Lao People's Democratic Republic

Peace Independence Democracy Unity Prosperity

NATIONAL ADAPTATION PLAN

Vientiane Capital, 2025

Ministry of Agriculture and Environment

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

National Adaptation Plan

Vientiane Capital
17 July 2025

Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Prime Minister

No. 496/PM
Vientiane Capital, 17/07/25

DECREE
On Adoption and Promulgation of the National Adaptation Plan

- Pursuant to the Law on the Government of Lao PDR (Revised), No. 03/NA, dated 16 November 2021;
- Pursuant to the Resolution of the Ordinary Government Meeting Session in April 2025, No.05/GM, dated 30 April 2025;
- Pursuant to Proposal of the Ministry of Natural Resources and Environment, No. 0930/MONRE, dated 11 June 2025.

The Prime Minister issues the Decree to:

Article 1 Official adoption and promulgation of the National Adaptation Plan;

Article 2 Assign the Ministry of Agriculture and Environment to take leadership, in coordination with the concerned sectors to translate this National Adaptation Plan into effective and efficient actions and implementation;

Article 3 Ministries, agencies equivalent to Ministries, provinces, Vientiane Capital and other concerned sectors acknowledge, cooperate, and implement this Decree effectively and efficiently;

Article 4 This Decree shall enter into force on the date it is signed.

Government of Lao PDR
Prime Minister

(Signed and sealed)

Sonexay Siphandone

FOREWORD

The Government of the Lao People's Democratic Republic (Lao PDR) recognises the critical importance of climate change and its profound impacts on national socio-economic development and the livelihoods of our communities. In response, the nation has committed to international frameworks, including the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. We have proactively worked to address climate impacts by building resilience and adaptation capacity across the country through relevant legislation, notably the Decree on Climate Change and the National Strategy on Climate Change to 2030, which sets the ambitious objective of achieving net-zero emissions by 2050.

In recent years, Lao PDR has experienced significant climate change manifestations, including rising average temperatures, altered precipitation patterns, prolonged droughts, severe storms, and more frequent flooding. In 2009, Typhoon Ketsana caused national economic damage of approximately USD 94.2 million, affecting over 180,000 people across 30,000 households. Subsequently, in 2011, Typhoon Nok-Ten caused economic damage of approximately USD 200 million, resulting in 41 fatalities across 12 provinces. In 2018, Typhoons Son-Tinh and Bebinca caused severe flooding with catastrophic impacts on infrastructure, production, services, transportation, and communications. This amounted to USD 371.1 million in damages, equivalent to 2.1% of Gross Domestic Product. Additionally, climate projections also indicate that future impacts will intensify, with the severity and frequency of droughts and floods expected to exceed current levels.

The Ministry of Agriculture and Environment, as the national focal point for climate change coordination across all sectors, has therefore developed this National Adaptation Plan to enhance adaptive capacity, build resilience, reduce climate change impacts and risks, and to serve as a key reference for relevant sectors to integrate this national adaptation framework into their respective policies and programmes. It builds upon the 2009 National Adaptation Programme of Action (NAPA), incorporating findings from recent studies, research outcomes, and lessons learned from previous climate change initiatives. It reflects the unique characteristics, opportunities, current realities, and socio-economic development strategies of relevant sectors across different periods.

The formulation of a National Adaptation Plan (NAP) is therefore essential and of national importance. Its development has involved extensive consultations with a wide range of stakeholders, including central and local government entities, development partners, and international organisations. Through participatory approaches, it will serve as a foundation for implementing adaptation measures to reduce the adverse impacts of climate change. The NAP's objective is to reduce climate risks and vulnerabilities by strengthening adaptive capacity and resilience, and by integrating adaptation measures into existing and newly developed policies, programmes, and activities. This seeks to mainstream adaptive actions into relevant sectoral strategies and plans to achieve important aspirational goals for adaptation.

Importantly, it establishes medium- and long-term goals, objectives, and adaptation measures for nine priority sectors, including agriculture, forestry and land use change, public works and urban development, energy, water resources, health, education, tourism and labour and social welfare.

It serves as a comprehensive reference framework for ministries, government agencies, and stakeholders at both central and local levels to implement and integrate climate change adaptation into their annual plans, five-year development plans, and long-term strategies.

On behalf of the Ministry of Agriculture and Environment, I extend our sincere appreciation to the government, ministries, state agencies, central and local authorities, development partners, and international organisations for their invaluable technical and financial contributions to the formulation of the NAP. We look forward to your continued support and active engagement in the successful implementation of this important national initiative.

Vientiane Capital, Date: 12 SEP 2025

Minister

Dr. Linkham BOUANGSAVANH

Contents

Acronyms and Abbreviations

ADB	Asian Development Bank
BTR	Biennial Transparency Report
CBD	Convention for Biological Diversity
CCA	Climate Change Adaptation
CCAP	Climate Change Action Plan
CCKP	Climate Change Knowledge Portal
CCTWG	Climate Change Technical Working Group
CDP	Committee for Development Policy
COP	United Nations Climate Change Conference of the Parties
CSOs	Civil Society Organisations
DCC	Department of Climate Change
DEC	District Environmental Committee
DAE	District Office of Agriculture and Environment
DRR	Disaster Risk Reduction
EbA	Ecosystem based Adaptation
EIA	Environmental Impact Assessment
ENSO	El Niño Southern Oscillation
EPF	Environmental Protection Fund
EWS	Early Warning System
FAO	Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FDI	Foreign Direct Investment
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GGA	Global Goal on Adaptation
GGGI	Global Green Growth Institute
GGPF	Green Growth Promotion Fund
GHG	Green House Gas
GIZ	German Agency for International Cooperation
GNI	Gross National Income
GoLPDR	Government of Lao PDR
HAP	Heat Action Plan
HDI	Human Development Index
IEE	Initial Environmental Examination
INDC	Intended Nationally Determined Contribution
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
Lao DI	Lao Disaster Information
Lao WIS	Lao Water Information System
Lao PDR	Lao People Democratic Republic
LDCs	Least Developed Countries
LEGs	Least Developed Countries Expert Groups
LENS II	Second Lao Environmental and Social Project
LPRP	Lao People's Revolutionary Party
MAE	Ministry of Agriculture and Environment
MCT	Ministry of Culture and Tourism
MIC	Ministry of Industry and Commerce
MLSW	Ministry of Labour and Social Welfare
MoF	Ministry of Finance
MoES	Ministry of Education and Sports
MPWT	Ministry of Public Works and Transport
MONRE	Ministry of Natural Resources and Environment
MRC	Mekong River Commission
MRV	Monitoring, Reporting and Verifying
MTT	Ministry of Telecommunication and Technology

M&E	Monitoring and Evaluation
NAP	National Adaptation Plan
NAPA	National Adaptation Plan of Action
NbS	Nature based Solutions
NCCS	National Climate Change Strategy
NC	National Communication
NCCS	National Climate Change Strategy
NCM	National Coordinating Mechanism
NDC	Nationally Determined Contribution
NECCC	National Environment Committee
NGOs	None Government Organisations
NSCCC	National Steering Committee on Climate Change
NSEDP	National Socio-Economic Development Plan
NTFP	Non-Timber-Forestry-Products
PAIAPs	Provincial Adaptation Implementation Action Plans
PDNA	Post-Disaster Needs Assessment
PEC	Provincial Environmental Committee
PGA	Peak Ground Acceleration
POPs	Persistent Organic Pollutants
PPP	Private Public Partnership
RCP	Representative Concentration Pathway
RPB	Results-Based Payments
SDGs	Sustainable Development Goals
SEA	South East Asia
SEZ	Special Economic Zone
SNC	Second NC to the UNFCCC
TWGCC	Technical Working Group on Climate Change
UNCTAD	UN Conference on Trade and Development
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-Habitat	United Nations Human Settlement Programme
UNEP	United Nations Environment Programme
WFP	World Food Programme
WHO	World Health Organisation
WMO	World Meteorological Organisation
WWF	World Wide Fund for Nature

Executive Summary

Lao PDR is highly exposed to flooding and drought and is one of the most vulnerable countries in the region to the effects of climate change. These hazards are being induced by observable changes in climate patterns including higher than usual intensity rainfall events during the raining season and extended dry seasons. It is projected that Lao PDR will face temperature increases of 3.6°C by the 2090s against the baseline conditions over 1986–2005, under the highest emissions pathway (RCP8.5). Rises in annual maximum and minimum temperatures are also expected predicted to amplify pressure on human health, livelihoods, and ecosystems.

Increased incidence of weather extreme represents a major threat to human health, especially for outdoor laborers and, given rapid ongoing urban migration, potentially for urban populations as well. Without action, the population annually exposed to river flooding is projected to double to over 80,000 people by the 2030s. Other key climatic risks facing Lao PDR include landslides and epidemics, the former in particular often proves very destructive not only altering the landscape, fauna and vegetation, but also destroying public infrastructure, property, productive land, agricultural assets and harvests. These climate change impacts collectively lead to a decrease in agricultural production, food insecurity, water shortage, damage to infrastructure, loss of human life and biodiversity as well as increase health issues.

Therefore, the development of a National Adaptation Plan (NAP) is critical for the Lao PDR to serve as a foundation for implementing adaptation interventions in order to reduce the impacts of climate change. The NAP has established various adaptation measures covering both medium-term and long-term periods, whereby the NAP can be improved and further developed periodically based on the country's characteristics and contexts.

The agreed objectives of the NAP are to:

- reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience; and
- facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate.
- achieve national targets for climate change adaptation by 2035, following a green and sustainable direction.

The aforementioned program has established targets, objectives, and adaptation measures for both medium-term and long-term periods across 9 priority sectors, namely: agriculture; forestry and land use change; infrastructure and urban development; energy; water resources; public health; education; tourism; and labor and social welfare. This is aligned with the vision and development plans of the priority sectors and is expected to promote human resource development and efficient utilization of natural resources, biodiversity conservation, ecosystem services, resilience building, and low-carbon economic development. The NAP consists of five main parts, which are:

- **Part I – Context and Governance**: This section presents the overview and objectives of NAP process development, the overall context of the country such as economic, social, and development, policy-legislative and governance frameworks of various sectors related to supporting the implementation of climate change adaptation.
- **Part II – The Historical, Climate Projections, Vulnerability and Impacts**: This section provides comprehensive information on evolving climate conditions, including historical analyses of temperature and precipitation patterns from 1980 through to 2022, as well as projected climate scenarios for the periods 2021-2050 and 2051-2099. It presents a detailed assessment of climate risks and vulnerabilities, examining the impacts across various regions of the country. Furthermore, the section identifies key challenges and constraints facing the Lao PDR in implementing the NAP.
- **Part III – Strategic Adaptation Pathways and Priorities**: This section presents

ecosystem-based adaptation (EbA) approaches to adaptation planning and provides guidance on their integration into national planning frameworks. It demonstrates how these approaches contribute to climate change solutions, particularly in fulfilling Nationally Determined Contributions (NDCs), while ensuring alignment with international agreements and the Sustainable Development Goals (SDGs). Additionally, it identifies potential funding sources available to support the implementation of adaptation initiatives.

- **Part IV – Sectoral Priorities for Adaptation:** This section summarizes the strategies, objectives and adaptation measures of the priority sectors such as: agriculture, forestry and land use planning, public works and transport, energy and mining, education, water resources, public health, tourism, and labour and social welfare. It also presents their timeframe, supporting governance arrangements, indicators and targets needed for implementation and achievement.
- **Part V – Coordination Mechanism, Monitoring, Reporting and Review:** This last section delineates the roles and responsibilities of relevant sectors and establishes coordination mechanisms for effective implementation. It outlines comprehensive monitoring and reporting systems for the Lao PDR NAP, ensuring alignment with both national requirements and international obligations under the Paris Agreement on Climate Change.

Glossary

1) **Climate** – is usually defined as the 'average weather', or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period of time is 30 years as defined by the World Meteorological Organisation (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind.
2) **Climate Change** – means an increase in the average temperatures on Earth's surface, exceeding the normal temperature ranges in the long term, caused by direct or indirect human actions or by nature, and resulting in changes to atmospheric composition.
3) **Climate Change Adaptation** – refers to the process of adjustment by humans, animals, vegetation, ecosystems, infrastructure, and urban developments to build resilience to climate change and minimize climate impacts by implementing appropriate measures to reduce potential vulnerability, risk, and damage.
4) **Ecosystem-based Adaptation** – refers to the use of biodiversity, nature and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change.
5) **Vulnerability** – refers to sensitivity and inability to cope with the impacts of climate change.
6) **Climate Risk** – are additional (exacerbated) risks that people and their livelihoods and assets face due to climate change. These risks can be direct, such as in exposure to more frequent heat waves or floods; or indirect, such as when a drought negatively impacts food supplies (and prices) and in effect livelihoods and nutrition.
7) **Climate Extreme** – refers to the occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable. For simplicity, both extreme weather events and extreme climate events are referred to collectively as 'climate' extremes.
8) **Resilience** – means an ability to respond to impacts and restore to a normal situation by/of communities, societies, infrastructure, and ecosystems.
9) **Climate Modelling** – means using statistical analysis of physical, chemical, and biological datasets to research and study climate change, including periodic assessment and prediction of climate impacts.
10) **Climate Projection** – refers to the calculated response of the climate system to emissions or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based on simulations by climate models.
11) **Climate Scenario** – means a plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships and assumptions of radiative forcing, typically constructed for explicit use as input to climate change impact models.
12) **Greenhouse Gas** – mean gases, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro-fluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), that are emitted into the atmosphere from the natural environment or human actions and which result in global warming and climate change. Greenhouse gases are particularly emitted from fuel consumption, forest and land use changes, and waste production and disposition.
13) **Greenhouse Gas Emission** – refers to the release of GHGs into the atmosphere which is estimated from a unit of available activity data (e.g., tons of fuel consumed, tons of product produced) and absolute GHG emissions.
14) **Mitigation** – means the process of reducing greenhouse gas emissions and enhancing carbon sinks**.**
15) **Climate Finance** – refers to climate specific support and financial mechanisms for climate change mitigation and adaptation activities to enable the transitions towards low-carbon, climate-resilient growth and sustainable development through capacity building, technology transfer, and economic development.
16) **Impact** –refer to effects on natural and human systems of physical events, of disasters, and of climate change.

17) **Hazard** – refers to a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
18) **Disaster** – is a man-made or natural catastrophe that causes severe danger and extensive damage to health, life, assets, the economy and livelihoods of the people in society, both in short-term and long-term horizons.
19) **Drought** – refers to a phenomenon that exists when precipitation is significantly below normal recorded levels, causing serious hydrological imbalances that often adversely affect land resources and production systems.
20) **Flood** – refers to the overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas that are not normally submerged.
21) **Heatwave** – refers to a period of abnormally hot weather. Heatwaves and warm spells have various and, in some cases, overlapping definitions.
22) **Representative Concentration Pathway (RCP)** – refers to climate modeling scenarios that integrate comprehensive data on emission trajectories, atmospheric concentrations of greenhouse gases, aerosols, and chemically active gases, as well as land use and land cover changes. These pathways encompass different levels of greenhouse gas concentration scenarios: low emission scenario (RCP 2.6), moderate emission scenario (RCP 4.5), and high emission scenario (RCP 8.5).

PART I: CONTEXT AND GOVERNANCE

1. Introduction

The Lao People's Democratic Republic (PDR) is a landlocked country located on the Indochina Peninsula and in Southeast Asia Region with a total area of 236,800 km2, which borders the following countries: China to the north, Vietnam to the east, Cambodia to the south and Thailand and the Union of Myanmar to the west. Most of the people live in rural areas and engage in agriculture. The landscape is mostly plateaus and mountains that are higher than 500 m above sea level. Most of the plains are along the banks of rivers that flow from north to south, which are suitable for agriculture.

The weather in Lao PDR is divided into two distinct seasons, namely the rainy season starting from May to October and the dry season starting from November to April. The average annual rainfall is about 1,300 to 3,000 mm. The average temperature in the northern and eastern areas is around 20 degrees Celsius and for the plains, the average temperature is around 25 to 27 degrees Celsius. The mountainous area in the north with an altitude higher than 1,000 m above sea level, has a hot and humid climate, the average amount of rain is about 1,500 to 2,000 mm. The average temperature in this area is lower than other areas of the country. For the central plateau area with an altitude between 500 and 1,000 m above sea level, the climate is hot and humid and the average amount of rain is 2,500 to 3,000 mm, which is higher than other parts of the country. For the plains that cover the central and southern regions, there is an average rainfall of 1,500 to 2,000 mm.[1]

Lao PDR remains one of the most highly vulnerable countries to climate change, exacerbated by floods and droughts that are induced by observable changes in climate patterns, including in particular rising temperatures experienced over the past decades. Recognizing the importance of climate change adaptation, the Government of Lao PDR (GoLPDR) has formulated its National Adaptation Plan, known as a 'NAP', which builds upon the foundation laid by the National Adaptation Programmes of Action (NAPA), approved by the government in 2009, and implements the United Nations Convention on Climate Change (UNFCCC) under the Cancun Adaptation Framework, approved at the 16th Conference of the Parties (COP16) in 2010, emphasizing the formulation and implementation of a prioritized adaptation plan for the future.

The Lao PDR has developed this NAP according to the technical guidelines of the UNFCCC, which has determined an adaptation pathway direction that is green and sustainable, that shall be achieved through a participatory process that involves input and consultation from various sectors at both national and local levels to help determine the adaptation measures deemed necessary that align to existing climate relevant policies and strategies, such as the National Strategy on Climate Change towards 2030 and the Nationally Determined Contribution (NDC). The main objectives of the NAP are to:

- reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience; and
- facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate.
- achieve the strategic goal of climate change adaptation by 2035 through green and sustainable development pathways.

2. The Approach

The NAP process aims to support the National Strategy on Climate Change towards 2030, the NDC (2021[2]), the 9th Five-Year National Socio-Economic Development Plan (NSEDP) as well as the resolution of the National Assembly on adopting of the government's report on the implementation of the NSEDP for 2022 and the direction of the plan for 2023, No. 82/NA, dated December 30, 2022.

[1] GoL (2009). Lao PDR National Adaptation Programmes of Action (NAPA)
[2] due to be updated as version 3.0 by early 2027

The methodologies used in developing the Lao PDR's NAP importantly adhere to the guidelines set by the UNFCCC[3] and demonstrated in Figure 1. This involves adhering to internal national processes including a thorough review of relevant national climate policies, strategies, policy briefs, and other scientific reports, assess risks and vulnerability as well as prioritize the adaptation measures through extensive national consultation and inputs from various stakeholders, including government sectors at both central and local levels, as well as development partners, international organizations, civil society organizations, and the private sector. In addition, this includes the analysis and integration of gender and social inclusion (GESI) into the NAP formulation.

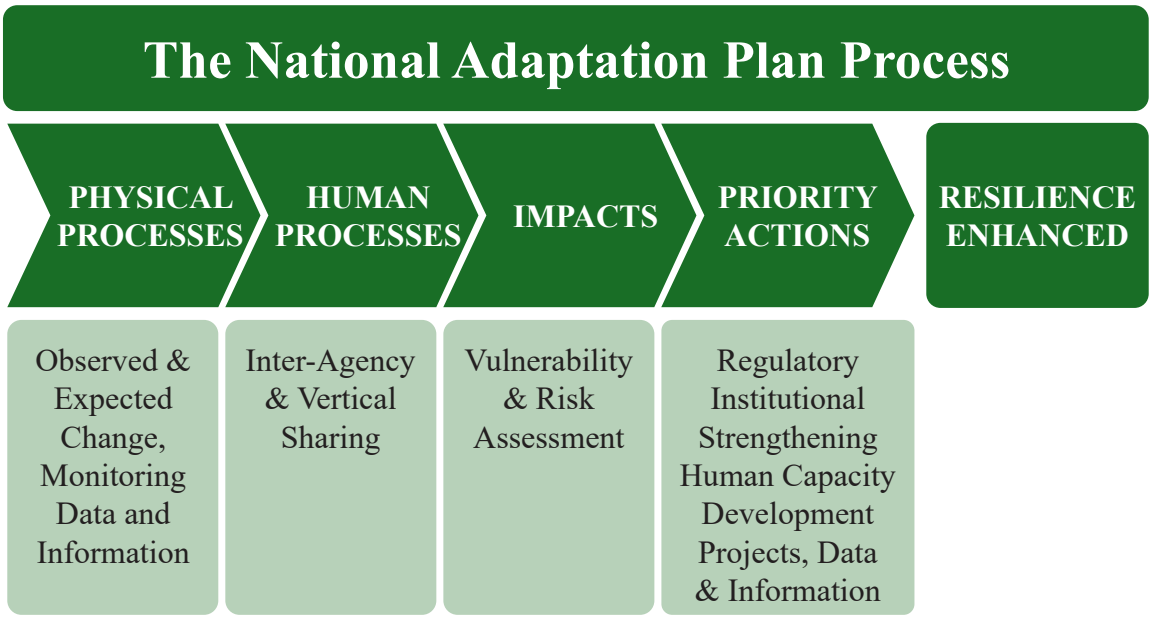


Figure 1: Overview of Lao NAP Process

3. National Context

3.1 Economic Profile

Over the past decade, Lao PDR has witnessed robust economic growth, bolstered by a surge in trade, investment, and regional connectivity, resulting in an average growth rate of 5.8% over the past five years.[4] Acknowledging this progress, the World Bank elevated Lao PDR's status from a low-income to a lower-middle-income country in 2011.[5] The country's 9th Five-Year National Socio-Economic Development Plan (2021-2025) suggests that if Lao PDR can sustain a growth rate of 6.5-7% from 2020-2030, it might attain upper-middle-income status into the next decade.[6] Furthermore, the United Nations has proposed that Lao PDR should graduate from its current Least Developed Country (LDC) status by 2026.[7] Table 1 below presents key macroeconomic indicators as reported in the 2023 Economic Report by the Bank of the Lao PDR. The data indicates that the Gross Domestic Product (GDP) reached 265,475 billion kip (at current prices), while per capita income achieved 1,832 USD. [8]

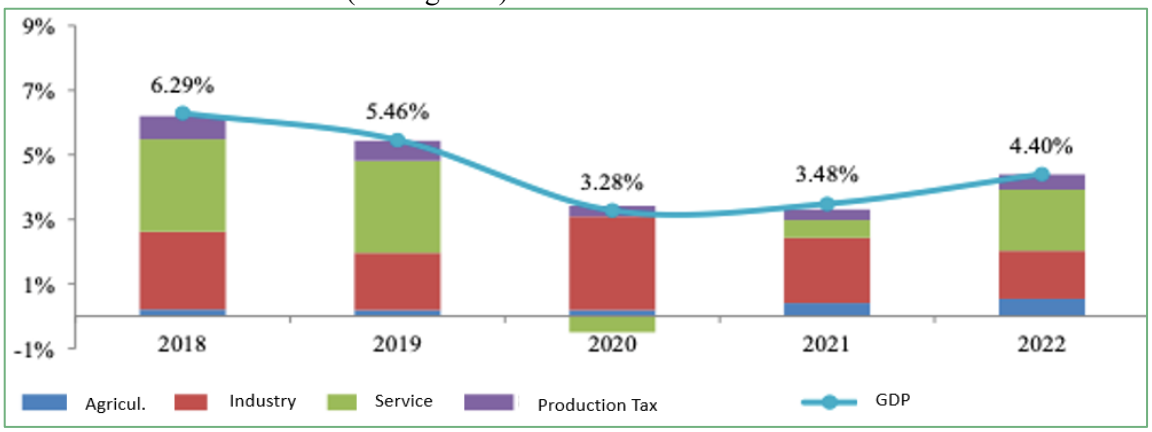
[3] The NAP was created under the auspices of the GEF funded project entitled, "Building the Capacity of the Lao PDR Government to Advance the National Adaptation Planning Process".
[4] Ministry of Planning and Investment, The 9th Five-Year National Socio-Economic Development Plan, 2021-2025), Vientiane: Ministry of Planning and Investment, (English version, 7 October 2021), p.9.
[5] https://www.worldbank.org/en/news/press-release/2011/08/17/lao-pdr-now-lower-middle-income-economy accessed on 30 June 2021.
[6] Ministry of Planning and Investment, The 9th Five-Year National Socio-Economic Development Plan, 2021-2025), Vientiane: Ministry of Planning and Investment, (English version, 7 October 2021), p.47.
[7] Ministry of Planning and Investment, The 9th Five-Year National Socio-Economic Development Plan, 2021-2025), Vientiane: Ministry of Planning and Investment, (English version, 7 October 2021), p.46; and https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/LDC_Profile_LaoPDR.pdf, accessed on 09 December 2021.
[8] Bank of Lao PDR (2023). National Economic Report

Table 1: Macro-economic indicators 2023

GDP (billion Kip)	265,475
GDP per capita (USD)	1,832
GDP growth	4.2%
Inflation rate, average consumer prices (Annual percent change)	31.23
General government gross debt (Percent of GDP)	74.15

Source: Economic Report, Bank of Lao PDR 2023

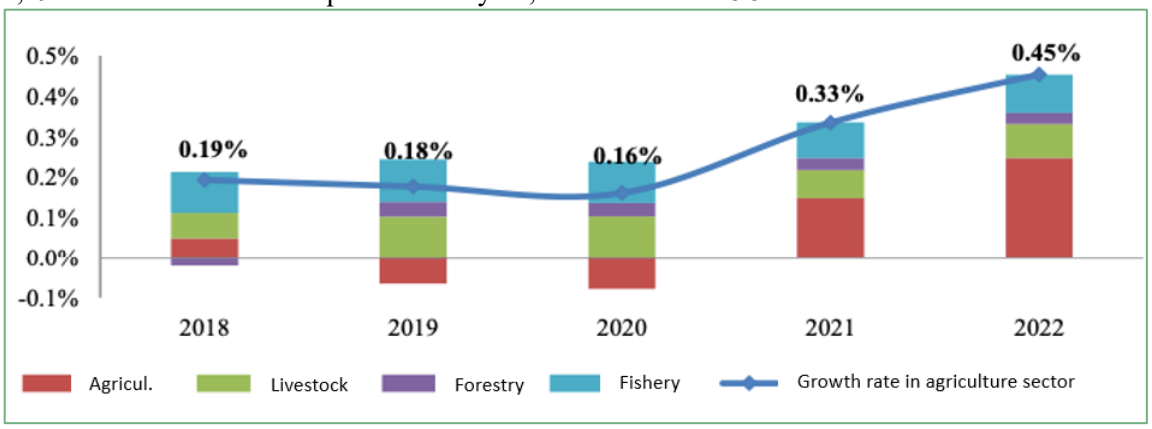
The economy of the Lao PDR, since 2022, is however within a recovery phase as a consequence of the effects of COVID-19 (when official national border opening took place) coupled with a focus on the implementation of the national agenda for solving the economic-financial difficulties (2021-2023), especially the promotion of potential production to replace imports. The promotion of exports created the conditions for gross domestic product (GDP) in 2022 to grow at the level of 4.4% from 3.48% in 2021 (see Figure 2).



Source: Lao National Statistics Bureau, MPI, 2022

Figure 2: Lao PDR GDP growth rate, 2018-2022

A primary economic sector of Lao PDR remains as being agriculture. This sector grew at the level of 3.4%, with a value of 38.436 billion kip in the year, which contributed 17.8% to the growth of the national economy, agricultural output reached 3.781.580 tons compared to last year, an increase of 3.3% (compared to the plan exceeding the plan by 2.2%). In addition, there are emerging industrial crops such as cassava that produced 4.8 million tons compared to last year, an increase of 31% (25% more than planned). The addition of crops such as coffee, sugarcane and high value crops such as rubber and cardomom has increased the sectors value accordingly. Compared to the export of plants and plant products in 2022, it is estimated that this will reach 1,294.4 million dollars compared to last year, an increase of 48.5%.[9]

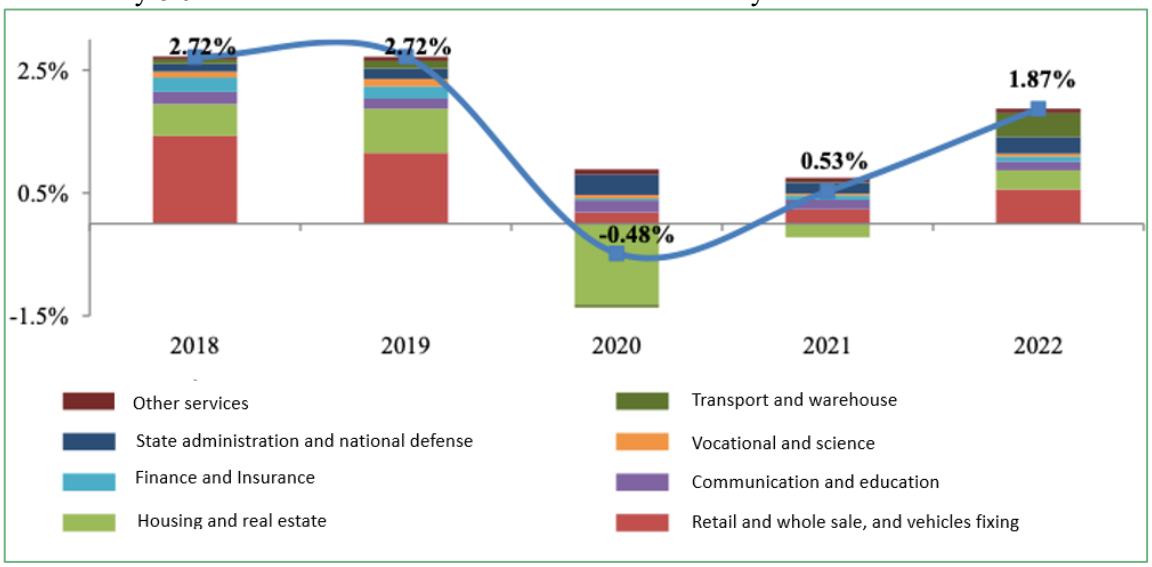


Source: Lao National Statistics Bureau, MPI, 2022

Figure 3: Growth rate of the agriculture sector from 2018-2022

[9] Bank of Lao PDR (2022). National Economic Report

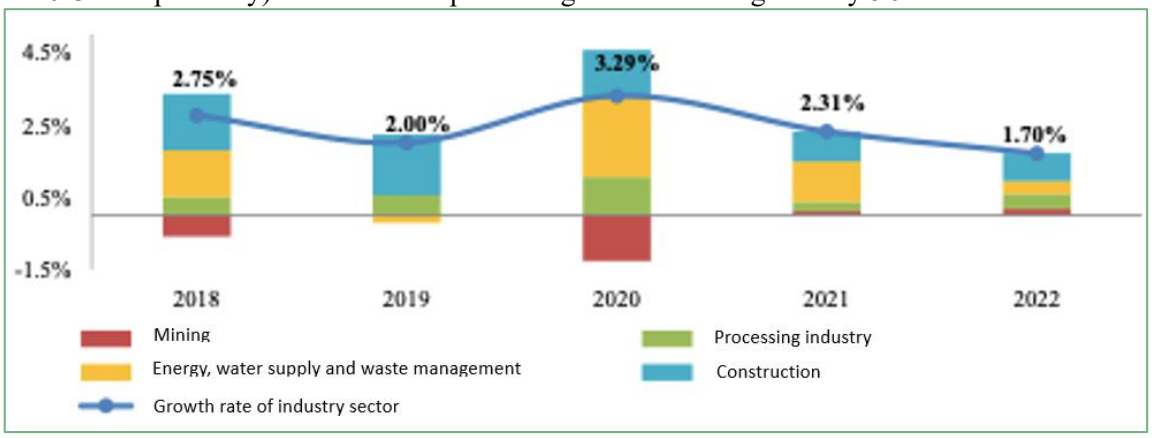
The service sector, more than any other, has interestingly grown at the level of 5% and now accounts for 37% of national economy growth since the post pandemic time (2022). Most notable is transportation-warehousing growth (up to 28.8%) which was boosted by transportation as a consequence of the Lao-China railway.[10] From a tourism perspective, there were 1,294,365 visitors who entered the country in 2022 after the official opening of the country. This number has slightly increased in comparison to 2021, resulting in accommodation, restaurants and wholesale-retail sales adjusted higher compared to last year whereby accommodation and restaurants increased by 8.6% whilst wholesale-retail sales also increased by 4.1%.



Source: Lao National Statistics Bureau, MPI, 2022

Figure 4: Growth rate of the service sector from 2018-2022

The industrial sector in 2022, however, is being affected by the increase in production costs and labor costs, which some small processing industries have stopped production, resulting in a decrease in the export of products, such as the production of electrical equipment parts, animal fat products, etc. The industrial sector also grew at the level of 4.4%, which covers 34% of the GDP. The reason for the growth of the industrial sector comes, in part, from enhanced electric power which has been created from locations including Nam Ngum Hydroelectric Dam, Se Phen-Se Nam Minh Hydroelectric Dam and Hongsa Thermal Energy Dam, followed by the construction of the National Highway Project No. 13, the Lao-Thai Bridge Friendship Project 5. The electric power industry, construction, mining and manufacturing industries are all growing by 2.7%, 7.2%, 2.8% and 9.3% respectively) whereas other processing industries has grown by 5.9%.[11]



Source: Lao National Statistics Bureau, MPI, 2022

Figure 5: Growth rate of the industrial sector from 2018-2022

[10] Bank of Lao PDR (2022). National Economic Report
[11] Bank of Lao PDR (2022). National Economic Report

3.2 Social Profile

The population of Lao PDR numbered approximately 7,123,000 people in 2019.[12] The 6th Household Consumption and Expenditure Survey 2018/2019 indicated that the total number of households in Lao PDR is circa 1,274,000 households whilst the average household size is 4.7 people per household. House numbers decreased by -8.8 percent in urban areas the size of households decreased by -8.1 percent, the household size in rural areas decreased by -8.4 percent, especially the rural areas with access roads decreased by -7.8 percent, while the average household size in areas without access roads was the same[13]. By region, the largest average household size is observed within the north and south, with the average inhabitant numbers being 4.9 people per household. Regional comparisons show that people living in the southern part of the rural area are higher than the remainder, accounting for 76.4 percent, the lowest area being in Vientiane Capital with 22.1 percent.

As for gender equality, progress has been made in advancing the status of women. The rights and opportunities of women and men are guaranteed equality according to the national constitution and the gender related laws, the forced and early marriage and discrimination and violence against women are prohibited by the laws.

For some geographic areas or ethnic groups, women and girls in Lao PDR have, however, limited access to various facilities, including access to social services, jobs and education. The main reason for this is because of social norms regarding gender roles and traditional practices that continue to be practiced in some areas. According to a 2022 report, literacy rates among women in impoverished households remain below 83.4 percent, compared to over 91.6 percent for men.[14] Though gender gaps are narrowing in Lao PDR, women still face challenges in accessing secondary education. That said, primary education attendance rates have significantly improved for both genders: in 2015, 80.6% of boys and 78.7% of girls were enrolled. However, early marriage and adolescent pregnancies, which are among the highest in Asia, remain a concern as these factors contribute towards higher dropout rates among young women and girls, creating obstacles to achieving secondary education.[15] (see Annex C for more details on the gender inclusiveness).

