droughts affecting multiple sectors. The various drought indicators and indices are: Standardized Precipitation Index (SPI); Palmer Drought Severity Index (PDSI); Rainfall Anomaly Index (RAI); Standardized Precipitation Evapotranspiration Index (SPEI).

In Lao PDR, the Standardized Precipitation Index (SPI) is commonly used to analyze drought conditions. The findings from this analysis will assist in determining which risk reduction strategies should be prioritized and integrated into the country's development plans. Drought indices can be utilized by government authorities to evaluate and take action against drought. [National Risk Profile of Lao PDR, National Disaster Management Committee, Government of Lao PDR, 2010]

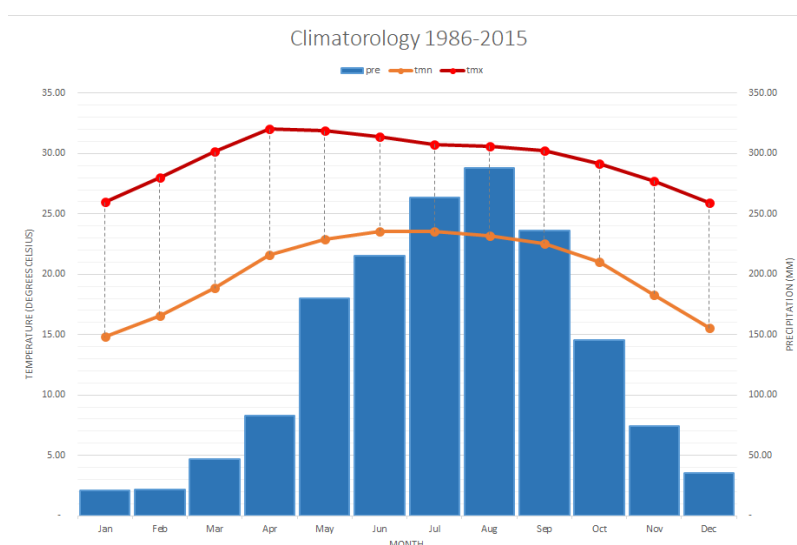


Figure 1. Climatology of Lao PDR, 1986-2015^[4]

⁴ Generated from Climate Research Unit v.3.23 and APHRODITE dataset.

Lao PDR's tropical climate is impacted by the south-east monsoon, which causes significant rainfall and high humidity. Two separate seasons define the climate: a dry season from mid-October to April followed by a wet season sometimes referred to as the monsoon from May to mid-October. Annual rainfall typically ranges between 1,300 and 3,000 millimeters. While temperature in the lowlands ranges between 25 to 27°C, the average temperatures in the northern and eastern hilly zones and the plateaus are around 20°C.

Over the past three decades, the intensity and frequency of both floods and droughts in Lao PDR have increased significantly, with some cases where these hazards occurring twice within a single year (see Table 1). Droughts were particularly prevalent during the 1980s, resulting in estimated damages of USD 40 million in 1988 and USD 20 million in 1989. These events had a profound impact on the rural communities, especially through reduced crop yields and limited water availability. The majority of those affected were farmers and agricultural workers whose livelihoods rely heavily on natural conditions, such as adequate rainfall for crop cultivation and aquaculture. ^[5]

Table 1. Damage caused by drought from 1967-2008^[1]

Item	Year	Type of damage	Damage cost (USD ,000)	Area or country region
1	1967	Drought	5,120	Central and Southern
2	1975	Drought	N/A	Central
3	1982	Drought	N/A	N/A
4	1983	Drought	N/A	N/A
5	1987	Drought	5,000	Central and Southern
6	1988	Drought	40,000	Southern
7	1989	Drought	20,000	Southern
8	1998	Drought	5,763	Northern and Southern
9	2003	Drought	16,500	Central and Southern

Currently, the annual median probability of severe meteorological drought in Lao PDR is approximately 4%, as defined by a Standardized Precipitation Evaporation Index (SPEI) value of less than -2.25 ^[6]. The rainfall in the Nam Ou basin, the largest tributary of the Mekong River in Laos, decreased by 41% compared to the same period in 2018. It continued to drop to 29% during July to September 2019. ^{[7] [8]}

⁶ Naumann, G., Alfieri, L., Wyser, K., Mentaschi, L., Betts, R. A., Carrao, H., . . . Feyen, L. (2018). Global Changes in Drought Conditions Under Different Levels of Warming. *Geophysical Research Letters*, 45(7), 3285–3296. URL: <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2017GL076521>

⁷ The report on the historical climate change, climate vulnerability and climate change projection for Lao PDR, 2016, MoNRE

⁸ The report on the historical climate change, climate vulnerability and climate change projection for Lao PDR, 2016, MoNRE

Table 2. Droughts occurrence and impact 2007-2020^[9]

Year	Main provinces affected	Total economic loss	Affected crop areas (ha)	Livestock loss	Households facing lack of water
2020	Luang Namtha, Luang Prabang, Borlikhomxay	NA	Affected crop areas (ha)	NA	3,548
2019	Bokeo, Phongsaly, LuangPrabang	LAK 4665 mil.	Bokeo, Phongsaly: 3,080ha Luang Prabang: 6,702ha*	NA	3,880
2015	Luang Prabang, Xayaburi	NA	Xayaburi: 1,000ha* Luang Prabang: 2,820ha*	4,000 (Jan, 2016)	663
2010	Southern (incl. Savannakhet)	NA	NA	NA	NA
2007	Central region of Laos	approximately US\$ 1 million in damages	NA	NA	NA

⁹ Anticipatory Action Protocol, Lao PDR, Agricultural Drought, 2024, FAO

2.2 Drought Risk Assessment Methodology

Drought risk in Lao PDR is defined by both the likelihood and severity of meteorological events that result in insufficient water availability. The impacts are shaped by the degree of exposure to adverse weather conditions and the vulnerability of affected systems or communities to water scarcity.

Among other hydrological and climatological parameters, drought indices are used to evaluate drought by means of measurements in atmospheric moisture, hydrological systems, and soil moisture. While these indices are helpful in identifying abnormal water conditions, it is important to note that the severity of a drought cannot be determined solely by its frequency.

Table 3. *Drought Indicators and indices listed* ^[10]

Meteorology	Input parameters	Additional information
Keetch–Byram Drought Index (KBDI)	P, T	Calculations are based upon the climate of the area of interest
Percent of Normal Precipitation	P	Simple calculations
Standardized Precipitation Index (SPI)	P, T	Highlighted by the World Meteorological Organization as a starting point for meteorological drought monitoring
Weighted Anomaly Standardized Precipitation (WASP)	P, T	Uses gridded data for monitoring drought in tropical regions
China Z Index (CZI)	P	Intended to improve upon SPI data
Drought Area Index (DAI)	P	Gives an indication of monsoon season performance
Drought Reconnaissance Index (DRI)	P, T	Monthly temperature and precipitation are required
Effective Drought Index (EDI)	P	Program available through direct contact with originator
NOAA Drought Index (NDI)	P	Best used in agricultural applications
Palmer Drought Severity Index (PDSI)	P, T, AWC	due to complexity of calculations and the need for serially complete data
Rainfall Anomaly Index (RAI)	P	Serially complete data required
Standardized Anomaly Index (SAI)	P	Point data used to describe regional conditions
Standardized Precipitation Evapotranspiration Index (SPEI)	P, T	Serially complete data required; output similar to SPI but with a temperature component

¹⁰ Handbook of Drought Indicators and Indices, 2016, World Meteorology Organization and Global Water Partnership

Soil Moisture	Input parameters	Additional information
Soil Moisture Anomaly (SMA)	P, T, AWC	Intended to improve upon the water balance of PDSI
Evapotranspiration Deficit Index (ETDI)	Mod	Complex calculations with multiple inputs required
Soil Moisture Deficit Index (SMDI)	Mod	Weekly calculations at different soil depths; complicated to calculate
Hydrology	Input parameters	Additional information
Palmer Hydrological Drought Severity Index (PHDI)	P, T, AWC	Serially complete data required
Standardized Reservoir Supply Index (SRSI)	RD	Similar calculations to SPI using reservoir data
Standardized Streamflow Index (SSFI)	SF	Uses the SPI program along with streamflow data
Standardized Water-level Index (SWI)	GW	Similar calculations to SPI, but using groundwater or well-level data instead of precipitation
Rainfall Anomaly Index (RAI)	SF	Similar calculations to SPI, but using streamflow data instead of precipitation
Remote Sensing	Input parameters	Additional information
Enhanced Vegetation Index (EVI)	Sat	Does not separate drought stress from other stress
Evaporative Stress Index (ESI)	Sat, PET	Does not have a long history as an operational product
Normalized Difference Vegetation Index (NDVI)	Sat	Calculated for most locations
Vegetation Condition Index (VCI)	Sat	Usually found along with NDVI calculations
Vegetation Health Index (VHI)	Sat	One of the first attempts to monitor drought using remotely sensed data
Composite or modelled	Input parameters	Additional information
Combined Drought Indicator (CDI)	Mod, P, Sat	Uses both surface and remotely sensed data
Multivariate Standardized Drought Index (MSDI)	Multiple, Mod	Available but interpretation is needed

Note:

AWC — Available water content
 CC — crop coefficient
 CD — crop data
 ER — ecoregion
 ET — evapotranspiration
 GW — groundwater
 LC — land cover
 Mod — modelled
 Multiple — multiple indicators used
 P — precipitation

PET — Potential evapotranspiration
 RAD — solar radiation
 RD — reservoir
 Sat — satellite
 SF — streamflow
 ST — soil type
 SWD — soil water deficit
 T — temperature
 Td — dewpoint temperature
 W — wind data

The indicators and indices referenced in Table 3 are drawn from the Handbook of Drought Indicators and Indices (World Meteorology Organization and Global Water Partnership, 2016). These are categorized based on their type and level of user-friendliness and are grouped into the following categories: (a) meteorology, (b) soil moisture, (c) hydrology, (d) remote sensing and (e) composite or modelled.

There is no single indicator or index suitable for all types of droughts, that can be used to determine appropriate actions. Because the impacts of drought vary across sectors and regions, the most effective approach is to apply a combination of indicators and thresholds tailored to the local climate, timing, and type of drought. Ideally, prior research should guide the selection of the most appropriate indicators for specific contexts.

Drought risk assessment in Lao PDR has primarily been conducted by international agencies such as the Asian Disaster Preparedness Center (ADPC), the Mekong River Commission (MRC), the Food and Agriculture Organization (FAO) and the CIMA Research Foundation and VU University of Amsterdam. Due to the varying data availability and specific objectives of each assessment, these agencies have applied different methodologies and indicators to determine drought risk.

For instance, the "Developing a National Risk Profile of Lao PDR" report from 2010 utilized the Standardized Precipitation Index (SPI) as a key indicator to assess drought conditions. In contrast, the Lao Climate Services for Agriculture (LaCSA) project employed the Effective Drought Index (EDI), which incorporates weighted contributions of daily rainfall over the past 60 days. The Drought Index is used to indicate two categories of drought: moderate and severe. On the other hand, it also gauges moist conditions, which can cause soil erosion and waterlogging.

Drought — characterized by reduced rainfall and decreased soil moisture — severely affects rain-fed agriculture, particularly rice production, which is a cornerstone of the national economy. However, excessive rainfall can also disrupt agricultural activities by causing erosion and flooding, underscoring the importance of monitoring both extremes.

A more comprehensive approach is seen in the Mekong River Commission's draft Drought Adaptation Guidelines for the Lower Mekong Basin (LMB), as it incorporated several indicators and drought conditions. This framework integrates multiple indicators, including Standardized Precipitation Index (SPI), Soil Moisture Anomaly (SMA), Normalized Difference Vegetation Index (NDVI), Temperature Condition Index (TCI), and a Combined Drought Indicator (CDI). These indicators support the classification of drought risk levels ranging from minimal to extreme.

When comparing these several initiatives, the LMB guideline's approach appears to provide more structured and comprehensive methodology applied. It is recommended that Lao PDR consider adopting this framework as a foundation for future drought risk assessments.

In this context, drought risk is understood as a function of three components:

1. **The nature of the hazard** (e.g., meteorological, hydrological),
1. **The exposure of people and assets**, and
1. **The inherent vulnerability or capacity** of the exposed social and natural systems to cope with the hazard.

$$\text{Risk} = f(\text{Hazard}, \text{Exposure}, \text{Vulnerability})$$

a) Key Components

Drought risk in Lao PDR can be assessed using three primary components: exposure, hazard, and vulnerability. These components help to evaluate drought risk (DRI) or combined drought index (CDI). Every component is computed depending on particular criteria, given weighting values, and underdefined conditions.

b) Exposure

Exposure is the state whereby people, infrastructure, homes, manufacturing capacity, and other physical human assets are located in in areas prone to drought. The degree of exposure is typically measured by the population or the kinds of assets found in a particular area.

The exposure index includes population density, land-use/landcover and baseline water stress indicators.

- Population density: In drought-prone regions, higher population density increases exposure to drought.

Table 4. Population density

Number of people/km ²	Exposure Level	Weighting Value
0-5	Mild	1
6-10	Moderate	2
10-20	Severe	3
>20	Extreme	4

Sources: (draft) Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC

- Land-use/landcover: The type of land use determines the degree of exposure to drought, particularly based on the economic value generated. Land with higher economic value, tends to show higher levels of exposure.

Table 5. Land-use/landcover types and exposure level

No.	Land cover/land use type	Exposure Level	Weighting Value
1	Waterbody	Mild	1
2	Wetland	Mild	1
3	Shrubland	Mild	1
4	Deciduous forest	Mild	1
5	Evergreen forest	Mild	1
6	Semi-evergreen forest	Mild	1
7	Flooded forest	Mild	1
8	Other plantations	Mild	1
9	Grassland	Mild	1
10	Mangrove	Moderate	2
11	Rubber plantation	Moderate	2
12	Built-up area	Severe	3
13	Village	Severe	3
14	Cropland	Extreme	4
15	Rice	Extreme	4

Sources: (draft) Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC

- Baseline water stress: ArcGIS data hub generates the baseline water stress estimation. Global Forest Watch has created the dataset to measure the ratio of total water use in respect to the yearly renewable surface water availability. It is a consistent indication of water-related issues since it implies that areas with more water stress will probably suffer more surface and groundwater resource depletion, more user competition, and impact on water quality and ecosystem services.