Based on the latest Household Expenditure and Consumption Survey (2018), the percentage of time spent on domestic work and unpaid care work is 46.2% (females: 48.9% and males: 37.2%). There are clear gender differences in unpaid care work and domestic work. Girls are generally expected to have more housework and caregiving duties than boys. This inequality and the family related responsibilities of girls have a significant impact on their lives as their remains an expectation on them to cook, clean, take care of siblings along with wider family related chores. These broad ranging responsibilities at a young age can limit opportunities for their education, as they may have less time for studies and extracurricular activities. In addition, the burden of unpaid care work can hinder girls' opportunities to pursue higher education or employment, as well as gender inequality and limit economic and social empowerment.

3.3 Development Profile

Since its establishment in 1975, Lao PDR has demonstrated consistent development progress, as indicated by its rating on the Human Development Index (HDI). In 2022, the country achieved a score of 0.620 on the HDI, ranking it 139th out of 193 countries and placing it within the medium human development category.[16] This marked a significant improvement from the year 2000 when the HDI score was just 0.471.[17] The Government of Lao PDR's (GoLPDR) primary objective is

[12] Lao National Statistics Bureau (2020), MPI – no further up to date statistics are available at present.
[13] The number of households in Lao PDR are mostly in rural areas accounting for 65.2 percent of all housing stock, nevertheless development or urbanization of the Lao PDR has certainly increased in recent years.
[14] UNES (2022). Literacy Report. https://countryeconomy.com/demography/literacy-rate/laos#:~:text=Laos%20it%20has%2C%20according%20publishes,%2C%20for%20females%20is%2083.37%25.
[15] World Bank Group.
[16] UNDP (2022). Human Development Report 2022: The Next Frontier—Human Development and the Anthropocene. https://hdr.undp.org/data-center/specific-country-data#/countries/LAO
[17] UNDP (2020). Lao PDR: Human Development Indicators. http://hdr.undp.org/en/countries/profiles/LAO

to transition from the status of a LDC to achieving upper-middle-income status by 2030. In 2021, the UN Committee for Development Policy (CDP) suggested that Lao PDR should graduate, proposing an extended preparatory period of five years. This effectively sets 2026 as the potential graduation year, provided the country maintains its positive development trajectory.[18]

In the broader context of human development, Lao PDR has made substantial strides over the past two decades. The country has managed to halve poverty to 23% and has successfully increased the overall literacy rate to 83%. There has also been a decline in infant and maternal mortality rates. However, progress in poverty reduction and human development is not uniform across all regions and ethnic groups.[19]

According to the 6th Household Consumption and Spending Survey 2018/2019, the trend of poverty in Lao PDR in many areas demonstrates that there are differences in various socio-economic factors related to poverty in 2018/2019 and including comparison to previous years. The survey indicated that the national poverty rate in 2018/2019 decreased to only 18.3 percent. Rural areas have the highest poverty rate, accounting for 23.8 percent, while the poverty rate in urban areas is at the level of 7 percent compared to 2012/2013. Also, the proportion of poor households shows that 13.5 percent of all Lao households remain poor. Among them, rural areas are higher than average and have a percentage of 18 percent.[20] The 2022 Human Development Report illustrates these human development indicators in Table 2.

Table 2: Key Human Development Indicators for Lao PDR

Life expectancy at birth, female (years)	71.1
Life expectancy at birth, male (years)	66.9
Mortality rate, infant (per 1,000 live births)	71.7
Maternal mortality ratio (deaths per 100,000 live births)	126
Literacy rate, adult (% ages 15 and older)	87.5
Mean years of schooling, female (years)	4.9
Mean years of schooling, male (years)	6.9
Population in multi-dimensional poverty, headcount (%)	23.1
Vulnerable employment (% of total employment)	70.7

Source: UNDP (2022)

As per the World Development Indicators 2022, the country experienced a significant reduction in poverty, from 33 percent of households in 2000 to 23.4 percent in 2010. There has also been a commendable improvement in reducing malnutrition and advancing health and educational outcomes. The estimated per capita income surged from $280 in 2000 to $2,450 in 2018, with the GNI per capita in PPP rising from $1,760 to $7,410. The sectors of health, education, and transport have been instrumental in poverty alleviation in Lao PDR.[21]

4. General Governance, Legal and Policy Framework

4.1 General Governance

4.1.1 Central Government

Lao PDR has a National Assembly as a legislative body that represents the rights and benefits of the Lao people. It is elected by the people and has the role of adopting the constitution and laws, agreeing on the fundamental issues of the nation and monitoring implementation of the

[18] UN (2021). Lao PDR is recommended to graduate from LDC in 2026. https://www.un.int/lao/news/lao-pdr-recommended-graduate-2026-least-developed-country-category-extended-preparatory-period
[19] Ministry of Planning and Investment & UNDP, 2017. National human Development Report: Graduation from Least Developed Country Status, Vientiane: Ministry of Planning and Investment.
[20] MPI (2020). The 6th Household Consumption and Expenditure Survey 2018/2019
[21] World Bank (2020). World Development Indicators database

constitution and laws of the government agencies.[22]

The GoLPDR is a state administrative body approved by the National Assembly that is responsible to both the National Assembly and the President. The administrative structure of the government consists of the Prime Minister, deputy prime ministers, ministers of ministries, ministers to the Prime Minister's Office, and chairpersons of ministry-equivalent organizations. The Prime Minister, appointed or removed by the State President with the National Assembly's approval, oversees the government and local administrations. The Prime Minister's Office functions as the government's secretariat, coordinating, examining, and summarizing government affairs and facilitating the operation of the government, the Prime Minister, and other organizations under the government's direct control.

The ministries and equivalent organizations serve as the government's secretariats, overseeing macro-management across their respective sectors nationwide. These entities comprise the ministry cabinets, equivalent organization cabinets, departments, divisions, institutes, and technical units, all of which are defined by the Prime Minister's decrees (Table 3).[23]

4.1.2 Local Government

State administration at a local level of Lao PDR known as local administration, is structured into a number of tiered entities within the Lao PDR: provincial, district, and communal levels (Table 3).[24]

Table 3: Structure of the public sector

Structure of the public sector	Number of entities
Central	There are 17 ministries and 2 ministry-equivalent organizations
Local	There are 17 provinces and 1 capital (Vientiane), 148 districts, and village groups (Communal).

Source: Constitution of Lao PDR (2025), Law on Local Administration (2025)

The primary role of local administration is to represent their respective localities and be accountable to the government for the administration of various aspects within their jurisdiction. These include political, socio-economic, and cultural affairs, human resource management, the use, conservation, and protection of natural resources and the environment, national and local defense and security, and responsibilities related to foreign relations as designated by the GoLPDR.

4.2 Regulatory and Policy Framework

4.2.1 Policy Framework

Since the 7th Five-Year National Socio-Economic Development Plan (NSEDP 2011-2015), the 8th Five-Year NSEDP (2016-2020), and the 9th NSEDP (2021-2025), these documents have incorporated climate change as a key goal of these plans, whilst in tandem they identify socio-economic development direction that is both green and sustainable. NSEDPs determine measures and conditions to build resilience and reduce the effects of climate change as well as promote green growth by investing with a focus on the green growth sector to promote diversity and turn to development based on a more circular economy. Moreover, they place the importance on climate change issues by reducing pollution, incineration of waste in the emission of greenhouse gases (GHG), along with determining strategies to cope with changes, prepare and respond to disaster and emergency events in a timely manner.[25]

[22] GoL (1991). Lao People's Democratic Republic's Constitution of 1991 with Amendments through 2015. (English translation). https://www.constituteproject.org/constitution/Lao_2003.pdf?lang=en
[23] GoL (2003). Law on Local Administration of Lao PDR. https://www.fao.org/faolex/results/details/en/c/LEX-FAOC173991/
[24] GoL (2003). Law on Local Administration of Lao PDR. https://www.fao.org/faolex/results/details/en/c/LEX-FAOC173991/
[25] GoL (2021). Lao PDR 2nd Voluntary National Review: Main Message.

Source: Lao PDR NSEDP, 2021

Figure 6: Outcomes of the 9th National Socio-Economic Development Plan (NSEDP)

https://sustainabledevelopment.un.org/content/documents/277122021_Main_Message_Lao_PDR.pdf. p. 1.

The GoLPDR has participated in the negotiation of the drafting of the United Nations Convention on Climate Change (UNFCCC) since 1990 and became a party to the Convention in 1995, the Kyoto Protocol on the Control of Greenhouse Gas Emissions in 2003 and the Paris Agreement on Climate Change in 2016.

Regarding climate adaptation, Lao PDR has set policies and developed important documents since 2009 that align to the framework of conventions and international agreements to which Lao PDR is a party. At the same time, climate change adaptation has been integrated into the national socio-economic development plan within each phase. This matter is now developed further as part of the following national strategy documents.

The **National Adaptation Programme of Action** (NAPA) was adopted in 2009, this plan established priority areas for climate change adaptation in the short term across various sectors. The action plan identified 45 projects aimed at building climate resilience in four priority sectors: agriculture, forestry, water resources, and public health.

In 2010, the **National Climate Change Strategy** (NCCS) was first promulgated to provide strategic direction for mainstreaming climate change considerations into the National Socio-Economic Development Plan, this framework encompasses seven key sectors: 1) Agriculture and Food Security, 2) Forest Resources and Land Use Change, 3) Water Resources, 4) Sustainable Energy and Transportation, 5) Industry with Environmentally Friendly Technology, 6) Sustainable Urban Development, and 7) Public Health.[26]

Building on the National Climate Change Strategy (2010), the **Climate Change Action Plan 2013-2020** was created in 2013. Its goal was to identify key initiatives, proposed projects and activities, and leading or responsible agencies. The action plan supplemented the strategy's vision and guiding principles with four key initiatives: 1) strengthening institutional and human resource capacities on climate change, 2) enhancing adaptive capability for coping with climate change, 3) reducing greenhouse gas emissions, and 4) strengthening education and raising public awareness about climate change.

The revision of the new **National Strategy on Climate Change-towards 2030** was recently endorsed in 2023.[27] This strategy aims to bolster capacity across several areas, including legal frameworks, institutions, technology, human and financial resources, economics, cooperation and coordination, research, information exchange, education, and climate change awareness. It outlines six primary objectives underpinned by three strategies and nine programs. These objectives include the effective integration of climate change mitigation, resilience, and adaptation into national, sectoral, and local policies, strategies, programs, and projects.

In 2020, the GoLPDR ratified the **National Disaster Risk Reduction Strategy (2021-2030).** This strategy aims to expand the application of the Disaster Management Law, enacted in 2019, and to execute regional and global disaster risk reduction policies and strategies. It takes into account various natural disasters including floods, droughts, landslides, fires, and disease outbreaks.[28] According to the strategy, the National Disaster Management Committee (NDMC) is required to be established at all levels in order to task with coordinating early warning, preparedness, emergency response, and recovery activities. In case of a severe disaster occurring, the NDMC has a role to collaborate and coordinate with the relevant line ministries, organizations, and local authorities, Provincial and District Disaster Management Committee (PDMC and DDMC) to respond to extreme events.[29] Moreover, the Disaster Management Fund has been established at all levels in response to the emergency events. This fund was set up according to the Decree on Disaster Management Fund approved by the national government in 2023.

Sectoral plans also are in existence, for example, Lao PDR has been working on the **National**

[26] GoL (2010). Lao PDR National Strategy on Climate Change
[27] GoL (2023). National Strategy on Climate Change (Revised)
[28] GoL (2020). National Disaster Risk Reduction Strategy to 2030: MLSW
[29] CFE-DM (2021). Lao PDR Disaster Management Reference Handbook

Forestry Strategy since 2005. This strategy categorizes forests into production, conservation, protection, regeneration, and degraded forests. It set goals for the forestry sector, such as stabilizing shifting cultivation by 2005, eradicating it by 2010, and improving forest cover and quality. Recognizing forestry as a key sector in addressing climate change in Lao PDR, the strategy aims to increase forest cover to 70% of the country's land area by 2025. This goal, intended to foster the development of carbon sinks and maintain it thereafter, is expected to mitigate the risk of floods, prevent land degradation, and reduce GHGs.[30]

Developed in 2015, the **Natural Resources and Environment Strategy 2016-2025** and **Vision 2030** emphasize the objective of *"green, clean, beautiful, rich in natural resources on the basis of green economic growth for sustainable development".*[31] This strategy establishes the overall direction and targets for 2025, as well as strategic plans for sustainable natural resource management, including land, water, wetlands, forests, biodiversity, and minerals. It promotes sustainable environmental quality in both urban and rural areas, enhances capacity to address climate change, and reduces the impacts of natural disasters.

The **National Green Growth Strategy toward 2030**, adopted in 2019, aims to integrate green growth into national, sectoral, and local planning, shifting Lao PDR's long-term development away from reliance on natural resources, particularly mining, forestry, and water resources, and graduating from the Least Developed Country (LDC) status, and becoming a developing country with high middle income according to the green-sustainable direction and achieving the Sustainable Development Goals (SDGs) in 2030.[32]

The **National Water and Water Resources Strategy**, approved in 2023, addresses water necessities, including the governance of fundamental water use. It outlines the government's direction and decision-making regarding water resource management, encapsulated in eight programs. These programs tackle key challenges in the water sector, such as integrated river basin management, water resources protection and restoration, groundwater management, and international cooperation, among others.[33]

The **National Housing and Urban Development Strategy**, approved in 2023 by the Ministry of Public Works and Transport (MPWT). The strategy underlines the necessity for city development and the establishment of urban development strategies at all levels, tying in with the national direction. It outlines objectives, policies, and programs for the urban sector, aligning with MPWT's long-term plans. The strategy aims to develop all urban areas, reduce the development gap between urban and rural areas, strengthen urban management authorities, and encourage civil society and private sector participation in urban development. It also generally addresses responses to climate change impacts in line with the SDGs.[34]

The Government of Lao PDR adopted the **National Action Plan on Gender Equality 2021-2025**. This action plan is designed to respond to gender issues, which covers several goals, such as the implementation of quotas to promote the participation of women and girls in various sectors, the plan also sets indicators on the number of participants, including female leadership positions in the field of climate change and disaster risk reduction, such as 30% of women have participated in the creation and implementation of national policies and programs on climate change, 30% of women are the MICbers of the national and local committees in disaster prevention, 40% of women have participated in disaster prevention and response training, and 50% of women have trained in energy-saving and sustainable agricultural technology.

4.2.2 Regulatory Framework

The country has ratified and is committed to numerous international conventions and frameworks,

[30] GoL (2005). National Forestry Strategy: MAF
[31] GoL (2016). Natural Resources and Environment Strategy 2016-2025 and Vision 2030: MAE
[32] GoL (2018). The National Green Growth Strategy to 2030: MPI. https://data.opendevelopmentmekong.net/dataset/e7db2aa8-c294-47dc-a2da-aa6e41493a12/resource/861b9f4c-cf6c-413b-aeff-e4f6b9346fd7/download/final_version_of_national_green_growth_strategy_english_feb_2019_.pdf
[33] GoL (2010). National Water Resources Strategy: MAE
[34] GoL (2023). Draft of the National Housing and Urban Planning Strategy

particularly those related to environmental and climate change matters. Among these, Lao PDR ratified all three **Rio Conventions**, namely, the **United Nations Framework Convention on Climate Change** (UNFCCC) in 1995, the **Convention on Biological Diversity** (CBD), and the **UN Convention on Combatting Desertification** in 1996. The country also committed to several other agreements that include the **Montreal Protocol** on Substances that Deplete the Ozone Layer, the Convention on International Trade in Endangered Species of Fauna and Flora, and the Stockholm Convention on Persistent Organic Pollutants (POPs).

With regards to climate change specifically, the GoLPDR ratified the **UNFCCC** in 1995 and the **Kyoto Protocol** in 2003. More recently, Lao PDR signed the **Paris Agreement** in 2016 and agreed to implement the **Intended Nationally Determined Contribution (INDC)** to reduce greenhouse gas emissions (GHG). As a result, the country is now dedicated to supporting global efforts to limit warming to 1.5°C and attain carbon neutrality by 2050.

Despite not having legally binding obligations under the Kyoto Protocol to reduce GHG emissions, Lao PDR is significantly impacted by climate change and is particularly vulnerable to natural disasters such as floods and droughts. Nonetheless, the country actively collaborates with other partners to mitigate GHG emissions. For instance, under the Protocol, Lao PDR completed the first and second GHGs inventory (**National Communication - NC**) and submitted them to the UNFCCC in 2000 and 2013, respectively. The government is also working on the third GHGs inventory, which they expect to finalize in 2025.[35]

The GoLPDR enacted the **Decree on Climate Change** in 2019, which is its first specific legal framework addressing climate change. The Decree outlines principles, regulations, and measures for climate change adaptation and mitigation.[36] It also emphasizes on the importance of the climate change mainstreaming into the national socio-economic development plan of sectors at all levels.

The **Law on Environmental Protection**, which was revised in 2024, No. 53/NA, dated March 28, 2024, establishes principles, regulations, and measures for the management, monitoring, protection, control, and restoration of the environment to ensure quality, reduce impacts and pollution caused by human activities or natural processes. This aims to achieve balance and sustainability between the social and natural environment, protect natural resources including public health, contribute to national socio-economic development, and mitigate global warming.[37]

In 2019, the country enacted its inaugural **Law on Disaster Management**. This legislation delineates principles and measures for efficient, effective, and contemporary disaster management. It prioritizes quick and clear dissemination of information and aims to minimize the impact of disasters on health, life, property, the environment, and infrastructure. It also outlines recovery, restoration, and rebuilding efforts following a disaster and links with the region and the international community to contribute to the socio-economic development in the green and sustainable manner and national security.[38]

The **Law on Meteorology and Hydrology** was updated in 2017. It outlines principles, regulations, and measures for managing and monitoring meteorological and hydrological activities. The law aims to reduce the impact of natural disasters on life and property and to ensure quick and accurate provision of information. It also facilitates regional and international cooperation and contributes to green, sustainable socio-economic development and national security.[39]

The amended **Law on Water and Water Resources** of 2017 provides a framework for managing, administering, protecting, and developing water resources. It also outlines measures for preventing water-related damage and restoring impacted areas. The law aims to ensure the quality, quantity,

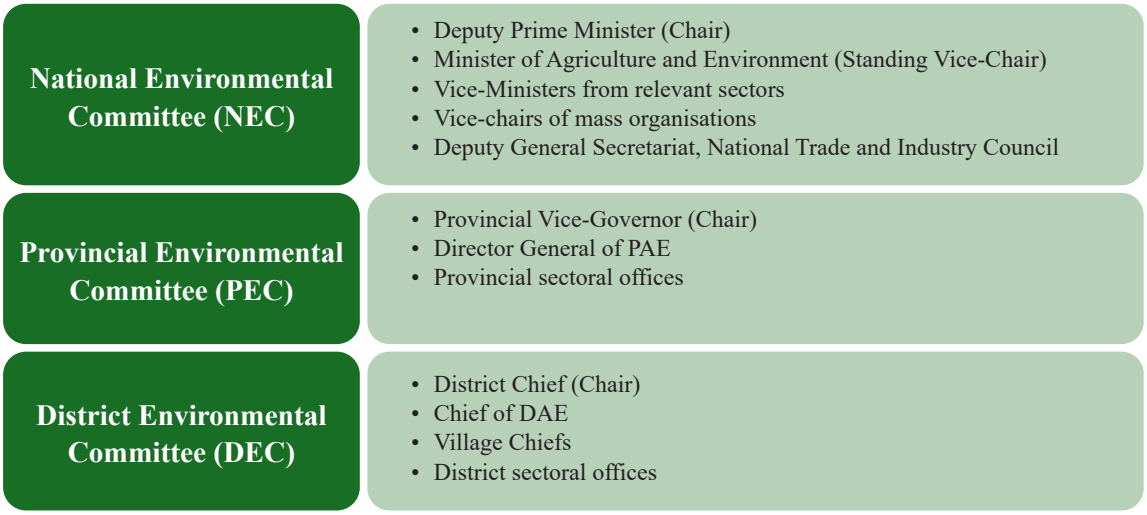
[35] MAE (2018). Biennial Update Report
[36] GoL (2019). Climate Change Decree. https://data.Lao.opendevelopmentmekong.net/dataset/decree-on-climate-change-lao-pdr-2019
[37] GoL (2024). Law on Environmental Protection
[38] GoL (2019). Law on Disaster Management
[39] GoL (2019). Law on Disaster Management. https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2021-03/DM%20Law%20Unofficial%20Translation.pdf

and sustainability of water resources to meet the needs of agricultural production, industry, and services. It also contributes to the protection of the natural and social environment, green and sustainable development, national security, and socio-economic development.[40]

Finally, the **Law on Lao Red Cross**, established in 2017, has the objective of providing first aid to disaster victims and those who are poor, destitute, disadvantaged, orphans, disabled, or residing in remote areas. It includes provisions for emergency rescue and assistance to victims of natural or human-made disasters as well as contributing to the socio-economic development and national security.

4.3 Institutional Framework for Climate Change

In 2009, the **National Environment Committee** (NEC) was established through Decree No. 162/PM, dated June 21, 2009, defining the roles, responsibilities, scope of rights, organizational structure and work plan of the NEC. It also defined the principles of implementation of work, coordination of decision-makers on environmental management related to many sectors at the center and coordination on the management, monitoring and solving of environmental problems effectively throughout the country. The NEC is composed of high-level representatives from various related sectors with the Deputy Prime Minister as the chairman of the committee, which have joint meetings as necessary to solve environmental problems. In addition, this committee has been established at the local level, including the provincial and district levels (see Figure 7).



Source: MONRE, 2009

Figure 7: Environment Committees at three levels

Currently, MAE is revising the NEC, although the strategic roles of the Committee remain unaltered and include the need to:

- Lead and guide the implementation of Party policies, laws, and regulations concerning the environment, climate change, water and water resources, and natural resources by developing them into detailed programs, plans, and projects for effective implementation during each period;
- Research and establish coordination mechanisms for environmental, climate change, water and water resources, and natural resources management in accordance with laws, the NSEDP, and relevant international conventions and agreements to which Lao PDR is a party;
- Study and review international conventions, treaties, protocols, declarations, and other relevant documents concerning the environment, climate change, water and water

[40] GoL (2017) Law on Water and Water Resources

resources, and natural resources for submission to the Government for approval, withdrawal, or cancellation;
- Coordinate and collaborate with ministries, agencies, local authorities, and all relevant stakeholders in implementing policies, strategies, action plans, laws, and regulations concerning the environment, climate change, water and water resources, and natural resources, and report to the Government periodically;
- Research and provide input on various policies, laws, and regulations concerning the environment, climate change, water and water resources, and natural resources;
- Guide environmental protection and restoration activities for both social and natural environments, raise awareness through education and training, and mobilize individuals and organizations both domestically and internationally to recognize the importance of social and natural environments for livelihood, and to strictly implement regulations, methods, and measures for environmental protection and climate change mitigation;
- Establish relations and cooperate with foreign countries, regional and international organizations to secure financial assistance, technical expertise, and exchange lessons learned to support the implementation of plans, programs, and projects concerning the environment, climate change, water and water resources, and natural resources;
- Promote, monitor, and inspect the implementation of environmental, climate change, water and water resources, and natural resources management at both central and local levels nationwide;
- Summarize and report on activities related to the environment, climate change, water and water resources, and natural resources to the Government periodically;
- Perform other duties as assigned by the Government.

At the national level, MAE oversees the management of agriculture, forestry, natural resources and environment, including land, water, air, biodiversity, climate change, and meteorology and hydrology. Specifically, MAE's responsibilities in relation to climate change include setting up coordination mechanisms among various ministries and development partners at both national and local levels. They are tasked with enhancing the policy and regulatory framework for climate change, designing and executing projects to secure funding, and monitoring and evaluating climate programs. Moreover, they are responsible for building capacity from the central government down to local levels. MAE is structured with 18 departments, along with 18 provincial offices and 148 district offices.[41]

MAE is the key player in implementing the NAP development process. The Department of Environment is a key department within MAE, specifically tasked with addressing climate change.[42] The Department's mandate spans topics including monitoring, promoting, evaluating, and reporting on climate change implementation, including the development and preparation of the NCCS, the NDC, NCs, and the NAP.

The Department also serves as the national focal point for climate change actions with various agencies and stakeholders at all levels, including the Ministry of Finance, Ministry of Industry and Commerce, Ministry of Public Works and Transport, Ministry of Education and Sports, Ministry of Health, academic institutions, CSOs, International Organizations, private sectors, and local governments.[43] The specific roles and responsibilities of the various stakeholders involved in the NAP process are detailed in Annex A.

[41] MAE (2022). MAE Mandates (These include: The Cabinet office, Personnel Dept., Inspection Dept., Planning and Finance Dept., Legislation Dept., Land Development, Water Resources Dept., Environment Dept., Natural Resources and Environmental Monitoring Dept., Meteorology and Hydrology Dept., and Climate Change Dept., Natural Resources and Environmental Research Institute, Lao National Mekong River Committee Secretariat, Environmental Protection Fund). http://www.MAE.gov.la/index.php/2018-07-09-15-05-58/2018-07-09-15-09-11

[42] World Bank (2014). Lao PDR Strengthening Institutional Capacities for Resilient Recovery: Country Case Study Series Disaster Recovery Framework Guide

[43] MAE (2022). Lao PDR NAP Roadmap

4.4 Alignment to the International Processes

4.4.1 Paris Agreement

Lao PDR ratified the Paris Agreement on climate change on April 22, 2016. The aim of the Paris Agreement is to reduce climate risk vulnerability, build resilience, finance development, and support humanitarian responses that bolster resilience. Lao PDR has committed to the Paris Agreement through the implementation of its NDC (2021), aiming to reduce GHG emissions. The country is steadfast in its efforts to limit the global average temperature increase to no more than 2 degrees Celsius, and preferably to 1.5 degrees Celsius, while establishing the goal of achieving net-zero greenhouse gas emissions by 2050.

4.4.2 Sendai Framework

The Sendai Framework, adopted at the Third United Nations World Conference on Disaster Risk Reduction in Japan, 2015, serves as a comprehensive 15-year global blueprint for bolstering the world's resilience against natural disasters.[44] The Framework seeks to substantially reduce disaster-related risk and potential losses affecting lives, livelihoods, health, and the economic, physical, social, cultural, and environmental assets of individuals, businesses, communities, and nations. This plan replaces the Hyogo Framework for Action (2005-2015) which focused on building the resilience of nations and communities to disasters.[45] In addition, the United Nations Organization for Disaster Reduction (UNDRR) has also adopted a gender action plan to support the implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030. This action plan supports governments and other stakeholders to reduce the negative impacts of gender discrimination and inequality in disasters.

In 2015, Lao PDR committed to the Sendai Framework for Disaster Risk Reduction (DRR). As the first significant agreement of the post-2015 development agenda, the Sendai Framework offers Member States tangible measures to shield their developmental progress from disaster risks. This Framework aligns with other 2030 Agenda accords, such as The Paris Agreement on Climate Change, The Addis Ababa Action Agenda on Financing for Development, the New Urban Agenda, and the SDGs.[46]

This NAP is primarily aligned with the first three priority areas of action under the Sendai Framework. These areas include understanding disaster risk, strengthening disaster risk governance, and investing in DRR.

1) The NAP aligns with the priority of understanding disaster risk by advocating for comprehensive data and information collection. This includes recognizing the distinct impacts of environmental and climate events on various social groups and emphasizing data usability.
2) The NAP aligns with the priority of strengthening disaster risk governance at all levels, supporting DRR mainstreaming efforts through its emphasis on both horizontal and vertical integration. It advocates for the incorporation of DRR into development planning processes and calls for the creation of sub-national disaster management plans for emergency situations.
3) The NAP operationalizes key aspects of the Sendai Framework, primarily through investing in DRR to bolster the resilience of national priority areas. Responsibilities for DRR are distributed among stakeholders and governments at all levels.4.4.3 Sustainable Development Goals (SDGs)

For Lao PDR, all 18 SDGs are applicable to various challenges, but only eight align with this NAP, as detailed in the subsequent table.[47]

[44] PreventionWeb.net. Chart of the Sendai Framework for Disaster Risk Reduction 2015-2030. https://www.preventionweb.net/files/44983_sendaiframeworkchart.pdf
[45] UNISDR. Sendai Framework for Disaster Risk Reduction. https://www.unisdr.org/we/coordinate/sendai-framework
[46] UNDRR (2023). Sendai Framework for DRR. https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030
[47] UN (2015). Agenda 2030 for Sustainable Development. https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

Table 4: SDG and NAP relevance

SDG No.	Description of the NAP Relevance
Goal 1: End poverty in all its forms everywhere	The NAP generally supports efforts to achieve Goal 1 in 2030 which is to end poverty in all its forms. Its implementation will support efforts to ensure that all low-income and otherwise disadvantaged groups have equal rights to economic resources, as well as access to financial and basic services.
Goal 2: End hunger achieve food security and improved nutrition and promote sustainable agriculture	The NAP support efforts to achieve Goal 2 which is to end hunger, achieve food and nutrition security, and promote sustainable agriculture. This will be predominantly achieved through the section on food and nutrition security.
Goal 3: Ensure healthy lives and promotes well-being for all, at all ages	The NAP supports efforts to achieve Goal 3 which is to ensure healthy lives and promote well-being for all at all ages. It will achieve this through the section on health which supports efforts to reduce the spread of tropical diseases and non-communicable diseases.
Goal 5: Achieve gender equality and empower all women and girls	The NAP supports efforts to achieve Goal 5 which is to achieve gender equality and empower all women and girls. The NAP will achieve this as gender was a key consideration during the prioritisation process.
Goal 6: Ensure availability and sustainable management of water	The NAP generally supports efforts to achieve Goal 6 which is to ensure availability and sustainable management of water and sanitation for all. It will achieve this through its infrastructure section and the sub-section on water and sanitation. I
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization	The NAP supports efforts to achieve Goal 9 which is to build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation. It does this predominantly through its section on infrastructure.
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable	The NAP is expected to have substantial benefits regarding efforts to achieve Goal 11 which is to make cities and human settlements inclusive, safe, resilient, and sustainable.
Goal 13: Take urban action to combat climate change and its impact	The NAP has obviously substantial benefits and leads government efforts to achieve Goal 13 which is to take urgent action to combat climate change and its impacts including building resilience and strengthening adaptive capacity to deal with climate-related hazards in all levels as well as integrating climate change adaptation into central and local sector policies, strategies and plans.

Source: Authors

PART II: THE HISTORICAL AND CLIMATE PROJECTION AND VULNERABILITY STORY

1. Historical and Current Climate Baseline

1.1 Temperature

Temperature variations are apparent in different part of the country. These correspond directly to altitude, with an average decrease of 1.7°C for every 300 meters. In the northern and eastern mountainous areas and the plateaus, the mean annual temperature is 20°C. Conversely, the plains experience higher temperatures, averaging between 25-27°C. The mountainous areas, especially in the northern provinces of Lao PDR, have a lower average temperature than the plain areas in the southern part of the country. The lowest temperature will be found in the north and high areas along the Vietnam border in the provinces of Borikamxay, Khammouan, Savannakhet, Saravan and Sekong (see Figure 8).[48]

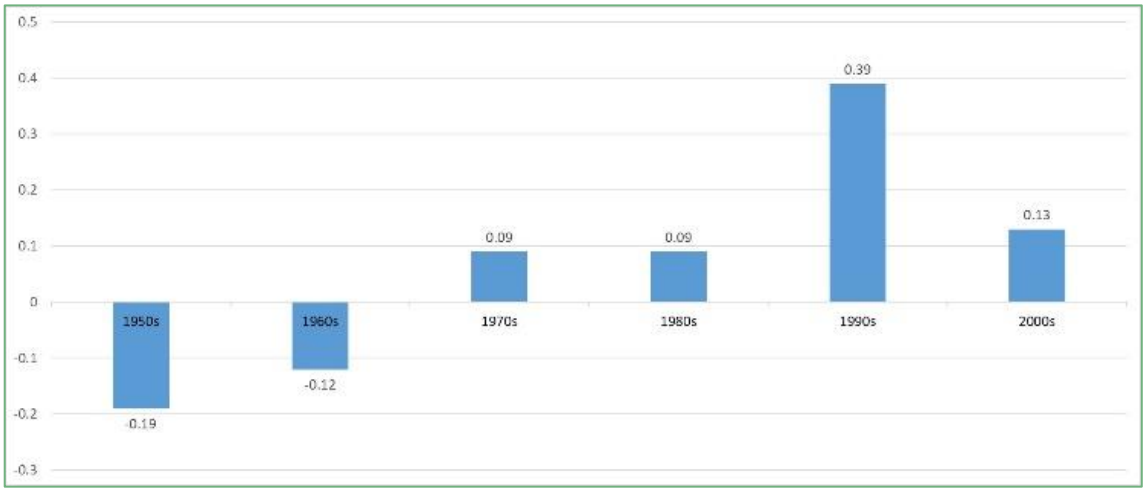
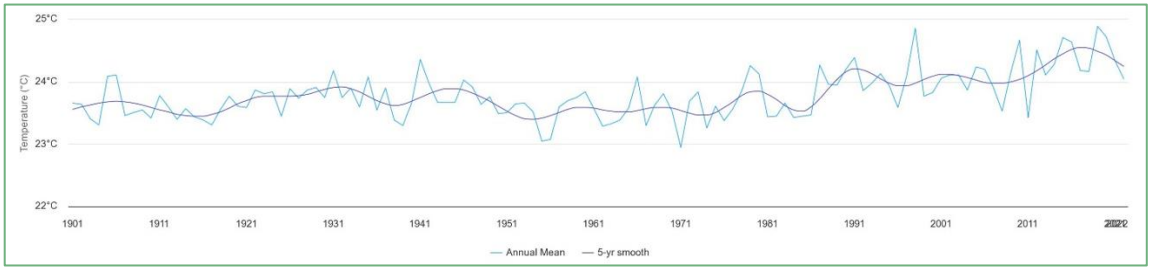


Figure 8: Temperature Average (1950s–2000s)

Temperatures reduce between December and February which represent the coolest months whereas the warmest months are typically April and May, with an average temperature of 26°C. January, the coldest month, has average temperatures as follows: Luang Prabang at 20.5°C (with a minimum of 0.8°C), Vientiane at 20.3°C (with a minimum of 3.9°C), and Pakse at 23.9°C (with a minimum of 8.2°C). By contrast, the average temperatures in April, the hottest month, are as follows: Luang Prabang at 28.1°C (with a maximum of 44.8°C), and Vientiane at 39.4°C.[49]

According to the World Bank, the temperature of Lao PDR has increased about 1°C over the past century. Specifically, during the period from 1901 to 1985, average temperatures did not exceed 24 degrees Celsius. However, from 1985 to 2020, temperatures increased significantly, surpassing 24 degrees Celsius (Figure 9).