Table 6. Baseline water stress

Baseline water stress	Level of stress	Weighting Value
< 20%	Mild	1
20-40%	Moderate	2
40-80%	Severe	3
>80%	Extreme	4

Sources: (draft) Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC

c) Hazards

Hazards refers to the frequency of drought occurrence at various levels of intensity and duration. The return period of a drought is related to the severity of the impacts, therefore provide vital information for drought risk management” ^[11]. Based on climatic conditions, hazard estimates the frequency and degree of drought occurrences

- Meteorological indicator: The standardized Precipitation Index (SPI) is the main indicator for meteorological drought assessment for this study.
- Hydrological indicator: Standardized Runoff Index (SRI)
- Agricultural indicator: The Soil Moisture Anomaly (SMA)
- The combined drought index (CDI) is calculated by taking the average of the three indicators.

Table 7. Drought severities

Number of drought occurrences	Severity Level	Weighting Value
0-2	Mild	1
3-4	Moderate	2
5-6	Severe	3
>6	Extreme	4

Sources: (draft) Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC

d) Vulnerability

Drought vulnerability measurement uses a multifaceted model including social, economic, and infrastructure elements. Social vulnerability relates to the welfare of people, groups, and society. The economic vulnerability is strongly correlated with the economic condition of individuals, communities, and nations. Infrastructural vulnerability pertains to the fundamental necessities required for production and the maintenance of one's lifestyle.

The UNISDR (2004) framework states that vulnerability reflects the current state of social, economic, and infrastructural factors in a specific area. Factors that help reduce the risk of crops being affected by droughts, such as irrigation systems and access to water, are also important for adapting to these hazards. These factors can be considered part of the overall vulnerability of a region (Naumann et al, 2014). ^[12]

¹¹ Karim Bargaoui, 2021. Methodology for Drought Hazard: Assessment, Modelling, and Mapping for Georgia. UNDP 2021.

¹² Naumann et al, 2014. Exploring drought vulnerability in Africa: an indicator-based analysis to be used in early warning systems. Available at: <https://hess.copernicus.org/articles/18/1591/2014/>

The vulnerability assessment within this framework identifies two key indicators: irrigated areas with access to surface water or reservoirs; and groundwater potential. In areas with irrigated systems - especially those supplied by surface water or reservoirs- vulnerability to drought is reduced, as these sources provide a reliable water supply for agricultural crops through connected irrigation channels. In contrast, areas lacking irrigation face a significantly higher risk of water scarcity during drought events.

- Groundwater potential: A higher level of vulnerability is associated with a lower groundwater rate in an area.

Table 8. *Groundwater potential rate and vulnerability level*

Groundwater rate	Level of Vulnerability	Weighting Value
>20cu.m/hr	Mild	1
10-20 cu.m/hr	Moderate	2
3-10 cu.m/hr	Severe	3
<3 cu.m/hr	Extreme	4

Sources: (draft) *Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC*

- Surface water and irrigation area: The vulnerability is significantly lower in the irrigated areas compared to the non-irrigated areas, which have the highest vulnerability.

Table 9. *Surface water and irrigation area and vulnerability level*

Type of Area	Level of Vulnerability	Weighting Value
Surface water	No drought	1
Irrigated area in dry season	Mild	2
Irrigated area in wet season	Moderate	3
None-irrigated area	Extreme	4

Sources: (draft) *Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC*

e) Drought Risk computation

Drought risk is calculated using the following formula:

$$\text{Risk} = \text{hazard} \times \frac{(\text{pop} + \text{landcover} + \text{Vulnerability})}{3} \times \frac{(\text{groundwater pot} + \text{irrigated area})}{2}$$

Where *pop* is population factor, *landcover* is land cover factor, *waterstress* is baseline water stress factor, *groundwpot* is groundwater potential factor, and *irrigateda* is irrigated area factor.

This framework allows for an integrated assessment of drought risk across different geographic areas and development contexts. The level of drought risk can be effectively visualized by considering the following combination of three indicators:

Indicator	RISK															
	Mild		Moderate				Severe				Extreme					
Hazard	Mild	Mild	Mild	Mild	Mod	Mod	Mod	Mod	Sev	Sev	Sev	Sev	Ext	Ext	Ext	Ext
Exposure	Mild	Mild	Mod	Mod	Mild	Mod	Sev	Sev	Mod	Sev	Ext	Ext	Sev	Sev	Ext	Ext
Vulnerability	Mild	Mod	Mild	Mod	Mod	Mod	Mod	Sev	Sev	Sev	Sev	Ext	Sev	Ext	Sev	Ext

While Mod = moderate, Sev = severe, and Ext = extreme.

2.3 Risk and Impact Assessment

The Lao People's Democratic Republic (Lao PDR) is extensively vulnerable to climate-related hazards, particularly droughts. The vulnerability of the country to drought is due to its heavy reliance on agriculture and water resources. The framework offers a comprehensive assessment of drought risks and their impacts on the economy, society, and environment of Lao PDR, utilizing data from diverse risk assessments. The aim is to have a better understanding of the challenges that Laos faces. The assessment identifies drought as a multifaceted threat that has adverse effects on agriculture, water resources, energy production, public health, and socioeconomic stability.

a) Current Drought Risk and Vulnerability

Drought presents Lao PDR with a major and continuous hazard especially affecting the agricultural industry, rural communities, and water supplies. Mostly reliant on agriculture, a good number of people suffer from the detrimental effects of continuous drought. Apart from acute issues like crop failures and water shortage, drought raises long-term vulnerabilities like poverty, food insecurity, and health issues.

The extreme consequences of acute water shortage in Laos are best shown during the 2015–2016 drought event. More than 1,000 hectares of highland crops were affected by this protracted drought; 420 hectares suffered especially damage. With about 104,000 hectares of affected rice seedlings, the impact on rice yield was clearly noteworthy. Furthermore, about 8,000 hectares of various crops, such as sweet corn, sesame, and job's tears, sustained damage. ^[13]

This event highlighted the susceptibility of Laos' agricultural sector to prolonged droughts and highlighted the necessity for enhanced drought-resistant farming techniques and crop diversification plans. The persistence of drought conditions throughout 2016 impacted water resources and agricultural systems, therefore perhaps increasing the social repercussions on the afflicted populace.

The 2019–2020 drought has a significant impact on Laos in population, agriculture, ecology, and livelihoods. Reduced soil moisture and much lower water levels everywhere marked this drought. The consequences affected the larger Mekong region and cut beyond country boundaries.

One important result of this drought was its impact on the reverse flow of Tonle Sap Lake, a unique hydrological occurrence essential for the fisheries of the area. This disruption underscores the interconnectedness of the Mekong ecosystem and the potential for drought to significantly impact food security and livelihoods, even in areas not directly experiencing water scarcity.

The 2019–2020 event demonstrated how human activities, particularly dam operations, have influenced natural drought conditions. The integration of water management strategies with climate-induced water scarcity underscores the necessity for comprehensive, basin-wide planning to mitigate drought risk and enhance water resource management.

Population Exposure

Nearly 16.5 percent of Laos's population—more than 1.2 million people—go without water every year due to the country's existing environment. This estimate is based on the idea that a 5% drop in rice production indicates widespread drought conditions affecting a region's population, which is a proxy for the severity of the drought. ^[13] The most affected regions are mainly found in the southwestern and central northern parts of the country. ^[14]

Agricultural Impacts

In Lao PDR, where rice is the main staple food and integral part of the nation's agriculture, output losses of this kind are a major obstacle. The current impact of droughts is a 2% reduction in rice yields per year, leading to a total loss of roughly 100,000 tons of rice annually. ^[11] ^[12] Food security and rural communities' well-being can be significantly affected by the magnitude of this loss, particularly in regions already prone to food shortages. In the north-west, the most notable yield declines sometimes surpassing 3% in particular years. ^[11]

Other Crops: Apart from rice, drought influences several crops including sweet corn, maize, and different fruits. Very little is known about how drought affects these crops. ^[12]

Water Resources impacts

Drought seriously affects water supply in several spheres in Laos. Reduced water levels influence supply of drinking water, systems of sanitation, irrigation for agriculture, and generation of electricity. For example, the 2019–2020 drought caused significantly lower Mekong River flows, which were aggravated by upstream dam works.

This event underscored the interconnectedness of the Mekong ecosystem and the need for transboundary water management strategies. Hydropower is a key source of energy and revenue for Laos, making the impacts of reduced water flow particularly damaging to the country's economy. ^[15] ^[12]

Drought exacerbates water scarcity, and upstream communities' activities contributes to disruptions in the natural flow of water. This situation intensifies competition for water resources between different sectors, including agriculture, energy production, and domestic consumption. ^[13]

The impact on water resources extends beyond immediate shortages. Drought can lead to long-term changes in groundwater levels, alter river ecosystems, and intensify competition for water among different sectors.

Socio-economic and health impacts

Although the given sources do not specifically estimate the economic expenses of drought for Laos ^[11], ^[12], ^[13] . the events of surrounding nations provide understanding of the possible scope of economic influence. While Vietnam suffered US \$669 million in losses and US \$1.5 billion in recovery expenses, Thailand was expected to lose US \$1.7 billion from drought in 2016. These numbers imply that severe drought episodes could have a major impact on Laos's economy, which is smaller and mostly depends on agriculture.

Drought in Laos most obviously influences not only agricultural output but also energy generation, water-dependent businesses, general economic development as well as other spheres of economy. Particularly for fragile rural areas mostly dependent on rain-fed agriculture, the combined impact of several droughts can weaken economic resilience.

Drought excessively affects underprivileged sections of Laos, especially those in rural areas depending on subsistence farming. These populations are particularly susceptible to the consequences of drought.^{[13][11]} since they have restricted access to resources including adaptive technologies, water storage, or irrigation systems. Often resulting in food shortage, crop losses can drive people even more into poverty.

Health Risks: Particularly for outdoor workers in industry and construction, drought-related heat waves raise the hazards of heat stress and other heat-related diseases. Furthermore, inadequate sanitation brought on by water shortages can cause epidemics of waterborne infections. As droughts get more regular and severe, these health issues should get worse.^{[11][13]}

b) Future Drought Projections and Risks

Climate models predict that the frequency and intensity of droughts in Lao PDR will increase significantly due to climate change. This will have far-reaching consequences for water resources, agriculture, and public health, placing an even larger portion of the population at risk.

The broader context of climate change provides critical insight into the factors contributing to increased drought risk. Depending on the emissions scenario, projection estimates temperature increases in Lao PDR by 2060 ranging from 0.4 °C and 3.3 °C.

Rising temperatures are likely to worsen drought conditions by increasing evapotranspiration rates and accelerating soil moisture loss.^[12]

Although subject to significant uncertainty, rainfall patterns are also expected to shift. Forecasts for the Mekong Basin suggest that average annual rainfall by 2060 could vary from a 16% decrease to a 17% increase. Rising temperatures combined with fluctuating precipitation could lead to more frequent and severe droughts—even in scenarios where total annual rainfall increases.^[14]

Population Exposure under Future Scenarios

Projections of climate change show Laos's future drought frequency to be somewhat alarming. Under the SSP1-RCP2.6 scenario—which assumes modest global emissions reductions—the number of people vulnerable to drought is predicted to more than double relative to present levels. Projecting a tripling of exposure, the more severe SSP5-RCP8.5 scenario might impact up to 6 million individuals yearly by 2025.^{[11][13]}

Anticipated population increase aggravates these estimates even further. Population increase by itself is expected to raise drought risk by 300% to 500% by 2025, even without accounting for climate change impacts. This rapid rise in the number of persons at risk emphasizes the immediate need of thorough drought management plans considering demographic changes as well as climate change.^[11]

¹³ Assessment of disaster risk under climate change, Disaster Risk Profile Lao PDR, WMO, CIMA, VU, 2024

¹⁴ Draft Drought Adaptation Guidelines for the Lower Mekong Basin, MRC, 2024

¹⁵ Lao PDR Climate Risk Country Profile, WB, 2021

Agricultural Risks

Regarding agricultural output, especially rice output, the picture is equally worrisome. Under the SSP1-RCP2.6 scenario and the SSP5-RCP8.5 scenario, estimates show average annual rice yield declines might rise to 4% and 5.3% respectively. At the national level, these numbers at least double current drought-related losses. ^[11] For millions of people, these production declines could compromise food security; for farmers especially in areas already highly vulnerable, they could cause significant financial losses.

These projections show notable regional variances. Certain locations, especially those near areas now most at risk for drought, could see yield declines more than triple. This spatial variation in potential drought effects highlights the importance of localized adaptation methods considering particular area vulnerabilities and agricultural practices.

Water resources Risks

For Laos' water resource management, the expected increase of drought conditions presents major difficulties. Rising water stress is probably going to cause shortages in industry, agriculture, and household consumption among other areas. The struggle for limited water supplies could also lead to disputes on water distribution among several users and industries

These challenges demand comprehensive combined water resource management strategies. Such plans must balance the needs of numerous stakeholders and ensure the long-term survival of water supplies.

These challenges demand comprehensive combined water resource management strategies. Such plans must balance the needs of numerous stakeholders and ensure the long-term survival of water supplies.

Socio-Economic Risks

As droughts become more frequent, the hydropower sector of the country will be tested even more. Reduced river flow associated with a drought will limit the generation of electricity, therefore resulting in possible power shortages and negative consequences on economic development. ^[11].

Rising likelihood of drought in Laos has major and wide social consequences. Particularly for rural communities mainly dependent on farming, crop losses and reduced productivity across various sectors could lead to greater economic fragility. The poorest parts of society usually have the least capacity to adapt to changing conditions, hence this economic stress could intensify poverty and increase inequality.

Moreover, severe or protracted droughts could set off more rural to urban migration as individuals look for other means of income. While decreasing the rural labour, this demographic change could tax metropolitan infrastructure and services. One should not undervalue the possibility of societal unrest resulting from financial difficulty and rivalry over limited resources.

Environmental Risks

Ecosystems and Biodiversity: Drought also seriously threatens Laos's native ecosystems. Extended droughts can destroy forests, lower biodiversity, and compromise soil quality. These effects on the environment thereby jeopardize the way of life of those depending on the river and forest services. ^[11] ^[13]

Drought seriously compromises Laos's diverse natural surroundings. More frequent and severe droughts could have as their possible effects increased danger of forest fires, damage of ecosystems, and biodiversity loss. Water purification, soil fertility, and natural pest control are just a few of the ecosystem services that communities depend on and whose cascading consequences these environmental changes can have.

Furthermore, aggravating the effects of drought is the degradation of natural habitats, hence generating an environmental feedback loop. Deforestation can, for example, cause lower soil moisture retention, increasing the vulnerability of landscapes to erosion and drought. Therefore, initiatives for drought resistance should naturally take protection and restoration of natural ecosystems into great importance.

Public Health

Heat Stress and Diseases: Rising temperatures combined with more frequent droughts will raise health hazards, especially for workers subjected to extreme heat. Furthermore, water shortage brought on by drought may increase the frequency of waterborne infections including diarrhoea and dengue fever, two major public health issues in Laos. ^[11] ^[13]

Public health in Laos may be severely affected by drought conditions. Direct results of the greater temperatures usually linked with drought are increased risk of heat-related diseases, especially for outdoor labourers. For vulnerable populations like the elderly, children, and individuals with pre-existing medical issues, the health effects could be very severe.

Water shortage can also lead to the frequency of water-borne infections when people depend on risky water sources. Changes in environmental conditions brought about by a drought could affect the frequency and distribution of disease vectors, therefore either increasing or reducing the risk of vector-borne diseases including dengue fever.

Furthermore, food scarcity and malnutrition brought on by drought can have long-term health consequences, particularly for children who might suffer with cognitive development and future production affected.

Energy

Laos's energy sector is particularly sensitive to effects of drought since it generates electricity largely from hydropower. Reduced water levels in rivers and reservoirs can significantly reduce the capacity for hydropower generation, therefore generating possible energy shortages and financial instability.

As Laos expands its hydropower resources, long-term reliability of water flows has to be considered in view of shifting climate trends. Investing in drought-resistant energy infrastructure and diversifying energy sources could help to provide energy security in the face of rising danger of drought.

2.4 Key Vulnerabilities

The northern regions of Lao PDR—particularly the provinces of Phongsaly, Houaphanh, and Louang Namtha—are highly susceptible to drought and are considered hotspots for the impacts of multiple hazards, including droughts. Based on the *Developing a National Risk Profile of Lao PDR* (2010), droughts ranging from moderate to extreme have occurred nationwide during both wet and dry seasons.

The *National Strategy on Disaster Risk Reduction (NSDRR) 2021-2030* identifies the following drought risk areas in different provinces with moderate and severe levels, as follows:

- The dry season (October to March) may occur in Oudomxay, Vientiane, Khammouan, Bolikhamxay and Savannakhet provinces;
- The rainy season (April to September) is likely to occur in Xiengkhouan, Xaysomboun provinces, adjacent area to Bolikhamxay province and some part of Savannakhet and Salavan province;

This phenomenon is due to the variability in rainfall distribution, where some areas may experience insufficient precipitation despite the overall rainy season. Such irregularities can lead to soil moisture deficits, impacting agriculture and water resources. Monitoring both drought and excessive rainfall is crucial for these regions to mitigate adverse effects on agriculture and livelihoods.

According to the *Drought Management Strategy for the Lower Mekong Basin (2020-2025)* by the Mekong River Commission (MRC), Savannakhet is identified as the province with the highest vulnerability, followed by Salavan and Khammouan.

As shown in Figure 2. Drought Risk map of Lower Mekong Basin [], the majority of drought occurrences are concentrated in the northern provinces, particularly Oudomxay, Houaphanh, Xiengkhuang, Xayabouly and Bokeo provinces. Central and southern provinces like Bolikhamxay, Savannakhet, Champasak and Attapeu province, also experience significant drought vulnerability. Droughts in these regions severely impact agriculture, forestry, and hydropower sectors, posing substantial threats to the national economy and food security. Therefore, it is crucial to develop and implement action plans aimed at mitigating the impacts of drought, including improved water management practices and promotion of sustainable agricultural techniques.

Drought risk

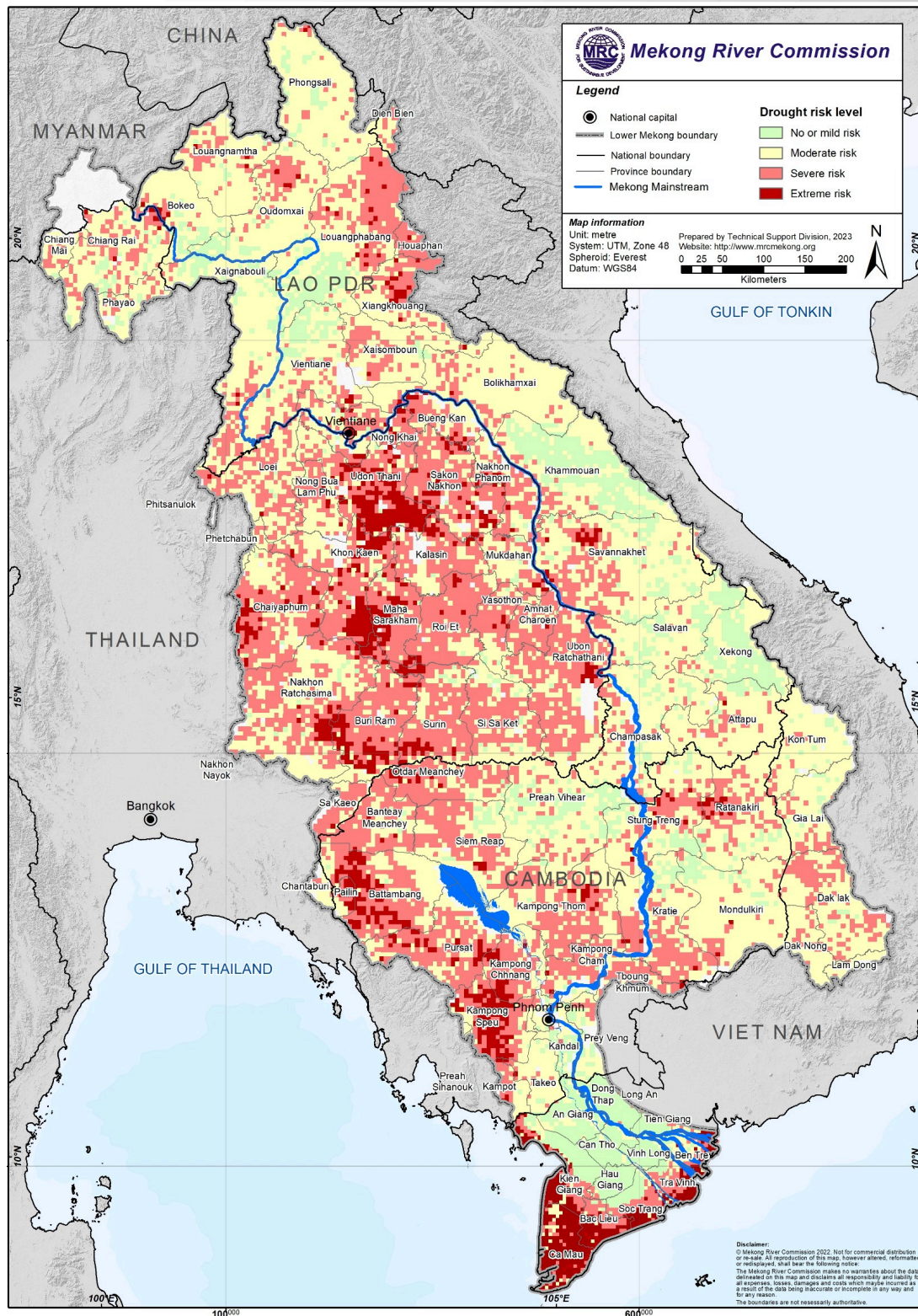


Figure 2. Drought Risk map of Lower Mekong Basin ^[16]

¹⁶ Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC

Table 10. Province drought risk of Lao PDR^[17]

No.	P. Name	Drought Risk	Drought Type
1	Louang Prabang	Severe-extreme	Meteo, hydro & agricultural drought
2	Xiangkhouang	Severe-extreme	Meteo and agricultural drought
3	Savannakhet	Severe-extreme	Meteo & agricultural drought
4	Xayaburi (Xaignabouli)	Moderate-severe	Meteo, hydro and agricultural drought
5	Oudomxai	Moderate-severe	Meteo & Agricultural drought
6	Vientiane	Moderate-severe	Hydro & agricultural drought
7	Vientiane Capital	Moderate-severe	Agricultural drought
8	Xaisomboun	Moderate-severe	Agricultural drought
9	Attapeu	Moderate-severe	Agricultural drought
10	Champasack	Moderate-severe	Agricultural drought
11	Louangnamtha	Moderate-severe	Meteo & hydro drought
12	Borikhamxai	Moderate-severe	Meteo & agricultural drought
13	Bokeo	Mild-moderate	Meteorological drought
14	Saravan	Mild-moderate	Agricultural drought
15	Phongsaly	Mild-moderate	Meteo, hydro & agricultural drought
16	Khammouan	Mild-moderate	Meteo, hydro & agricultural drought
17	Xekong	No or mild risk	None

Source: *Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC*

¹⁷ Drought Adaptation Guidelines for the Lower Mekong Basin, 2024, MRC

3. Institutional and Legal Framework

Plants on cracked soil
Source: www.pexels.com
Photo By: Kelly

3.1 Relevant National Policies and Strategies

Scope

Since drought is a component of natural disaster, there are few policies, plans, or frameworks specifically designed to manage drought. However, Laos has created several policies and frameworks aimed at managing disasters, including drought. These documents outline the government's approach to mitigating the impacts of drought through various measures. These documents are listed below:

Table 11. Summary of the key acts and plans related to disaster management, climate change, and risk reduction in Lao PDR.

Act/Plan	Year	Purpose	Key Objectives/Focus Areas
Decree on Establishment of National Disaster Management Committee	1999	Establish a national disaster management institution	Comprehensive disaster management from national to village level, with goals up to 2020
Decree No. 373/PM (Renaming Committee)	2011	Rename the National Disaster Management Committee	Foundation for multi-sectoral disaster risk management in the country
National Strategic Plan for Disaster Risk Reduction	2003-2020	Articulate DRM strategy, direction, and priority actions	Lessons learned, setting DRM priorities and actions for 2003-2020
National Adaptation Programme of Action to Climate Change	2009	Rapid climate-related hazard assessment	Focus on flood, drought, and climate change adaptation in agriculture, forestry, water resources, and health
Developing a National Risk Profile of Lao PDR	2010	Map hazard-prone areas and assess risk exposure	Hazard evaluation, mapping, and risk assessment of people, property, infrastructure, and economic activities
Strategy on Climate Change of Lao PDR	2010	Address climate change impacts	Provide objectives and directions for climate change adaptation and SDGs integration
National Disaster Management Plan	2011 (2012-2015)	Provide policy framework for disaster management	Disaster management framework, set policies for 2012-2015
Law on Water and Water Resources (Amended)	1996 (Amended 2017)	Improve water resource management	Ensure sustainable use of water resources, environmental protection, and economic development
Law on Meteorology and Hydrology	2017	Framework for weather and water resource services	Accurate weather data, integration with agriculture, water resources, and disaster management
Decree on Climate Change	2019	Address climate change risks	Define regulations and measures to mitigate and manage climate change impacts
Law on Disaster Management	2019	Outline disaster management principles	Provide disaster management framework, regional and international linkages for sustainable development
National Strategy on Disaster Risk Reduction (NSDRR)	2021-2030	Strengthen disaster management capabilities	Build resilience across sectors and government levels from 2021 to 2030

The National Determined Contribution (2021) builds on their 2015 submission and sets out enhanced commitments to tackle climate change through both mitigation and adaptation measures. The mitigation target aims to reduce greenhouse gas emissions by 60% by 2030 compared to baseline, with potential for net-zero emissions by 2050 if international support is provided. The adaptation strategy focuses on building resilience across six vulnerable sectors and emphasizes addressing floods and droughts. The plan distinguishes between unconditional measures that Lao PDR can implement with existing resources and conditional measures requiring USD 4,762 million in international financial support. The Ministry of Natural Resources and Environment will coordinate implementation while seeking international cooperation to meet Paris Agreement objectives.

3.2 Institutional Arrangements

In 1999, the Government of Lao PDR established a national framework to guide disaster risk reduction (DRR) and emergency response. As part of this initiative, the National Disaster Management Committee (NDMC) was created, comprising directors from various ministries. The NDMC is responsible for coordinating early warning, preparedness, emergency response, and recovery efforts. The National Disaster Management Office (NDMO) was designated as the Secretariat to the NDMC and subsequently developed a focal point system involving NDMC members and relevant agencies. Over time, policies and the Disaster Risk Management (DRM) framework have changed to reflect reallocation of roles and responsibility within government institutions. From 2013 to 2018, the newly established Department of Disaster Management and Climate Change under the Ministry of Natural Resources and Environment (MoNRE) assumed DRM responsibilities. During this period, the Ministry of Labour and Social Welfare (MLSW) was primarily responsible for response and relief. Recently, DRM mandates at the national level have been reassigned to the MLSW.