[49] ADB (2023). Climate Risk and Vulnerability Assessment: Climate-friendly Agribusiness Value Chains Sector Project



Source: FAO, MONRE and MAF (2022)

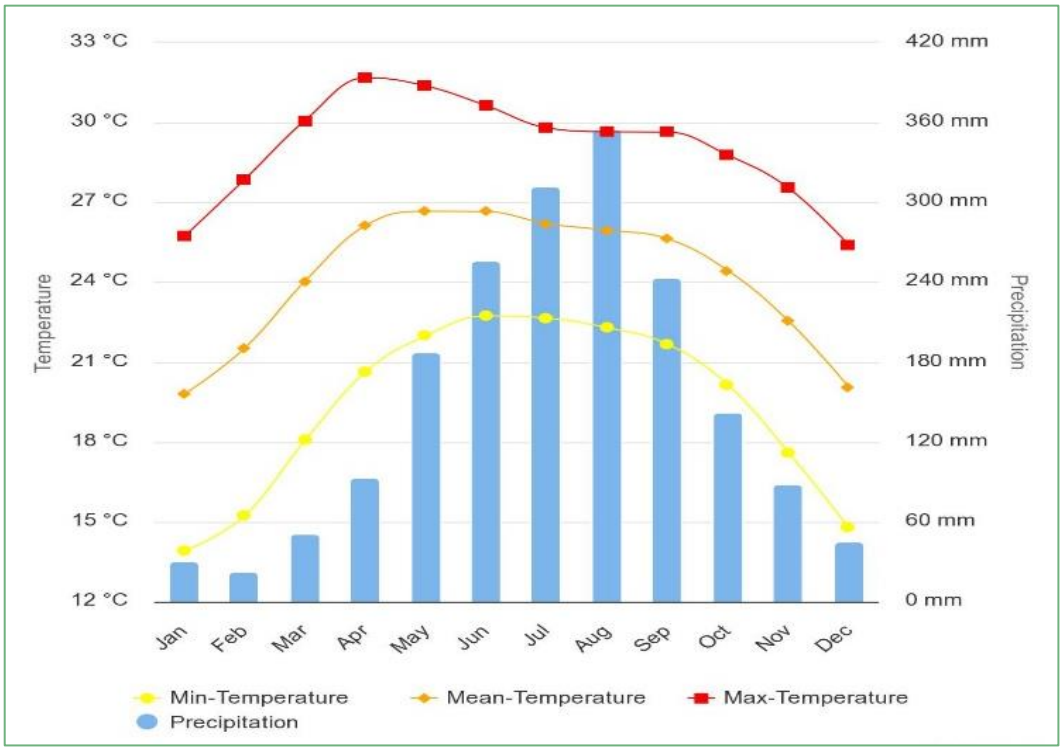
Figure 9: Average temperature trends in the 21st century of Lao PDR (1901-2022)

1.2 Precipitation

Lao PDR's geographical positioning fosters a tropical monsoon climate, heavily influenced by the southeast monsoon. This monsoon brings approximately 70% of the annual rainfall and high levels of humidity. The country experiences two primary seasons: the rainy, or monsoon, season, from May to mid-October, and the dry season, from mid-October to April.[50]

Considering the country's altitude, Lao PDR is categorized into three distinct climatic zones:

1. The northern mountainous areas, situated above 1,000 meters (m) in altitude, have a temperate and hilly sub-tropical climate. This region is relatively dry and cooler compared to the rest of the country, with an average rainfall between 1,500 to 2,000mm.
2. The central mountainous areas in the Annamite Chain, with an altitude ranging from 500 to 1,000 m, are characterized by a tropical monsoonal climate. These areas experience high temperatures and receive an average annual rainfall of 2,500 to 3,500 mm.
3. The tropical lowland plain and floodplains have an average annual rainfall of 1,500 - 2,000 mm. This region, along the Mekong River and its main tributaries, is home to more than 50% of the population.[51]



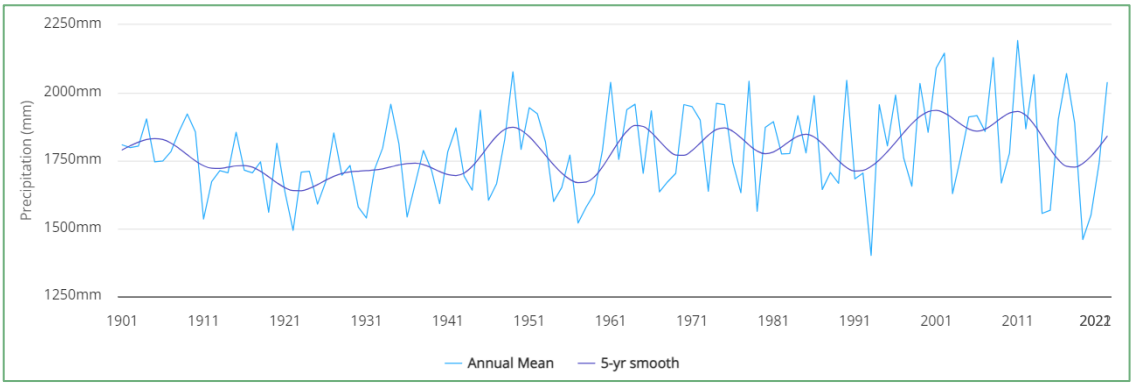
Source: Department of Meteorology and Hydrology, MONRE (2022)

Figure 10: Monthly climatology of min-, max- and mean- temperature and precipitation 1991-2020

[50] Climate Research Unit (CRU) of the University of East Anglia. Average Monthly Temperature and Rainfall for Lao, People's Democratic Republic from 1901-2015. 2017. World Bank. http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisCCode=LAO

[51] Lao PDR (2013). Second National Communication to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/Laonc2.pdf

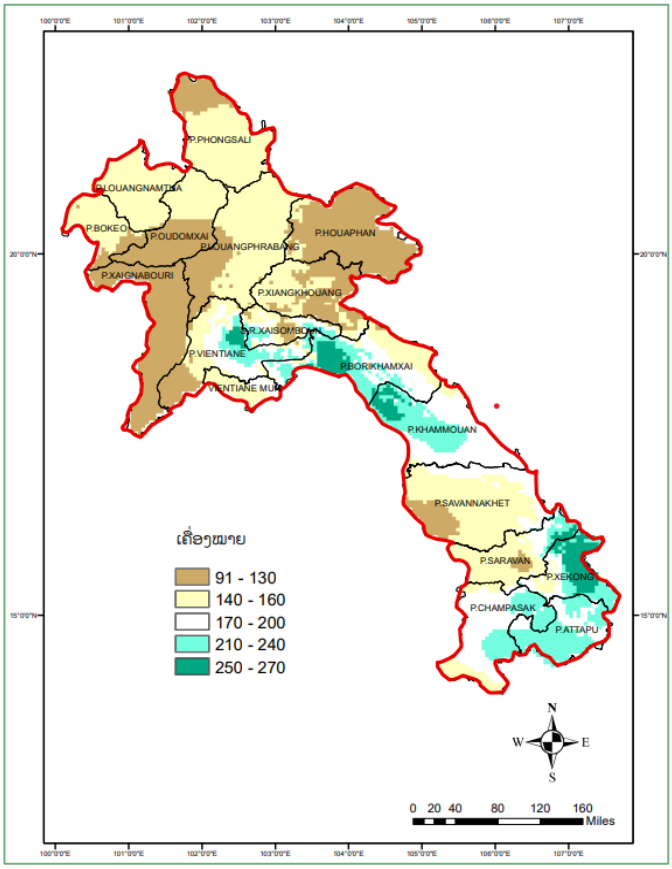
Rainfall data from 1901 to 2022 shows an increasing trend in rainfall. During the period 1961-1985, the average amount of rain is about 1850 mm/year (100 mm higher than previous years). The amount of rainfall was less than 1750 mm/year in the 1990s. However, the amount of rainfall increased greatly in the years 2001-2011 to about 1900 mm/year (Figure 11).



Source: World Bank

Figure 11: Rainfall Average (1901-2022)

Figure 12 shows that in the central part (Vientiane Province, Xiengkhouang Province, Xaysomboun Province, Borikhamxay Province and Khammouan Province) and in the South (Champasak Province, Sekong Province and Attapeu Province), the average rainfall is higher than 2,500 mm/year during 1980-2022. However, in the next 30 years, the amount of rain is predicted to increase between 10 mm/year and more than 30 mm/year in the southern provinces of Lao PDR along with rainfall increases within the provinces of Sekong, Attapeu, Champasak and part of it is along the border with Vietnam in Khammouan and Saravan provinces.



Source: MONRE, 2022

Figure 12: Rainfall Average (1980-2022)

2. Regional Trends (South East Asia)

The Mekong River Commission (MRC) predicts the following changes in the forthcoming decades: a rise in temperatures throughout the Basin in all seasons; a decrease in rainfall by 16-17% by 2060; a reduction in agricultural yields compelling changes in farming practices, irrigation, and technological improvements; a decline in hydropower production; limited navigation during the dry season, especially in the upper Mekong; increased occurrences of washouts and landslides damaging roads and other infrastructure; loss of plant and animal species; and soil erosion.[52].

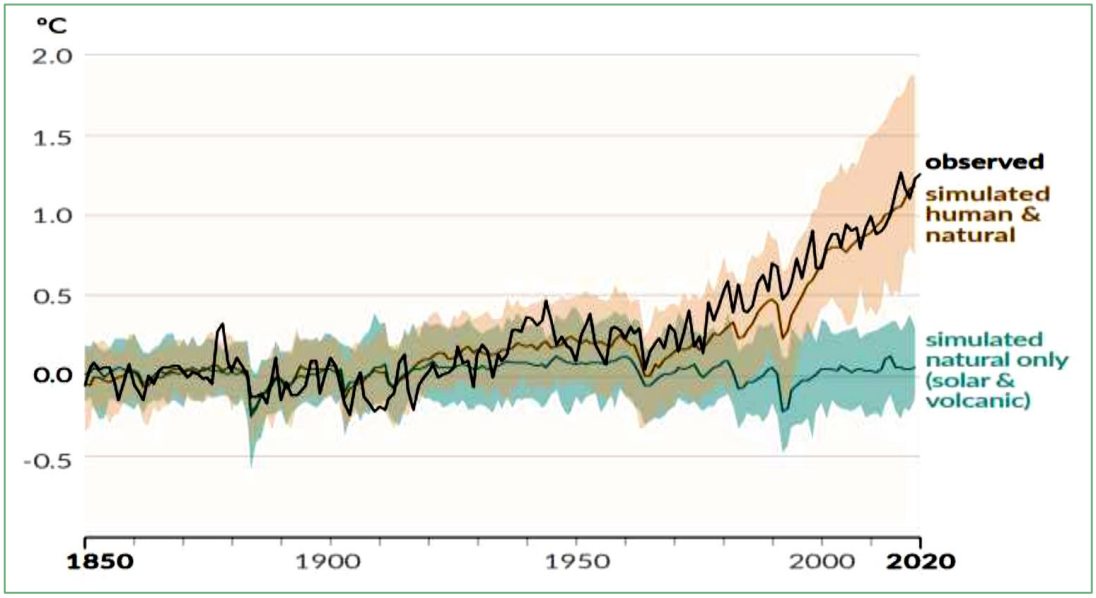
Such predicted rises in temperatures, along with changes in rainfall, floods, and storms, are already causing significant damage to homes, infrastructure, crops, and fisheries across South East Asia (SEA). Consequently, vulnerable communities are having to contend with food shortages and reduced livelihoods. When considering the projected alterations to the average climate in SEA, it's crucial to note that natural climate fluctuations, such as monsoon patterns, exert a significant influence on the climate from year to year.

The 6th Assessment Report of the IPCC outlines key climate changes for the SEA region:

- **Temperature:** There has been a noticeable increase in the mean surface temperature since 1900. The trend of more frequent heat extremes is anticipated to persist in the upcoming decades (high confidence).
- **Precipitation:** The region will see an increase in average and heavy rainfall (high to medium confidence).
- **Monsoons:** Southeast Asian monsoon precipitation is predicted to rise in the long term (medium confidence).
- **Flooding:** Higher flood levels will result from the combined effects of climate change, land subsidence, and local human activities (high confidence).
- **Storms:** While there hasn't been a significant long-term trend in the overall number of tropical typhoons, the region has experienced fewer but more severe tropical cyclones.[53]

The AR6 report[54] provides an estimated increase in temperature of 2.5°C to 4°C, demonstrating high confidence in these figures. This is a narrower estimate compared to the 1.5°C to 4.5°C range projected in the AR5 report. Figure 13 illustrates the current alterations in global surface temperature (annual average) as observed and simulated from 1850 to 2020. It is important to note that even if global temperatures stabilize at an average rise of 1.5°C to 2°C above pre-industrial levels, numerous regions, SEA included, can expect a surge in extreme rainfall events and severe droughts.[55]

[52] Mekong River Commission (2020). Climate Change. Mekong River Commission for Sustainable Development. http://www.mrcmekong.org/our-work/topics/climate-change/
[53] ADB (2023). Climate Risk and Vulnerability Assessment: Climate-friendly Agribusiness Value Chains Sector Project
[54] The analysis uses projections and illustrations from the World Bank's CMIP5 and CMIP6 Multi-Model Ensemble models, which include specific alterations in temperature, rainfall, and extreme events for both Lao PDR and the Greater Mekong Subregion. These projections draw from the most recent 6th Assessment Report (AR6) issued by the International Panel on Climate Change (IPCC).
[55] ADB (2023). Climate Risk and Vulnerability Assessment: Climate-friendly Agribusiness Value Chains Sector Project



Source: AR6 Report, 2021

Figure 13: Change in global surface temperature (annual average) as simulated (1850-2020)

With regards specifically to heat wave conditions over Lao PDR, a humid heat-wave with a 0.5% chance of occurring in any given year (1 in 200 years) is now 2.3°C hotter in heat index. An event of the same magnitude as the observed heat-wave would have been extremely rare in a 1.2°C cooler climate and hence it would have been virtually impossible to have occurred without climate change. These trends will continue with further warming. They are stronger for the rarer event over Lao PDR where a heat-wave like the recent event in April 2023.

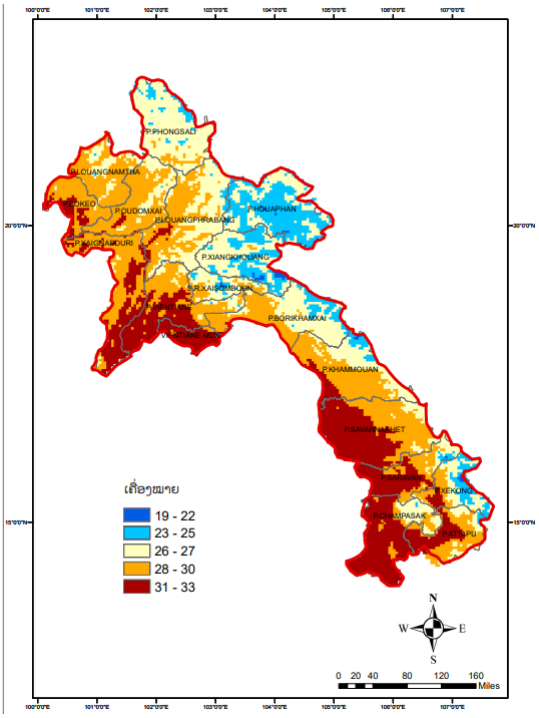
3. Future (Projected) Climate Change Scenarios

3.1 Temperature

A. Temperature Trends under RCP2.6

Climate change caused by an increase in GHG's originating from human development activities has caused the global temperature to rise over the past several years or global which entails severe climate-related disasters such as: storms, floods, droughts, forest fires, rising sea levels and others that have affected the ecological system and living things that rely on this system as a main source of food including socio-economic development.

According to forecasts predicted by the Department of Meteorology and Hydrology (DMH), MAE and the Department of Agricultural Land Management, (within MAE) that the average maximum temperature and minimum temperature over the next 30 years shows an increase in temperature in each part of the Lao PDR. As a result, the dry season will be longer each year than before, which may lead to changes in the planting season. Especially in the north, the maximum temperature will increase between 0.4°C-0.8°C and the minimum temperature will increase by more than 0.8°C (Figure 14 and 15).



Source: DCC and DMH, MONRE 2022

Figure 14: Max temperature trend over the next 30 years

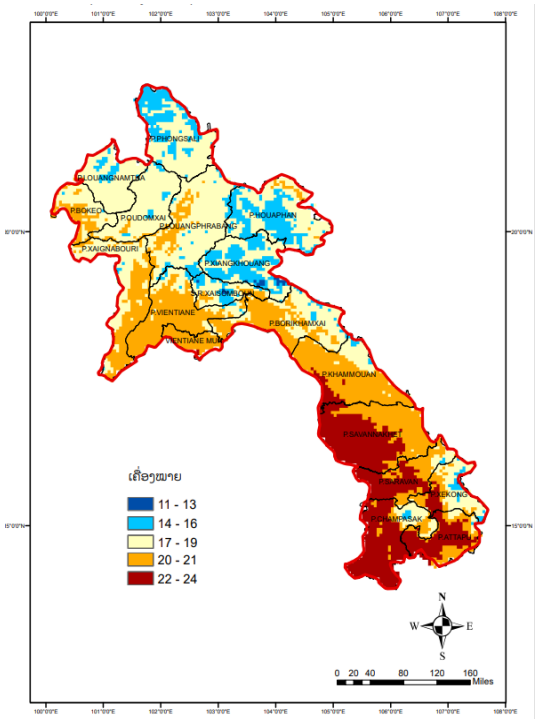


Figure 15: Min temperature trend over the next 30 years

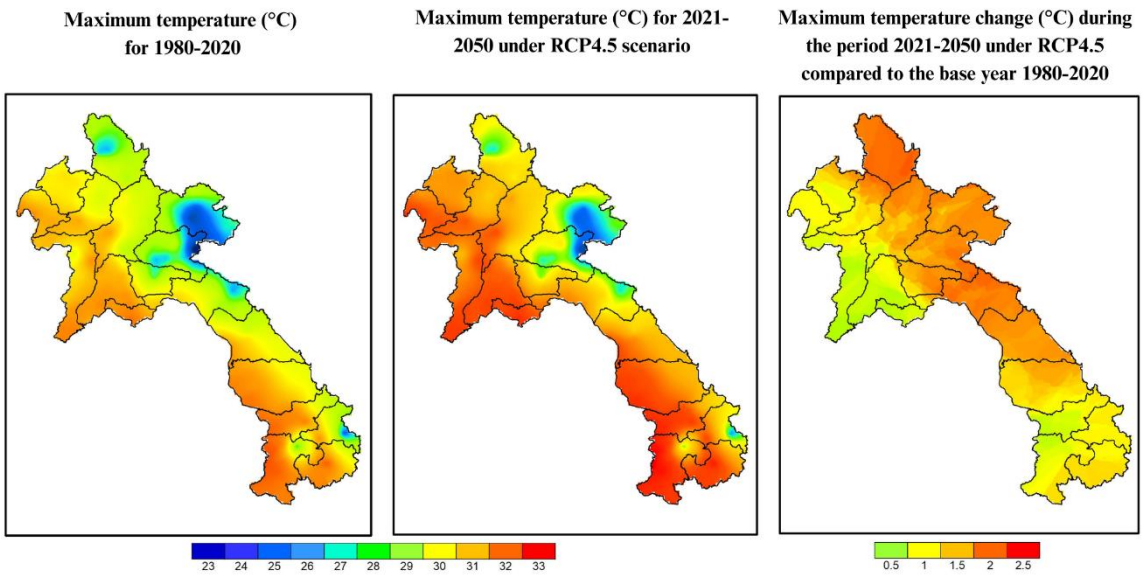
B. Temperature Trends under RCP4.5 and RCP8.5

According to the Lao PDR Historical Climate Change, Vulnerability and Projection Report, future temperatures are expected to increase further, especially the eastern Provinces will experience increased temperature in both the short-term (2021-2050) and long-term (2051-2099) under both RCP 4.5 and RCP 8.5 scenarios.[56]

Under the RCP 4.5 scenario, for the short-term (2021-2050), the average maximum temperature will increase from 0.98 to 1.35 °C, and the northern part of the country will experience an increase of the temperature in comparison with the southern part (Figure 16). In the long-term (2051-2099) or 2080s, the average maximum temperature will increase from 2.0 to 2.65 °C, and it will increase more in the northern part of the country in comparison with the southern part. Luang Prabang, Phongsaly and Huaphan province, for example, the temperature could rise up to 2.65°C (Figure 17).

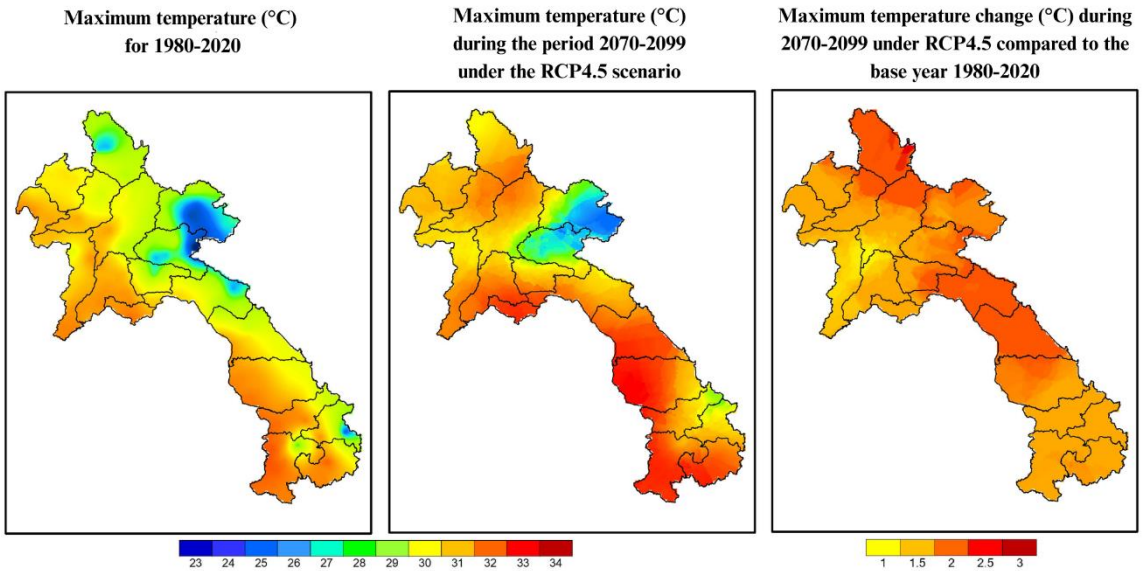
Under RCP 8.5 scenario, the average maximum temperature will increase from 1.2 to 1.6 °C in the short- term (2021-2050), and it could go up to 1.6 °C for Phongsaly province (northern Lao PDR - see Figure 18). In the long-term (2051-2099), the average maximum temperature will increase from 3.55 to 4.5 °C, and it will increase more in the north part of the country in comparison with the south part. In Phongsaly and Huaphan provinces, for example, the temperature could rise up to 4.5°C (Figure 19).

[56] MAE (2016). Lao PDR Historical Climate Change, Vulnerability and Projection Report



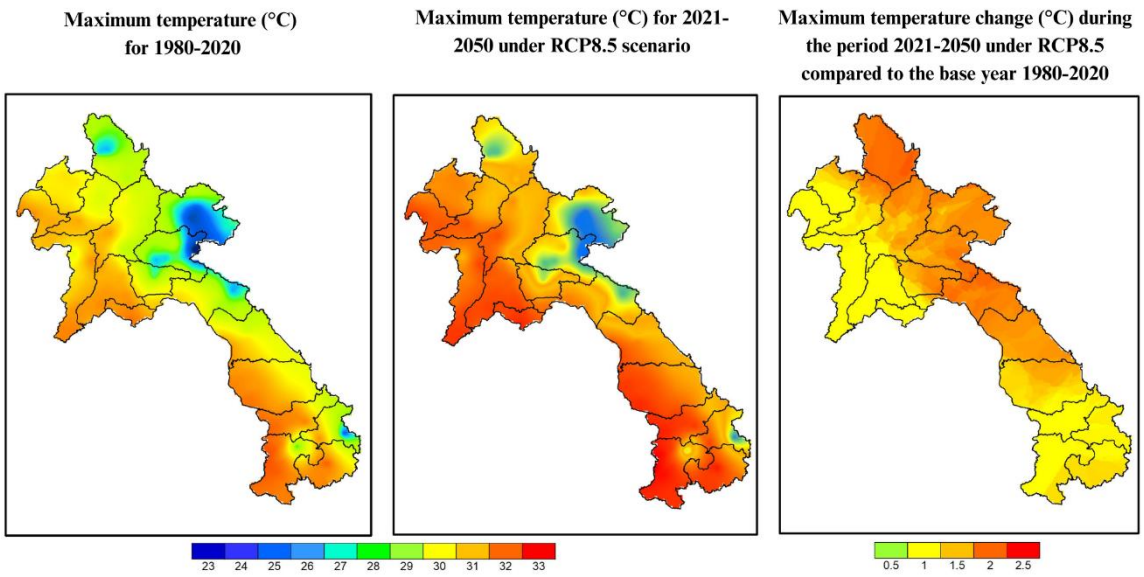
Source: MAE, 2025

Figure 16: Change in Maximum temperature between Observed (1980-2020) and Projected for short-term (2021-2050) under RCP 4.5



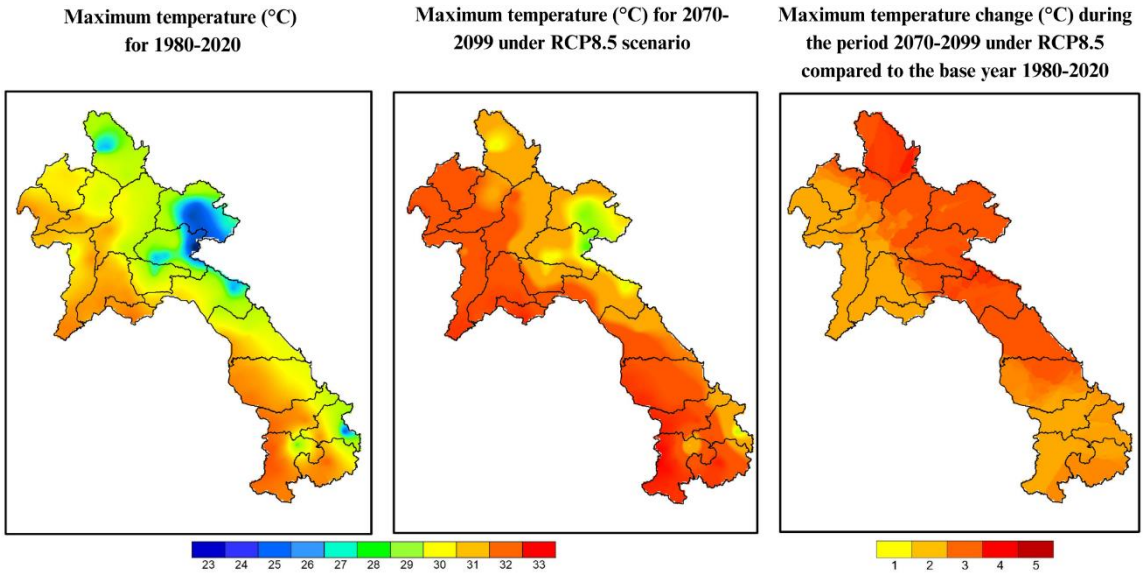
Source: MAE, 2025

Figure 17: Change in Maximum temperature between Observed (1980-2020) and Projected for long-term (2051-2099) under RCP 4.5



Source: MAE, 2025

Figure 18: Change in Maximum temperature between Observed (1980-2020) and Projected for short-term (2021-2050)-RCP 8.5

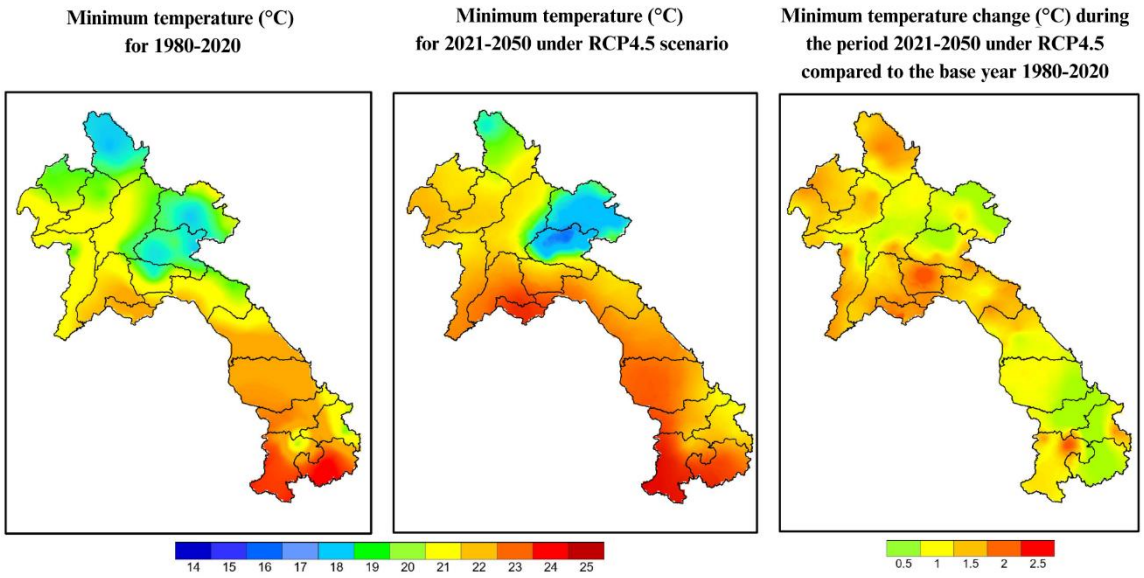


Source: MAE, 2025

Figure 19: Change in Maximum temperature between Observed (1980-2020) and Projected for long-term (2051-2099) RCP 8.5

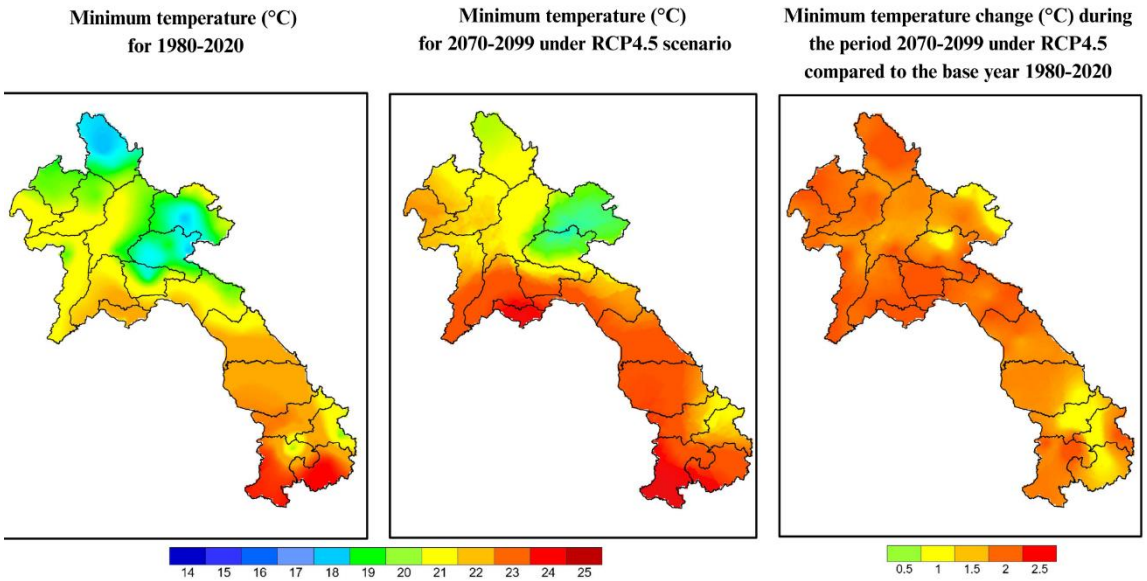
Regarding the minimum temperature under RCP 4.5, the projection showed that the temperature increases from 1.05 °C to 1.4 °C in several provinces including Phongsaly, Luang Namtha, and Bokeo province for short-term (2021-2050) in comparison with the baseline 1980-2020 (Figure 20). Under RCP 4.5, the change of minimum temperature increases from between 1.45 °C to 1.55 °C for the north (e.g., Phongsaly, Luang Namtha, Bokeo, Oudomxay, and Xayabouly provinces) and between 1 °C to 1.15 °C for the south (Salavan and Xekong provinces). In the long-term 2051-2099, the minimum temperature increases 2.4 °C to 2.5 °C for the northern part and 2 °C to 2.2 °C for the southern part (Figure 21).

In the short-term (2021-2050) under RCP 8.5, the average minimum temperature increases around 2.0 °C to 2.5 °C in several provinces including Phongsaly, Luang Namtha, and Bokeo province (Figure 22). Under RCP 8.5, the change of minimum temperature ranges from between 1.45 °C to 1.55°C for the north and between 1.2 °C to 1.5 °C for the south (Salavan and Xekong province). In the long term RCP 8.5, 2051-2099, the temperature increases to 4.4 °C, which occurs in Phongsaly and Huaphan provinces (Figure 23).