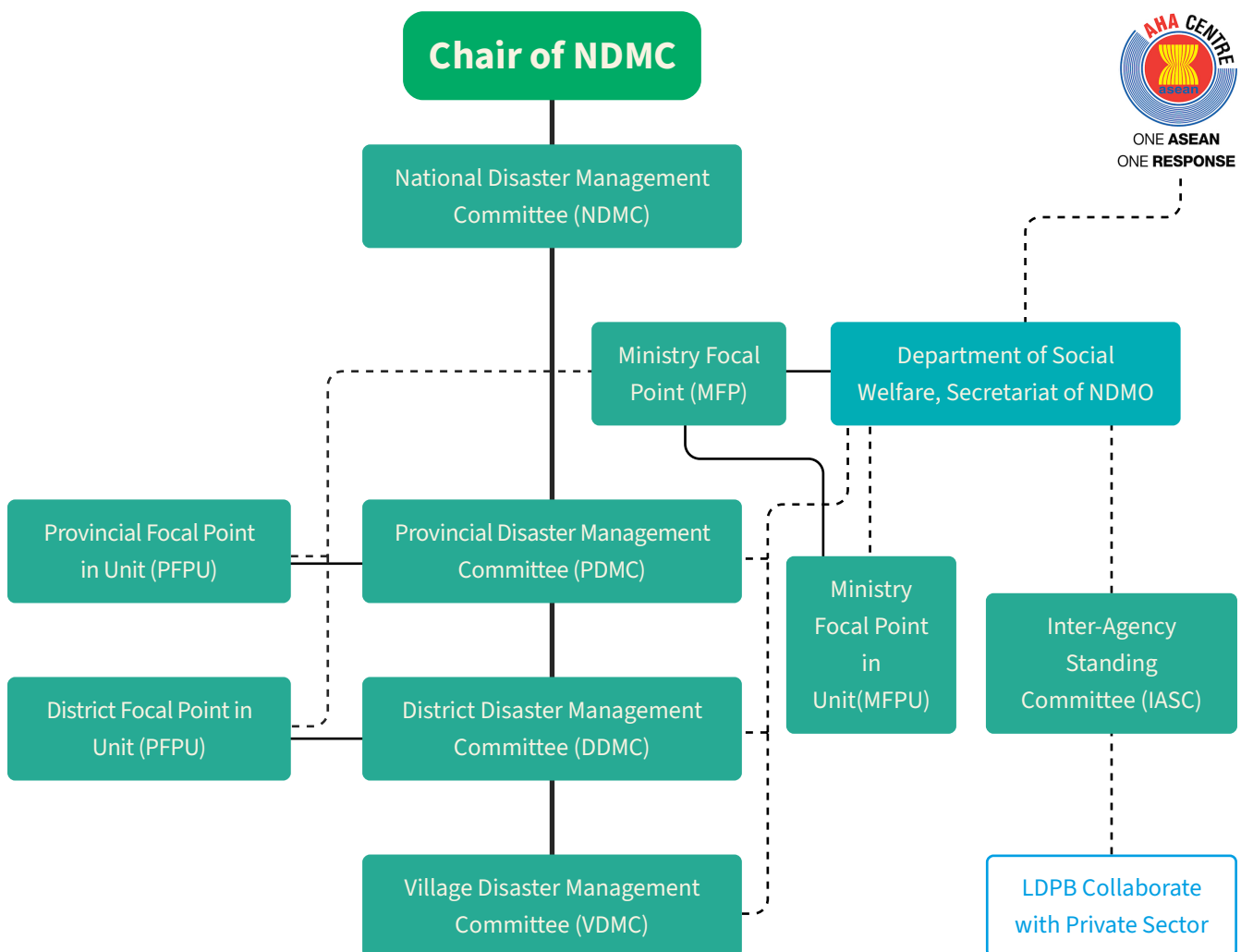


Figure 3. National Disaster Management Organizational Structure of Lao PDR

The national disaster management system includes the following committees:

- Central Disaster Management Committee (CDMC)
- Provincial Disaster Management Committees (PDMCs)
- District Disaster Management Committees (DDMCs)
- Village Disaster Management Committees (VDMCs)

Disaster management and climate change were mainstreamed into the Lao PDR's National Socio-Economic Development Plan (NSED) and relevant sectoral development plans under the framework of Sustainable Development and Poverty Alleviation. For instance, sectors such as public works, transport, agriculture, and forestry prepare annual action plans for drought and flood prevention, along with pest outbreak response plans.

Laos has formalized its disaster management system through a structured institutional framework mandated by the Disaster Management Law. This framework is led by the Central Disaster Management Committee (CDMC), chaired by the Deputy Prime Minister and with the Minister of Labour and Social Welfare serving as Deputy Chairperson. The CDMC is responsible for overseeing the implementation of disaster risk reduction, coordinating relevant agencies and development partners, and assessing the national DRR landscape.

The committee includes Deputy Ministers from key ministries such as Defense, Finance, Health, Agriculture and Forestry, Public Works and Transport, Education and Sports, Information, Culture and Tourism, and Natural Resources and Environment. Supporting the CDMC is its Secretariat, located within the Department of Social Welfare under the Ministry of Labour and Social Welfare (MLSW). The secretariat acts as the central coordination body, tasked with policy formulation, planning, implementation oversight, and coordination with government departments, sectors, local committees, and development partners. The National Strategy on Disaster Risk Reduction designates the CDMC as the lead agency for nationwide implementation, monitoring, and evaluation.

To ensure coordination at all administrative levels, the DM Law establishes a hierarchical committee structure:

- Provincial Disaster Management Committees (PDMCs) chaired by Provincial Vice Governors
- District Disaster Management Committees (DDMCs) chaired by District Vice Governors
- Village Disaster Management Committees (VDMCs) led by Village Heads or Deputy Heads

Cross-sectoral coordination is facilitated through:

- A management and information system (MIS) hosted by the MLSW that centralizes all information produced during NSDRR implementation and other disaster-related information
- Annual disaster preparedness plans developed and updated with input from all sectors
- Regular disaster response exercises conducted at all administrative levels
- Standardized assessment tools for concerned sectors, including disaster impact assessment, emergency needs assessment, and post-disaster recovery assessment

Capacity building for the application of these coordination tools has been provided to responsible staff at both central and local levels. Logistics to support emergency response has been enhanced by improving the MLSW's warehouse in Km 17, equipped with systematically organized supplies. Social welfare warehouse management staff at central and provincial levels have received logistics training, and eight mobile warehouses have been distributed to provinces for emergency response.

During emergencies, the Government activates this coordination structure by assigning specific responsibilities to Disaster Management Committees at each level and concerned sectors. This ensures efficient assistance delivery to affected populations. Central party-state leaders provide additional oversight through field visits to affected areas.

For post-disaster rehabilitation, funding is allocated from the state budget to relevant departments at all levels, including public works and transport, agriculture and forestry, health, and education. Additionally, relevant sectors coordinate with international partners to implement recovery programs that help affected populations return to normal living conditions.

The implementation of this comprehensive institutional framework ensures that all concerned sectors incorporate disaster risk reduction into their development plans, programs, and projects for coordinated implementation.

Drought management in Lao PDR involves a range of national institutions, with core responsibilities anchored in government agencies and supported by international partners. In terms of drought management (the meteorological drought, hydrological drought and agricultural drought), the key player is the National Disaster Management Office (NDMO), Department of Water Resources (DWR), Department of Meteorology and Hydrology (DMH), Department of Climate Change (DCC), the National Agriculture and Forestry Research Institute (NAFRI), Department of Agricultural Land Management (DALAM), Department of Agriculture, Department of Irrigation.

The National Disaster Management Office (NDMO) serves as the Secretariat of the National Disaster Management Committee (NDMC) and is responsible for implementing coordination protocols among disaster management agencies and government institutions. While the NDMO and Ministry of Agriculture and Forestry (MAF) lead efforts in coordinating drought management, achieving effective coordination across sectors and levels of government remains a significant challenge. The Department of Water Resources (DWR), operating under the Ministry of Natural Resources and Environment (MoNRE), serves as the primary governmental body entrusted with the management, development, and preservation of water resources. Its responsibilities include the development of water resources plans and the implementation of integrated water resource management (IWRM) approaches, particularly in the context of drought management.

The Department of Meteorology and Hydrology (DMH) within the Ministry of Natural Resources and Environment (MoNRE) is a prominent contributor in the field of early warning systems pertaining to weather, climate, hydrology, and earthquake hazards.

DMH is responsible for maintaining the weather-climate database management on manual weather stations. In addition to this, they provide seasonal early warning information on rainfall and temperature every 3 to 6 months. Furthermore, they offer monthly drought forecast information for the upcoming 3-month season.

The Department of Climate Change (DCC) serves as the secretariat for climate change policies and management in the country. As the central government agency, it is responsible for coordinating and implementing climate change policies, strategies, and actions in Lao PDR. This includes developing a data and information system on climate change for Laos, ensuring reliable, accurate, and timely data collection, compilation, management, and provision of services.

The National Agriculture and Forestry Research Institute (NAFRI) is instrumental in the progress of agriculture, forestry, and fisheries in Lao PDR. Its primary function is to offer research and policy assistance to the Ministry of Agriculture and Forestry, specifically focusing on providing climate-smart agriculture information, developing cropping technologies and methodologies, offering recommendations for coping with climate risks, and advancing crop variety development.

The Department of Agricultural Land Management (DALAM) functions as a crucial government agency within the Ministry of Agriculture and Forestry in Lao PDR. It is responsible for agriculture land management and planning, national cropping calendar database management, as well as soil research and improvement methodologies. DALAM's contribution to the ASSET project is highly valuable, as it brings expertise in various aspects of agricultural land management.

The Department of Agriculture is tasked with the implementation of policies and strategies pertaining to the agricultural sector, which encompasses drought management. It effectively enhances agricultural productivity, fosters food security, and advocates for sustainable agricultural practices. It serves as a source of early warning data for the occurrence of pests and diseases, manages data related to pests and diseases, and ensures the maintenance of information on outbreaks of pests and diseases in LaCSA.

The Department of Irrigation, which operates under the Ministry of Agriculture and Forestry in Lao PDR, has multiple responsibilities. These include the management, development, and transfer of irrigation systems to farmers, as well as the creation of regulations and policies related to irrigation. Additionally, the department is accountable for the development, operation, and maintenance of irrigation infrastructures. Its primary goal is to ensure the efficient use of water resources and mitigate the negative effects of droughts on agriculture.

The Lao Red Cross also contributes to improving community resilience to natural disasters, including droughts. They provide emergency assistance and support the development of disaster risk reduction and management strategies.

The Ministry of Energy and Mines (MEM) does not have direct involvement in drought management but their role in overseeing hydropower projects could indirectly contribute to drought mitigation by ensuring stable water flows through dam operations. Dams like the Nam Ngum 3 stabilize river flow by storing water during the rainy season and releasing it during the dry season. Maintaining minimum flow downstream is crucial for ecological balance and supporting agriculture and fisheries and is essential for mitigating drought impacts. The MEM implements dam safety measures to ensure safe operation including monitoring water flow from reservoirs to ensure safe and efficient operation.

International organizations are vital partners in strengthening Lao PDR's drought management capacity. Besides the World Meteorological Organization (WMO), the Food and Agriculture Organization (FAO), the World Food Programme (WFP), the Asian Disaster Preparedness Centre (ADPC), the Mekong River Commission (MRC) and Lao Red Cross, are engaged in drought management practices in Laos. They implement various initiatives and projects aimed at improving agricultural productivity, food security, disaster risk reduction, and water resource management.

Development Partner	Role / Project in Lao PDR's Drought Management
Food and Agriculture Organization (FAO)	Focuses on enhancing agricultural productivity and food security by promoting climate-resilient agricultural practices, improving irrigation systems, and building farmers' capacity to adapt to climate change. Supports the development of drought management policies and strategies, including anticipatory actions to mitigate drought impacts on communities.
World Meteorological Organization (WMO)	Provides technical assistance in strengthening Lao PDR's national meteorological and hydrological services. Supports drought monitoring, early warning systems, and assessment, while also enhancing the country's capacity to predict and prepare for droughts, floods, and other natural disasters.
World Food Programme (WFP)	Plays a key role in improving food security and nutrition. Provides emergency assistance during droughts and other disasters. Supports sustainable agricultural practices and irrigation system improvements to reduce drought impacts and enhance long-term food security.
Asian Disaster Preparedness Center (ADPC)	Offers technical support for developing disaster risk reduction and management strategies, with a specific focus on drought. Works to improve national capacity to prepare for and respond to natural disasters.
Mekong River Commission (MRC)	Focuses on water resource management in the Mekong River Basin. Develops drought control strategies and implements activities to minimize the effects of drought on agriculture and water availability.
International Water Management Institute (IWMI)	Specializes in water management and drought resilience through research and technical support. Enhances groundwater policies and management in drought-prone areas. Facilitates community-level consultations on irrigated groundwater use to strengthen agricultural resilience during dry seasons.
Lao Red Cross	Participates in drought response efforts, including the provision of emergency assistance and support to vulnerable communities affected by drought.
OXFAM	While not primarily focused on drought, Oxfam may provide emergency assistance during severe drought events—such as food aid or water supply—to support vulnerable populations.
International Union for Conservation of Nature (IUCN)	Supports conservation initiatives that indirectly contribute to drought resilience. Promotes sustainable land use and ecosystem restoration to improve the resilience of communities to environmental stressors, including drought.

4. An Analysis of Current Drought Management Practices and Processes in Lao PDR



Dry rice fields, rivers in Northern Laos
Source: www.shutterstock.com

4.1 Monitoring and Early Warning

The Department of Meteorology and Hydrology (DMH) under the Ministry of Natural Resources and Environment (MONRE) is the agency responsible for monitoring, forecasting, and early warning of hydrological and meteorological hazards particularly drought monitoring and early warning in Lao PDR. The DMH maintains a network of meteorological and hydrological surveillance stations that are dispersed throughout the country in order to collect data on water levels, temperature, and rainfall. Using this data, drought conditions are monitored, and drought indices, such as the Standardized Precipitation Index (SPI), are developed to assess the severity and frequency of droughts.

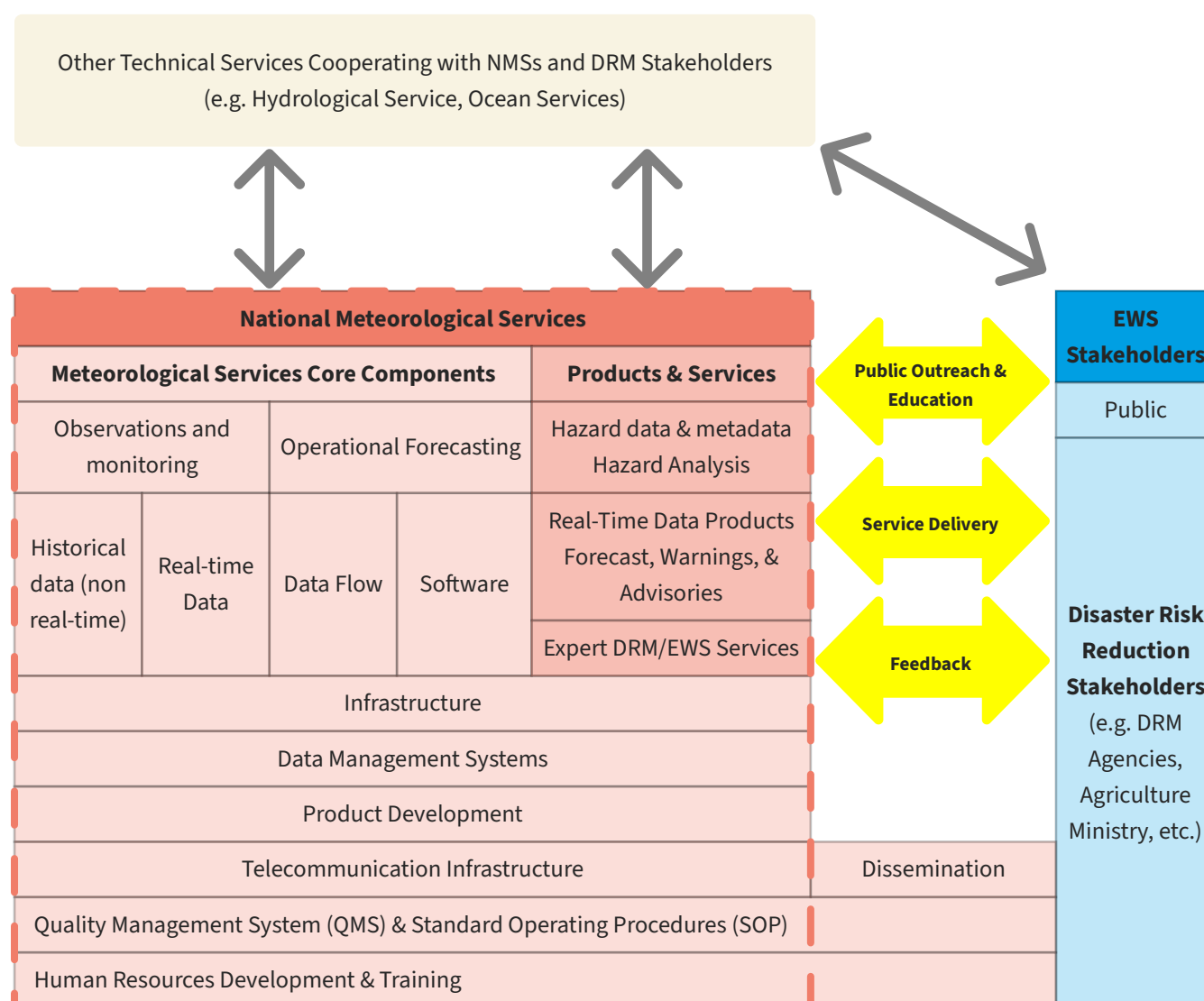


Figure 4. Schematic of linkages of Meteorological Services with EWS and DRM stakeholders

The DMH uses numerical weather prediction models and other tools to forecast drought conditions and provide early warning information to relevant government agencies and the public namely the Ministry of Agriculture and Forestry (MAF), the Ministry of Labour and Social Welfare (MLSW).

¹⁸ LaCSA - Website

The Strengthening Agro-climatic Monitoring and Information System (SAMIS) project by the FAO, in collaboration with the Climate division of DMH, has established the Laos Climate Services for Agriculture (LaCSA)^[18] system. This system provides farmers with specific information on drought risk. It offers 3-hour and 7-day weather forecasts, as well as 3 to 6-month seasonal forecasts for rainfall and temperature. Additionally, it includes agriculture drought EDI-based monitoring, weekly and monthly agromet bulletins, warnings for pests and diseases, and a weekly agromet index. LaCSA is the only localized national agromet service system available, and it allows for the monitoring of drought risk situations on a weekly, monthly, and three-month ahead basis.

The SERVIR-Mekong programme^[19], a joint initiative by the US agency for International Development (USAID), NASA, and five other countries including Myanmar, Thailand, Cambodia, Laos, and Vietnam, is undertaken by the Asian Disaster Preparedness Centre (ADPC). This programme specifically provides drought and crop yield monitoring information for five countries in the Mekong region, namely Thailand, Lao PDR, Myanmar, Cambodia, and Vietnam. The organization's Regional Drought & Crop Yield Information System (RDCYIS) is responsible for making this information available. To calculate various indicators used to study drought conditions in the region, the RDCYIS utilizes remote sensing observation data and global model climate data. These indicators include the Standardized Precipitation Index (SPI), Standardized Runoff Index (SRI), Soil Moisture Deficit Index (SMDI), and Root Zone Soil Moisture (RZSM).

The MRC DFEWS^[20], or Mekong River Commission Drought Forecasting and Early Warning System, is explicitly intended to monitor and predict drought conditions in the Lower Mekong Basin (LMB). This approach employs various drought indicators, including the Combined Drought Index (CDI), Soil Moisture Deficit Index (SMDI), Standardised Precipitation Index (SPI1), and Standardised Runoff Index (SRI1), to proficiently monitor and predict drought situations. The main objective is to furnish practical and valuable information for MRC Member Countries and its Line Agencies. The MRC DFEWS utilizes a holistic and cohesive strategy to guarantee effective drought monitoring and forecasting.

¹⁹ [SERVIR-Mekong](#)

²⁰ [The Mekong River Commission - DFEWS](#)

4.2 Risk Mitigation, Preparedness and Response

The Government of Lao PDR has initiated various measures to mitigate and prepare for droughts, including the development of drought management policies and strategies. There are structural and nonstructural measures for drought mitigation and preparedness.

The National Disaster Management Office (NDMO) with implementing partners (the Asian Disaster Preparedness Center (ADPC) and the Public Works and Transport Institute (PTI) and UNDP developed “The National Risk Profile of Lao PDR, 2010”, this risk profile provides a comprehensive profile of the natural hazards and overall impacts on Lao PDR. It features maps of all hazard prone areas (based on historic disaster events), analysis and assessment of exposure, vulnerability and risks to people, property, and affected sectors including critical facilities, infrastructure and economic activities. The risk profile has been extensively used to identify the risk priorities to guide national disaster risk reduction strategies (NDMO, 2010).

MRC has done the development of the strategy on Drought Management for the Lower Mekong Basin 2020-2025. The Drought Management Strategy for the Lower Mekong Basin 2020-2025 aims to enhance regional cooperation and coordination on drought risk management in the Lower Mekong Basin (LMB). Building on the past Drought Management Programme 2011-2015, the plan addresses the needs of the four MRC members—including Laos—while also the approach emphasizes on developing institutional capacity and regional cooperation; improving drought monitoring, forecasting, and early warning; and so enhancing drought mitigating and adaption methods. Laos is predicted to benefit much from the approach, including:

- Enhanced monitoring of drought indicators including hydro-meteorological and reservoir water monitoring, groundwater monitoring, soil moisture and crop condition monitoring, and salinity level monitoring.
- Enhanced Drought Forecasting and Early Warning: To help with timely decision-making and preparedness, better drought forecasting and early warning systems support
- Strengthened institutional capacity: Development of national and regional institutions to improve their capacity to control risk of drought
- Improved Cooperation: On drought risk management, national agencies and regional institutions have become more cooperative, hence producing more sensible drought mitigating and adapting strategies.

The National Strategy on Disaster Risk Reduction (2021-2030) recognizes that women and marginalized groups are disproportionately affected by droughts and other disasters. The strategy incorporates comprehensive gender-responsive and inclusive approaches through the following key components:

- **Vulnerability Assessment and Targeted Resilience Building:** identifies and targets vulnerable populations requiring increased resilience, including people living with disabilities, children, the elderly, pregnant or nursing women, women and girls at risk of gender-based violence, remote rural communities, and people living in poverty. These assessments inform tailored interventions that address specific vulnerabilities.
- **Inclusive Governance and Representation:** All disaster management committees at central, provincial, district, and village levels must include a minimum of 30% women, in accordance with the DM Law, the Law on Gender Equality, and the National Action Plan on Gender Equality 2021-25. This ensures diverse perspectives in disaster risk reduction decision-making and implementation.
- **Data-Driven Policy Development:** The Lao disaster information system (Lao-Di) collects and analyzes disaster impact data disaggregated by age, sex, disability status, and other relevant factors. This evidence base supports gender-responsive policy development aligned with SDG 5 on gender equality and Sendai Framework reporting requirements.
- **Economic Resilience and Empowerment:** The Advisory Group on Private Sector Resilience, proposed to setup by the NSDRR, provides gender-inclusive capacity building for micro, small and medium enterprises, with targeted opportunities for rural tourism and women-led MSMEs to enhance their disaster resilience and business continuity.

5. Sectoral Priorities and Recent Interventions



Mountainous desert valley with curvy river

Source: www.pexels.com

Photo by: Arthouse Studio

The impacts of drought have intensified across multiple sectors, including agriculture, forestry, water resources, infrastructure development, water supply, public health, energy, and urban expansion. Among these, three priority sectors were identified as requiring immediate intervention for drought response. During the training session held on September 2–3, 2024, in Vang Vieng, Lao PDR, the CREWS team and participants collaboratively assessed drought impacts and engaged in discussions with external experts. The key outcome of this process was the identification of water resources, agriculture, and forestry-biodiversity as the top three sectors most urgently in need of action.

Can you identify the top three sectors to prioritize for drought management?

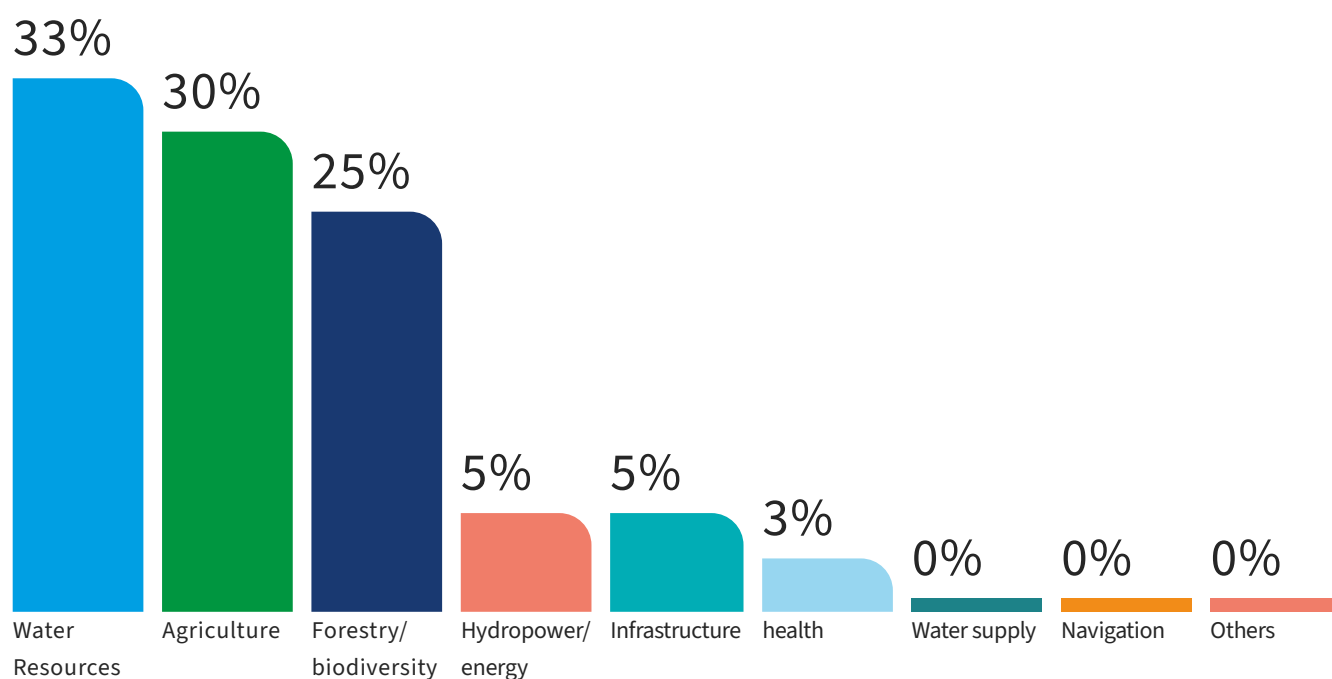


Figure 5. Top three priority sectors for drought management (source: polling during stakeholder consultation workshop)

5.1 Forestry and biodiversity

It is crucial to implement initiatives focused on forests and biodiversity to promote a sustainable future. By addressing critical environmental challenges, these efforts create economic opportunities and improve social welfare in communities simultaneously. Forest and biodiversity initiatives are generally focused on achieving objectives such as forest expansion, biodiversity conservation, poverty reduction, sustainable livelihoods, water resources management, and enhancement of ecosystem services.

Forestry and biodiversity initiatives, despite being primarily designed to achieve goals such as forest cover expansion, poverty reduction, and ecosystem restoration, also contribute to drought management. Although they don't directly mitigate drought, their impact is still significant. In this discussion, we will explore how these sectors support drought management and highlight some of the key actions that are currently being taken.

The Community-based Fire Management (CBFiM) Project ^[21] is an initiative aimed at enhancing fire management practices through community involvement in the Asia-Pacific region. This project is particularly relevant in countries such as Cambodia, Lao PDR, Thailand, and Viet Nam, where forest fires pose significant environmental and public health challenges. The CBFiM project commenced on October 1, 2022, and is set to conclude on March 31, 2025. The primary goal is to reduce the frequency and intensity of forest fires while building resilience against climate change impacts. This is achieved by strengthening local capacities and promoting sustainable fire management practices

The Lao Landscapes and Livelihoods Project ^[22] is a significant initiative aimed at promoting sustainable forest management and enhancing livelihoods in selected landscapes across Laos. The project seeks to improve sustainable forest management, enhance protected area management, and create livelihood opportunities in various landscapes in around 600 villages across 8 provinces. The project is financed by the International Development Association (IDA – World Bank) with a budget of \$50 million, supplemented by \$7.37 million from trust funds. It is set to run from 2021 to 2027. The key outcomes of the project are to create a coordinated approach to landscape management that integrates environmental sustainability with community livelihoods; and by fostering collaboration among various stakeholders, it seeks to maximize the impact of investments in these landscapes, ultimately improving both ecological health and local economies. The project includes the construction of flood protection embankments and sluice gates that help manage floodwaters while also providing a means to store rainwater for use during dry seasons. This dual-purpose infrastructure is crucial for maintaining ecosystem health and reducing the risks associated with both flooding and drought.

²¹ [The Community-based Fire Management \(CBFiM\)](#)

²² [The Lao Landscapes and Livelihoods Project](#)

The project consists of four main components designed to achieve comprehensive impacts:

1. Investing in Natural Wealth and Resilience:

Focuses on enhancing the ecological health of forest landscapes.