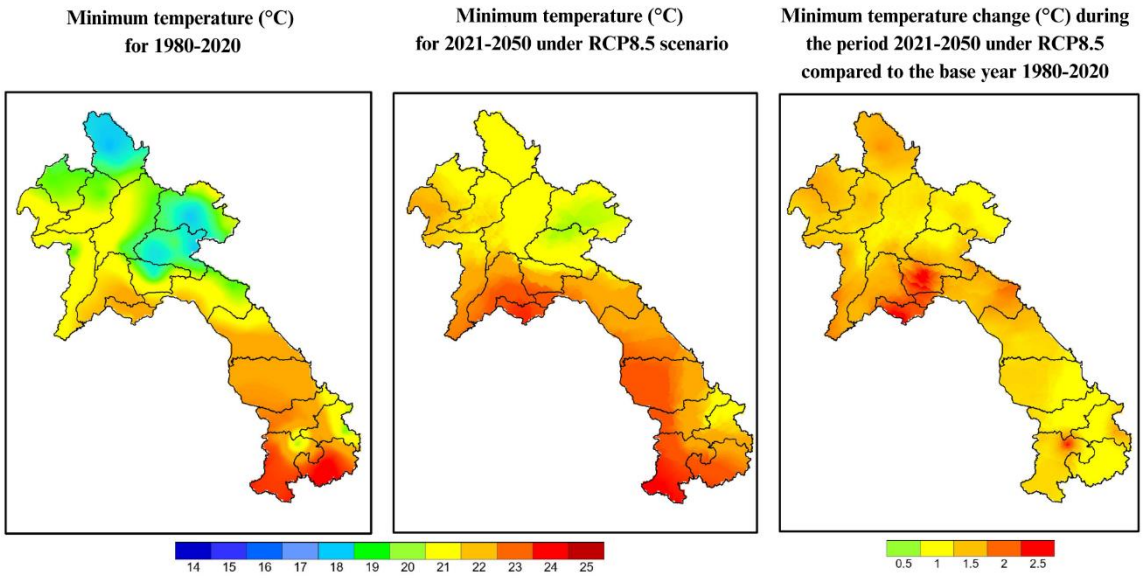
Source: MAE, 2025

Figure 20: Change in Minimum temperature between Baseline, Observed (1980-2020), and Projected for short-term (2021-2050) RCP 4.5



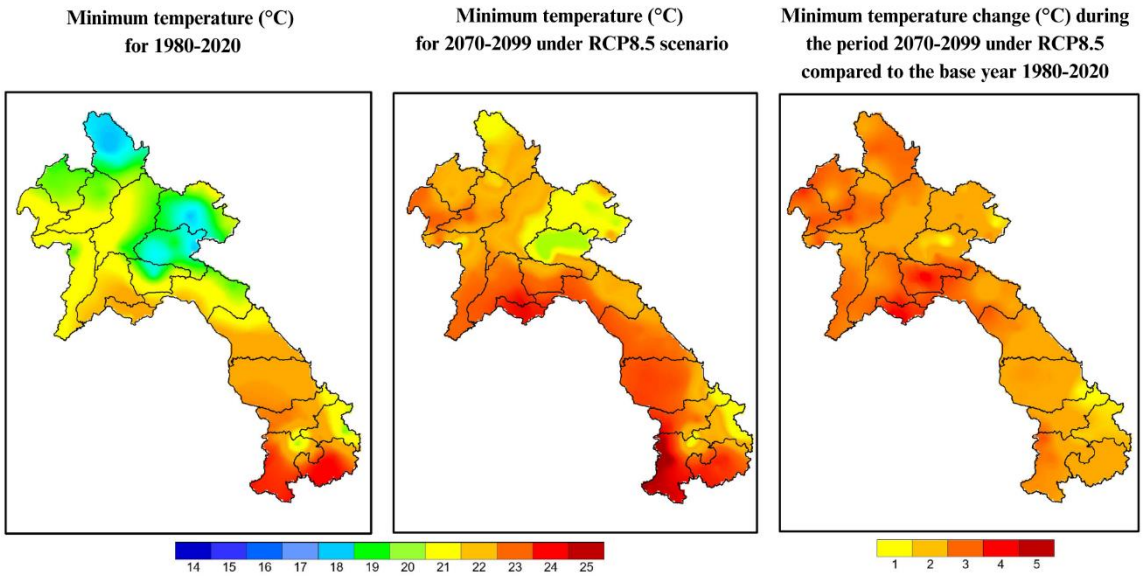
Source: MAE, 2025

Figure 21: Change in Minimum temperature between Baseline, Observed (1980-2020), and Projected for long-term (2051-2099) RCP 4.5



Source: MAE, 2025

Figure 22: Change in Minimum temperature between Baseline, Observed (1980-2020), and Projected for short-term (2021-2050) RCP 8.5



Source: MAE, 2025

Figure 23: Change in Minimum temperature between Baseline, Observed (1980-2020), and Projected for long-term (2051-2099) RCP 8.5

C. Climate projection results conducted by the project

Climate change projections for Lao PDR has been conducted by the Walker Institute (under a contract led by WSP Ltd in 2024), as part of the *"Building the Capacity of the Lao PDR Government to Advance the National Adaptation Planning Process"*. The objective of the assessment was to provide downscaled climate change information across three future periods, 2025 to 2050, 2051 to 2075 and 2076 to 2100, for six provinces of Lao PDR, including Phongsaly and Oudomxay (north), Xiengkhouang and Khammouane (centre), and Champasak and Xekong (south) as illustrated in Figure 24.

Source: Walker Institute, 2023

Figure 24. Regions used in the self-organising maps analyses, the South (green rectangle) and the North (red rectangle).

Note: the star shapes locate the six provinces for which downscaled analyses have been prepared. Champasack (red star), Sekong (yellow star), Khammuane (purple star), Xiengkhouang (white star), Oudomxay (brown star), Phongsaly (grey star).

The first stage of the process was to obtain background information for 6 provinces (WSP contracted to work on 6 Provinces only namely Champasack, Sekong, Khammuane, Xiengkhouang, Oudomxay and Phongsaly). This presented a basic summary of results according to the IPCC AR5 and AR6 (see "Summary of IPCC Projections") plus a review of local climates. The work used the ERA5 re-analysis data set (see "Provincial Climate in Lao PDR based on ERA5 data").

Climate change projections for each Province were then created for 2025 to 2050, 2051 to 2075 and 2076 to 2100 to assess recorded changes in climate values between 1980 and 2020. The approach used was designed to simplify information from the substantial range of climate change projections used by the IPCC whilst retaining much of the information on the uncertainties involved.

A background climatic assessment of each of the six Provinces was produced using the ERA5 data sets for 1980 to 2020. This ERA5 is acknowledged generally as providing the highest quality global data available and hence offers the most reliable data for use within this NAP. Climate Change projections were then obtained from the global models within the CMIP5 dataset as this is used primarily in the IPCC AR5 and downscaled using regional climate models in the CORDEX data set.[57]

The main results on temperatures obtained from the analysis were:

[57] WSP (2024). Historical, Climate Projection and Climate Risk and Vulnerability Assessment: *Building the Capacity of the Lao PDR Government to Advance the National Adaptation Planning Process*

1) Maximum temperatures have increased over 1980 to 2020 across all Provinces in general by a little over 1ºC;
2) Increases were similar in both seasons except for a likely higher increase in the Monsoon Season in the north;
3) Rises by late century in the Monsoon Season according to the highest-likelihood Scenarios A, compared with 1980 to 2020, will be about 1.0ºC under RCP2.6, 2.0ºC to 2.5ºC under RCP4.5, and 3.0ºC to 4.0ºC under RCP8.5;
4) Equivalent figures for the Dry Season are about 0.5ºC in the south and 1.0ºC in the north under RCP2.6, about 2.0ºC in the south and 2.5ºC in the north under RCP4.5, but about 4.0ºC in the south compared to 3.5ºC in the north under RCP8.5;
5) The frequencies of hot days (>=30ºC) will increase, more so in the Monsoon Season;
6) There may be a slight reduction in frequencies of hot days late in the century associated with reducing temperatures under RCP2.6;
7) Frequencies of hot days increase more under higher emissions;
8) Greatest increases in terms of additional hot days are estimated as likely to occur in the Monsoon Season in the north, but in the south in the Dry Season;
9) No changes in the frequencies of hot spells (all days >=30ºC) were detected;
10) There will be increases in the average and maximum lengths of hot spells caused by the extra number of hot days; many of the scenarios indicate that the frequencies of spells up to 10 days will decrease to be replaced by more spells of 11 days or more.

In addition, the analysis of downscaled climate projections for six focus provinces and under three emissions scenarios presents a picture of future climate change in Lao PDR. Findings suggest that there is an increase in maximum temperature and a likely increase in annual precipitation, although with considerable possibility of a decrease in annual precipitation too. The increase in maximum temperature ranges between 1-2 °C for RCP2.6, 2-3 °C RCP4.5 and between 3-4.5 °C for RCP8.5, between 1980 and 2100. There is a slightly higher maximum temperature increase *in the dry summer season*. The change in precipitation *in the monsoon season* ranges between -10% and +10% for RCP2.6, between -15% and +15% for RCP4.5 and between -5% and +30% for RCP8.5, between 1980 and 2100. The likelihood of increase in precipitation, expressed as percentages from the models analysed, is generally above 50% for RCP4.5 and RCP8.5.

Figure 25 shows climate models projections for maximum temperature and precipitation changes in Xiengkhouang province, in the centre of the country, for both the monsoon and dry seasons. The plots demonstrate an increase in maximum temperature and temperature, which increases with higher emission scenarios. The uncertainty in the direction of change for the precipitation can be clearly seen and notably, is largely independent of emission scenario.

From this analysis of the climate model projections, four representative *climate storylines* for Xiengkhouang have been defined. These are:

1. Warmer and wetter (+1.5ºC and +10% precipitation);
2. Hotter and wetter (+4ºC and + 20%);
3. Warmer and drier (+1.5ºC and -5%); and
4. Hotter and drier (+4.5ºC and -5%).

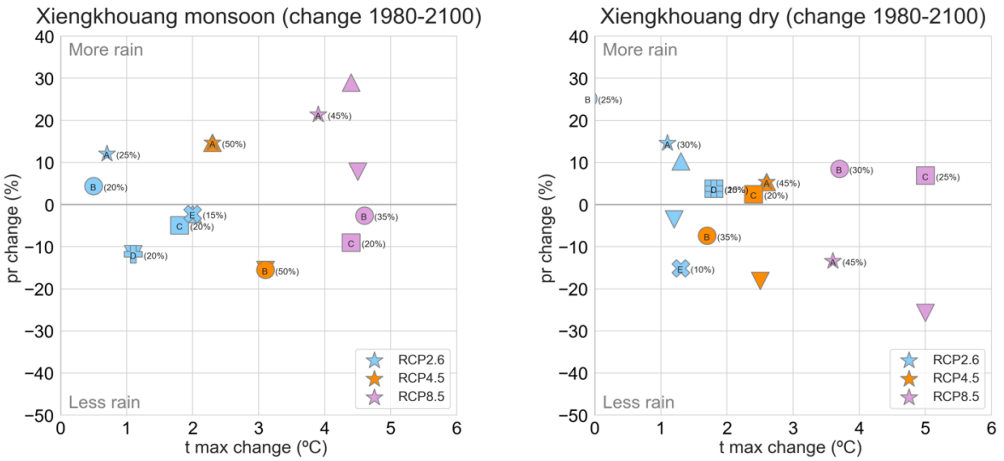
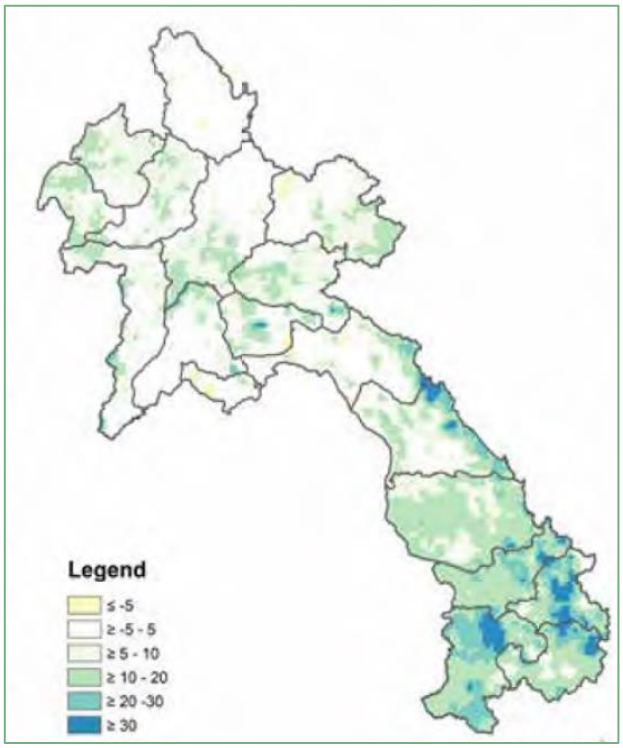


Figure 25 Xiengkhouang climate projections for maximum temperature (ºC) and percentage precipitation change (%) in the monsoon season (left) and dry season (right).

3.2 Precipitation

Climate models predict sudden and rapid changes across the country's northern and mountainous regions. In the next 30 years, the amount of rain is predicted to increase between 10 mm/year and more than 30 mm/year in the southern provinces of Lao PDR (impacting the provinces of Sekong, Attaphu, Champasak and part of it is along the border with Vietnam in Khammuane and Salavan provinces - see Figure 26).

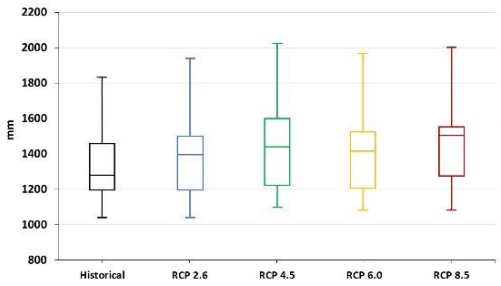


Source: MONRE, 2022

Figure 26: Projected precipitation change over the next 30 years under RCP 8.5

Climate models forecast a rapid and dramatic shift in the bioclimatic conditions across the northern and mountainous regions of the country. By 2030, substantial warming coupled with changes in rainfall patterns are expected, with these alterations are likely to intensify by 2060. The impact and degree of change in rainfall could vary significantly (either increasing or decreasing) depending on the location. Under a high emission, dry scenario, the average change in rainfall by 2060 could decrease by 16%, while a high emission, wet scenario could see an increase of up to 17% across most of the country.

Furthermore, annual total precipitation appears to increase across the majority of the country. Most climate models anticipate higher yearly rainfall rates, with more pronounced changes under higher emission scenarios.[58] On average, under the CMIP6 model, annual rainfall is projected to increase (see Figure 27 and 28). The most substantial increases are expected during the wet season, ranging from 9.9% to 22% (between 2011 and 2100) compared to the period of 1981-2010 under the RCP8.5 scenario.



Source: World Bank, 2019

Figure 27: Projected average annual precipitation (mm) for Lao PDR in the period 2080–2099

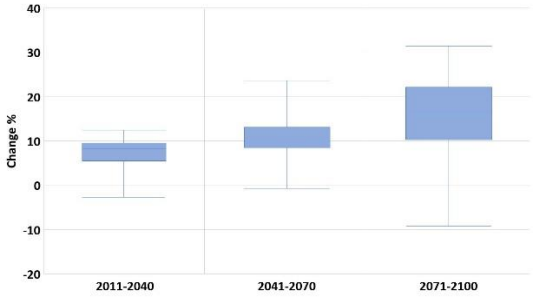


Figure 28: Projected change in mean annual precipitation in Lao 2011 to 2100 as compared to 1981-2010 (RCP8.5)

There remains, however, a high level of uncertainty in these precipitation trends due to the range of model estimates. This uncertainty is also reflected in the limited number of studies that apply downscaling techniques to assess precipitation changes. For instance, one downscaling study estimated annual precipitation changes to range from a reduction of 27% to an increase of 41% under 3˚C of warming.[59] The inconsistent precipitation projections from global climate models have been attributed to their insufficient simulation of the El Niño phenomenon.[60]

The World Bank's data suggests potential rainfall increases of 10-30%, particularly in the eastern and southern parts of Lao PDR. Additionally, the number of annual wet days is expected to rise in the southern region of the Mekong River.[61] The distribution of rainfall throughout the year is also predicted to change. There will be an increase at the beginning of the season, with a decrease mid-season, resulting in an overall reduction in rain availability. This could potentially lead to an early onset of rains, reduced overall rainfall, dry spells, and decreased soil moisture. Conversely, rainfall might become more concentrated, with lower levels at the start and end of the season, but increasing mid-season, leading to an overall increase in water availability. This could result in more water during the main wet season, leading to waterlogging and flash floods.[62]

According to a study conducted by USAID in 2013, it is projected that there will be an overall increase in the number of wet days throughout the southern region of the Mekong River. The mean annual rainfall is expected to rise by 10% to 30% during the rainy season, particularly in the eastern and southern provinces of the nation. Both the Champasak and Khammuane provinces are anticipated to witness a rise in their yearly precipitation levels. Among these, Champasak is most susceptible to these rises, with precipitation projected to increase by up to 175mm per year (Figure 29). This could result in a 35% increase in rainfall for the month of December alone, but a 12% decrease in average monthly rainfall during January and February.[63]

[58] World Bank and ADB (2021). Climate Risk Profile of Lao PDR. https://www.adb.org/publications/climate-risk-country-profile-lao-pdr

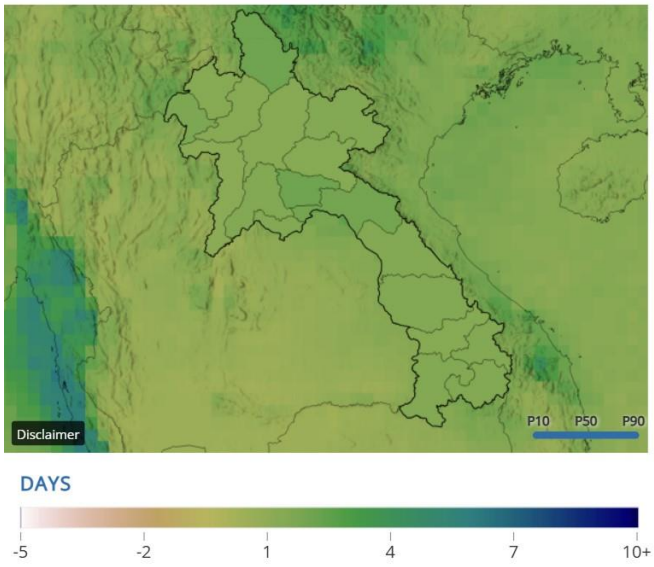
[59] Shrestha, B., Babel, M.S., Maskey, S., Griensven, A.V., Uhlenbrook, S., Green, A. and Akkharath, I. (2013). Impact of climate change on sediment yield in the Mekong River Basin: a case study of the Nam Ou Basin, Lao PDR. Hydrology and Earth System Sciences, 17(1), pp.1–20. URL: https://www.hydrol-earth-syst-sci.net/17/1/2013/hess-17-1-2013.pdf

[60] Yun, K.S., Yeh, S.W. and Ha, K.J. (2016). Inter-El Ni๏o variability in CMIP5 models: Model deficiencies and future changes. Journal of Geophysical Research: Atmospheres, 121, 3894–3906. URL: https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2016JD024964

[61] Idem

[62] World Bank and ADB (2021). Climate Risk Profile of Lao PDR. https://www.adb.org/publications/climate-risk-country-profile-lao-pdr

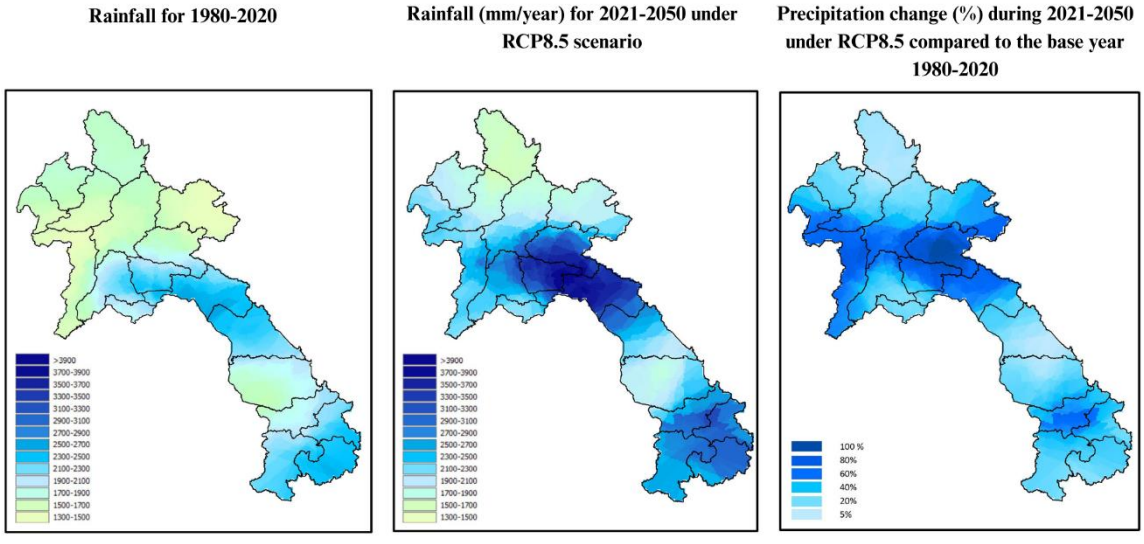
[63] ADB (2023). Climate Risk and Vulnerability Assessment: Climate-friendly Agribusiness Value Chains Sector Project



Source: World Bank

Figure 29: Projected Change in Very Wet Days of Lao PDR for 2080-2099 (Compared to 1986-2005)

Projected precipitation between 1980 to 2025 reveals that there is greater precipitation recorded in central parts of Lao PDR (namely in Khammuane province) of around 190 mm per day and some areas along the east and south of the country. In the northwest of Laos, change of precipitation ranges from 100 to 150 mm per in Xayabouly, Borkeo, Luang Namtha, and Oudomxay province. Under RCP 8.5 scenario projection, it shows a higher precipitation in Khammuane province about 250 to 260 mm per day. Projected annual precipitation change compared to the baseline shows that reduced precipitation ranging from circa 10% to 25% will take place in Xaysomboun province, on the east part of Phongsaly, Luang Prabang, and Houaphan province, Champasak, Attapue, and Xekong province. A higher precipitation change occurs in the more central Khammuane province area (Figure 30) where relative to the northwest region, change of precipitation ranges from 30% to 45% mm per year in Xayabouly, Borkeo, Luang Namtha, and Oudomxay province.[64]



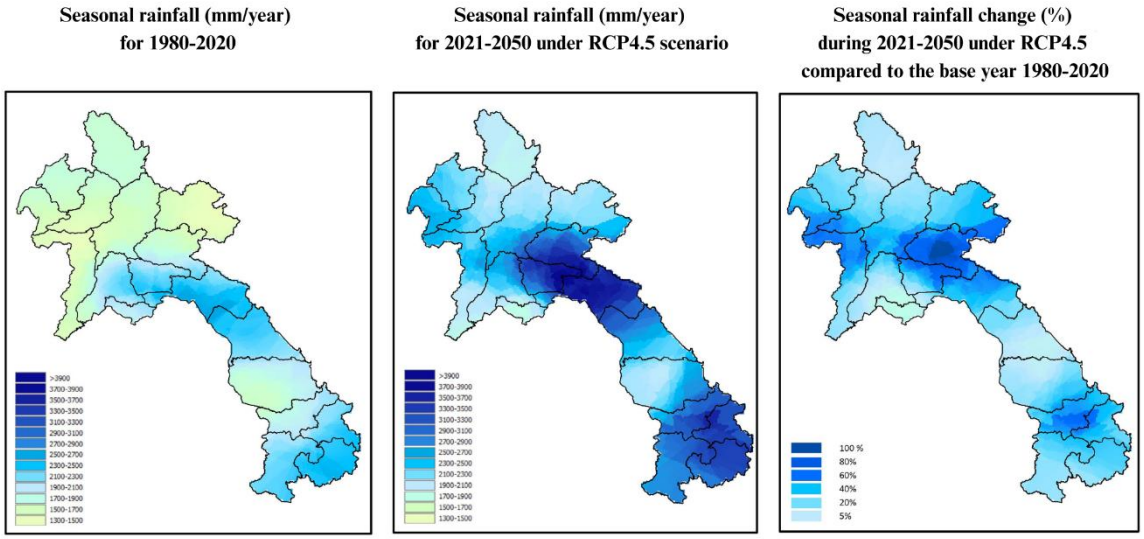
Source: MAE, 2025

Figure 30: Projection Precipitation Change for Historical 1980-2020, annual change in precipitation (%) for 2021-2050 relative to baseline period 1980-2020 for RCP 8.5

While the seasonal precipitation projection during May-October under historical 1980-2020 indicates that a higher amount of precipitation varies from 220 to 280 mm per day take place from the central to southern region of the country (but mostly occurring in Khammouane province),

[64] MAE (2016). Lao PDR Historical Climate Change, Vulnerability and Projection Report

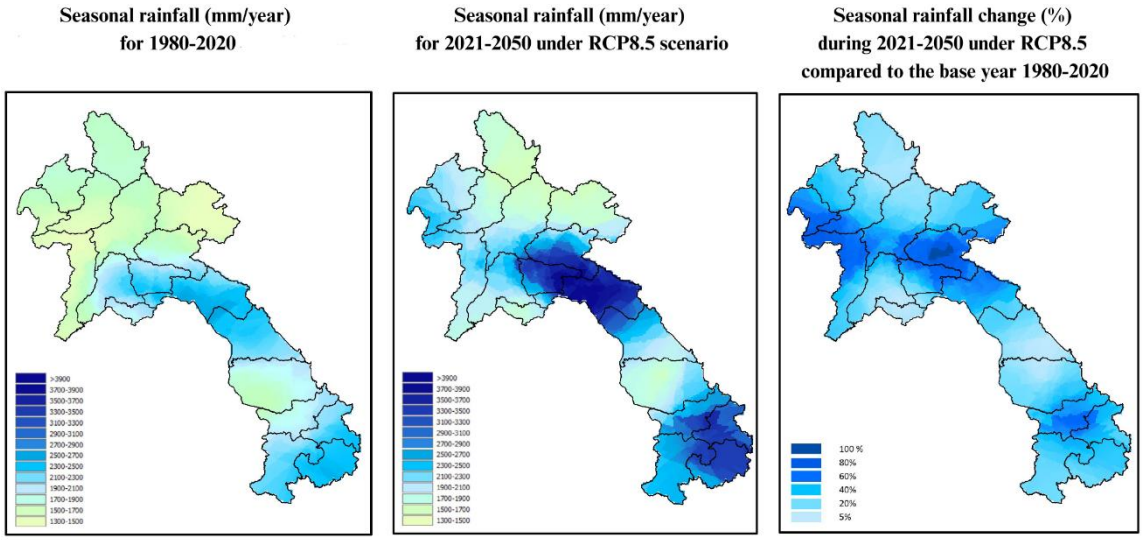
whereas in the northern region has less precipitation on the northwest part of the country vary from 145 to 180 mm per day. For RCP 4.5 scenario project it shows a similarity trend according projected historical result. The less precipitation of seasonal change occurs in the north region; in Luang Prabang province changes about 2% and on the southwest of Xayabouly, Vientiane and Boulikhamxay province change vary from 5.5% to 6% (Figure 31).



Source: MAE, 2025

Figure 31: Projection Seasonal (MJJASO) Precipitation Change for Historical 1980-2020, annual change in precipitation (%) for 2021-2050 relative to baseline period 1980-2020 for RCP 4.5

Projection of seasonal precipitation during May to October under historical 1980-2025 scenario indicates that in Khammoune province, this shows the highest precipitation of circa 260 mm per day, where the precipitation rates vary from 145 to 220 mm per day in several part of the country. The RCP 8.5 scenario projection shows that Khammoune province has the highest precipitation around 380 mm per/day, many provinces in the southern region ranges from 260 to 310 mm per day, and less precipitation in the north region. Projection under the RCP 8.5 for 2030s, compared to the baseline 1990s, indicates that Xaysomboun province has very low precipitation of about 8% to 20%, whereas some provinces in the northern and southern region have a higher variation of recitation ranging between 35% to 50% (Figure 32).



Source: MAE, 2025

Figure 32: Projection Seasonal (MJJASO) Precipitation Change for Historical 1980-2020, seasonal change in precipitation (%) for 2021-2050 relative to baseline period 1980-2020 for RCP 8.5

Rainfall projections show that rainfall has decreased during the monsoon season between 1980 and 2020 across four Provinces at a rate of around 25mm/decade or more. The exceptions being

at Sekong and at Xiengkhouang where there have been increases of around 25mm/decade. During the dry season, all Provinces have become drier by circa 25mm/decade except at Sekong where there has been minimal change.[65] Moreover, the rainfall is most likely to increase in both seasons across all six Provinces; in all cases the likelihood of a decrease in rainfall is the lowest amongst the three possibilities of increase/decrease/minimal change. Key results on rainfall analysis are summarized below:

1) Projections cover a range of possible changes in rainfall, including both increases and decreases, but with highest likelihoods for increases;
2) Largest changes will be in the Monsoon Season;
3) Changes are relatively limited under RCP2.6 but ranges increase under higher emissions;
4) For the Monsoon Season proportional changes from 1980-2020 to 2076-2100 are in the ranges -2% (Phongsaly) to +12.1% (Xiengkhouang) under RCP2.6, +4% (Khammaune) to +14.7% (Xiengkhouang) under RCP4.5 and +4.4% (Sekong) to +39.6% (Khammaune);
5) Proportional changes for the Dry Season may appear large on occasion but only because the base rainfall in 1980-2020 is relatively small and so large proportional changes may not necessarily equate to large absolute increases: −12.7% (Champasack) to +33.4%; (Khammaune) under RCP2.6, +5% (Khammaune) to +15.3% (Phongsaly) under RCP4.5 and −13.4% (Xiengkhouang) to +24.1% (Phongsaly) under RCP8.5;
6) No clear picture in changes in the frequencies of dry (<=1mm) or wet (>=20mm) days was detected, although under Scenarios A in the Monsoon Season most projections suggest an increase in dry days, while increases in wet days are possible under RCP8.5;
7) Typically, the average rainfall per day will increase in the future (see e above), with larger expected likely increases under higher emissions;
8) Most projections suggest that average and the maximum lengths of dry spells, are likely to increase.

3.3 Extreme Weather Events

The occurrence of extreme weather events in Lao PDR has seen a significant rise, going from once every two years prior to 1992 to annually or even biannually post-1992. Interestingly, nearly 75% of all disasters in Lao PDR are climate-related. Alongside heavy rainfall, the country also grapples with tropical storms, which are anticipated to escalate in intensity. From 1966 to 2009, flooding emerged as the most frequent climate change hazard, followed by epidemics like dengue, cholera, diarrhea, and avian influenza (H5N1), then storms and drought.

Nevertheless, recent observations indicate an increase in fine particulate matter (smaller than 2.5 microns - PM2.5), which concerningly can contribute to respiratory diseases. Additionally, there have been outbreaks of COVID-19, health impacts from heat waves, and mental health issues arising from disasters, according to reports from the Ministry of Health.

According to a study by Paltan et al. (2018), even if world nations strictly adhere to the lower emissions pathways outlined in the Paris Climate Agreement, nearly all Asian countries, including Lao PDR, are likely to witness an increase in the frequency of extreme river flows.[66] This shift implies that a flow which would have historically occurred once every 100 years could now potentially happen every 50 or even 25 years in most regions of SEA. There is a strong consensus among climate models that points towards this trend, and the heightened potential for major disaster-level events necessitates immediate climate resilient adaptive measures.

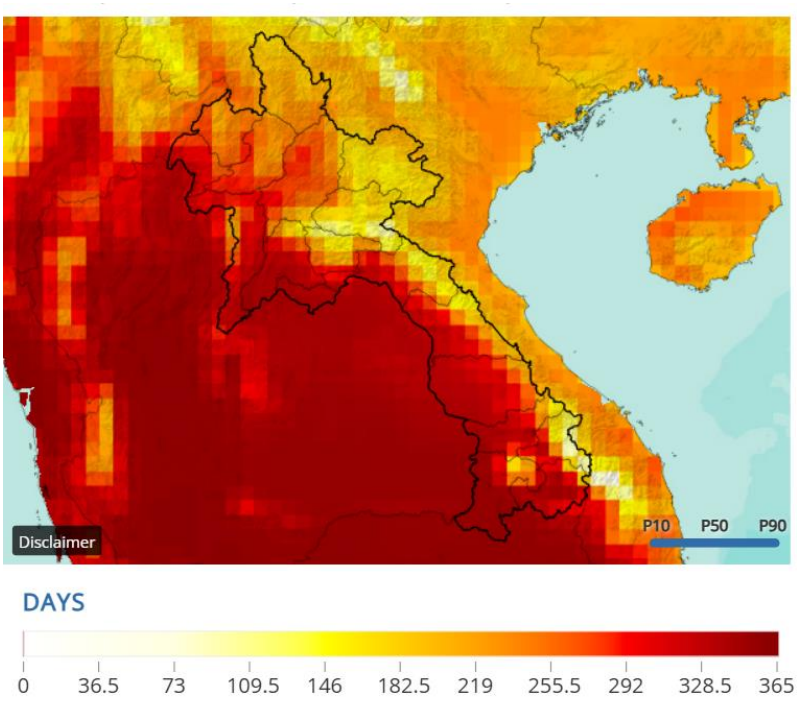
In conjunction, model ensembles are predicting an increase of up to 23% in the volume of rainfall accumulated during extreme weather events under the highest emissions pathway. This increase could further escalate the risk of flash floods or surface flooding, and related problems like

[65] WSP (2024). Historical, Climate Projection and Climate Risk and Vulnerability Assessment: *Building the Capacity of the Lao PDR Government to Advance the National Adaptation Planning Process*

[66] Paltan, H., Allen, M., Haustein, K., Fuldauer, L., & Dadson, S. (2018). Global implications of 1.5C and 2C warmer worlds on extreme river flows Global implications of 1.5C and 2C warmer worlds on extreme river flows. Environmental Research Letters, 13. URL: https://doi.org/10.1088/1748-9326/aad985.

landslides. More comprehensive research is, however, needed to accurately map the spatial and temporal risks of landslides under changing climate conditions. One particular concern in Lao PDR is the vulnerability of critical infrastructure such as schools, health centers, and main roads. The country's disaster response and recovery efforts are often hindered by the damage inflicted by floods and landslides.

Nationwide, it is anticipated that the dry seasons will extend, leading to droughts that are more severe and occur more frequently.[67] Although there is a forecasted increase in the frequency of droughts, more detailed projections require further research. Lao PDR experienced drought in the years 2015, 2016, and 2019.[68] Studies have also revealed a strong correlation between drought and El Niño–Southern Oscillation (ENSO) events. [69] Remarkably, 71 percent of flood or drought disasters in Lao PDR have coincided with ENSO events. Figure 33, shows the projected increase in severe drought likelihood for Lao PDR from 2080-2099, compared to the historical baseline from 1986-2005.[70]



Source: World Bank

Figure 33. Projected Change in Severe Drought Likelihood of Lao PDR for 2080-2099 (Compared to 1986-2005)

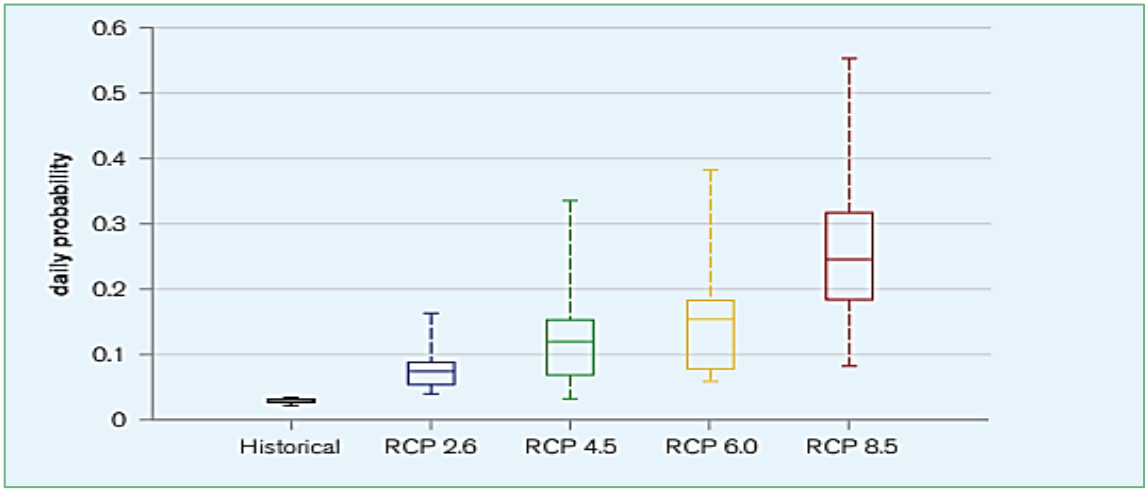
World Bank identifies significant increases in the annual probability of heat waves under the different emissions pathways (Figure 34). General warming and increased climate variability are both almost certain to increase the probability of heat waves compared with the historical baseline (1986–2005). Simultaneously, the general increase in temperatures also suggests a transition to a chronically heat stressed environment, with an increase in the number of days in which temperatures breach 35°C moving from approximately 40 days to 50–110 days depending on emissions pathway and climate model.

[67] Lao Statistics Bureau, 'Lao Country Report: 2019 KOICA-ESCAP Fellowship Programme, Capacity Building on Drought Monitoring and Early Warning'

[68] Sutton, William R., Jitendra P. Srivastava, Mark Rosegrant, and Jawoo Koo, and Ricky Robertson, 'Striking a Balance: Managing El Niño and La Niña in Lao PDR's Agriculture', 2019

[69] Sutton, William R., Jitendra P. Srivastava, Mark Rosegrant, and Jawoo Koo, and Ricky Robertson.

[70] ADB (2023). Climate Risk and Vulnerability Assessment: Climate-friendly Agribusiness Value Chains Sector Project



Source: World Bank
Figure 34: Projected change in the probability of observing a heat wave in Lao PDR for the period 2080–2099.

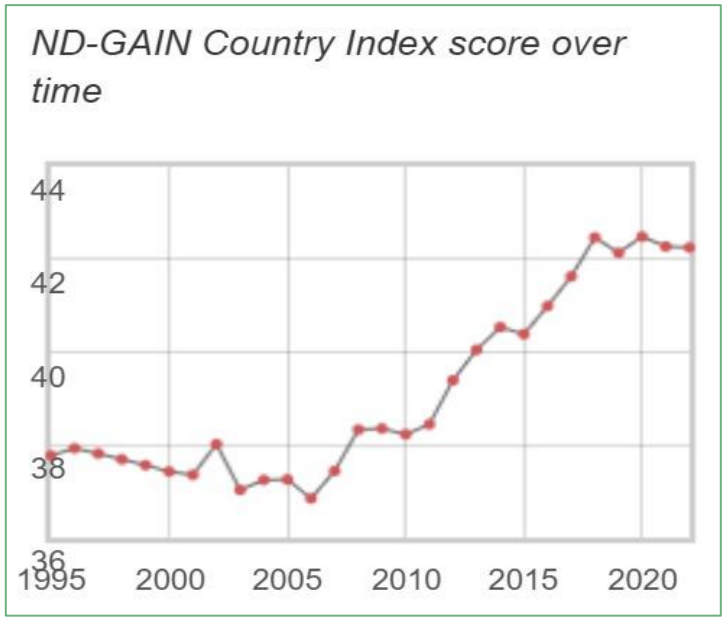
Note: A 'Heat Wave' is defined as a period of 3 or more days where the daily temperature is above the long-term 95th percentile of daily mean temperature.

4. Climate Vulnerability, Hazards and Expected Impacts

4.1 Climate Vulnerability and Hazards

4.1.1 Overview

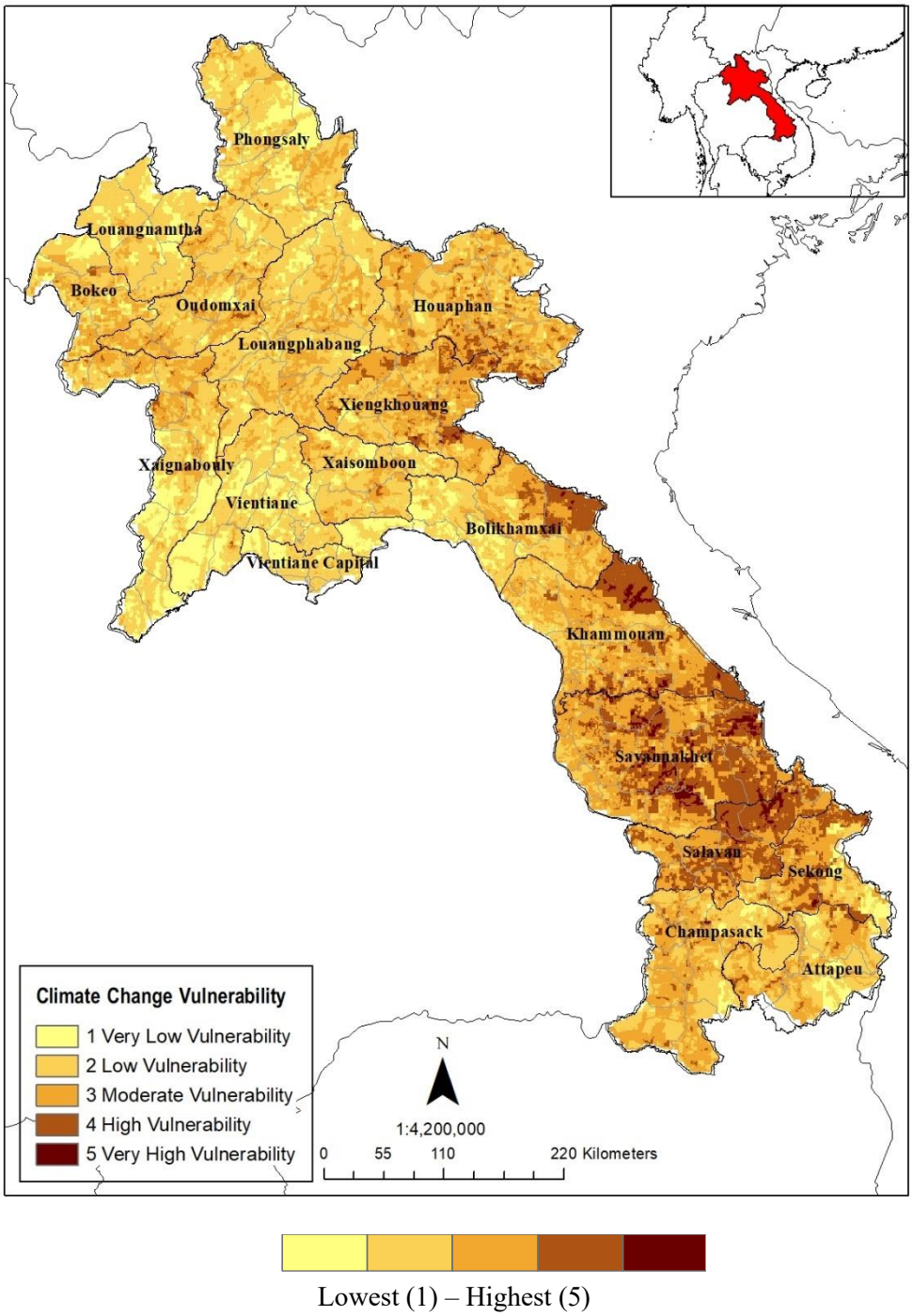
Globally, Lao PDR ranks 131st out of 187 countries according to the Global Adaptation Index (ND-GAIN Index), with a total score of 42.3 points in 2022, categorizing it as a country with lower-middle preparedness for addressing climate change. This ranking reflects the country's vulnerability due to geographical and social factors. The ND-GAIN Index is calculated based on a country's vulnerability to climate change and global changes, combined with its readiness factors. Figure 35 illustrates the Lao PDR's index scores over recent years through 2022.[71]



Source: World Bank
Figure 35: The ND-GAIN Index Scores of Lao PDR

[71] University of Notre Dame, 'Notre Dame Global Adaptation Initiative.', 2021. The ND-GAIN Country Index summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience.

However, based on climate scenario from NASA-NEXGDDP that used baseline year of 1976-2020 for projection of 2021-2050 under RCP4.5 and RCP8.5, Lao PDR's vulnerability remains at a medium level on average of which, seven provinces, particularly districts in Savannakhet, Saravan, Sekong, and parts of Borikhamxay, Khammouan, Champasak, and Attapeu Provinces, are considered highly vulnerable. Provinces with a medium level of vulnerability include Huaphan, Xiengkhouang, Xayabuly, Oudomxay, Bokeo, and parts of Phongsaly and Luang Namtha. Provinces with moderate to low vulnerability encompass Vientiane Province, Vientiane Capital, and certain parts of Phongsaly, Xayabuly, Borikhamxay, and Attapeu provinces (see Figure 36).[72]

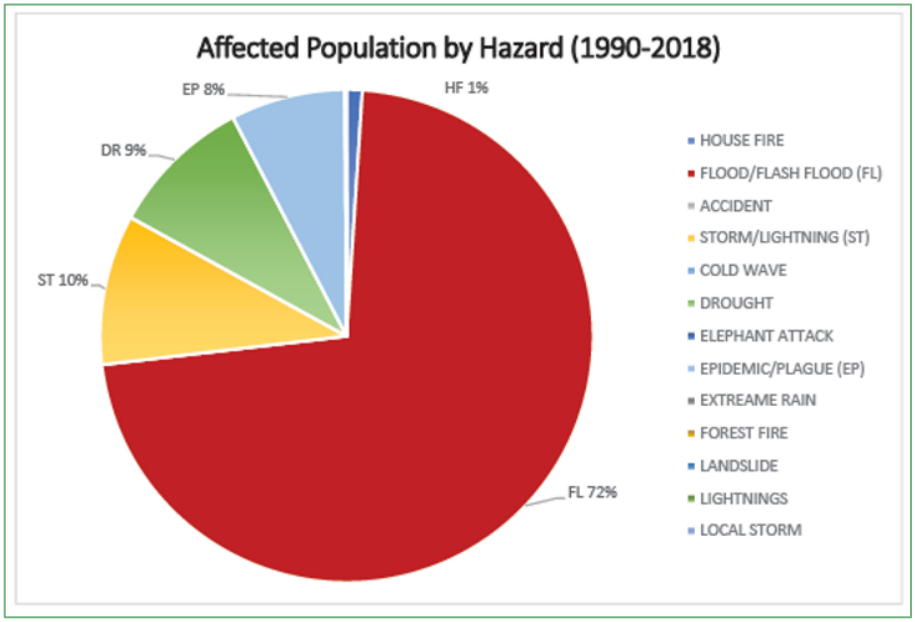


Source: MAE, 2025

Figure 36: Climate change vulnerability map of Lao PDR

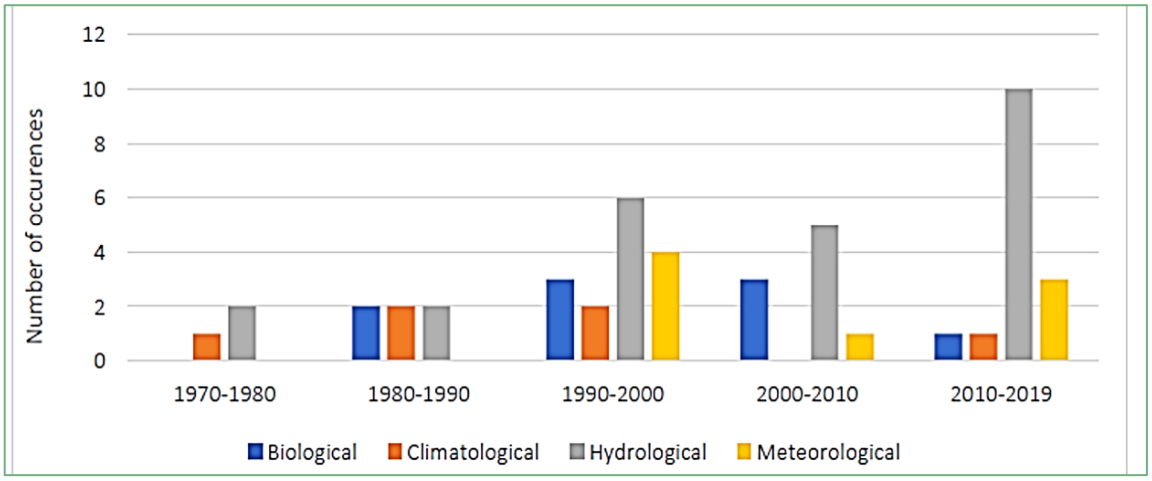
[72] MAE (2019). Lao PDR National Climate Change Vulnerability Assessment:

Figure 37 illustrates that between 1990 and 2018, floods affected 72% of those impacted by disasters. Meanwhile, storms, droughts, and epidemics affected 10%, 9%, and 8% of the population, respectively.



Source: MLSW, 2018
Figure 37: Affected population by hazards 1990-2018

According to UNDP (2009), there's been a noticeable increase in both the frequency and intensity of floods and drought over the past three decades (as illustrated in Figure 38 - number of disasters categorized by types and periods).[73] These extreme weather events, particularly floods and droughts, pose a significant risk to impoverished households, potentially pushing them into extreme poverty.



Source: UNCTAD
Figure 38: Number of hazards by type and period

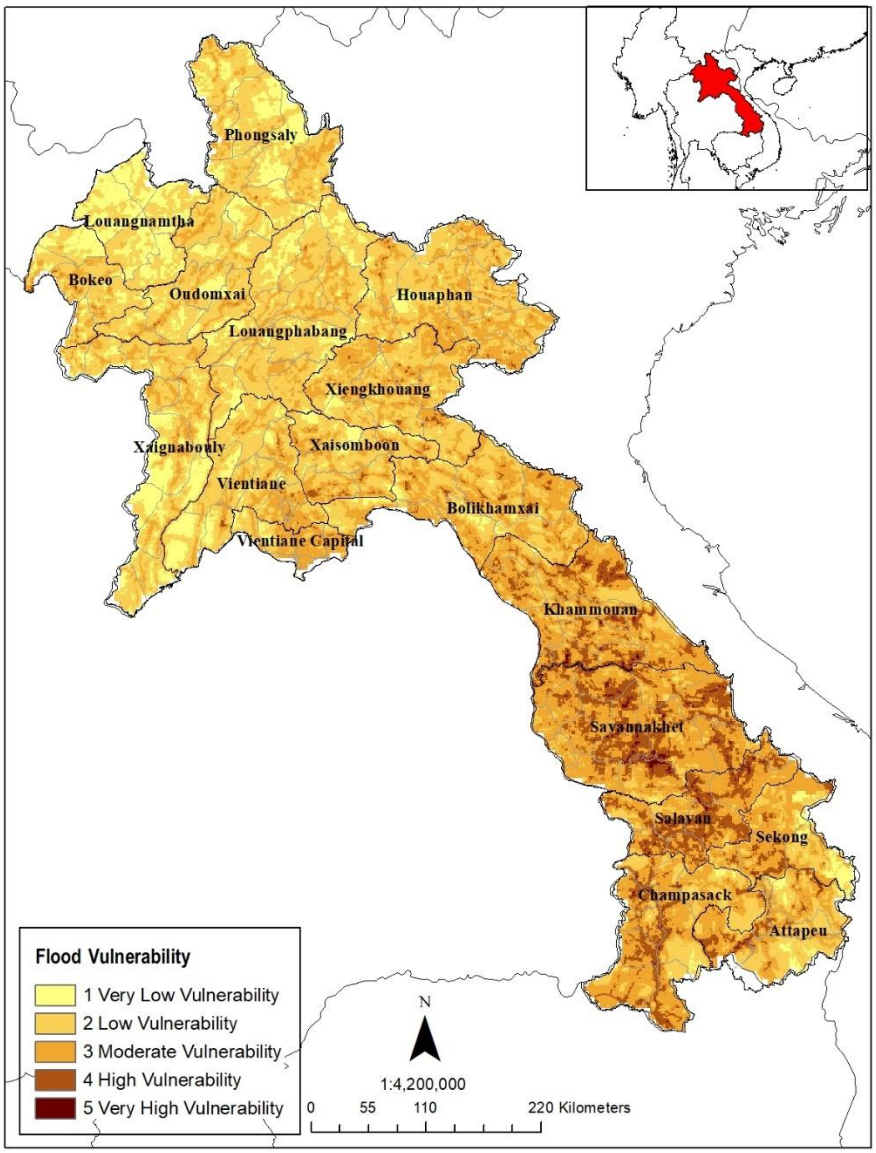
4.1.2 Floods and Extreme Weather

Lao PDR is extremely vulnerable to floods with the INFORM Country Profile showing a score of 9.1 on a scale of 0 – 10 for risk to floods.[74] Despite these projections, climate change impacts in Lao PDR are highly localized and may not play out the same in all districts and provinces. In 2023, MAE has updated the 2020 national climate vulnerability assessment, especially climate

[73] UNDP. (2009). NATIONAL ADAPTATION PROGRAMME OF ACTION TO CLIMATE CHANGE: LAO PDR. United Nations Development Programme (UNDP).
[74] INFORM, 'Lao PDR: INFORM Risk Country Risk Profile'.

vulnerability mapping within all provinces.

Based on the climate change risk and vulnerability assessment conducted under this project, flash floods are likely to occur when heavy rainfall persists for two to three consecutive days. By incorporating socio-economic factors, sensitivity, and adaptive capacity alongside flood risk considerations, it is possible to identify areas most susceptible to flooding and those most vulnerable to drought impacts. The updated resulting data is shown in the maps in this section (see Figure 39 – Flood prone areas). The assessment reveals that floods are the main climate-related hazard in most provinces, affecting, over four times the people affected by storms, the second major threat in the area. As shown in the below figure, the provinces most vulnerable to flooding are Khammouane, Savannakhet, Saravan, and Champasak. Provinces with high vulnerability to flooding include Champasak, Attapeu, Sekong, and Borikhamxay. Provinces with moderate vulnerability comprise Borikhamxay, Xaysomboun, Xiengkhuang, Vientiane Province, and Vientiane Capital. Additionally, certain districts in the northern provinces also contain areas of extreme vulnerability.[75]

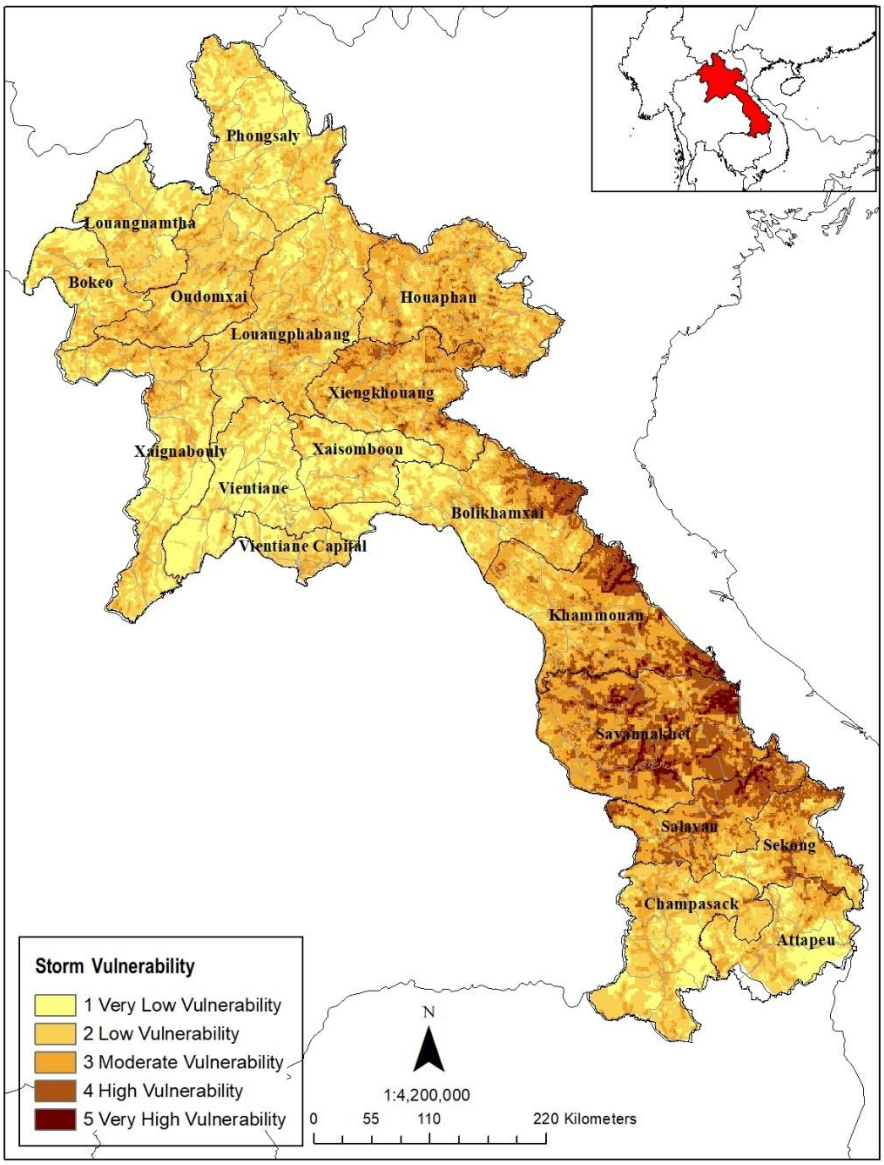


Source: MAE, 2025

Figure 39: Flood-prone areas

[75] MAE (2020). Lao PDR National Climate Change Vulnerability Assessment: Updated maps (2023)

The vulnerability analysis, which integrates risk factors with socio-economic variables, sensitivity, and adaptive capacity, reveals that areas with extremely high storm occurrence are located in Savannakhet and Saravan provinces (Figure 40). Areas experiencing high-level storms include Khammouane Province and portions of Borikhamxay, Sekong, Xaysomboun, and Xiengkhuang provinces.[76]

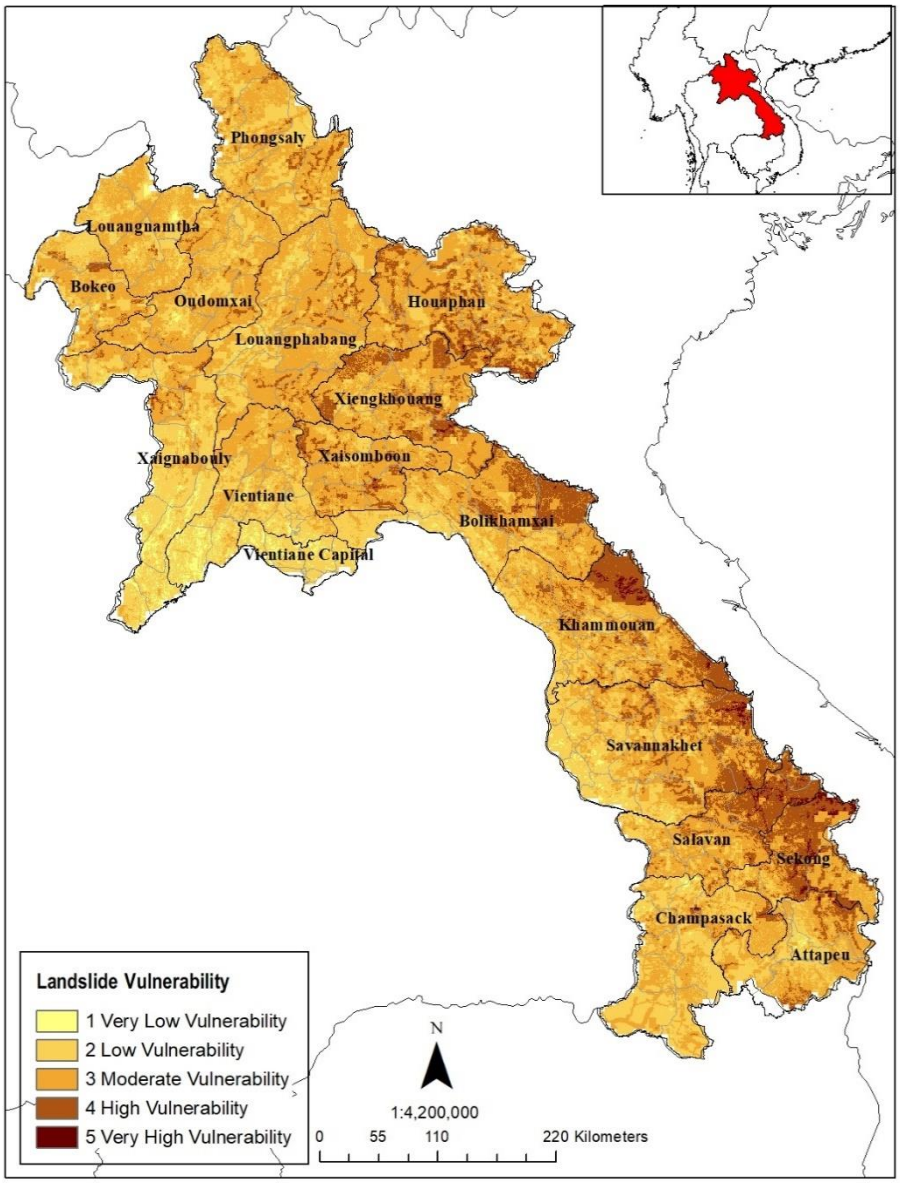


Source: MAE, 2025

Figure 40: Storm-prone areas

Areas most susceptible to landslides are predominantly located in the eastern region of Lao PDR. Based on the assessment, areas with extremely high risk and vulnerability to landslides are found in Sekong and Saravan provinces, as well as portions of Savannakhet, Khammouane, Borikhamxay, Xaysomboun, and Xiengkhuang provinces adjacent to the Vietnamese border. Additionally, areas with moderate to high vulnerability are distributed across various districts throughout the country.[77]

[76] MAE (2020). Lao PDR National Climate Change Vulnerability Assessment: Updated maps (2023)
[77] Ibid



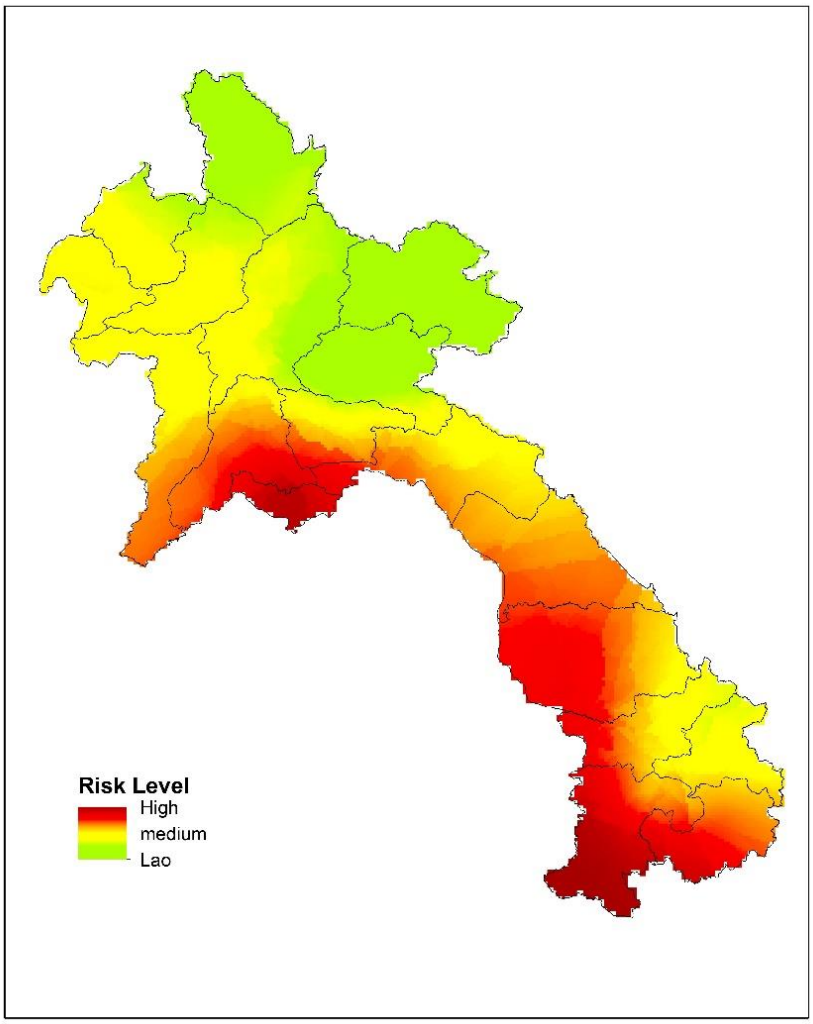
Source: MAE, 2025

Figure 41: Storm- and Landslide-prone areas

In 2008, floods and tropical storms had a severe impact, affecting over 200,000 people and damaging 75,000 hectares of agricultural land. This was followed by another devastating flood in 2011, which incurred a loss of US$200 million. In 2013, a series of floods, caused by varying weather systems, occurred across different parts of the country. These floods impacted an estimated 395,000 individuals, costing over 20 lives in 12 provinces.[78] 2018 saw the advent of Tropical Storm Son-Tinh, which brought heavy rains and flooding to 55 districts across 13 provinces. The storm's heavy rainfall caused a dam in Attapeu Province to fail, triggering flash floods.[79] Certain provinces in central and southern Lao PDR were also affected by Tropical Storm Podul and Tropical Depression Kajiki in 2019. The damage caused by these events was estimated at US$164 million.[80]

[78] https://www.reuters.com/article/us-Lao PDR-floods/floods-in-Lao PDR-kill-20-damage-rice-crops-idUSBRE97R0BB20130828
[79] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment
[80] AHA Centre (14 October 2019) Situation Update: Tropical Storm Podul and Tropical Depression Kajiki. Retrieved from https://ahacentre.org/situation-update/situation-update-no-5-tropical-storm-podul-and-tropical-depression-kajiki-13-sep-2019/

Tropical storms, while not a direct threat due to their diminished force by the time they reach Lao PDR from the South China Sea, often lead to floods as a result of heavy rainfall. As such, flooding poses a significant threat across much of Lao PDR (see Figure 42).



Source: MLSW, 2019

Figure 42: Flood Mortality Risks and Distribution

4.1.3 Drought and Extreme Heat

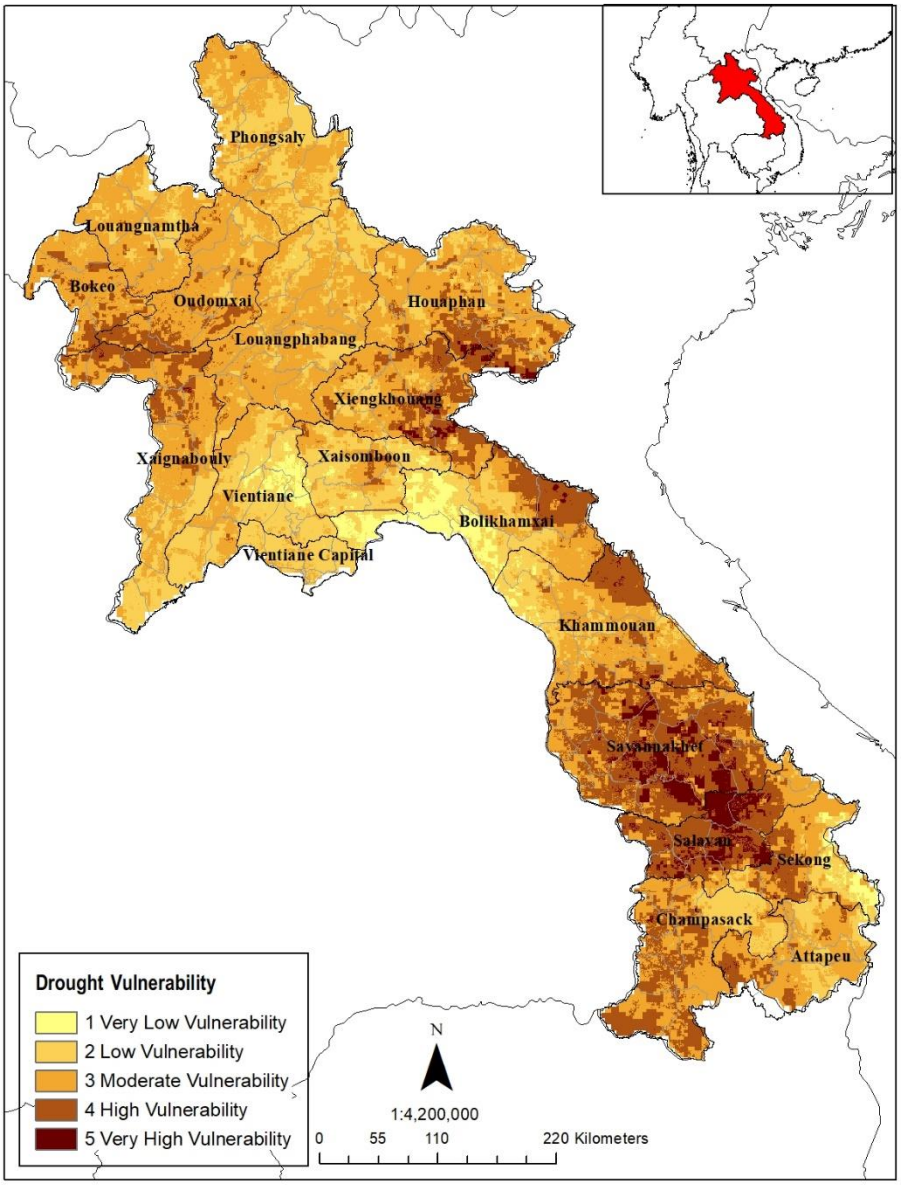
In recent years, an increased occurrence of drought conditions has been experienced in Lao PDR (notably in 2015, 2016 and 2019). Research also shows a strong correlation also between drought and El Niño–Southern Oscillation (ENSO) events, with 71 percent of flood or drought disasters in Lao PDR coinciding with ENSO events.[81] Added to heavy rainfall and droughts, Lao PDR experiences droughts which are projected to increase in both intensity and frequency.[82]

According to the assessment, areas experiencing extremely high risk and vulnerability to drought (Figure 43) are located in Savannakhet and Saravane provinces. Areas with high risk and vulnerability are found in portions of Champasak, Sekong, Attapeu, Khammouane, Borikhamxay, Xaysomboun, Xiengkhuang, Xayabury, Oudomxay, and Luangnamtha provinces.[83]

[81] Sutton, W., Srivastava, J., Rosegrant, M., Koo, J., Robertson, R. (2019). Striking a balance: Managing El Niño and La Niña in Lao PDR's Agriculture. World Bank Group. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/31523/Striking-aBalance-Managing-El-Ni%C3%B1o-and-La-Ni%C3%B1a-in-Myanmar-s-Agriculture.pdf

[82] Ibid

[83] MAE (2020). Lao PDR National Climate Change Vulnerability Assessment: Updated maps (2023)



Source: MAE, 2025

Figure 43: Drought-prone areas

In the past four decades, the country has encountered five major drought incidents, impacting over three million people.[84] A particularly severe drought struck in 1998, during which the dry season temperatures were markedly elevated, affecting approximately 750,000 individuals. In 2003, another intense drought occurred, believed to be an outcome of regional climate change. The World Bank report highlighted that from 1995 to 2005, there was an inconsistent temperature rise associated with drought events. These localized droughts pose a threat to both domestic crop production and food security.[85]

In 2010, an extreme drought hit during the typical rainy season from May to October. This event drastically affected the year's harvest, leading to critical food shortages in Southern Lao PDR and impacting around 85,000 people (see Table 5).[86] This drought occurred following Typhoon Ketsana, which inflicted significant damage to agricultural lands, housing, and infrastructure,