1. Livelihood Opportunities from the Forest Landscape:

Aims to create economic opportunities for local communities through sustainable practices.

1. Institutions, Incentives, and Information:

Works on building institutional frameworks that support natural wealth and resilience.

1. Project Coordination, Management, and Monitoring:

Ensures effective oversight and evaluation of project activities

The Sustainable Forestry and agricultural Development Project (SUFORD) ^[23] in Laos is a project that aims to enhance agricultural livelihoods and promote sustainable forest management. The objective of this initiative is to enhance rural livelihoods and modify forest management strategies through the implementation of sustainable forestry. It advocates for the use of non-timber forest products and addresses the issue of forest degradation.

Starting in 2013, the project is scheduled to go through several phases; the present phase, planned to finish around 2020 with over 29 million USD from two important donors including the World Bank and Global Environment Facility (GEF), With focus towards Luang Prabang, Xiengkhuang, Savannakhet, Champasak, Bolikhamxay, and Vientiane provinces, the project aims various provinces and districts all across Laos.

The initiative aims to achieve a number of significant outcomes:

1. Enhanced Forest Cover

Increased the extent of forest cover through the implementation of sustainable management strategies.

1. Improved Livelihoods

Local communities are able to improve their livelihoods by generating more revenue through sustainable timber harvesting and non-timber forest products.

1. Strengthened Governance

the establishment of legal and institutional frameworks that promote sustainable development.

The SUFORD initiative, which is primarily focused on sustainable forest management and community resilience, incorporates a diverse array of activities related to drought management. The following are the specific responsibilities that are associated with drought management:

- **Agroforestry Practices:** The agroforestry systems that SUFORD promotes are those that integrate agriculture and trees to improve soil moisture retention and reduce the effects of drought. These methods offer other livelihoods during dry spells and assist to increase food security.
- **Forest Restoration:** Through supported natural regeneration, the initiative consists of activities meant to bring degraded forests back. This restoration improves forest cover, which is quite important for microclimate control and water retention, therefore reducing the consequences of drought.

²³ [The Sustainable Forestry and agricultural Development Project \(SUFORD\)](#)

- **Community Engagement in Water Management:** Adapting to drought situations depends on community involvement in water management, hence SUFORD promotes this kind of engagement. These covers teaching nearby populations environmentally friendly water use and management techniques.
- **Capacity Building:** The initiative teaches nearby populations sustainable forestry techniques including drought-resistant tactics. This capacity building enables communities to adjust to evolving environmental conditions, such as prolonged droughts.
- **Monitoring and Data Collection:** In response to drought conditions, SUFORD endorses the accumulation of data on water supplies and forest health, as it can inform more effective management strategies. This information is crucial for the adjustment of strategies, as the climate pattern is susceptible to change.
- **Policy Development:** The initiative guarantees that policies integrate drought risk management into forest management strategies to mitigate any drought-related effects on both forests and local communities.

The primary objectives of Laos's National Biodiversity Strategy and Action Plan (NBSAP) ^[24] are the preservation of biodiversity and sustainable development. This strategic plan, which encompasses the years 2016 to 2025, is consistent with the national development objectives of Laos and the Convention on Biological Diversity (CBD).

Including all of Laos, the NBSAP focuses especially on protected areas and important biodiversity hotspots. Various funding mechanisms, notably the Global Environment Facility (GEF), help it financially; technical support comes from groups like the International Union for Conservation of Nature (IUCN).

The NBSAP aims primarily in four directions:

1. Conservation of biodiversity
2. Promotion of sustainable resource utilization
3. Integration of biodiversity considerations into national and sectoral policies
4. Enhancement of public awareness regarding biodiversity issues

Targeted at tackling biodiversity concerns and advancing sustainable land management in Laos' Savannakhet Province, the Sustaining an Abundance of Forest and Ecosystems (SAFE) Project—also known as the SAFE Ecosystems Project—is Operating in five distinct districts: Xonnabouly, Palanxay, Phone, Songkhone, and Thappangthong, the project

Operating under the United Nations Development Programme (UNDP) and funded by the Global Environment Facility (GEF), the SAFE Ecosystems Project has been running for almost six years; its end is expected in May 2022.

²⁴ [The primary objectives of Laos's National Biodiversity Strategy and Action Plan \(NBSAP\)](#)

The main aims of the initiative are three-fold:

1. To secure critical wildlife habitats and conserve biodiversity in the Dry Dipterocarp Forest landscape
2. To facilitate a transition from unsustainable practices to integrated sustainable land and forest management
3. To support the provincial government in developing clear policies, regulations, and coordination mechanisms for natural resource management

This project's expected results are: 1) better management of land and forest resources in selected districts; 2) more local community involvement in sustainable resource management and conservation; and 3) strengthened governance systems helping to preserve biodiversity. The project concentrates on several important outputs in order to produce these results: Implementation of creative community conservation agreements to promote local participation in forest protection; Development of enabling policies supporting biodiversity-friendly practices; and Execution of capacity-building activities to improve local stakeholders' forest management skills.

The Sustaining an Abundance of Forest and Ecosystems (SAFE) Project ^[25] in Savannakhet Province aims to address biodiversity threats and promote sustainable land management. Operating in five districts. The SAFE Ecosystems Project incorporates drought management strategies as a crucial component of its sustainable land management practices. This approach recognizes the interconnectedness of forest ecosystems and water resources, particularly in the drought-prone Dry Dipterocarp Forest landscape. Aiming to solve biodiversity concerns and support sustainable land management, the Sustaining an Abundance of Forest and Ecosystems (SAFE) Project in Savannakhet Province of Laos

Expected outcomes include improved forest resource management, enhanced community engagement, and strengthened governance frameworks. In the context of drought management, the project likely emphasizes water-efficient agricultural practices and the preservation of natural water retention features within the forest ecosystem. These efforts aim to increase the resilience of both the environment and local communities to periods of water scarcity.

Key outputs of the project include community conservation agreements, supportive policy frameworks, and capacity-building initiatives. Drought management is likely integrated into these outputs, with training programs potentially covering topics such as water conservation techniques, drought-resistant crop varieties, and sustainable water harvesting methods.

By incorporating drought management into its broader conservation and sustainable development goals, the SAFE Ecosystems Project strives to create a comprehensive approach to environmental stewardship. This strategy not only aims to protect biodiversity and improve livelihoods but also enhances the region's ability to withstand and adapt to drought conditions, contributing to long-term ecological and community resilience in Savannakhet Province.

²⁵ [The Sustaining an Abundance of Forest and Ecosystems \(SAFE\) Project](#)

5.2 Agricultural practices and crop diversification

The Strengthening Agro-climatic Monitoring and Information System (SAMIS) project aims to enhance the resilience of agricultural communities in Laos to climate change by improving agro-climatic monitoring and information systems. The project focuses on strengthening the capacity of farmers and smallholders to adapt to climate change by providing them with accurate and timely climate information. This includes seasonal climate forecasts and weekly agro-meteorological bulletins that help farmers make informed decisions about planting, harvesting, and crop management. The project also supports the development of climate-resilient agricultural practices and the integration of climate information into agricultural planning and decision-making. By improving the availability and use of climate information, the SAMIS project aims to reduce the vulnerability of agricultural communities to droughts and other climate-related hazards, ultimately enhancing food security and livelihoods in Laos. The SAMIS project is playing a crucial role in enhancing Lao PDR's capacity to monitor, forecast, and respond to drought through improved climate information systems and decision-support tools for the agricultural sector. This is expected to significantly boost the resilience of farmers and farming communities to the impacts of droughts and other climate-related hazards.

In 2011, Lao PDR and ADB implemented the Lao PDR: **Northern Community-Managed Irrigation Sector Project**. This project improved the livelihoods of rural communities in the northern provinces of Lao PDR by enhancing the sustainability and resilience of the irrigation sector. The project focuses on community-managed irrigation systems to ensure that farmers have access to reliable and sustainable water supplies. The project includes measures to enhance drought resilience in the irrigation sector, such as:

- **Water Storage:** Construction of water storage structures to ensure a reliable water supply during drought periods.
- **Water Harvesting:** Implementation of water harvesting systems to collect and store rainwater for irrigation during drought periods.
- **Water Conservation:** Promotion of water conservation practices among farmers to reduce water waste and ensure efficient use of water resources.
- **Climate-Resilient Irrigation:** Development of climate-resilient irrigation systems that can withstand drought conditions and ensure continued water supply to farmers.

Promoting drought-tolerant crop varieties and sustainable agricultural practices are key strategies for mitigating the impacts of drought on agriculture. Crop diversification helps spread risk and ensures food security.

5.3 Water resource management and conservation

The **"Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts" project** (2011-2014) aimed to reduce the vulnerability of farmers to extreme flooding and drought events through the introduction of an applied ecosystems-based approach to agriculture. The project focused on reducing food insecurity and increasing the resilience of agricultural production to climate change impacts, particularly in drought-prone areas. By the end of the project, a framework for climate change resilient agriculture was available, and 75% of target households in pilot districts had implemented climate change adaptation measures.

The 2013–2017 project Effective Governance for Small-scale Rural Infrastructure and Disaster Preparedness in a Changing Climate aimed to boost rural communities in Laos in resilience against the consequences of climate change, notably droughts. It focused on improving local governance and designing policies to ensure that budgets and development plans for local areas matched the needs of most vulnerable communities to climate variability and change. This comprised steps to integrate ecosystem-based methods and climate-resilient infrastructure solutions as well as to increase the ability of district and provincial decision-makers in climate-sensitive planning. The initiative also helped funding to carry out small-scale, climate-resilient infrastructure projects including those pertaining to water management.

The project aimed to increase water security and the capacity of rural communities to bear the effects of droughts and other climate-related disasters by strengthening local governance and planning for climate adaptation.

The Mekong Integrated Water Resources Management Project Phase 1 in Lao PDR (2012-2021), funded by the International Development Association (IDA), improved water resource and fisheries management through enhanced regulatory frameworks, institutional capacity, and community involvement. Targeting important provinces such as Savannakhet, Khammouane, Champasak, Attapu, and Vientiane Municipality, the initiative supports national development goals by means of sustainable agricultural and fisheries growth, so reducing climate impacts. Under the direction of several government departments, this project conforms to the objectives of the World Bank towards shared prosperity and poverty reduction as well as Lao PDR's National Socio-Economic Development Plan.

The Mekong and Sekong Rivers Fisheries Management Project (2014-2019) targeted fisheries management in provinces along the Mekong River. This project aimed to establish a joint monitoring system and management plan between Cambodia and Lao PDR, promoting sustainable fishing practices in these shared waterways. Similarly, the "Xe Bang Hieng and Nam Kam River Basins Wetland Management Project (2013-2018)" fostered knowledge exchange and community involvement in wetland management. This project focused on the Xe Bang Hieng basin in Lao PDR and the Nam Kam River basin in Thailand. These collaborative efforts stem from the Mekong Integrated Water Resources Management Project (M-IWRMP) launched in 2009.

The M-IWRMP aims to enhance cooperation on water management practices among member countries. This includes promoting coordinated planning, utilizing technical tools for water use planning, and facilitating data sharing and flow monitoring across the Mekong River basin. Notably, the M-IWRMP has undertaken five bilateral transboundary projects so far, with two specifically benefiting Lao PDR.

The National Integrated Water Resources Management Support Program (NIWRMSP) ran from 2011 to 2015. This collaborative effort involved the Asian Development Bank (ADB) and the governments of Australia and Spain. The project focused on developing institutional frameworks for integrated water resource management (IWRM) suited to Lao PDR's specific needs. Implemented in select river basins, the NIWRMSP aimed to integrate river basin management plans into broader government planning and investment processes.

The Lao PDR and the ADB are collaborating on the implementation of the **Flood and Drought Mitigation and Management Sector Project** (2024-2029). The objective of this project is to strengthen the resilience of agricultural communities in central Laos against the adverse effects of climate change, encompassing both flood and drought events. Specifically, the project will focus on improving water reliability during drought periods through strengthening the climate-resilience of irrigation infrastructure. This includes supporting the diversification of crops into higher-value, drought-tolerant varieties and establishing market linkages to improve farmer incomes. The project will also modernize agrometeorological information systems to provide better weather and climate data to support climate-smart agricultural practices. By harnessing floodwaters, improving irrigation, and enhancing access to climate information, the project seeks to reduce the vulnerability of rural communities to the increasing frequency and intensity of droughts driven by climate change. These interventions are aligned with the government's strategies for sustainable agricultural development and building climate resilience.

The Department of Water Resources and UNDP have launched the **Project for Water Resource Management and Climate Change Adaptation in Mekong River Basin for Laos and Cambodia** in August 2022. The project aims to improve integrated water resource management and climate resilience in the Mekong River Basin, which is highly vulnerable to the impacts of climate change, including droughts. In Lao PDR, the project is focused on the Xe Don and Xe Bang Fai River basins, which are prone to drought. The project is working to strengthen the capacity of national and local institutions to gather, analyze, and share climate information to support agricultural planning and decision-making. This is expected to enhance the ability of farmers and communities to prepare for and respond to drought events. The project also supports the development of integrated water resource management strategies and climate-resilient infrastructure solutions, such as water storage and irrigation systems. These interventions are designed to improve water security and the resilience of rural communities in Lao PDR to the impacts of droughts and other climate-related hazards. By leveraging expertise and technologies from Korean partners, the project seeks to provide comprehensive solutions for addressing the challenges of water resource management and climate change adaptation in the Mekong River Basin.

Efforts to manage water resources include the construction of reservoirs and irrigation systems. Water conservation practices, such as rainwater harvesting, are also promoted to ensure water availability during dry periods.

6. Implementation Roadmap



Forest around river at dusk Luang Prabang, Luang Prabang province, Laos

Source: [www.Pexels.com](https://www.pexels.com)

Photo by: Ehsan Haque

The implementation roadmap for drought management in Lao PDR is designed as a phased approach, split into two key timeframes: short-term actions (1–3 years) and medium to long-term considerations (3–10 years).

This two-tiered structure reflects the urgency to provide immediate support to drought-affected communities while simultaneously laying the foundation for a sustainable and climate-resilient future. The short-term actions focus on practical, quick-impact interventions, such as capacity building, information system upgrades, and pilot programs. In contrast, the medium to long-term actions emphasize systemic change through integrated planning, institutional development, large-scale ecosystem restoration, and robust research and innovation programs. Together, these phases aim to strengthen Lao PDR's resilience to drought at local, national, and transboundary levels.