[84] UNDP. (2009). NATIONAL ADAPTATION PROGRAMME OF ACTION TO CLIMATE CHANGE: LAO PDR. United Nations Development Programme (UNDP).
[85] World Bank (2011). Climate Risk and Adaptation Country Profile: Lao PDR Vulnerability, Risk Reduction, and Adaptation to Climate Change.
[86] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment

particularly in the southern provinces, resulting in an economic loss of US$58 million.[87] Droughts represent a key hazard to Lao PDR as they potentially disrupt hydrological systems, endanger biodiversity, and adversely affect human health. They may also trigger forced migrations and increase the prevalence of diseases.[88] It is estimated that nearly 188,000 households in Lao PDR risk experiencing food insecurity due to droughts. With climate change, these droughts are anticipated to become more frequent, prolonged, and severe.[89] According to the recent assessment, it is assumed that climate change impacts on drought is associated with daily rainfall events of 1mm or less (a "dry day") in terms of adjustments in daily averages, frequencies and spell lengths.[90]

Table 5: Losses from droughts 1998-2020

Disaster Type	Year	People Affected	Deaths	Cost of damages (USD)
Drought	1998	750,000	-	-
Drought	2003	-	-	
Drought	2010	85,000		
Drought	2016	NA	0[2]	126,200[2]
Drought	2019 - 2020	67,800[4]		

Source: UNCTAD

Lao PDR experienced increases of temperatures and hot days, and is expected to face an increased frequency of heatwave into the future. The current median probability of a heat wave suggest that climate change made a 29% contribution to the extreme temperatures experienced across Southeast Asia in April 2016, while ENSO contributed 49%. The World Bank and ADB reported that under the CCKP model, there will be a significant increase in the annual probability of a heat wave under the different emissions pathways compared with the baseline, 1986–2005. However, Lao PDR has not recorded number of people affected associated with heat-waves and limited an in-depth-study and monitoring.[91]

The WHO reports that as climate change is expected to increase mean annual temperature and the intensity and frequency of heat waves, resulting in a greater number of people at risk of heat-related medical conditions. The elderly, children, the chronically ill, the socially isolated and at-risk occupational groups are particularly vulnerable to heat-related conditions. Under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to about 72 deaths per 100,000 by 2080 compared to the estimated baseline of about 3 deaths per 100,000 annually between 1961 and 1990. A rapid reduction in global emissions could limit heat-related deaths in the elderly to about 15 deaths per 100,000 in 2080.[92]

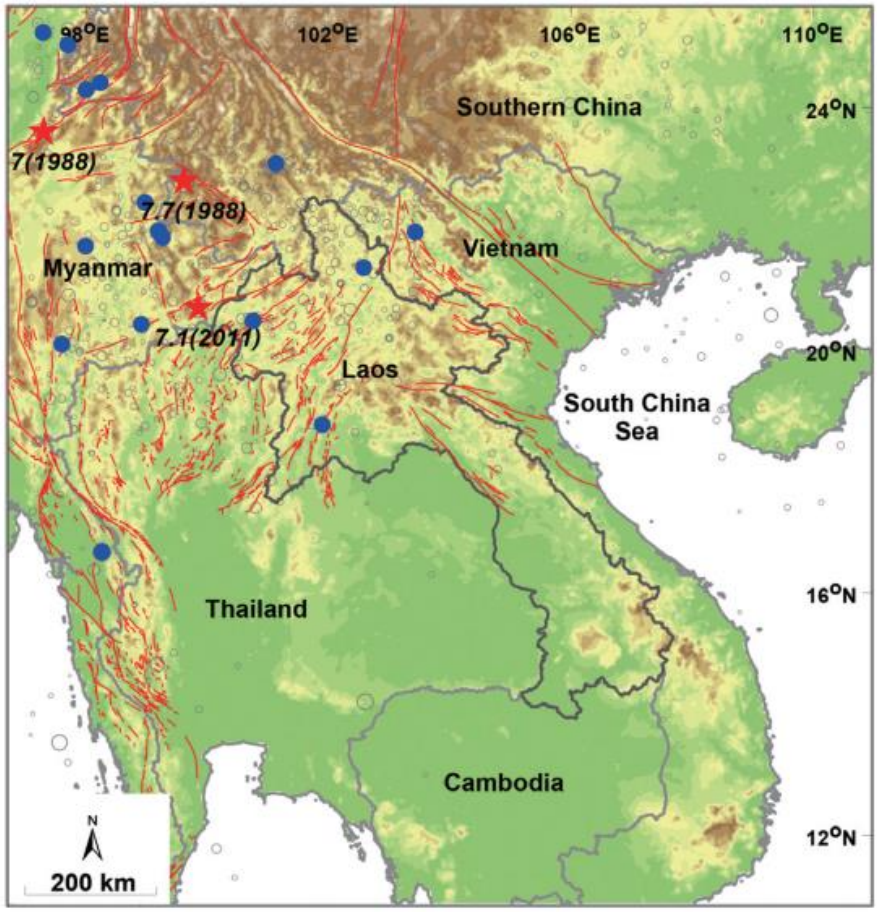
4.1.4 Seismic Hazards

In addition to climate-related hazards, and in line with the principles of the Sendai Framework (see Section 4.4.2 above) this NAP incorporates data on earthquake risks and analyzes the severity levels of potential earthquakes in Lao PDR.[93] Figure 44 illustrates the epicenters of earthquakes that have occurred in areas near Lao PDR in recent years. The data shows that earthquakes frequently occur in the northwestern region of Lao PDR and within Myanmar's territory, ranging from moderate to large magnitudes. The blue circles in Figure 44 represent seismic events with a

[87] http://www.un-spider.org/sites/default/files/41.%20UN-SPIDER_Lao PDR%20rev1-ilovepdf-compressed.pdf
[88] ADB. (2019). Disaster Risk Assessment: Lao PDR Sustainable Rural Infrastructure and Watershed Management Sector Project.
[89] EcoLao 2012
[90] WSP (2024). Historical, Climate Projection and Climate Risk and Vulnerability Assessment: *Building the Capacity of the Lao PDR Government to Advance the National Adaptation Planning Process*
[91] World Bank and ADB (2019). Lao PDR National Climate Profile
[92] WHO (2015). Climate and Health Country Profile, Lao People's Democratic Republic
[93] ADPC (2010) & Paiboplee and Charusiri (2017). Earthquake Assessment in Southeast Asia

magnitude Mw ≥ 6.0 (where Mw refers to Moment Magnitude, the standard scale for measuring earthquake strength), while the red stars indicate earthquakes with magnitude Mw ≥ 7.0 or greater that occurred in the past, particularly the 1988 earthquake event with magnitude Mw = 7.7.

Furthermore, Figure 44 displays the locations of various active fault lines that can trigger earthquakes when movement occurs along these faults. Lao PDR is situated in a seismically active area and is susceptible to earthquake impacts, although less severely than some neighboring countries in the Lower Mekong Basin region. The red lines in the figure represent seismogenic fault zones with significant potential to generate earthquakes.

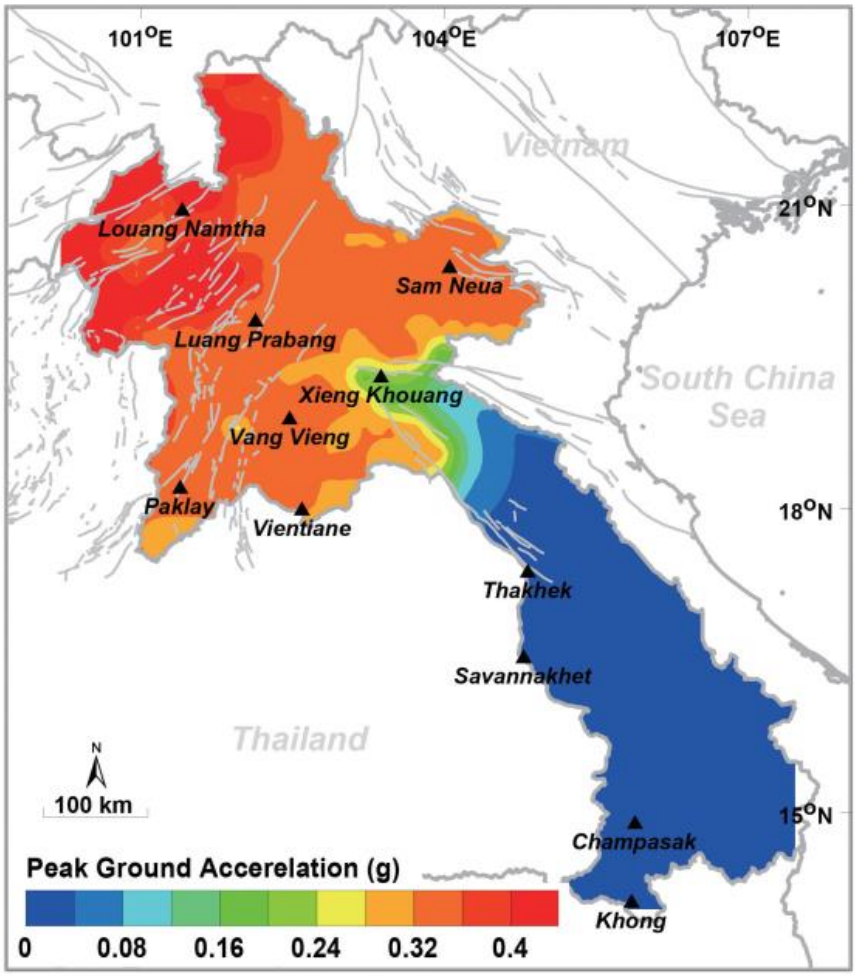


Source: ADPC, 2010

Figure 44: Earthquake epicenter areas

The earthquake hazard map of Lao PDR, developed by Pailoplee and Charusiri (2017), illustrates earthquake risk throughout the country and the maximum ground shaking intensity expected to occur in various regions of Lao PDR. This assessment assumes the worst-case scenario of a Maximum Credible Earthquake (MCE) occurring at the nearest point of a fault line to any given location. The map displays Peak Ground Acceleration (PGA) values ranging from 0 to 0.4 g (where g represents acceleration due to gravity).

The map reveals that nearly all northern provinces of Lao PDR are highly susceptible to earthquake impacts, with maximum PGA values reaching up to 0.4 g, particularly in Luang Namtha, Luang Prabang, and Xayabury provinces. Central provinces such as Vientiane Capital and Vientiane Province, along with some northern provinces including Luang Prabang and Huaphanh, exhibit moderate hazard levels with PGA values ranging from 0.27 to 0.32 g. Meanwhile, certain central provinces such as Borikhamxay and Khammouane, as well as all southern provinces, are classified as low-impact zones with PGA values below 0.04 g.



Source: Pailoplee and Charusiri, 2017

Figure 45: Impact risk areas from earthquakes

4.2 Impacts on Food Chains and Nutrition

As a significant portion of Lao PDR's population still relies on agriculture for their primary livelihood, this dependence makes the country and its inhabitants highly vulnerable to climate change. The sector is highly susceptible to extreme weather events and climate change, which could exacerbate existing vulnerabilities and threaten the low incomes of agricultural workers.[94] Meanwhile, those employed in the construction sector often face insecure employment, resulting in irregular incomes, minimal savings opportunities, and thereby limiting their ability to invest in adaptation measures or respond effectively to extreme events. In the country's more mountainous regions, flash floods primarily caused the destruction, washing away crops and livestock. Conversely, in the lower-lying areas along the major rivers, paddy rice fields were particularly affected, with additional crop damage caused by standing floods.

The floods and heavy rains also impacted upland rice cultivation, resulting in reduced yields. Other crops such as maize, cassava, and vegetables were severely affected.[95] In addition to crops, the agricultural land itself, including areas used for growing paddy, coffee, and vegetables, was obliterated primarily due to landslides and erosion triggered by the floodwaters.

However, in the most heavily affected low-lying flood plains where water levels rise gradually, farmers have the opportunity to relocate their farm equipment and stored supplies to safer, higher

[94] World Bank (2020). COVID-19 to Impact Lao PDR Growth: New World Bank Report, https://www.worldbank.org/en/country/lao/publication/covid-19-to-impact-lao-pdr-growth-debt-in-2020-new-world-bank-report.
[95] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment

ground, thereby minimizing the damage to these resources[96]. The overall damage to the sector amounted to 139.8 billion Lao kip, while the total damage and losses came to 1,227.3 billion Lao kip. The floods resulted in the loss of over 23 million fingerlings, with 42 percent of them in Vientiane Capital, followed by 14 percent in Oudomxay Province.[97]

Despite Lao PDR's abundance of water resources, the demand for water supply is steadily rising. Particularly in the southern plains, surface water cannot meet the needs for irrigation, and any disruptions in the natural hydrological cycle could pose severe threats to the agriculture sector due to climate change. Changes such as alterations in the onset, duration, and intensity of the rainy season, increased drought frequency, and a rise in heat wave incidence (such as that recently experienced in April 2023) could negatively impact total crop production and its reliability as a source of income, especially if they coincide with crucial phases at the start and end of the cropping cycle. Intensive groundwater use could dry out shallow wells, potentially reducing crop production by up to 10% by mid-century.

A significant portion of Lao PDR's agricultural areas is also dedicated to producing paddy rice, with maize production increasing. Rice, which is particularly susceptible to higher night-time minimum temperatures, could face declining yields due to changing temperature and rainfall patterns. It is estimated that rice yields could fall by 5–20% by the 2040s, impacting food security as rice forms a staple food for many households.

Women also play a crucial role in ensuring food security and nutrition for their families. Women often face greater risks than men in adapting to climate change, as they must work harder and longer to secure food sources and adequate nutrition for their households.[98]

4.3 Impacts on Health

Climate change has affected the health of the Lao people and caused an increase in the epidemic of various diseases such as diarrhoea, malaria, respiratory diseases, malnutrition, mental health and others. In addition, there are frequent and severe disasters that have resulted in damage to the foundation, infrastructure of health service facilities and water, sanitation and hygiene systems, including the health services of the people encountering difficulties, especially vulnerable groups such as women, children, the elderly and the disabled.[99]

Flooding affects the health sector both directly and indirectly. Direct effects include damaged health facilities (hospitals and health centres) whereas indirect impacts include the increase of water-related diseases (such as E. coli and Salmonella causing diarrhoea) transmitted via faeces in areas where the water and sanitation systems are not clean and safe. In addition, melioidosis and leptospirosis, which are local diseases, may cause outbreaks during the rainy season and there is a high risk if the floods increase. The negative effects of floods also include eczema, muscle spasms and respiratory failure.[100]

Moreover, the number of dry days is predicted to increase to 10 days on average from 55 days in 1990, causing the prolonged droughts – which affect the quantity and quality of water and sanitation systems resulting in an increased risk of water-related diseases. The number of livestock species decreased and destroyed, affecting food security and increasing the risk of malnutrition. The heatwave also affects health, causing illness, especially for people with chronic diseases of the respiratory system and heart failure. Children, the elderly, workers who work under the sun and people with chronic diseases are the most vulnerable groups when it comes to heatwave. It

[96] Continuous heavy rain led to rivers overflowing their banks, thereby flooding the adjoining plains and fields. As standing water lingered in the fields for weeks, rice and crops began to rot, resulting in total crop destruction in the worst-affected areas. It was reported that an estimated 2,733 villages and 128,890 households, comprising 745,681 people, were affected.
[97] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment
[98] UNWOMEN, https://www.uncclearn.org/wp-content/uploads/library/unwomen700.pdf
[99] GoL (2018). *Post Disaster Needs Assessment (PDNA) 2018 Floods*. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment
[100] WHO (2015). Climate and Health Country Profile, Lao People's Democratic Republic

was estimated that the mortality rate of the elderly people (65+ years) is expected to increase to approximately 72/100,000 by 2080 compared to a baseline of approximately 3/100,000 per year during 1961-1990.

The increase in temperature has increased the geographic distribution of malaria. Researchers have shown that the humidity and the increase in temperature during the rainy season led to the creation of a good breeding condition for malaria in Lao PDR. The death rate due to malaria is 8% and it is still a public health problem in Lao PDR. Recent years have experienced serious malarial epidemics. In 2006, the infection rate was 96.9/100,000 people. In 2010, there were 22,890 cases of malaria and in 2013 there were 44,171 cases and 95 deaths. Malaria usually occurs in big cities in each province and the people who live in those cities, but in 2009 there was a high number of malaria cases in the rural areas of Lao PDR. Climate change associated with an increase in temperature and rainfall can increase the spread of malaria. Most malaria diagnoses occur during the rainy season from December to October and hence the incidence of malaria is often very high in the rainy season, but the distribution pattern of the disease changes according to the region and has a significant relationship with the average temperature, rainfall and humidity in the whole country.[101]

In Lao PDR, nutrition is also a serious public health problem. In 2012, the prevalence of stunted growth in children under age 5 was 43.8%, the prevalence of underweight children and wasting in children under 5 was 26.5% and 6.4%, respectively. Rising temperature, lack of water and drought, all cause negative impacts on crop production and destruction of food production system. These imbalances will make the situation in the Lao PDR more severe, especially affecting the most vulnerable groups of people who may be at risk.[102]

The World Health Organization (WHO) asserts that climate change could derail progress in reducing disease risk in Lao PDR. Malaria (as stated above), however poses perhaps the largest threat, with projections indicating an increase of around 400,000 in the population at risk by the 2040s and 2070s under different emissions scenarios (RCP2.6 to RCP8.5). The transmission potential of dengue fever is also projected to increase under both scenarios, albeit slightly less under RCP2.6 compared to RCP8.5.

The following summary is extracted from "Overall Summary of the Downscaling Results" of the Historical, Climate Projection and Climate Risk and Vulnerability Assessment conducted by WSP (2024), which is based on a simplified overview of Chapter 7 of the IPCC AR6, whereby a number of categories of climate-related of disease and health outcomes are assessed. The IPCC offers various levels of confidence for these associations, and drivers listed in the table in italics have not been assessed directly or via proxies.[103]

Table 6: Health impact summary

Category	Climate Drivers (notes: listed drivers do not necessarily apply to all possible disease or health outcomes within each category; no filtering has been made of drivers/possibilities specifically for LPR). No assessments or proxies have been made for drivers in italics	Proxy adjustments listed above where relevant	Additional information assessed
Communicable diseases			
Vector-borne	Increased temperatures, *increased humidity*, increased rainfall, longer transmission season, vector migration	Pluvial/river flooding	Temperature trends

[101] Ibid
[102] MoH (2017). National Strategy on Climate Change and Health Adaptation to 2025
[103] WSP (2024). Historical, Climate Projection and Climate Risk and Vulnerability Assessment: *Building the Capacity of the Lao PDR Government to Advance the National Adaptation Planning Process*

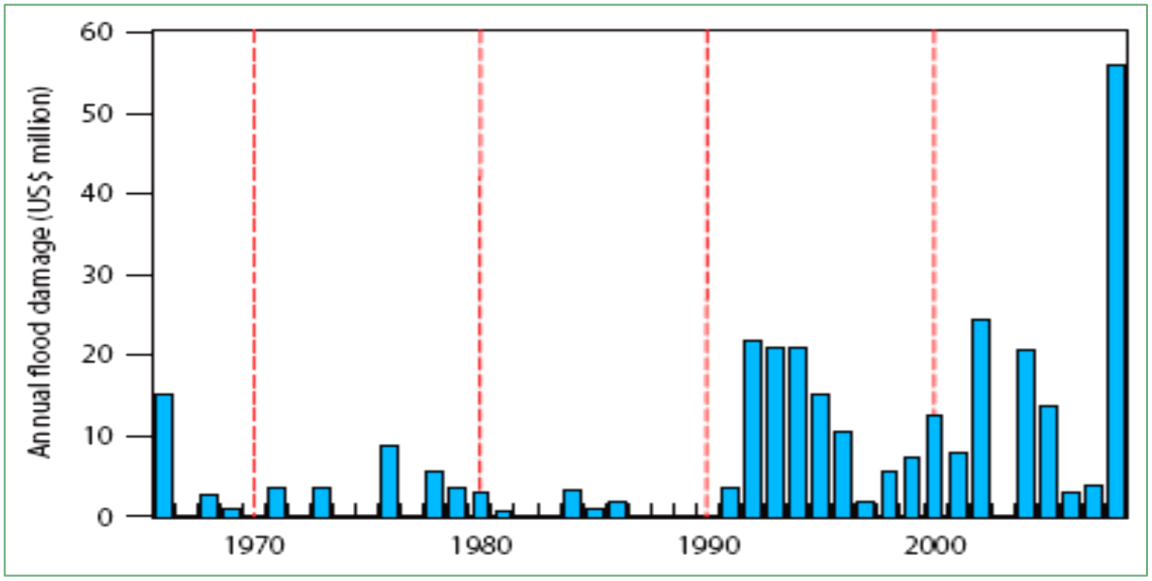
Water-borne	Increased temperatures, heavy rainfall, flooding, drought	Flash flooding, pluvial/river flooding, drought	Temperature trends
Food-borne	Increased air and water temperatures, longer summer seasons, increased rainfall	Pluvial/river flooding	Temperature trends
Respiratory tract infections	Temperature and *humidity* extremes *including sudden changes*, *dust storms*, heavy rainfall events, *increased climate variability*	Flash flooding	Temperature trends
Non-communicable diseases			
Cardiovascular	Extreme heat		Temperature trends, spells of high temperatures
Respiratory	*Dust storms and transport, pollution, ozone concentrations*, higher temperatures, *pollen load*		Temperature trends, spells of high temperatures
Cancer	*Atmospheric and surface chemical changes*, flooding*, cloudiness (decreases may reduce melanomia), disease migration*	Pluvial/river flooding	
Diabetes	Increased temperatures, extreme weather events affecting treatment	Pluvial/river flooding	Temperature trends, spells of high temperatures
Other disease/health impacts			
Temperature-related mortality	Increased temperatures (also decreased temperatures but not relevant to LPR)		Temperature trends, spells of high temperatures
Weather-related injuries not from heat/cold	Flooding, *wildfires*, storms	Flash flooding, pluvial/river flooding	
Child birth	Extreme weather events, drought, increased heat	Flash flooding, drought	Temperature trends, spells of high temperatures
Malnutrition	Multiple complex drivers including higher temperatures, increased/reduced rainfall	Flash flooding, pluvial/river flooding, drought	Temperature trends, spells of high temperatures
Chemical contamination	*Multiple complex drivers involving climate*		
Mental health and well-being			
Mental disorders	*Extreme weather events* including storms, increased temperatures, increased rainfall, *wildfires, climate anxiety*	Flash flooding	Temperature trends, spells of high temperatures
Well-being	Storms, drought, *wildfires*, heat, *air quality, disruption*	Flash flooding, drought	Temperature trends, spells of high temperatures

Source: UNEP, (WSP) 2024.

4.4 Impacts on Economic Development

The impacts of floods and storm hazards manifest through social, economic, and environmental damage, resulting in loss of life, population displacement, destruction of homes, and substantial

economic losses. It's estimated that floods alone contribute to a loss of 2.8% to 3.6% of Lao PDR's annual GDP. Figure 46 illustrates a consistent increase in damages caused by floods.[104] While extreme weather events have been steadily increasing, certain years have seen particularly extensive damage. As shown in Table 7, which provides a comparison of disaster impacts from 2008 to 2020, the years 2018 and 2019 were particularly devastating due to severe floods and storms.



Source: MRC

Figure 46: Rise in damages caused by flooding in Lao – 1966- 2008 (USD millions). Mekong River Commission, 2008.22.

Table 7: Losses from disasters 2008-2020

Disaster Type	Year	People Affected	Deaths	Cost of damages (USD)
Flood	2008	243,342[105]	3[2]	17,157,2242
Typhoon Ketsana	2009	271,943[2]	28[2]	58,000,0002
Tropical Storms Haima and Nokten	2011	429,954[2]	42[2]	220,568,382[2]
Flood	2013	353,966[2]	25[2]	280,375,000[2]
Flood	2014	15,308[2]	1[2]	
Flood	2015	37,815[2]	0[2]	7,434,604[2]
Floods after Tropical Storms Son-Tinh and Bebinca	2018	616,145[106]	56 (as of Oct 2018)[3]	147,000,000 + losses of 224,500,000[3]
Floods	2019	1,000,000+[107]	19[4]	
Floods	2020	69,764[4]	2[108]	

Source: UNCTAD

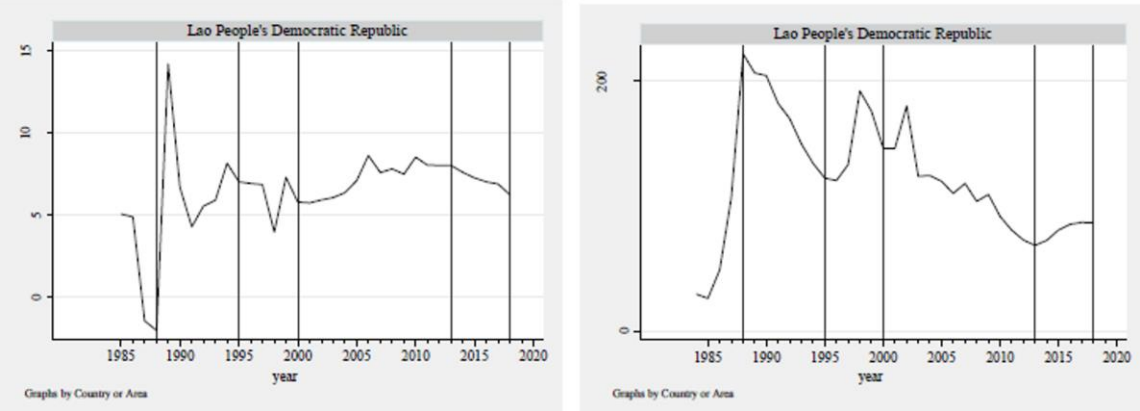
Figure 47 illustrates the trends in GDP (on the left) and external debt (on the right), with the five

[104] World Bank (2019). Recovery and Resilience in Lao PDR', The World Bank. https://www.worldbank.org/en/news/feature/2019/04/09/recovery-and-resilience-in-lao-pdr.
[105] GoL. Lao Statistics Bureau, 'Lao Country Report. https://www.unescap.org/sites/default/files/Country%20Report_drought%20monitoring%20and%20early%20warning_Lao%20PDR.pdf.
[106] GoL (2018) 'Post-Disaster Needs Assessment. https://laopdr.un.org/sites/default/files/2019-08/2018%20PDNA_English.pdf.
[107] CFE-DM (2021). Lao PDR Disaster Management Reference Handbook. https://reliefweb.int/sites/reliefweb.int/files/resources/disaster-mgmt-ref-hdbk-lao-pdr2021.pdf.
[108] AHA Centre (2020). Tropical Storms "Linfa" & "Nangka" Cambodia, Lao PDR, Viet Nam: Flash Update #4'. https://reliefweb.int/sites/reliefweb.int/files/resources/FlashUpdate_04_21Oct2020-TS-NANGKA-LINFA-MEKONG.pdf.

most devastating natural disasters since 1980. These events occurred in 1988, affecting 18.1% of the population, in 1995 affecting 12.2%, in 2000 affecting 8.6%, in 2013 affecting 9.3%, and most recently in 2018, affecting 10.6%. Following each of these catastrophic events, there appears to be a slight uptick in external debt as a proportion of GDP either during that year or the subsequent one. Although it's not possible to definitively establish a causal link, this trend suggests Lao PDR's heightened vulnerability to natural disasters.[109]

In 2018, the total damage amounted to $371.5 million, which equates to 1.25-2% of GDP and represents 9.6% of the annual budget. This data seems to suggest a negative correlation between natural disasters and Lao PDR's current account balance. This correlation is likely due to the necessary increase in imports and investment projects, which led to the deficit rising from 10.6% in 2017 to 12% in 2018. The most significant damage was incurred by the transport sector, accounting for 50% of the total damage. Additionally, within the productive sector, floods had a particularly detrimental effect on agricultural output. Damage to the agriculture sector comprised 39% of the total damage.[110]

These external vulnerabilities need to be taken into consideration when assessing Lao PDR's access to concessional funding. The country's existing high-interest rate and current debt levels could potentially hinder its ability to secure the necessary financial resources to recover from natural disasters and build resilience.



Source: UNCTAD

Figure 47: Constant GDP growth, External debt and severe natural disasters. Note: The vertical lines present the worst natural disasters in terms of affected population: 1988 (18.1 per cent) 1995 (12.2 per cent), 2000 (8.6 per cent), 2013 (9.3 per cent), 2018 (10.6 per cent).

The Covid-19 epidemic has had a significant impact on women's economic in Lao PDR, the impact of the pandemic has led to widespread job losses, layoffs, and economic instability. Women, especially mothers in vulnerable sectors and outside the system are affected differently. Many women who work in sectors such as tourism, services, retail, are heavily affected by the epidemic. As a result, many women have lost their jobs or had their hours reduced, leading to financial insecurity and challenges in supporting themselves and their families.

Women contribute significantly to the informal economy in Lao PDR, with activities such as small-scale trade, agricultural production and handicrafts. Restrictions imposed due to the pandemic, including travel and restrictions on market activities, have affected livelihoods, affecting women's earning capacity and inequality in women's access to resources, especially in rural areas. Limited access to finance, services, markets, and agricultural raw materials hinders women's economic empowerment. The economic impact of the epidemic has also affected women's ability to access education and health care for girls due to financial constraints, while limited access to health services has affected their overall well-being and ability to participate in the workforce.[111]

[109] UNCTAD (2021). Vulnerability Profile of Lao PDR
[110] GoL (2018) 'Post-Disaster Needs Assessment. https://laopdr.un.org/sites/default/files/2019-08/2018%20PDNA_English.pdf.
[111] Voluntary National Review Report on the Implementation of the 2030 Agenda for Sustainable Development, 2024.

4.5 Impacts on Water Resources

Climate change significantly impacts the hydrological cycle, affecting the frequency, intensity, and timing of rainfall. Precipitation tends to increase during the rainy season and decrease during the dry season as a result of climate change. While some areas experience prolonged droughts, others face increasingly frequent abnormal heavy rainfall events that lead to flooding, causing substantial economic, social, and environmental impacts, including damage to agriculture, industry, and other sectors. For instance, in 2008, severe flooding affected more than 200,000 people and destroyed 75,000 hectares of agricultural land. The major flood event of 2011 resulted in damages totaling USD 200 million. In 2013, multiple flooding incidents occurred due to climate variability, which increased rainfall and storm intensity during the monsoon season from May to October, causing floods across various regions of the country. These floods impacted approximately 395,000 people and resulted in more than 20 fatalities across 12 provinces.[112] In 2018, Lao PDR was struck by Tropical Storm Son-Tinh, which brought heavy rainfall and severe flooding to 55 districts across 13 provinces. Several provinces in central and southern Lao PDR were also affected by Tropical Storm Podul and Tropical Depression Kajiki during the 2019 monsoon season, with damages from these events estimated at approximately USD 164 million.[113]

The energy sector which is the key sector contributing to the country development, is heavily reliant on water resources. The national hydropower development potential (see Section 4.9) is around 26,000 megawatts (MW). There were 78 power plants with an installed capacity of 9,972 MW in 2019, with hydropower plants accounting for approximately 80% of overall generation capacity. Despite the hydropower potential, climate change threatens the stability of power generation, impacting energy security and energy exports. The financially viable hydropower potential is also expected to reach its maximum by 2030, and its share of total generation is forecast to drop to around 77% by 2040.[114]

Climate change also poses a threat to groundwater resources. Under changing climate conditions, depletion of groundwater volume and deterioration of quality could limit local communities' access to these resources, thereby challenging food security and livelihoods. Moreover, due to the rapid socio-economic development in recent years and the depletion of surface water caused by both climate change and human activities, the demand for groundwater has drastically increased in the Mekong River Basin. [115]

Moreover, flooding in the Mekong River basin and its tributary basins is also a frequent occurring process that brings the negative impacts of loss and damage to the country's infrastructure (Section 4.7), human lives (Section 4.6) and properties. The complex hydrological system of the basin means that rainfall in different parts of the catchment can result in varying downstream effects, and local floodplains play a key role in mitigating flood waters. As of 2018, it is estimated that damages associated with floods are expected to rise by a factor of 5-10 annually given the rate of proposed and existing development in the basin, often in the floodplain areas.[116]

A joint study by MAE and the Food and Agriculture Organization (FAO) has identified climate change as a significant factor contributing to the rise in storms and variations in rainfall. The study reveals that the increase in rainfall differs across different regions and altitudes. Over the past three decades (1990-2019), provinces such as Sekong, Attapeu, Champasak, and those along the border with Vietnam, such as Saravan, have experienced an average increase in rainfall. Additionally, high-altitude areas in provinces like Xaysomboun, Vientiane, and Xiengkhouang,

https://laocso.org/wp-content/uploads/2024/06/VNR-2024-Lao-Report-final-version.pdf.

[112] https://www.reuters.com/article/us-Lao PDR-floods/floods-in-Lao PDR-kill-20-damage-rice-crops-idUSBRE97R0BB20130828

[113] https://ahacentre.org/situation-update/situation-update-no-5-tropical-storm-podul-and-tropical-depression-kajiki-13-sep-2019/

[114] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)

[115] Liu, J., Chen, D., Mao, G., Irannezhad, M., Pokhrel, Y (2020). Past and Future Changes in Climate and Water Resources in the Lancang-Mekong River Basin: Current Understanding and Future Research Directions, a). School of Environmental Science and Engineering, Southern University of Science and Technology, Shenzhen 518055, China b). Regional Climate Group, Department of Earth Science, University of Gothenburg 40530, Sweden C). Department of Civil and Environmental Engineering Michigan State University, East Lansing MI 48824, USA.

[116] http://www.fao.org/nr/water/aquastat/basins/mekong/mekong-CP_eng.pdf

as well as regions in Khammouan and Borikamxay, have also seen substantial rainfall. At a regional level, the trend in annual rainfall varies between the southern and northern parts of the country.[117] While the north has seen a relatively stable or slightly increased annual rainfall over the past 30 years, the south has experienced a significant rise, with some areas seeing an increase of more than 5 mm annually, and in some cases up to 30 mm.[118]

Over the past four decades, Lao PDR has experienced five major droughts, impacting over 3 million people. The severe drought in 1998, characterized by exceptionally high temperatures during the dry season, affected more than 750,000 people. Another severe drought in 2003, attributed to regional climate change, further jeopardized domestic agricultural production and food security. The year 2010 witnessed a severe drought during the rainy season, from May to October, significantly impacting agricultural production and leading to a severe food shortage in the southern region, affecting approximately 85,000 people. This drought followed Typhoon Ketsana, particularly impacting the southern provinces. These localized droughts not only threaten agricultural production and food security but also have adverse effects on the hydrological system, biodiversity, and public health.