6.1 Short-term Actions (1-3 years)

Component	Actions	Key Activities	Responsible organizations/ Key Stakeholders	Budget (USD)
Monitoring, Early Warning, and Risk Assessment	Forestry and Biodiversity. Strengthen monitoring methods for drought in forests.	• Install soil moisture sensors in key forest areas • Conduct training sessions for forestry staff on drought indicator monitoring. • Design a system to detect droughts in forests in advance.	• Ministry of Agriculture and Forestry (MAF) • Ministry of Natural Resources and Environment (MoNRE)	2,000,000
	Water Resources Management. Establish early warning systems for drought prediction.	• Upgrade meteorological and hydrometric stations • Develop drought information platforms that prioritize user-friendliness. • Provide training to officials on how to interpret forecasts.	• Department of Water Resources, MoNRE • Department of Meteorology and Hydrology, MONRE	1,500,000
	Agriculture. Upgrade information systems for agricultural weather forecasting.	• Upgrade weather stations for agricultural data • Create weather applications that are user-friendly for farmers. • Provide climate data interpretation training to extension workers.	• Department of Meteorology and Hydrology, MONRE • MAF • Department of Climate Change, MoNRE	2,000,000
	Cross-sectoral. Commence the creation of a nationwide drought strategy, plans, and policy.	• Perform preliminary assessments to determine vulnerability to drought risks. • Create initial sector-specific adaptation and drought response plans. • Establish a working group that will focus on addressing drought-related issues.	• Department of Meteorology and Hydrology, MONRE • Department of Meteorology and Hydrology, MONRE • Ministry of Labour and Social Welfare	500,000

Component	Actions	Key Activities	Responsible organizations/ Key Stakeholders	Budget (USD)
Monitoring, Early Warning, and Risk Assessment	Cross-sectoral. Set up basic Research & Development (R&D) programs.	- Identify top priority research topics for drought management. - Perform a comprehensive assessment of drought risk and its impacts nationwide. - Form collaborative partnerships with universities and research institutes. - Commence the baseline and climate projection studies to assess drought effects and develop adaptation/response strategies.	- Ministry of Labour and Social Welfare - National University of Laos - Department of Water Resources - Department of Meteorology and Hydrology, Department of Climate Change, MONRE	1,000,000
	Institutional. Develop local drought management response plans.	- Conduct drought management workshops - Offer technical training for utilizing assessment tools. - Formulate response plans for drought at a community level.	- Ministry of Labour and Social Welfare - Department of Water Resources; Department of Meteorology and Hydrology	500,000
Drought Communication and Response Actions	Institutional. Establish protocols for managing water distribution during drought conditions.	- Review existing water allocation policies - Initial recommendations for periods of drought - Carry out consultations with stakeholders.	- Ministry of Labour and Social Welfare - Department of Water Resources; Department of Meteorology and Hydrology	50,000
	Cross-sectoral. Launch programs aimed at developing human resources.	- Assess the current state of capacity and identify gaps in skills for managing droughts. - Create training programs for various stakeholders. - Organize introductory training sessions for essential staff.	- Ministry of Labour and Social Welfare - MoNRE - Related ministries	300,000

Component	Actions	Key Activities	Responsible organizations/ Key Stakeholders	Budget (USD)
Drought Communication and Response Actions	Cross-sectoral. Develop drought awareness education programs	• Create age-appropriate educational materials about drought²⁶ • Develop pilot curriculum modules for primary schools • Train teachers on drought awareness education • Establish school-based water conservation projects	• Ministry of Labour and Social Welfare • Ministry of Education and Sport • National University of Laos	1,000,000
	Forestry and Biodiversity. Community based fire prevention and control.	• Train communities in fire prevention and control • Create fire watch groups within the community. • Establish fire management strategies specific to the local area.	• MAF • Ministry of Labour and Social Welfare • Provincial	1,000,000
Risk Mitigation and Preparedness	Water Resources Management. Enhance the infrastructure for storing water on a small scale.	• Construct small-scale reservoirs • Implement rainwater harvesting systems. • Restore and improve current water storage facilities.	• MAF • MoNRE • Ministry of Energy and Mines	10,000,000
	Water Resources Management. Incorporate practices that conserve water.	• Launch public awareness campaigns • Utilize innovative methods to save water. • Introduce different approaches to pricing water.	• MoNRE • MAF • Ministry of Labour and Social Welfare	200,000

²⁶ Example: COPE Disaster Book Series

Component	Actions	Key Activities	Responsible organizations/ Key Stakeholders	Budget (USD)
Risk Mitigation and Preparedness	Agriculture. Implement new crop varieties that can withstand drought conditions.	• Carry out field experiments to evaluate drought-resistant varieties. • Provide farmers with seeds. • Deliver training on techniques for cultivation.	• MAF	2,000,000
	Agriculture. Deliver training on climate-smart agriculture.	• Develop training modules • Carry out farmer field schools. • Establish farms for practical demonstrations.	• MAF	500,000
	Cross-sectoral. Launch pilot projects for ecosystem-based adaptation.	• Identify key ecosystems for pilot projects • Carry out ecosystem restoration on a small scale. • Monitor and evaluate pilot project outcomes	• MAF • MoNRE	2,000,000

6.2 Medium to Long-term (3-10 Years)

Component	Actions	Key Activities	Responsible organizations/ Key Stakeholders	Budget (USD)
Monitoring, Early Warning, and Risk Assessment	Cross-sectoral. Expand and deepen R&D initiatives	• Establish a national drought research center • Develop long-term research programs on drought prediction, impacts, and adaptation • Create a national drought data repository and analysis platform	• Department of Water Resources, Department of Meteorology and Hydrology, MoNRE • Ministry of Labour and Social Welfare • Natural Resources and Environment Institute • National University of Laos (NoUL)	800,000
	Institutional. Develop long-term research programs	• Set up research centers on drought and climate change • Establish long-term ecosystem monitoring sites • Develop international research partnerships	• Department of Water Resources, Department of Meteorology and Hydrology, MoNRE • Ministry of Labour and Social Welfare	500,000
Drought Communication and Response Actions	Cross-sectoral. Implement comprehensive human resource development strategy	• Establish specialized academic programs in drought management and climate resilience • Develop a national pool of drought management experts • Implement continuous professional development programs for all relevant sectors	• NoUL • Natural Resources and Environment Institute, MoNRE • Ministry of Labour and Social Welfare	1,000,000

Component	Actions	Key Activities	Responsible organizations/ Key Stakeholders	Budget (USD)
Drought Communication and Response Actions	Cross-sectoral. Primary and Secondary School Curriculum Development	- Establish comprehensive drought education program - Create grade-specific learning objectives - Develop advanced drought science modules - Create research-based learning projects - Develop hands-on learning materials - Implement student-led water conservation projects - Create teacher training modules on drought education - Establish regular teacher workshops - Develop teaching resources and guides - Create teacher networks for sharing best practices	- NoUL - Natural Resources and Environment Institute, Department of Meteorology and Hydrology, MoNRE	2,000,000
Risk Mitigation and Preparedness	Forestry and Biodiversity. Large-scale forest restoration projects	- Identify priority areas for restoration - Implement reforestation using native species and/or scientifically recommended species. - Monitor long-term impacts on water retention	- MAF - MoNRE	10,000,000
	Forestry and Biodiversity. Develop long-term biodiversity conservation strategies	- Conduct comprehensive biodiversity assessments - Develop species-specific conservation plans - Establish wildlife corridors	- MAF - MoNRE - iNGOs like WWF, WCS	5,000,000

Component	Actions	Key Activities	Responsible organizations/ Key Stakeholders	Budget (USD)
Risk Mitigation and Preparedness	Water Management. Construct major water infrastructure projects	• Conduct feasibility studies for large reservoirs • Implement inter-basin water transfer projects • Develop flood control systems	• MoNRE • MAF • Ministry of Energy and Mines (MEM)	3,000,000
	Water Management. Implement integrated water resource management	• Establish river basin management committees • Develop river basin management plans • Implement ecological water allocation systems	• Department of Water Resources, MoNRE • Lao National Mekong Committee	5,000,000
	Water Management. Develop transboundary water agreements	• Develop shared water monitoring systems • Negotiate fair water sharing agreements	• Resources, MoNRE • Lao National Mekong Committee	2,000,000
	Agriculture. Transition to drought-resilient farming systems	• Implement crop diversification programs • Modernize irrigation systems • Develop drought-resistant livestock breeding	• MAF	10,000,000
	Agriculture. Establish market linkages for drought-resistant crops	• Conduct market studies • Develop value chains • Establish farmer cooperatives	• MAF	2,000,000
	Agriculture. Modernize agricultural sector with climate-smart technologies	• Implement precision agriculture • Develop climate-controlled greenhouse farming • Establish agricultural innovation centers	• MAF	8,000,000

Component	Actions	Key Activities	Responsible organizations/ Key Stakeholders	Budget (USD)
Risk Mitigation and Preparedness	Institutional. Integrate drought management into all levels of planning	• Develop guidelines for drought risk in sector plans • Train planners in drought-sensitive budgeting • Establish cross-sector drought management committee	• Ministry of Laour and Social Welfare • Department of Water Resources, Department of Meteorology and Hydrology	1,000,000
	Institutional. Establish national drought policy and action plan	• Draft comprehensive national drought policy • Conduct nationwide stakeholder consultations • Establish national drought management authority	• Ministry of Laour and Social Welfare • Department of Water Resources, Department of Meteorology and Hydrology	500,000
	Cross-sectoral. Implement large-scale ecosystem-based adaptation projects	• Scale up successful pilot projects • Restore large wetlands and floodplains • Develop payment for ecosystem services schemes	• Ministry of Labour and Social Welfare • Department of Water Resources, • MAF	8,000,000
	Cross-sectoral. Develop comprehensive national drought strategy	• Conduct detailed national vulnerability assessment • Develop comprehensive sector adaptation plans • Establish national climate change fund	• MAF • MoNRE • Ministry of Labour and Social Welfare	4,000,000

7. Funding and Monitoring



Woman walking on dry ground concept hope and drought

Source: www.shutterstock.com

7.1 Potential Funding Sources

Managing drought in Lao PDR is particularly challenging due to limited domestic resources and a strong dependence on international funding and technical support. To sustain its climate resilience and disaster risk reduction initiatives—including drought management—Lao PDR must mobilize a diverse range of financial resources. A combination of national funding, international aid, private sector investments, and innovative financial mechanisms is essential to ensure the continued implementation of the Drought Management Framework.

National Budgets

- **Government Allocation for Disaster Risk Management (DRM):** The Lao government might set aside specific funds from national budgets for drought resilience among other projects aimed at disaster risk management.
 - Allocations to the **National Disaster Management Office (NDMO)** for drought-specific projects.
 - Sectoral funding from the **Ministry of Agriculture and Forestry (MAF)**, **Ministry of Natural Resources and Environment (MoNRE)**, and **Ministry of Energy and Mines (MEM)** to support reforestation, irrigation, and climate-resilient infrastructure.
- **Public Infrastructure Investment:** National infrastructure development programs can finance the construction of drought-resilient infrastructure, including reservoirs, water storage systems, and irrigation networks.
- **Climate Change Funds:** The government may establish or utilize existing national climate or environmental funds to finance climate adaptation measures, including drought management.

International Aid and Development Assistance

- **Global Climate Funds:**
 - **Green Climate Fund (GCF):** Lao PDR is eligible for GCF grants and concessional loans for projects related to climate resilience, water resource management, and agricultural adaptation—all aligned with drought mitigation goals.
 - **Adaptation Fund:** Supports climate adaptation projects in developing countries. Lao PDR can submit proposals focusing on ecosystem-based adaptation, drought-tolerant agriculture, and water conservation.
 - **Global Environment Facility (GEF):** Funds projects that promote environmental sustainability, including those focused on land degradation, sustainable forestry, and climate adaptation.

- **Multilateral Development Banks (MDBs):**

- **World Bank (via the International Development Association - IDA):** Offers low-interest loans and grants for projects in sustainable agriculture, water management, and disaster risk reduction.
- **Asian Development Bank (ADB):** Provides various funding windows, including for climate resilience and water resource management, which are suitable for drought-related initiatives in Lao PDR.

- **Bilateral and Multilateral Aid:**

- **Lancang-Mekong Cooperation:** Established in 2016 to promote cooperation among the nations along the Lancang-Mekong River, Lancang-Mekong cooperation is a multinational project. The partnership seeks to advance regional connectivity, sustainable development, and common issues including water resource management, environmental protection and reduction of disaster risk.
- **Mekong River Commission (MRC):** Can assist Lao PDR in transboundary water management and drought resilience projects across the Mekong basin.
- **Japan International Cooperation Agency (JICA):** Lao PDR has the potential to secure funding for drought mitigation initiatives, as JICA focuses on the reduction of catastrophe risk and the adaptation to climate change in Asia.
- **Korea International Cooperation Agency (KOICA):** Supports projects on climate adaptation and disaster management across Asia, including in Lao PDR.
- **European Union (EU):** Provides climate financing through development cooperation instruments for sustainable agriculture, forestry, and water conservation.

- **International and United Nations Agencies:**

- **International Fund for Agricultural Development (IFAD):** Allocates financial resources for rural development initiatives, particularly those focused on enhancing climate resilience for smallholder farmers in arid areas.
- **United Nations Development Programme (UNDP):** UNDP can assist in the acquisition of funding for national drought resilience initiatives, particularly through climate adaptation programmes.
- **Food and Agriculture Organization (FAO):** In drought-affected regions, FAO can offer technical assistance and project funding for agroforestry programmes, water management, and drought-tolerant crops.

Private Sector Investment

- **Public-Private Partnerships (PPPs):** The government has the potential to establish partnerships with private companies to construct drought-resilient infrastructure, including renewable energy projects, irrigation systems, and water storage facilities. PPP models can enable the private sector to co-share both risks and the benefits.

Innovative Financing Mechanism

- **Carbon Markets and Debt-for-Nature Swap:** Carbon credits and debt-for-nature swaps provide incentives for agroforestry and forest restoration, which help sequester carbon. Lao PDR can generate revenue by selling carbon credits from reforestation efforts or negotiate debt relief in exchange for environmental commitments. Both approaches contribute to reducing drought risk while addressing financial constraints.

In addition to the aforementioned funds, the UNFCCC established the Loss and Damage Fund (Fund for responding to Loss and Damage (FRLD))²⁷ to provide financial assistance to the most vulnerable nations affected by climate change. This fund aims to pay for sea-level rise, frequent storms, irreversible losses and damages resulting from climate-related events. The fund is currently in its early stages, and representatives from a variety of countries (including those that are members of the UNFCCC) are collaborating to determine its structure, contributions, and distribution methods.

The Fund for responding to Loss and Damage (FRLD) can significantly aid Laos in managing droughts by providing financial resources to implement drought management strategies and climate adaptation measures namely early warning system, water resource management, infrastructure development and agriculture practices.

The implementation of Lao PDR's Drought Management Framework will require a combination of innovative financing mechanisms, private sector investment, international development assistance, and national government funds. By involving a variety of stakeholders, including government ministries, international agencies, NGOs, and private companies, it will be possible to secure sufficient funding for both short-term drought relief measures and long-term resilience-building projects.

²⁷ [The Fund for responding to Loss and Damage \(FRLD\)](#)

7.2 Key Performance Indicators

The Drought Management Framework of Laos uses Key Performance Indicators (KPIs) to evaluate sectors and timeframes. These indicators are crucial for assessing strategies and improving drought resilience.

During the short-term (1-3 year), the KPIs focus on building fundamental components and starting major projects. Indicators in the Forestry and Biodiversity sector, for example, track the number of communities equipped in fire management and the application of monitoring devices including soil moisture sensors. KPIs in water management follow the building of small-scale reservoirs and meteorological station upgrading. Agricultural indicators assess the adoption of drought-tolerant crop varieties and the training of farmers in climate-smart methodologies. Institutional KPIs evaluate the advancement of policy updates and local capacity building, while cross-sectoral indicators monitor the commencement of experimental projects and the development of national initiatives.

Long-term KPIs—3–10 years—have as their goal consistent changes and evaluation of more extensive projects. The figures represent the completion of major water infrastructure projects, crop output during drought years, and the rehabilitation of hectares of forests. The primary institutional indicators are the integration of drought control into sector-wide planning and the establishment of specialized agencies.

Cross-sectoral long-term KPIs track the execution of specialized academic programmes in drought management and major adaption initiatives.

Complementing these sector-specific metrics are impact-based KPIs spanning both short- and long-term durations. These quantify more general results including decreases in economic losses resulting from drought, enhancements in water availability during dry spells, and advances in general drought resilience. By means of tracking these large sets of indicators, policymakers and stakeholders may assess the efficiency of the drought management system, identify areas requiring further attention, and make data-driven decisions to enhance Laos's capacity to withstand and minimize the consequences of drought.

Table 12. Schematic of linkages of Meteorological Services with EWS and DRM stakeholders

Component	Sector	Short-term KPIs (1-3 years)	Long-term KPIs (3-10 years)
Monitoring and Early Warning System	Forestry and Biodiversity	1. Percentage of key forest areas with soil moisture sensors 2. Number of agroforestry demonstration pilots	1. Hectares of forest restored 2. Number of species-specific conservation plans implemented 3. Percentage increase in forest cover
	Water Management	Percentage of meteorological stations upgraded	-
	Agriculture	Number of agro-meteorological information systems implemented	-
	Institutional	-	Number of long-term drought research programs initiated
	Cross-sectoral	1. Number of foundational R&D programs established 2. Progress on mainstreaming drought management into curriculum of primary and secondary schools	Number of specialized academic programs in drought management
Monitoring and Early Warning System	Institutional	Number of local institutions completed drought management workshops	1. Percentage of sector plans with integrated drought management 2. Establishment of national drought management authority
	Cross-sectoral	1. Progress on national drought strategy development 2. Number of academic programs on drought management and climate resilience 3. Number of experts and training sessions	Number of students and experts in drought management

Component	Sector	Short-term KPIs (1-3 years)	Long-term KPIs (3-10 years)
Risk Mitigation and Preparedness	Forestry and Biodiversity	Number of communities trained in fire management	1. Hectares of forest restored 2. Number of species-specific conservation plans implemented 3. Percentage increase in forest cover
	Water Management	1. Number of small-scale reservoirs constructed 2. Percentage reduction in water consumption	1. Number of major water infrastructure projects completed 2. Number of operational river basin management committees 3. Number of transboundary water agreements implemented
	Agriculture	1. Number of drought-tolerant crop varieties adopted 2. Percentage of farmers trained in climate-smart agriculture	1. Percentage increase in crop yield during droughts 2. Number of drought-resistant livestock breeds adopted 3. Percentage of agricultural land using precision agriculture
	Institutional	Percentage of relevant policies updated for drought water allocation	-
	Cross-sectoral	Number of pilot ecosystem-based adaptation projects	1. Number of large-scale ecosystem-based adaptation projects 2. Percentage of vulnerable populations covered by adaptation plans

8. Conclusion and Way Forward



Scenic river with few houses and trees on shore near mountains

Source: www.pexels.com

Photo by: Stephen Leonardi

8.1 Conclusion

The Drought Management Framework for Lao PDR offers a thorough and coordinated solution to handle the growing difficulties presented by drought events, aggravated by climate change. Lao PDR suffers increasing vulnerabilities since it depends on water resources for livelihoods, electricity, and agriculture. Under important areas such as agriculture, forestry, and water resource management, this framework stresses proactive actions including drought monitoring, early warning systems, and the encouragement of sustainable and climate-resilient practices.

Success of this approach depends on multi-sectoral cooperation among local players, foreign organizations, and government authorities. The initiative integrates short-term initiatives, such as capacity development, community engagement, and small-scale infrastructure enhancements, with long-term objectives, such as the promotion of climate-smart agriculture, forest restoration, and integrated water resource management. In the face of climate-related challenges, this comprehensive approach enables the framework to promote sustainable economic development, ensure food security, and protect underprivileged communities.

8.2 Way Forward

The successful implementation of this framework will rely on the collaborative efforts of all involved parties, both in the short-term and long-term aspects. To move forward successfully, it is crucial to continuously enhance the capacity in various sectors and levels of governance, thereby empowering Lao PDR to take proactive measures in addressing the growing occurrence and intensity of droughts.

- In the short term (1-3 years), priority actions should concentrate on improving drought monitoring and early warning systems, supporting drought-tolerant crops, increasing community involvement in sustainable water management, and applying instantaneous infrastructure improvements including small-scale reservoirs and rainwater collecting systems. Initiatives in research and development (R&D) should start looking at creative drought-resistant technology and adaptive farming methods.
- For the long term (3-10 years), efforts should focus on large-scale forest restoration, building thorough water management systems, and switching to climate-resilient farming methods. The government has to improve institutional structures by including drought control into national plans and making sure that every industry matches its policies with objectives of climate adaption. While the creation of transboundary water agreements guarantees regional collaboration in managing shared water resources, expanding Research & Development programs will be vital in developing long-term drought resistance.

To transform the Drought Management Framework into a feasible plan or action plan, it is essential to establish a systematic approach that guarantees the translation of framework goals into practical and measurable actions. The following steps outline the procedure to improve or upgrade the framework into an action plan, workplan, or strategic document for effective implementation:

1. Stakeholder Engagement and Consultation:

- It is important to conduct consultations at multiple levels with various stakeholders, including government agencies, local communities, international partners, and civil society organizations. By engaging in these consultations, we can guarantee that the framework will accurately represent the current situation and will incorporate input from all relevant parties.
- Establish sector-specific working groups (agriculture, water resources, forestry, etc.) to refine the framework's general recommendations into specific actions. These groups should include local representatives, policymakers, and technical experts.

1. Improving drought monitoring and early warning

- **Monitoring Infrastructure:** Extending and modernizing the network of meteorological and hydrological stations would help to guarantee accuracy of data.
- **Forecasting Models:** The development and utilization of advanced forecasting models can effectively help in providing early warnings and assistance in predicting drought situations.
- **Capacity Building:** A key component of capacity building is the provision of training for personnel in data analysis, forecasting, and the efficient dissemination of early warning messages.

1. Extensive Risk and Impact Assessment:

- Carry out in-depth sectoral assessments to identify the most vulnerable areas and populations. Using drought risk assessment tools, map out high-risk zones and prioritize areas for intervention.
- Assess the resource requirements, such as financial, technical, and human resources, needed for each sector to implement drought management measures effectively.

1. Development of a Comprehensive Action Plan:

- By defining specific activities, responsible entities, timelines, and key performance indicators (KPIs), the framework can be translated into a comprehensive national drought management action plan. The identification of short-term, medium-long-term actions should be clearly stated in this action plan for better planning and execution.
- The action plan must incorporate budgeting and resource allocation for each priority sector, as well as address funding gaps through partnerships with development partners, banks, international donors, agencies, and public-private initiatives.
- Ensure that the action plan is consistent with current national policies and international commitments, including the Sendai Framework for Disaster Risk Reduction and the Paris Agreement on climate change.

1. Integration into National and Sectoral Plans:

- It is essential to incorporate the drought action plan into national development plans, particularly Lao PDR's National Socio-Economic Development Plan (NSED). Integrating drought management into comprehensive policies will ensure essential governmental support and resource alignment.
- Develop sector-specific workplans for agriculture, water resources, forestry, and biodiversity conservation, describing the roles and responsibilities of relevant ministries and agencies.

1. Pilot Projects and Capacity Building:

- Implement pilot projects based on the high-priority areas identified in risk assessments. These can be used to test and refine action plan before they are implemented on a national scale.
- A primary focus should be on capacity building, ensuring that local authorities, farmers, and communities are equipped with the necessary skills and knowledge. By implementing training programs focused on drought-resilient practices, water management, and forest and ecosystem restoration, the local community will be able to enhance their capacity to effectively respond to drought conditions.

1. Monitoring, Evaluation, and Learning (MEL) System:

- Establish a comprehensive monitoring and evaluation (M&E) system to assess achievement against the key performance indicators (KPIs) specified in the action plan. Regular assessments will aid in the refinement of action plan, the efficient allocation of resources, and the adjustment of plans in response to changing needs.
- Establish a learning mechanism to ensure the continuous improvement of the drought management action plan by capturing the lessons learned from ongoing initiatives and pilot projects.

1. Formalization and Institutionalization:

- Formalizing the drought management action plan into a National Drought Management Strategy or policy document with government endorsement is essential to ensure its long-term sustainability.
- Implement policies that require all sectors to be prepared for droughts, regularly updating and revising them based on new data, climate models, and changing socio-economic conditions.

By following this structured approach, Lao PDR could effectively move from a strategic framework to a detailed action plan or workplan, which will enable the practical implementation of drought management measures. This will ultimately enhance the country's resilience to drought.

9. Appendices

Glossary of Terms

Climate change	A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use.	IPCC, 2014
Disaster	A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.	UNISDR, 2017
Disaster Risk	The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.	UNISDR, 2017
Disaster Risk Management (DRM)	Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.	UNISDR, 2017
Disaster Risk Reduction (DRR)	Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development.	UNISDR, 2017
Drought	(1) Prolonged absence or marked deficiency of precipitation. (2) Period of abnormally dry weather sufficiently prolonged for the lack of precipitation to cause a serious hydrological imbalance.	WMO, 1992
Drought assessment	Assessment reviewing drought conditions and indicating potential impacts for various economic sectors, such as agriculture and forestry.	NOAA NWS, 2017
Drought forecast	The statistical estimate of the probability of occurrence of a future drought event.	GWP CEE, 2015
Drought impact	A specific effect of drought on the economy, society, and/or environment, which is a symptom of vulnerability.	GWP CEE, 2015
Drought impact assessment	The process of assessing the magnitude and distribution of the effects of a drought.	GWP CEE, 2015

Glossary of Terms

Drought index	Computed numerical representations of drought severity, assessed using climatic or hydrometeorological inputs, including precipitation, temperature, streamflow, groundwater and reservoir levels, soil moisture and snowpack. They aim to measure the qualitative status of drought on the landscape for a given time period. Indices are technically indicators as well.	WMO/GWP, 2016
Drought indicator	Variables or parameters used to describe drought conditions. Examples include precipitation, temperature, streamflow, groundwater and reservoir levels, soil moisture and snowpack.	WMO/GWP, 2016
Drought Management Plan	It is a planning tool that can be applied to the basin scale or to other scales. It aims to define mechanisms and a methodology for detecting and predicting droughts, establish thresholds for different stages of drought as it intensifies and recedes, define measures to achieve specific objectives in each drought stage, ensure transparency and public participation in the development of drought strategies. The main objective of drought management plans is to minimize the adverse impacts on the economy, social life and environment when drought appears.	GWP CEE, 2015
Drought vulnerability assessment	It is a drought vulnerability quantification and description that consist in identifying the relevant factors influencing it, from the point of view of exposure, sensitivity and adaptive capacity. The final aim of a drought vulnerability assessment is to identify the underlying sources of drought impact.	Urquijo et al., 2015
Early Warning (EW)	The provision of timely and effective information, through identified institutions, that allows stakeholders at risk of a disaster to take action to avoid or reduce their risk and prepare for effective response.	GWP CEE, 2015
Early Warning System (EWS)	The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities, and organizations threatened by a hazard to prepare to act promptly and appropriately to reduce the possibility of harm or loss.	IPCC, 2014
Exposure	The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.	UNISDR, 2017

Glossary of Terms

Hazard	A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards may be natural, anthropogenic or socio-natural in origin. Natural hazards are predominantly associated with natural processes and phenomena. Anthropogenic hazards, or human-induced hazards, are induced entirely or predominantly by human activities and choices. Hazards may be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity or magnitude, frequency and probability.	UNISDR, 2017
Integrated Water Resources Management (IWRM)	IWRM is a process which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.	GWP, 2000
Mitigation	Mitigation (of disaster risk and disaster): The lessening of the potential adverse impacts of physical hazards (including those that are human-induced) through actions that reduce hazard, exposure, and vulnerability.	IPCC, 2012
Mitigation (of climate change)	A human intervention to reduce the sources or enhance the sinks of greenhouse gases.	GWP, 2000
Preparedness	The knowledge and capacities developed by governments, response and recovery organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters.	UNISDR, 2017
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.	UNISDR, 2017
Response	Actions taken directly before, during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. Disaster response is predominantly focused on immediate and short-term needs and is sometimes called disaster relief.	UNISDR, 2017
Vulnerability	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.	UNFCCC, 2014

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