It is estimated that nearly 188,000 households in Lao PDR are at risk of food insecurity as a result of more severe droughts during the dry season. In 2019, a shortened monsoon season has led to severe drought conditions and brought the water levels of the Mekong to their lowest point in 60 years, threatening agricultural productivity across the lower Mekong River basin.[119] According to a study by the FAO, the reduction in rainfall during the rainy season has heightened the risk of drought, particularly in the plains of Luang Namtha, Luang Prabang, Xaysomboun, and the northern part of Vientiane Province. This risk has escalated over the past 30 years (1990-2019).[120] Moreover, the persistent high risk of drought poses a significant challenge to the development of national water resources. Changes in water demand patterns resulting from climate warming and increased water evaporation are projected to diminish water availability, posing concerns for water resources, particularly for electricity generation and irrigation. Given this scenario, bolstering the integrated water resources management (IWRM) framework is crucial to support broader economic development goals and strategies.

Hence, climate change has significantly impacted upon the hydrological cycle, leading to alterations in the frequency and quantity of rainfall, surpassing normal thresholds. This is a result of the complex changes in the hydrological system, affecting water levels across the Mekong River and its tributaries, and causing severe economic, social, and environmental damages. Additionally, climate change is anticipated to influence groundwater resources, potentially leading to reduced volume and deteriorating quality. These changes may impose limitations on local communities' access to groundwater resources in the future.

4.6 Impacts on Human Settlements and Society

Urbanization is increasing throughout Lao PDR, with the 2016 UN-Habitat World Cities Report recognizing it as the fastest urbanizing nation in Southeast Asia.[121] In 2020, the average urban population in Lao PDR was 22 percent (World Bank, 2023), of which a portion resided in unstable housing conditions that negatively impacted their health.

Smaller settlements are also becoming more urban in character due to factors such as rural-urban migration and government policies, such as merging several villages to form a small town. However, poor coordination among the multiple ministries in charge of different facets of urban planning and management means that many small-town populations lack access to basic services and infrastructure, including waste management.

[117] MAF and FAO (2020). Climate and Meteorological Maps of Lao PDR
[118] GoL (2018) 'Post-Disaster Needs Assessment. https://laopdr.un.org/sites/default/files/2019-08/2018%20PDNA_English.pdf.
[119] http://www.mrcmekong.org/news-and-events/news/drought-continues-to-hit-mekong-countries-risking-stress-on-crop-production-water-shortage/
[120] MAF and FAO (2020). Climate and Meteorological Maps of Lao PDR
[121] UN-Habitat, 'World Cities Report 2016: Urbanization and Development - Emerging Futures' (Nairobi, 2016)

Of particular note, climate-related impacts often hit the poorest demographics hardest. For instance, the 2018 flood affected household economies, with an estimated 70% of debt-ridden people having to increase their loans due to lost property and assets, according to the GoLPDR. These economic impacts often cause a ripple effect of other issues such as forced migration, education drop-out rates, worsened food security, loss of job opportunities, and increased prostitution, among others.[122]

As a country that continues to rely primarily on natural resources and agricultural production, Lao PDR's capacity for disaster prevention, emergency response control, and post-disaster recovery remains limited and underdeveloped, partly due to its status as a developing nation. Climate change poses a significant risk factor that will expose Lao PDR to increased natural disasters. Rising precipitation levels and temperatures are expected to alter the Mekong River hydrological system, with flood and drought risks also anticipated to increase. To address these challenges, the coordination mechanisms among ministries and sectors responsible for various aspects of urban planning and management require further improvement.

By mid-2024 there were more than 400,000 migrant workers working abroad, more than half of whom were female migrants. Depressed agricultural productivity leads to a lack of stable income due to natural disasters caused by climate change, which is one of the causes of labor migration from rural areas to large cities and abroad. [123]

4.7 Impacts on Critical Infrastructure

It is clear that extreme weather events such as floods can severely affect infrastructure such as roads, storm sewers, drainage systems, housing and health infrastructure, as well as facilities for food production, water management and power generation. In Lao PDR, public works and transport sector remains one of the most highly susceptible sectors to flooding and river bank erosion with the road network, for instance, being at risk due to inadequate maintenance and its exposure to continue and worsening climatic risks. Floods initiated by tropical typhoons in particular have caused considerable damage, impacting on one-fifth of the nation's road network. In 2009 typhoon Ketsana damaged the Southern parts of Lao PDR, including the sector of roads, irrigation, and public infrastructure (school, and hospital), estimating a cost of approximately USD94.2 million[124] whilst the 2011–2015 floods and landslides also damaged roads and bridges valued at USD327,05.[125]

Floods also inflicted significant damage on waterway infrastructures and facilities associated with flood protection and navigation along the Mekong, Nam Khan, and Nam Nguem rivers. The majority of this damage occurred in Vientiane Capital, Luangprabang, Xayaboury, and Khammuane provinces.
In total, 9,853 kilometers of roads and 656 meters of bridges were damaged in 2018 as a consequence of a flash flooding event, where 786 meters of bridges were completely destroyed and around 2,085 vehicles (including trucks, cars, motorcycles, and farm trucks etc), were damaged, primarily in Attapeu when the Xe pien-Xe Nam Noy saddle dam breached due to heavy rainfall.[126]

Other types of infrastructure affected include river course slope protection, dikes, embankments, floodgates, ports, and navigation aids. The total estimated cost of this disaster is around 116.9 billion Lao kip. The floods resulted in the erosion and collapse of river course slope protection, dikes, and embankments along the Mekong River and its Nam Khan and Nam Nguem tributaries. In total, 3,000 meters of river course slope protection, 4,400 meters of dikes and embankments, 22 floodgates, and eight ports and navigation aids were damaged.

[122] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment
[123] Ministry of Labour and Social Welfare
[124] ReliefWeb (2009). Typhoon Ketsana caused 94.2 million dollars of damage in Lao. https://reliefweb.int/report/lao-peoples-democratic-republic/typhoon-ketsana-caused-942-million-dollars-damage-laos
[125] Vongphachan (2017). Mainstreaming Disaster and Climate Risk into the Road Sector in Lao PDR
[126] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment

The floods also bring severe impacts to both urban and rural water supply, sanitation, and hygiene (WASH) facilities. The estimated cost of the damage and losses to the sector amount to 69.9 billion Lao kip. The funds needed for recovery are estimated at 68.2 billion Lao kip. In the urban water supply sub-sector, 31 urban water supply systems across 12 provinces incurred physical damage amounting to 7.1 billion Lao kip and losses of 7.7 billion Lao kip, totaling 14.8 billion Lao kip. This affected 289,774 people across 54,600 households. The short-term recovery needs are estimated at 6.3 billion Lao Kip to restore water supply to the affected households and conduct necessary emergency repairs to resume normal services.

One significant impact of increasing human activities in Lao PDR is the escalating rate of sand mining from the Mekong River. While natural processes typically produce approximately 20 million tons of sand through sediment flow and replenishment annually, current extraction rates have doubled, according to recent research (WWF, 2016). The rapid growth of mineral extraction in Lao PDR, coupled with high domestic and regional demand, is leading to increased erosion and land degradation, with subsequent impacts on air pollution and floodplains that threaten biodiversity and affect the livelihoods of millions of Lao people. The impact of this damage extends to economic sectors such as fisheries and agriculture as well as biodiversity related impacts on freshwater ecosystems leading to the collapse of infrastructure along riverbanks.[127]

4.8 Impacts on Forestry and Terrestrial Environment

The forestry sector in Lao PDR significantly contributes to the national economy and sustains the livelihoods of a high percentage of the local (rural) populace. Climate change significantly impacts the forest sector, upon which the Lao people heavily depend for their food and livelihoods. Variations in rainfall and temperature, causing changes in soil water availability, have led to a decrease in natural forest regeneration, biodiversity loss, and a decline in ecosystem services. Furthermore, changes in precipitation patterns could negatively affect the survival of flora and fauna, including seedlings and saplings. [128] A comprehensive study by the Regional Community Forestry Training Center for Asia and Pacific on Food Security and Vulnerability Analysis revealed that climate change also poses a threat to forest productivity and leads to the degradation of forest resources. This suggests that local communities require increased access to Non-Timber-Forestry-Products (NTFP), vegetables, and other household essentials. It is estimated that 157,000 people face food insecurity due to these changes.

In addition, rising temperatures are predicted to increase the frequency of forest fires and pest and disease infestations within forests. These changes could also escalate the severity of extreme flooding events caused by soil erosion. [129] These floods have had varying impacts across Lao' economic and social sectors. The economic sector most affected have been agriculture, in particular impacts on crops, fisheries, livestock, and irrigation which combined results in, circa 57 percent of the total national losses. The impact on the forestry sector has, however, been relatively limited. Flash floods have mainly impacted the densely forested highlands, particularly in the northern provices of Lao PDR, while flood events have primarily affected crops and agriculture along riverbanks and basins. While some trees along valleys and streams were also affected, the stagnant water in the plains following the floods lacked the force to uproot and displace trees.

Quantifying losses in the forestry sub-sector remains a challenge as most benefits from forests are often not economically accounted for due to a lack of natural capital accounting (NCA) procedures being in place. In the damaged forest areas, a decrease in the availability and collection of NTFP such as firewood, wild vegetables, and roots is anticipated. However, assigning a monetary value to these losses is problematic. According to the Post-Disaster Needs Assessment (PDNA), the total damage to the forestry sub-sector is estimated at 10.1 billion Lao kip.

The World Bank Group's Country Partnership Strategy Progress Report identified ongoing exploitation of Lao PDR's forests, both through poorly regulated legal logging and illegal logging

[127] https://www.eastasiaforum.org/2023/03/02/mekong-river-sand-mining-is-a-crumbling-castle/
[128] Lao PDR, 2011. Climate Risk and Adaptation Country Profile, Vulnerability, Risk Reduction, and Adaptation to Climate Change, Lao
[129] EU (2011). Managing Climate Change Risks for Food Security in Lao PDR

activities. This unsustainable exploitation culture, along with deforestation, compromises the long-term sustainability of the landscape and rural livelihoods, particularly in light of climate change impacts. The recent surge in rubber monocultures has also led to a decrease in income diversification for farmers. This shift to rubber monoculture interventions reduces resilience to climate and other shocks, and also impairs the biodiversity of terrestrial ecosystems.[130]

The increasing magnitude and frequency of extreme events such as floods are expected to erode the quality and quantity of forest and fallow products that sustain livelihoods. These events may also lead to soil erosion, watershed degradation, and massive landslides. Additionally, forest fires, triggered by rising temperatures and more frequent and prolonged dry spells and droughts, are expected to increase. There is also an anticipated loss of biodiversity, including some endemic plants and animals, due to changing climate patterns.

4.9 Impacts on Energy and Mining

Climate change has had a profound impact on the energy and mining sectors, particularly in terms of operations, profitability, and export. The increase in temperature, along with extreme weather events such as flooding and drought, can negatively affect mining operations, leading to delayed activities and the destruction of equipment and infrastructure. Furthermore, water scarcity presents a challenge for the energy sector in securing sufficient water for their operations. [131]

The energy and mining sector is therefore at risk from an array of climate, technological, and human-caused hazards that may interrupt the provision of electricity or lead to a chronic undersupply of power. Each increasing hazard has potential impacts on the power sector in Lao PDR. This is because hydropower is based on the environmental flows of water, the hydropower sector in Lao PDR is vulnerable to existing extremes and variability in climate, and climate change modelling predicts these extremes and variability may become more intense in the future under a range of greenhouse gas emission scenarios and pathways. Climate hazards such as flooding can damage the electricity sector in all provinces in Lao PDR. In 2018, the total cost of flood damage was 45.3 billion kip, encompassing 43.2 billion kip destructed to the transmission line and 3.1 billion kip destroyed infrastructure. This mainly caused by faults in distribution lines and grids, while landslides may directly damage transmission and sub-stations.[132] At the community level, heavy rainfall during the flood event damaged distribution grids in all provinces and disrupted the power supply in 1,091 villages.[133]

The ADB also highlighted that climate change probably augments adverse impacts and poses a significant risk to power generation in Lao PDR. The tendency of climate change variation was likely to harm the operation of hydropower, including performance risk: sensitivity of generation to reservoir inflows due to daily, weekly, and seasonal changes in rainfall and evaporation rate; the operating life of a hydropower plant can be influenced by amplified sediment loads, reducing the amount of reservoir storage; augment risk and intensity of extreme flooding that it can propensity threaten the dam structure.[134]

Climate-related disasters can also destroy infrastructure such as roads, bridges, and ports, indirectly affecting the mining sector. For example, the global financial crisis led to price volatility for major products in Lao PDR, including copper and gold. A significant drop in global copper prices presented challenges for Lao PDR's primary mining operator.

Heavy rainfall can exacerbate erosion, affecting the slope stability near opencast mines, disrupting land transportation routes, and hindering the delivery of input materials such as steel, timber, cement, hydrochloric acid, and consumables like diesel and tires. In addition, rising temperatures

[130] Brown, P. R., Afroz, S., Chialue, L., Chiranjeevi, T., El, S . Williams, L. J. (2018). Constraints to the capacity of smallholder farming households to adapt to climate change in South and Southeast Asia. Climate and Development, 0(0), 1–18. URL: https://www.tandfonline.com/doi/abs/10.1080/17565529.2018.1442798
[131] Lao PDR (2010). Economic, Social and Environmental of Investments in mining, Lao PDR
[132] GoL (2018). Post Disaster Needs Assessment, Lao PDR
[133] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment
[134] ADB (2019). Energy Sector Assessment, Strategy and Road Map, Lao PDR.

may increase energy demand and strain transmission capacity, affecting the higher cost of operation and resulting in decreased production and profits. This temperature rise also heightens the risk of heat-related illnesses, injuries, accidents, and fatalities.[135]

4.10 Impacts on Tourism

The climate impacts on the tourism sector differ from province to province according to the type of natural hazard. Impacts to the private sector within this sector are often felt more than that to the public sector. In general, the impacts on tourism sector from, for example, floods occurred primarily because of revenue lost when facilities closed and staff had to be laid off and lost their salaries. Tourism operators also experience losses because of higher operating costs, additional costs associated with providing access to tourism sites (for example, temporary bridges), temporary higher costs of electricity, water, and other services etc. Road closures, for instance, often lead to higher transportation costs, while extensive damage to rice crops around the country is expected to have a knock-on effect on operating costs for hotels and restaurants.

The climate impacts on the tourism sector can include hardships placed on both individuals and families who either operate or work in the various facilities affected by the hazard. With regards to floods, many tourism facilities located along rivers and waterways often suffer damage when embankments overflow during storm events and resulting flood impact. Community-based tourism ventures and homestays are also deemed more at risk after such disasters because they often lack the resources to sustain themselves during the crisis period or lack the funds to rebuild.[136]

In addition to the effects of climate change, the spread of the Covid-19 has also affected the tourism sector, especially in 2020, the number of foreign tourists decreased by -81.5% from 4,791,065 people in 2019 to only 886,447 people due to the strict enforcement of measures to prevent and control the spread of the disease, including the closure of various international checkpoints from April 2020. However, the number of foreign visitors to Lao PDR in 2023 increased but lower than before the outbreak of Covid-19, which shows that the recovery of foreign tourists has not reached yet because the global market environment still has many challenges, especially risk factors from the global economic crisis and others.[137]

With regard to gender differences, women who work in the tourism industry frequently have the lesser-paid jobs, such as housekeeping in hotels and guesthouses. If a facility closes, these jobs will be most at risk, whereas managers, who are more than likely men, will be kept on during the time of the disaster. The women, are, thus, more at risk for seeking riskier employment options elsewhere, or for unsafe migration.

4.11 Impacts on Education

Climate-related hazards, particularly floods, have had significant impacts on the education sector in Lao PDR. The flooding has severely damaged 229 public schools, leading to an estimated loss of about 20.4 billion kips. Schools, especially in the hardest-hit Savannakhet Province, were submerged for up to two months. This flooding obliterated classrooms, restrooms, and integral structures such as walls and foundations. It also ruined educational resources like teacher's manuals, textbooks, and furniture, including desks, chairs, and blackboards, along with electronic devices like computers and printers. Teachers reported losing uniforms, educational materials, musical instruments, and sports equipment, while many families grappled with displacement and loss of their homes. [138]. Poor construction practices that have made schools vulnerable to any type of hazard resulting in severe damage to many of their foundations. School classrooms and toilets incurred damage to foundations, walls, ceilings, and roofs.[139]

Furthermore, flooding causes student absenteeism in both rural and urban areas. In rural regions,

[135] Scheuchard, R & Nelson, J (2010). Adapting to climate change: A guide for the Mining Industry.
[136] MICT (2017). Statistical Report on Tourism in Lao PDR 2017
[137] MICT (2017). Statistical Report on Tourism in Lao PDR 2023
[138] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment
[139] GoL (2018). Lao PDR Post Disaster Needs Assessment Report

when floodwaters exceed safe levels and cause multiple rivers to become impassable, students must stay home to assist their families, particularly when homes and agricultural products are destroyed by floods and heavy rainfall. In addition, increased frequency of weather events such as severe cold weather, heat waves, disease outbreaks, and erosion all affect children in both urban and rural areas. Additionally, children living in remote areas are more likely to drop out of school due to changing climatic conditions and disaster events.

Adding to these challenges, droughts have precipitated water scarcity in local communities, adversely affecting both students' and teachers' daily lives. For instance, in rural areas, droughts have exacerbated poverty as inadequate water supply hinders agricultural productivity. This lack of resources often leads students to drop out of school to help in agricultural fields or migrate elsewhere to earn income and support their families.

According to a 2018 Post-Disaster Needs Assessment (PDNA), flooding damaged 229 public schools and disrupted educational services nationwide, resulting in total damages to the education sector. However, the number of affected schools varied significantly across provinces, with Khammouane and Savannakhet provinces experiencing the most severe impacts. In the heavily affected provinces, some schools remained flooded for up to two months. Substandard construction rendered schools vulnerable to flooding conditions. Classrooms and restroom facilities sustained damage to floors, walls, ceilings, and roofs. Damaged assets included teaching and learning materials, school furniture, and equipment such as desks, chairs, blackboards, and other essential items.

It is important to note that children are physically more vulnerable and less able to withstand and survive shocks such as floods, storms, and severe weather, during which they are largely reliant on adults for protection from harm. A clear lack of preparedness in schools and communities among the adult population exacerbates the situation, which often manifests itself in inadequate protection of the children and other vulnerable community members.

During natural disasters such as droughts and floods, women are often more burdened to ensure the livelihood of the family, which gives women less time to access training, education and develop their skills. Girls are often dropped out of school because their families cannot afford their education. Girls' household responsibilities increase, as parents need to work more to earn an income. In addition, girls are often engaged in paid work outside their homes and communities, even when they are still in school, causing poor academic performance or leading to school dropouts. Rates of early marriage and forced marriage are on the rise, as families may force girls to accept marriage to improve their financial situation. Girls and young women are also at risk of violence on their way to school, which may make families reluctant to send girls to school.[140]

4.12 Impacts on Women, Children, Elderly, Disabled and Ethnic Groups

Women, children, disabled, elderly and migrant women are considered the most vulnerable groups. Various reports have indicated that women, girls and persons with disabilities experience higher mortality rates during disasters, emphasizing the need for governments and development partners to pay attention to the issue.

Adapting to climate change requires an understanding of gender relations that affect both men and women, including gender-diverse groups. Factors contributing to the gendered vulnerability to climate change risks include duties and responsibilities, time usage, access to resources and credit, access to services, treatment by formal institutions, limited involvement in policy discussions and decision-making, and a lack of gender-specific data for policy enhancement.[141]

[140] Plan International Organization: https://plan-international.org/uploads/2023/11/Climate-Change-and-Girls-Education_Synthesis-Report_Nov2023.pdf
[141] World Bank Group (2016). Gender Equality, Poverty Reduction, and Inclusive Growth. URL: http://documents1.worldbank.org/curated/en/820851467992505410/pdf/102114-REVISED-PUBLIC-WBG-Gender-Strategy.pdf

For Lao PDR, the impacts of climate hazards on men and women can vary based on gender inequality levels and roles in work distribution and familial care responsibilities. Given the overrepresentation of women in the informal sector, their lower wages in the formal sector, and their limited access to land and housing, women could face more significant relative economic losses and longer recovery periods after losing their homes or possessions. This situation could also increase their unpaid home and care responsibilities following climate hazards. Women, particularly in the poorer demographics, tend to be disproportionately affected by these issues due to traditional practices and systems that may hinder land ownership, reducing the financial support opportunities available to them. Disparities in access to education, healthcare, and infrastructure, combined with uneven poverty distribution between rural and urban areas, increase the vulnerability of people in hard-to-reach locations.

The human toll of natural disasters disproportionately affects the poor, with women and children being especially vulnerable. The harsh reality for these poor households is a day-to-day existence, devoid of adequate resources to mitigate the impacts of climate-induced shocks. This vulnerability is exacerbated by monoculture practices, limited livelihood diversity, and insufficient infrastructure.[142] Floods, for example, have accounted for 37% of hazard-related deaths, 85% of hazard-related injuries, and 77% of recorded economic losses from 1990 to 2018. Women are disproportionately affected by these floods, for instance, the 2018 floods increased women's workloads and heightened their risk of experiencing gender-based violence in temporary shelters and camps. In fact, extreme weather events, such as the 2018 floods, not only caused immediate damage but also obstruct long-term resilience-building efforts. A prime example of this is how these floods hindered the creation of a national rice reserve. The broader implications of these climate-related shocks highlight the urgent need for effective mitigation strategies.[143]

Children in Lao PDR are especially vulnerable to disasters. Despite little progress in the birth registration process over the past five years, only one in ten mothers knows how to register births with the authorities, as per the Lao Statistics Bureau. Consequently, a group of unregistered children, who are outside the reach of social protection systems and undocumented, have limited means of establishing legitimacy if their families are affected by disasters.[144]

As of 2017, Lao PDR boasted one of the highest proportions of women (27.5 percent) in national parliaments. However, women's representation in local decision-making is less robust, despite evidence worldwide that women can be effective leaders at the local level. A key challenge moving forward is to increase awareness and research on how climate change impacts gender, ethnicity, and inclusion in the local context. Addressing this issue is critical in shaping sustainable development policies in Lao PDR.

5. Adaptation Barriers and Limiting Factors

5.1 Information, Knowledge and Technology

The information and knowledge management gaps and needs identified to support the future implementation of this NAP are presented as follows:

- The need for Department of Environment to access up-to-date and reliable data from other departments in a timely fashion and in suitable format. Although there are shared databases and portals, there is widespread (yet disorganized) practices around Lao PDR of storing data, reports and other digital information on personal laptops, computers and external hard drives. Department staff spend excessive time searching for data and reports, and interpreting supplied data to meet their information and reporting needs. There is also the risk of vital information and knowledge being lost when custodians of that information/knowledge leave the project or organisation.

[142] GoL (2018). Post Disaster Needs Assessment (PDNA) 2018 Floods. Retrieved from https://laopdr.un.org/en/12913-2018-floods-post-disaster-needs-assessment
[143] World Bank and ADB (2021). Climate Risk Profile of Lao PDR. https://www.adb.org/publications/climate-risk-country-profile-lao-pdr
[144] ADPC (2019). Disaster Risk Reduction in Lao PDR

- Lack of Lao PDR-specific scientific research to inform adaptation planning and decision-making. In most cases, research is conducted as part of a larger regional programmes or projects, with limited budgets and resources allocated for Lao PDR. This presents some challenges, including difficulties in accessing research data, as the ownership of the data may be retained by an external organisation and there is limited potential for the research to be replicated (or sustained as a longitudinal study).
- The culture of information sharing between and within government and non-governmental organisations is gradually improving. The exchange of information and knowledge is occurring through personal relationships and social interactions. Enhanced focus on data sharing, information exchange and knowledge transfer across development sectors and with subnational stakeholders (District level) is necessary for every stage of the NAP process.
- There is currently inconsistent use of metadata, which is a gap with potential implications for the process of NAP implementation. The data, information and documentation collected and generated by the NAP process should apply consistent metadata standards to ensure their authenticity, source, year, format and other characteristics.
- There is a gap in systematically documenting and capturing traditional and local knowledge of changes in climate and coping strategies used to adapt to the impacts of climate change. Whilst some projects have been more successful than others in documenting traditional and local knowledge, the information is held by projects, rather than being stored in a central repository for greater access and application of information for NAP and other adaptation planning processes. This in turn leads to limited understanding about what information already exists and who holds this information.
- There remains a need to increase efforts to develop and improve a gender-disaggregated statistical data collection system for the climate change adaptation, including capacity building for relevant sectors to collect data, analyze and use gender-disaggregated statistical data to support the development and improvement of the relevant policies and programs.
- Technology utilization for adaptation remains limited, with the primary challenge being inadequate access to appropriate, modern, and applicable technologies in priority sectors. These include: promoting advanced technologies to control weeds, pests, water scarcity, and water quantity in agriculture; utilizing satellite imagery technology to support policy-making and monitor deforestation or changes in forest cover for forestry and land use planning; implementing real-time early warning systems for disaster events; using permeable materials to prevent soil erosion and reduce urban heat island effects; deploying e-Health systems or satellite imagery to improve public health system efficiency and modernization; and applying technologies such as Geographic Information Systems (GIS), satellite imagery, and remote sensing for risk and vulnerability assessments across various sectors.
- Technical capacity for managing and maintaining technology to ensure sustainability remains insufficient. The lack of infrastructure and skilled, experienced personnel presents a significant challenge for technology implementation at various levels. Furthermore, inadequate budgetary resources and coordination mechanisms among different sectors pose additional difficulties in systematically implementing adaptation technologies. Therefore, capacity building across various domains is essential, including international technological cooperation to enhance long-term adaptive capacity.

5.2 Institutional Governance

Governance and institutional barriers limit adaptive capacity by exacerbating drivers of vulnerability as well as impeding action, decision-making, and the flow of resources to where they are needed. This is likely because climate change poses, exacerbates, and introduces new problems which are yet to be fully accounted for in Lao PDR national planning processes.

Integration of environmental and climate risk into development planning processes would be greatly enhanced through the creation of climate change focal points or “units” with the capacity and authority to effectively manage cross-sector mainstreaming across government and within

projects. These can also support cooperation and coordination between Government Ministries by identifying cross-sectoral linkages and by breaking down silos. Greater use of development planning tools would support the integration process. Tools such as strategic environment assessment (SEA), multi-criteria analysis (MCA), integrated vulnerability assessments, as well as gender analysis and action plans will support outcomes with equitable benefits for low-income and otherwise disadvantaged groups, robust decision-making, and the management of trade-offs.

Development planning processes would also be enhanced greatly by integrating adaptation and disaster management into planning and budgetary processes. This is particularly important as vulnerability is often driven by the "weakest link in the chain," thus reinforcing one sector alone without action to support others, an approach which is unlikely to be efficient over the long term. Tracking adaptation measures would be greatly facilitated if budgetary processes are regularly updated so that environment- and adaptation-related initiatives can be accounted for across ministerial lines at both national and sub-national level, over political timescales. Generally, efforts to improve resilience will be strengthened by giving greater support and resources to the enforcement of relevant existing legislation, most notably those which support and govern natural resource use and management. This should include greater levels of monitoring and evaluation in tandem with an improved understanding of climate change adaptation. For instance, under the NESDP, no progress reports are required to monitor climate change-related indicators within any project initiative across and outside of government.

Finally, there is strong potential to enhance local government and sub-national development planning processes so that sufficient consideration is given to new and evolving environmental and climate risks within sub-national structures, decision-making, and budgetary processes. There is also potential to upgrade processes and mechanisms which can guide decision-making and manage trade-offs between different potential measures and development pathways.

5.3 Finance

Financial barriers directly inhibit adaptation as financial literacy, capital, and services are vital components to support and create adaptive capacity. All adaptation measures, including more inclusive decision-making processes involve the use of financial capital. A comprehensive approach to resource mobilization is required which: 1) seeks to increase levels of adaptation finance, 2) aligns financial flows so that they contribute towards a climate-resilient pathway, 3) supports autonomous adaptation by the private sector, households, and communities, and 4) coordinates financial inclusion efforts with other development and adaptation activities. Increased levels of adaptation finance would improve available funds for important infrastructure maintenance and investment required to manage the additional risks associated with climate change.

The incorporation of risk transfer mechanisms and contingency finance into development planning processes would partially alleviate the use of scarce resources at both national and household level being devoted towards disaster recovery efforts rather than prevention and risk reduction. For instance, national budgets often still allocate scarce resources towards recovery efforts regarding severe/extreme weather events (including heat waves that are being experienced in Lao PDR). In fact, climate models are all predicting typhoon intensity to increase in the future which will have significant future financial implications.

Increasing local-level financing mechanisms, modalities, and fiduciary management would greatly enhance the ability of finance to flow to this level to support adaptation processes. Additionally, enhancements to budgeting and resource mobilization processes would help to ensure initiatives can be accounted and financed in a timely and flexible fashion while meeting local needs. There is also potential for these to be designed in a way which provides incentives for incorporating green infrastructure and restoring natural resources which support adaptive capacity.

Potential for improving financial inclusion in the more rural Districts of Lao PDR is especially important to help to substantially improve efforts to reduce vulnerability. It would also potentially

have a catalytic effect in creating employment, reducing poverty and contributing to sustainable economic growth. Vulnerability reduction efforts by the private sector would be enhanced by updating financial services so that they incorporate environmental and climate risks and dis-incentivize investment patterns which increase vulnerability.

In the implementation of the NAP, the gender perspective must be considered in the development of sectoral strategies for raising funds and resources, using financial mechanisms, and ensuring equal participation in the access and use of financial resources, especially at the local level.[145]

5.4 Economy and Livelihoods

A major barrier to adaptation is that the national economy is predominantly comprised of climate-sensitive activities which depend heavily on healthy levels of biodiversity and the importance of natural capital. While potential adaptation options exist to reduce the vulnerability amongst key economic sectors, a greater focus of adaptation planning efforts on the needs of the private sector would greatly alleviate some of the issues created by economic barriers. Such support should deliver the tools and capacity required to help private sector entities identify and address climate risks in their supply chains and business portfolios, and their ability to participate in sub-national development planning processes.

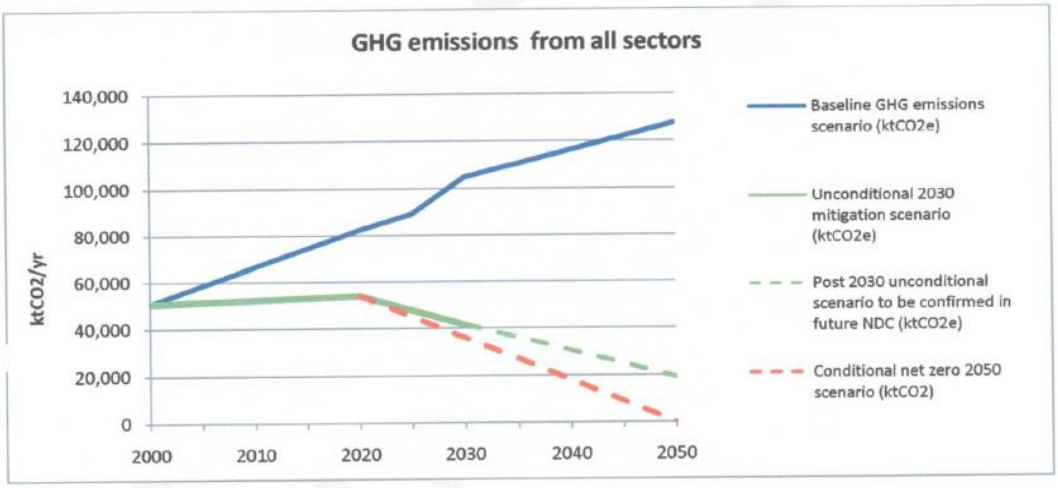
Finally, enhancing relationships with private sector entities and representative bodies would hence be invaluable. Economic barriers also are often generated from patterns of urbanization which have resulted in much of the population, real estate, and critical infrastructure being located along the Mekong River. These areas are naturally highly exposed to multiple environmental and climate hazards. Therefore, while potential adaptation options exist to reduce the vulnerability of these settlements and infrastructure, residual vulnerabilities will inevitably continue into the future.

[145] United Nations Framework Convention on Climate Change (UNFCCC)

PART III: STRATEGIC ADAPTATION PATHWAYS AND APPROACHES

1. Synergies with the NDC

Lao PDR submitted its latest NDC in 2021 (updating the version produced in 2015) to the UNFCCC. This current NDC increased its ambition with an unconditional emission reduction target of 60% by 2030 relative to the baseline scenario, reinforcing mitigation measures in the forestry and energy sectors, and incorporating gender equality perspectives (see Figure 48). The adaptation component was broadened within the 2021 version of the NDC, which highlighted the circular economy as a crucial tool for pursuing a low-carbon development pathway. Version 3.0 f the NDC for Lao PDR is being updated in 2025 to assist in mainstreaming climate change adaptation and mitigation within sectoral strategies.[146]



Source: Lao PDR (2021) NDC

Figure 48: National GHG emission scenarios

2. Synergies with International Conventions and SDGs

Lao PDR has established both adaptation and mitigation measures within this NAP that aligns well with international conventions, including the Rio Convention on Biological Diversity (CBD) and climate change commitments through 2030. Particular emphasis is placed on adaptation measures that promote ecosystem resilience through, for example, the restoration of forests, land, and water resources, while addressing the root causes of biodiversity loss and ecosystem degradation, thereby contributing to GHG emission reductions. The implementation of these measures contributes to achieving the objectives of these conventions by harnessing nature's potential and promoting the conservation, management, and restoration of ecosystems and ecosystem services, in accordance with the biodiversity management strategy under the CBD.

The NAP also creates synergies that can generate co-benefits for several of the SDGs, particularly with respect to activities related to clean water and sanitation, agriculture, resilience, infrastructure, land use and management, forests, ecosystems, the environment, disaster risk reduction, awareness, employment, well-being, resource efficiency and adaptive capacity, which are related to Goals 1, 2, 3 5, 6, 9, 11, and 13.

[146] GoL (2021). Nationally Determined Contribution (NDC). https://unfccc.int/NDCREG. This is expected to be updated as the NDC 3.0 by early 2026.

3. Tackling Adaptation Planning Barriers and Challenges

A critical obstacle to climate change adaptation planning is the paucity of detailed (downscaled) national meteorological data and information, which results in uncertain and unclear climate projections particularly at the local level. The application of meteorological data and climate projections in sectoral planning also remains limited. Currently, the agriculture and water sectors have initiated database development to improve clarity and coverage across all 18 provinces nationwide.

Improving data management systems in Lao PDR and establishing centralized datasets through web portals is essential to facilitate sectoral data access and utilization. Currently, meteorological and hydrological data used for climate analysis and projections, as well as climate change risk and vulnerability assessments, remain uncentralized and inaccessible. Furthermore, the capacity to analyze and integrate this data into various sectoral planning processes remains limited. Therefore, capacity building is necessary to ensure optimal utilization of available data. These challenges are particularly critical for flood and drought risk management planning. Strategic planning considerations must include upgrading database management and services, and building capacity for various levels of government organizations and development partners.

Additionally, Lao PDR faces other difficulties and challenges in implementing climate change adaptation, including: lack of quantified information on climate change impacts across various sectors; insufficient mainstreaming of climate change into sector development plans; weak inter-sectoral coordination mechanisms; inadequate “climate tagging” of budget lines across GoLPDR along with technical-technological capacity to implement climate accounting procedures; limited access to appropriate adaptation technologies for each sector; absence of monitoring and evaluation systems for adaptation implementation; and incomplete public awareness at various levels, with climate change not being prioritized in current lifestyles, as evidenced by behaviors such as indiscriminate waste burning and agricultural production without consulting weather and climate information.

4. Reinforcing Ecosystem-based Adaptation

The integration of Ecosystem-based Adaptation (EbA) into sectoral policies and programs represents an adaptation approach utilized by many countries to mitigate climate change impacts and generate comprehensive benefits for both central and local sectors in the long term. This NAP considers the integration of EbA into national and local policies, strategies, and programs, specifically by:

1. Utilizing ecosystem potential and services to promote resilience-building across all vulnerable sectors;
2. Incorporating ecosystem-based adaptation approaches into socio-economic and environmental planning processes;
3. Conserving and restoring flora, fauna, and habitats to enhance adaptive capacity or reduce climate change and environmental impacts.

This NAP hereby prioritizes EbA and nature-based solution (NbS) measures, particularly those that focus on agro-forest and water resource management which in combination, all help to build climate resilience while contributing to GHG absorption, biodiversity conservation, health, and the country's socio-economic stability.

With specific reference to the agriculture sector, this embraces a series of EbA measures that adhere to international principles and may include interventions such as maintaining soil fertility, implementing agroforestry systems in cultivated areas, and conservation agriculture practices that reduce GHG and build resilience. These measures also generate environmental, socio-economic, biodiversity, and ecosystem service benefits.

Furthermore, integrating EbA measures for both adaptation and mitigation into water resources management, the outcome has easily measured benefits to public health, as this often results in the public being able to have improved access to clean water, sanitation, and hygiene, whilst promoting community health and economic well-being.

For urban development, integrating EbA measures into provincial and district socio-economic development plans is crucial, particularly in urban master planning where EbA delivery can support the delivery of spatial planning for local development projects. EbA should also be promoted and prioritized in local community awareness-raising processes and information exchange. Community-level climate change adaptation planning should consider and value local knowledge and traditional sustainable livelihoods, along with natural resource potential that supports adaptation efforts.

Furthermore, the education sector should consider incorporating climate change curricula at all educational levels and providing scholarships for various societal sectors to study climate change at the university level. Strengthening partnerships between universities and international research institutions is important for providing and exchanging data and best practices for adaptation planning.

5. Indicative Action Plan

The following list of indicative action plans is created to improve climate change adaptation planning (information management and services, climate change awareness and knowledge, capacity development, etc.):

- Establish a cross-sectoral working group to coordinate and regularly update the content of awareness raising and knowledge raising material.
- Improve place-based material on climate change impacts.
- Identify lessons learnt from current or completed adaptation projects to identify what worked or did not work and prepare potential duplication of the successful measures.
- Strengthen mandate and capacity of the relevant stakeholders to enhance cooperation, communication, and coordination relating to climate change and disaster risk reduction efforts, and to improve preparation and participation in relevant international and Asian regional meetings.
- Strengthen capacities of national level and provincial government entities to enhance planning processes so that they incorporate the needs of particularly vulnerable groups through inclusive analysis and responsive decision-making systems to ensure effective delivery of development initiatives and compliance within the NAP Framework.
- Develop and implement a monitoring and evaluation system to assess progress made towards implementing the Lao NAP and in particular the integration of climate change issues across Ministerial work plans and strategies at national and subnational levels, with results transparent and open to the public to the extent possible.
- Mainstream cost-benefit analysis, multi-criteria analysis, and other relevant tools (such as gender analysis) into decision-making processes regarding climate change adaptation and disaster management.

6. Understanding Community Aspirations

Communities in Lao PDR often tend to be risk-averse owing to their limited resources. However, these same communities commonly display a readiness to strengthen and diversify existing livelihoods into new areas, thereby absorbing associated risks to support their resilience.[147] Assistance is nevertheless needed for these communities to modify their livelihood models and build climate resilience at the local level. They are well aware that recovery from damage caused by floods and extreme weather events can take years. Integration of climate change adaptation into investment planning across various sectors would lessen the vulnerability of the Lao PDR's

[147] FAO CSA project, 2019, p.18. https://www.thegef.org/sites/default/files/web-documents/10187_LDCF_Lao_PIF.pdf

populace to climate change and enhance the sustainability of resource management. Yet, local investments have not sufficiently improved climate resilience or fostered sustainable development. Local stakeholders have suggested climate-resilient investments such as storage, drying, and agro-processing facilities and technologies.[148]

Internally, the government has strived to strengthen climate resilience and DRR. As stated in Part I, the GoLPDR has displayed strong commitment through its involvement with the UNFCCC, the Paris Agreement, and the Sendai Framework for DRR. Areas for improvement have been identified, such as the current lack of comprehensive data to facilitate sector-specific risk assessments, which hampers effective recovery. For instance, despite severe storms in 2017 causing damage to properties and lives, particularly in the agriculture and transportation sectors, there was no damage estimate or count of affected individuals reported in EM-DAT. It is imperative to enhance local capacities to ensure that even small, recurrent climate hazards are recorded and factored into risk assessments.[149] As local communities are the first responders to disasters, strengthening institutional capacity and resources at the village and district level is crucial.

The GoLPDR has also reinforced its coordination and management mechanisms, exemplified by the establishment and fortification of Disaster Management Committees at central, provincial, district, and village levels. The NEC and the Technical Working Group (TWG) on Climate Change are also both part of these efforts. Additionally, the GoLPDR has implemented widespread awareness campaigns on climate risks and impacts, coupled with suitable prevention and loss reduction measures for communities and society at large. The establishment of the Round Table process further demonstrates the government's commitment. This initiative brings together governments, national development agencies, United Nations agencies, civil society organizations, and the private sector. It ensures that funds, time, and knowledge are effectively utilized for nationwide development. The Natural Resources & Environment Sub-Sector Working Groups, which include the Disasters, Climate Change & Environment group, chaired by the Department of Environment and Co-Chaired by UNDP, are an integral part of this process.

To improve the quality, quantity, and accessibility of data for this NAP and other DRM purposes, various initiatives were implemented to institutionalize disaster data and information management systems. These initiatives include the Lao Disaster Information (LaoDI), Lao Water Information System (LaoWIS), and the GeoNode Risk Atlas web platform.[150] The GoLPDR has also undertaken significant measures to enhance weather forecasting and early warning systems. This includes modernization of weather forecasting methodologies and reporting mechanisms, the establishment of the National Water Resources Information Center, and the construction and upgrade of 163 meteorological and hydrological stations.

7. Addressing Loss and Damage

Climate change-induced Loss and Damage (L&D) in Lao PDR faces significant barriers due to the absence of comprehensive, disaggregated, and systematic data on climate-related hazards such as floods, droughts, landslides, and extreme weather events. The lack of standardized methodologies for assessing disaster-related losses presents a major challenge. Although Post-Disaster Needs Assessments (PDNAs) and Disaster Damage and Loss Assessments (DaLA) aligned with global approaches exist, they are not consistently applied across all events or sectors. Currently, sectoral ministries conduct independent damage assessments without standardized tools or centralized coordination, resulting in inconsistent and incomparable data. Moreover, the absence of climate attribution studies in these assessments limits Lao PDR's ability to establish connections between disaster impacts and climate change, thereby hindering access to international support.

[148] UNDP IRAS project, 2010, p.10. https://www.globalsupportprogramme.org/sites/default/files/downloads/09-30-2010_id4034_-_proj_doc_final_revised.pdf
[149] UNCTAD (2020). Vulnerability Profile of Lao PDR
[150] UNCTAD (2020). Vulnerability Profile of Lao PDR

To address these challenges, Lao PDR should establish comprehensive data collection systems that capture disaggregated information on all climate-related hazards. The implementation of standardized methodologies for disaster-related loss assessments must become systematic, ensuring PDNAs and DaLA frameworks are consistently applied across all sectors and events. Incorporating climate attribution studies into assessment frameworks will strengthen the country's ability to demonstrate clear linkages between disasters and climate change, facilitating access to international funding. Additionally, developing downscaled risk assessment data at district and village levels will significantly enhance local planning and response capabilities.

Establishing a centralized coordination mechanism for L&D governance will streamline efforts across relevant departments and ministries. This mechanism should focus on building institutional capacity to assess both economic and non-economic losses, capturing impacts on livelihoods, cultural heritage, ecosystem services, and community well-being. An integrated, interoperable data platform connecting disaster impacts with climate monitoring systems will enable effective tracking of historical and real-time loss data. This platform should incorporate geo-referenced, disaggregated datasets for vulnerability mapping and trend analysis while integrating existing systems like LaoDi and the Sendai Framework Monitoring System.

Full integration of L&D considerations into the National Adaptation Plan (NAP) and sectoral planning frameworks is essential for strengthening climate resilience. This integration must extend to public finance tracking, investment planning, and key sectoral policies in agriculture, infrastructure, and water management. Developing anticipatory actions and social protection instruments will help reduce residual risks, particularly for vulnerable populations. Enhanced inter-sectoral coordination will ensure comprehensive L&D coverage across all relevant government bodies.

Strengthening research and academic institutions' role in generating L&D evidence will provide crucial insights for policy development. Priority areas include advancing attribution science, studying non-economic losses, and documenting community-level impacts. Targeted advocacy, training, and knowledge exchange programs at policy and community levels will build widespread understanding and support for L&D integration. Improving public access to disaster loss data will increase transparency and stakeholder engagement in planning and response efforts.

Establishing structured access to international L&D finance mechanisms, including the new Loss and Damage Fund, will provide sustainable funding sources. Developing context-specific risk transfer schemes and climate risk insurance products will enhance financial resilience. A diversified financing strategy combining domestic resources, international climate finance, and innovative instruments will ensure adequate resources for L&D response. Clear resource mobilization strategies aligned with global L&D frameworks are essential for long-term sustainability.

Building capacity at subnational levels is crucial for conducting reliable assessments of both economic and non-economic losses. This includes developing standardized tools and providing comprehensive training for local officials to conduct community-specific impact assessments. Clear communication channels between national and subnational levels will facilitate effective strategy implementation and ensure that local experiences inform national policy development, creating a responsive and adaptive L&D management system.

8. Financial Resources for Implementation

Globally and nationally, the response to climate change is limited due to serious budget deficits. Lao PDR, for example, will be unlikely to stem theses costs and build resilience without external financial support. A range of stakeholder are included in emergency response management and resilience building.

Currently, three projects (large-scale) are financed by Green Climate Fund (GCF), which currently represents the largest climate fund. According to the OECD Development Assistance Committee (DAC) Finance statistics 2018, $106 million is committed for adaptation-related financing, 57 per cent of which come from the Asian Development Bank and the International Development

Association, and 28 percent from OECD member countries.

Lao PDR received considerable assistance from development partners. Given that ODA has declined over the preceding decade to only 3.3 per cent of GDP in 2018, there could be room to engage more resolutely with bilateral development partners on financing climate change mitigation and adaptation, and to access more grants and investment financing on more concessional terms. In 2018, more than 50 per cent of all climate-related development finance was funded by multilateral development banks; 37 per cent of which was in the form of debt instruments (OECD DAC Finance statistics).

The GoLPDR is committed to the implementation of its NDC (2021), the NCCS and other related sectoral climate change action plans. Thus, significant financial resources will be needed to deliver the mitigation and adaptation actions within these, as well as enhancing the enabling environment for climate-related investment. In particular the NDC (2021) highlighted adaptation measures that require an indicative investment of approximately USD1 billion.[151]

While the situation of Lao PDR is peculiar as in addition to the standard budgeting and financing through the Ministry of Finance, a number of funds have been established and are used either as a mechanism to channel earmarked resources or to complement the budget. These funds are either national ones or set-up as part of the country's cooperation with Partners. The Environmental Protection Fund (EPF), for example, is a semi-independent domestic fund. It is funded up to 80% by WBG funds through the Second Lao PDR's Environmental and Social (LENS) project, while some of the funds are from concession agreements allocated for environmental protection and rehabilitation, such as through hydropower project investments. EPF is currently in the accreditation process by the GCF, supported by GIZ, since 2018.[152] Moreover, EPF is also being accredited to the Green Growth Promotion Fund (GGPF) which is being set-up as part of the country's effort to mainstream green growth and adaptation in its sectors and broad national development planning.

The NAPs Implementation Plan shall identify the strategy to mobilize funds from various relevant domestic sources in a manner that is sustainable in an effort that mainstreams climate change and adaptation work into sectoral work plans and budgets, thereby building resilience to climate change. Table 8 below summarizes the relevant domestic funding sources.

Table 8: Existing domestic funds

Fund	Administrator	Status	Sectors	Donors
Environmental Protection Fund – EPF	Ministry of Agricultre and Environment	On going	Biodiversity Environment Protected Area Management EIA capacity building (mining, hydro, transport, construction)	WB ADB Domestic Private Sector - hydro and mining
State Reserve Fund	Ministry of Labour and Social Welfare	On going	Disaster risk reduction and recovery	Domestic (g Global Facility for Disaster Reduction and Recovery)
Poverty Reduction Fund – PRF	Ministry of Agricultre and Environment	On going	Water supply Rural infrastructure (roads,	WB SDC

[151] MAE (2015). Lao PDR Nationally Determined Contribution
[152] EPF (2023). EPF Lao PDR. https://laoepf.org.la/en/

			dispensaries, educational facilities)	
Green Growth Promotion Fund – GGPF	Ministry of Finance	Planned	Green growth	GGGI
Forest and Forest Resource Development Fund – FFRDF	Ministry of Agriculture and Environment	On going	Forestry	Domestic (production forest revenues)
Rural Electrification Fund – REF	Ministry of Industry of Commerce	On going	Energy (household solar)	WBG NORAD

Source: Authors

In the last decade, almost all multi- and bilateral development partners in Lao PDR have provided funding for climate initiatives directly or indirectly related to various sectors such as agriculture, transport, energy, etc. Funding climate change activities that come from climate adaptation financing sources is on the rise. The following donors and financing sources provide adaptation funding:

- Green Climate Fund (GCF);
- Global Environment Facility (GEF);
- Adaptation Fund (AF);
- Least Developed Countries Fund (LDCF);
- Pilot Program for Climate Resilience (PPCR);
- Special Climate Change Fund (SCCF);
- Global Climate Change Alliance (GCCA).
- International Climate Initiative (ICI)

PART IV: SECTORAL PRIORITIES FOR ADAPTATION

1. Agriculture

1.1 Sector Policy Linkages and Implementation Considerations

The agricultural sector is identified within the 9th National Socio-Economic Development Plan (NSEDP) 2021-2025 as perhaps the primary national sector for Lao PDR's development. This is because it plays a vital role in the Lao PDR economy, with employing more than 73 percent of its citizens and contributing approximately 28 percent to the country's GDP.[153] According to the 9th NSEDP, the agriculture and forestry sector aims to achieve the growth rate of the agricultural and forestry products including processing by 2.5% per year, accounting for 15.3% of GDP, contributing to the growth of the economic structure at the level of 4% per year to ensure the security of food supply. It also sets the target to produce 3.5-4 million tons of rice per year (of which 2.5 million tons of guaranteed rice), aiming to increase the consumption of meat, fish and eggs by an average of 73 kg per person per year, by ensuring the growth of livestock at an average of 3-4% per year and the growth of fish farming at the level of 3-4% per year. Aiming for an average export value of agricultural products of 1.200 million dollars per year; 70% forest cover by 2025 and build 69 urban areas in the country.[154]

Moreover, the 5-Year Development Plan for agriculture, forestry and rural development (2021-2025) also promotes agricultural production to guarantee food security and nutrition, to produce quality and diverse agricultural products; People have increased income, reduced poverty and the living conditions of rural people have been greatly improved; Forests and forest resources have been protected, developed to create added value and income to the national economy. Floods and droughts, as well as pests, and animal diseases have however caused severe damage to the agriculture sector, creating a key challenge to achieving the goals and objectives of the NSEDP, as well as that of the Agriculture, Forestry, and Rural Development Plan. Disasters and climate change also threaten national food security and nutrition.

1.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

Agriculture		
 **Flooding**	 **Increased temperature**	 **Decreased p recipitation**
 **Decreased water for irrigation**	 **Loss of crops due to extreme weather**	 **Increased crop pest and disease**

Climate Change Impact	Adaptation Strategy	Sample Adaptation Activities
	1. Prevent agricultural food crop production impacts from climate hazards including floods, erosion of agricultural land and surface erosion.	Integrate management, prevention and control of climate change through ecosystem resilience where possible to support updates to agriculture d evelopment planning at all levels within the agricultural sector.

[153] GoL (2021). 9th National Socio-Economic Development Plan (2021-2025)
[154] MAF (2021). 5-Year Development Plan for Agriculture and Forestry Sector (2021-2025)

	2. Initiate research to apply new technology and techniques for improved climate resilient agricultural production.	Research and develop innovative techniques to adapt to climate change including research and planning in the management of agricultural production systems related to integrated land management to reduce the risk of climate change and research, develop and adopt the use of climate resilient rice varieties and crops/plant seeds that are durable to flooding, droughts and cool weather in addition to developing the application of appropriate plantation techniques.
	3. Build human capacity on climate change adaptation within the agriculture and fishery sector.	Provide training to farmers/fishers on technical knowledge and demonstration of various techniques and technologies together to adapt to climate change in an ecosystem resilient manner.
	4. Promote communication tools to raise awareness on climate risks for the agriculture sector.	Design and develop a communication plan for awareness raising on climate risks for the agriculture sector in collaboration with relevant stakeholders.
	5. Improve information management systems and strengthen the development of early warning systems within the agriculture sector.	Expand agricultural meteorological systems in all regions (North, Central and South) to support agricultural value chains to reach every province and district that is at risk to key climate hazards.
	6. Improving tools, mechanisms, and facilities for better preparedness.	Develop manuals and guidelines on how to build livestock shelters (such as goat cage, cowsheds, fish ponds, or frog farms) with enhanced safety standards, or align with technical principles as well as develop and use modern tools in related work such as drones, satellite images and aerial photos and create the ability for personnel to use such equipment.

1.3 Adaptation Activities and Action Plan

The following summary table develops further the adaptation "strategies" highlighted above into more details "activities" of importance for the sector. It also presents the sectoral strategies and objectives towards achieving climate resiliency, whom is responsible for its delivery and indicative timeframe for activity completion as well as indicators and targets to be achieved.

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
Strategy 1: Prevent agricultural food crop production impacts from climate hazards including floods, erosion of agricultural land and surface erosion.[155] [156] [157]					
Objective 1: Prevent, control and resolve impacts from climate hazards including flood, drought, outbreaks of animal and plant diseases, particularly in the agriculture production areas.	Integrate management, prevention and control of climate change through ecosystem resilience where possible to support updates to agriculture development planning at all levels within the agricultural sector. . The integration includes revising agricultural laws, decrees and other policies related to agricultural sector and other relevant stakeholders.	Ministry of Agriculture and Environment (MAE): Department of Planning and Cooperation (DPC), Department of Land Management and Development, Department of Agriculture (DOA), National Agriculture and Forestry Institute (NAFRI), Department of Irrigation (DOI), Department of Agriculture Extension and Cooperatives (DAEC)	✓	✓	Mid-year plan, five-year ministerial development plan integrated including revised national strategies, and regulation documents, especially a strategy on agriculture development 2035 and vision towards 2050 is being developed
	Collect information to identify and map out risk areas where climate-related disasters often occur (and may occur) such as downstream flood/drought risk areas, areas affected by the outbreak of animal and plant diseases, or at risk to soil erosion and other risks by applying modern techniques or technologies to help determine and assess impacts of key climatic events through the use of satellite image, aerial photos/maps, applying modern warning systems and others.	MAE: DPC, Department of Land Management and Development, Department of Agriculture (DoA), National Agriculture and Forestry Research Institute (NAFRI)	✓	✓	The number of flood and drought risk areas that can be identified or the number of risk maps developed in 18 provinces across the country

[155] MAF (2015). Agriculture Development Strategy to 2025 and Vision to the Year 2030
[156] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)
[157] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	Develop and update climate risk and vulnerability maps for the agricultural sector (main crops, irrigation, livestock, fisheries, and forestry) to support the integration of climate change adaptation into the Agricultural Development Plans at all levels.	MAE: Department of Land Management and Development, NAFRI	✓		CRVA is re-assessed or updated at least once every 5 years, especially updating the risk and vulnerability map.
	Review and assess vulnerabilities, risks, impacts of previous floods, droughts, extreme climate events, and changing rainfall patterns on the agriculture sector as well as plan-options for climate change adaptation in agriculture and food security in general and in detail, focusing on production systems and other value-added chains that are at risk and affected.	MAE: NAFRI, Department of Meteorology and Hydrology (DMH)	✓	✓	CRVA is re-assessed or updated at least once every 5 years, especially updating the risk and vulnerability map
	Construct, improve and renovate water gates and/or weirs such as the areas along both river banks and other areas with risks, particularly in large plains alongside with the inspection and repair the embankments of the water pump stations on the Mekong and its tributaries.	MAE: DPC, Department of Irrigation (DoI)	✓	✓	At least 10 projects on constructing and improving the water gates and weirs implemented across the country
	Utilize climate resilient designed infrastructure (i.e.: “hybrid” EbA measures) such as local water conservation measures or more national scale interventions such asirrigation reservoirs and hydropower reservoirs by controlling and determining appropriate and safe water level in the reservoirs ahead of flooding season starts (rainy season), particularly Nam Ngum Dam 1, Nam Mang 3, Nam Theun 2, Theun Hinboun, Xe Pien-Xe Namnoi, Xe Kaman and others.	MAE: DPC, DoI	✓	✓	At least 6 reservoirs, particularly Nam Ngum Dam 1, Nam Mang 3, Nam Theun 2, Theun Hinboun, Xe Pien-Xe Namnoi, and Xe Kaman is developed
	Adopt EbA principles to support the construction of water conveyance/diversion channels system to release water from large production areas that have flooding risks (such as Xe Banghieng, Xe Bangfai reservoirs).	MAE: DPC, DoI	✓	✓	At least five related projects developed in main river basins such as Xe Banghieng, Xe Bangfai reservoirs

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	Adopt EbA principles to build flood protection canal systems in areas where the conditions are available, including installing water pumps to drain water and build water drainage canals, in particular in large plains that have risks a long side with the use of modern technology to monitor water levels in each important river by determining emergency warning levels in each water level measurement station by establishing centralized management, monitoring and control centers.	MAE: DPC, DoI, DMH	✓	✓	At least 10 projects developed and implemented across the country
	Promote the need for infrastructure to store water to support communities by constructing small-scale weirs that block creeks, making small-sized ponds for storing water for use in dry seasons or drought conditions, particularly in drought/mound paddy field that are outside of constructed irrigation areas.	MAE: DPC, DoI	✓	✓	At least 50 percent of farmers in vulnerable areas across the country have been promoted on water stocking or at least 30 small scale projects have been established across the country.
	Develop and enhance infrastructure and facilities for the production, processing and storage of durable agricultural products and help adapt to climate change and disasters.	MAE: DPC, DoA	✓	✓	Number of infrastructure facilities in the agricultural sector has been developed in 7 large plains and 14 small plains
	Identify and design location specific irrigation schemes and technologies to reduce energy related risks such as improved use of solar energy, gravity (self-flowing) water supply systems that better transport surface and/or underground water.	MAE: DoI	✓		At least 20 locations identified and designed to ensure supplying of water for agriculture production for 2 seasons a year
	Establish production schedules or seasonal planning calendars in areas where the conditions exist for constructing infrastructure for monitoring, control and prevention system by determining rice and plant varieties to plant on timely basis	MAE: DPC, DoA, DoI, NAFRI, Department of Water Resources (DWR)	✓	✓	At least 10 areas are eligible to build agricultural production agriculture are established by determining

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	and be suitable with the areas (soil) in connection with mapping that determine climate risks (flood and drought) in each area.				the diversity of plants to be planted at the appropriate time in the production area.
	Improve irrigation and storage of excess rainfall (harvesting) to reduce impacts from droughts at village, District and Provincial levels.	MAE: DPC, DoA, DoI, DWR	✓	✓	Number of improved irrigation or storage of excess rainfall
	Improve drainage systems through using "hybrid" nature-based solutions where suitable to mitigate the damage to plants from waterlogging.	MAE: DPC, DoA, DoI, DWR	✓	✓	Number of improved drainage systems to mitigate the damage to plants from waterlogging
Strategy 2: Initiate research to apply new technology and techniques for improved climate resilient agricultural production[158] [159] [160] [161] [162]					
Objective 1: Identify techniques and technologies for improved agriculture production, enhancing the development and transfer of climate resilient technologies and techniques within agricultural areas that	Research and develop innovative techniques to adapt to climate change including research and planning in the management of agricultural production systems related to integrated land management to reduce the risk of climate change and research, develop and adopt the use of climate resilient rice varieties and crops/plant seeds that are durable to flooding, droughts and cool weather in addition to developing the application of appropriate plantation techniques. Especially, initiate research into new varieties of rice (i.e.: early maturing glutinous rice) that are resistance to insect diseases and other pests, floods, droughts and saline soils (For	MAE: NAFRI	✓	✓	Increase productivity about 4.5-5 tons per hectares for rainy season and 5.5-6 tons per hectares for dry season (of which 2.5 million tons of guaranteed rice). In addition, develop 3 varieties of flood-resistant plants, 5 varieties of drought-resistant plants, 2 varieties of animals and 2 varieties of water-resistant animals.

[158] MAF (2015). Agriculture Development Strategy to 2025 and Vision to the Year 2030
[159] MAF (2021). 5-Year Development Plan for Agriculture and Forestry Sector (2021-2025)
[160] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)
[161] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)
[162] MAF (2020). Plan of Action for Livestock and Fishery Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
are affected by all climate hazards.	example, how to manage soil, water and nutrients in arid and coniferous areas).				
	Use of sustainable agriculture production practices, climate smart agriculture (CSA), EbA and NbS solutions that embrace sustainable land management (SLM) such as water saving techniques in the areas that have high risk to drought, particularly in the dry paddy fields that are outside irrigation zones, including other related techniques such as: water harvesting techniques, integrated farming system techniques, integrated forest management techniques (Agroforestry), soil improvement techniques and prevention of soil erosion, and livestock management techniques.	MAE: DoA, NAFRI, Department of Livestock and Fishery (DLF), Department of Land Management and Development	✓	✓	Number of land or hectares of land used for sustainable agricultural production (techniques) or at least to be able to convert small farms into large farms up to 720 hectares using 80 sustainable agricultural production techniques
	Analyze, research and predict changes in climate conditions for agricultural production that are expected to be at risk from floods, drought conditions and seasonal pest-insect outbreaks within the different zones (North, Central and South).	MAE: NAFRI	✓		The analyzed reports or research can be used in 18 provinces across the country, or at least studied at the national level or at least in 3 different regions (North, Central and South)
	Determine and implement technology transfer programmes for adaptation and resilience to climate change in the agricultural sector, especially technologies that take into account the effects of climate change by developing agricultural systems and seeds that are diverse, promote conservation and embrace ecosystem-based adaptation principles.	MAE: NAFRI	✓	✓	At least five relevant projects implemented a year
	Research and develop management techniques to improve soil, water, and fertilizer quality for crops to promote climate change adaptation and ensure acceptance by farmers in upland areas.	MAE: NAFRI, Department of Land Management and Development	✓		At least 10 research papers developed on management techniques and soil, water and fertilizer fertility improvement

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	Establish Climate Smart Agriculture (CSA) Village Models that focus on implementing climate change adaptation within risk prone areas to be a place/platform for technological knowledge transfer and innovation for farmers.	MAE: Department of Agriculture Extension and Cooperatives (DAEC), NAFRI	✓		50 percent of farmers in vulnerable areas throughout the country have participated in the model village project for agricultural production (CSA)
	Enhance farming practices, including agro-ecological methods and modern agricultural technology, can help manage weeds, pests, water scarcity, and excess rainfall.	MAE: NAFRI, DoA	✓	✓	Number of land or hectares of land used by agro-ecological methods and modern agricultural technology
	Identify varieties of existing or new crops that are more suitable for future hotter and variable rainfall patterns to maintain or increase productivity. This can include crops like maize, cassava, and local varieties such as Kuay Nam bananas.	MAE: NAFRI, DoA	✓		At least 10 varieties of new crops are identified for future hotter and variable rainfall patterns
	Enhance agroforestry practices, such as intercropping trees with rice and other products including coffee, by adopting EbA principles, to support the important role of trees/vegetation against floods and landslides, local temperature reduction, and broader ecosystem services to support adaptation to climate change.	MAE: NAFRI, DoA, Department of Environment	✓		Number of land or hectares of land used by agroforestry practices
	Study and implement projects that demonstrate the long-term environmental and socio-economic opportunities of monocultures, such as rubber and banana plantations (that have replaced forests) in a more sustainable manner that embraces the concept of inter-cropping, to help improve livelihood	MAE: NAFRI, DoA	✓		Number of studies and implemented projects demonstrating the long-term environmental and socio-economic benefits of inter-

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	resilience and food security, especially concerning non-timber forest products (NTFPs).				cropping as part of monoculture projects
	Enhance collaboration among researchers, farmers, commercial partners, and policymakers on innovation in food systems.	MAE: NAFRI	✓		The number of research articles or contract farming or MoUs for the cooperation
Objective 2: Increase livestock quality, that is suitable to local conditions and which can be adapted to climate change.	Research, compile and expand traditional animal species to conserve and develop high productivity, good quality, resistant to animal diseases and climate change. The research includes animal feed, animal disease prevention and control as well as for upgrading an animal raising techniques and its profit.	MAE: DLF and NAFRI	✓	✓	The number of research articles or papers on native species
	Improve varieties of livestock for breeding that have commercial potential such as indigenous cross breed cattle that offer high productivity, good quality, resistance to climate change, resistant to diseases and other disease outbreaks.	MAE: DLF and NAFRI	✓	✓	Increase the body weight of the cattle reared in the farm, crossbred cattle, on average 2 years, 300 kg per animal and traditional cattle with an average of 220-250 kg per head
	Enhance research, development and promotion of livestock and fish varieties, with a focus on production for nutrition and food security, trade in products, conservation of genes and suitable species that can adapt to climate change.	MAE: DLF and NAFRI	✓	✓	Increase the growth rate of livestock at an average of 3-4% per year and fish farming at the level of 3-4% per year, and the consumption of meat, fish and eggs by an average of 73 kg per person per year
	Enhance research the genetics of animal diseases, ensuring to use them to produce quality medicines to prevent various	MAE: NAFRI, DLF	✓	✓	At least three different research conducted

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	animal diseases to meet the needs of the country's farmers and livestock breeders.				
	Support animal/fish breeding centres/stations, animal and fish feed factories, veterinary medicine factories, and fodder plantations in order to supply to farmers affected by climate-related disasters in a timely manner.	MAE: DLF and NAFRI	✓		At least two centres/stations built across the country
	Promote a gender sensitive approach to improve inclusivity within the fisheries value chain to increase profitability, fairness, and transparency within the market.	MAE: DLF and NAFRI	✓		At least 2 projects to promote the added value chain in fish production have been developed annually throughout the country
	Encourage studies to demonstrate how emission levels of livestock rearing may be reduced across Lao PDR, seeking to implement a low emissions model that reduces the impacts of animal husbandry on the environment	MAE: DLF and NAFRI	✓	✓	At least 1 model project to promote the assessment of appropriate levels of greenhouse gas emissions for animal populations has been initiated.
	Apply various approaches to mitigate heat stress on livestock, including grazing at night, providing highly digestible and high-energy feed, constructing cooling stables, and harvesting water for dry periods.	MAE: NAFRI, DLF	✓		At least five approaches identified to mitigate heal stress on livestock
	Safeguard the fisheries sector by coordinating dam and hydropower usage to ensure adequate water flow, and by protecting water quality through industrial waste treatment and controlled fertilizer use.	MAE: DoA MIC	✓		Number of dam or hydropower projects had a effective coordination mechanisms for fishery impact management
	Upgrade food processing and storage infrastructure to protect perishable items like meat, fish, and dairy in hot conditions.	MAE: NAFRI, DLF MIC	✓	✓	Number of food processing storage infrastructure upgraded or built

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	Diversifying farming systems can enhance food security during climate shocks affecting specific crops.				
Strategy 3: Build human capacity on climate change adaptation within the agriculture and fishery sector.[163] [164] [165] [166]					
Objective 1: To strengthen understanding of and build capacity on climate change adaptation in agriculture sector at all levels.	Create an adaptation plan to manage and reduce the climate risk in the agricultural sector at the district and village levels by initiating a programme of "reserves" for seeds, fertilizer, medicine, machine equipment, tools for pumping and draining water in case of floods, disease outbreak, insects, including allocating livestock evacuation areas.	MAE: DPC, NAFRI	✓		One plan for national level, 18 plans for provincial level and 145 plans for district level or the number of deposits created in 3 regions
	Implement plans, programmes and capacity of organisations, including farmers' organisations, to adapt to climate change, respond to emergencies and recover after disasters in all areas of agriculture.	MAE: DoA, NAFRI	✓	✓	At least five programmes a year across the country
	Provide training on technical knowledge and demonstration of various techniques and technologies together with farmers to adapt to climate change.	MAE: DoA, NAFRI	✓		At least 20 trainings are organized annually across the country targeting provincial, district and farmers in target provinces based on CRVA.
	Promote of integrated diversified agricultural production, as well as creating links between farmers to access the market by encouraging the creation of added value of potential products.	MAE: DoA, NAFRI	✓		At least 1-2 local products are promoted per village in the target province based on CRVA.

[163] MAF (2021). 5-Year Development Plan for Agriculture and Forestry Sector (2021-2025)
[164] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)
[165] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)
[166] MAF (2020). Plan of Action for Livestock and Fishery Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	Promote production, business, value chain and expand the livelihood options of farmers to adapt to climate change.	MAE: DoA, NAFRI	✓	✓	At least five programmes conducted a year targeting district officials, entrepreneurs, investors and farmers in target provinces based on vulnerability assessment.
	Create an Integrated Landscape Partnership approach for watershed areas (in the more mountainous Northern Laos Provinces) that engage communities and technologies to improve baseline data (i.e: , specific agricultural ecology details) that may be used to help plan the use of land with the participation of the community to grow crops and raise various kinds of animals as a basis for making decisions and planning the development of agriculture, forestry and rural areas in each locality.	MAE: DoA, NAFRI, Department of Land Management and Development	✓		At least three Integrated Landscape Partnerships are established that (through a participatory approach) help to map the ecology of mountainous areas, which may be used to plan future land use to grow communally important crops plus raising various kinds of animals for market
	Assess use of and adjust existing cropping calendars for specific agro-ecological zones.	MAE: DoA, NAFRI	✓		At least three calendars developed for three different zones or regions, focusing on the calendar of seasonal crops such as rice and other economic crops
	Build capacity of technical staff to be able to lead, guide farmers and entrepreneurs effectively on livestock and aquatic animal production.	MAE: DLF, DoA	✓	✓	At least 1000 technical staff have been trained in the field of providing advice to farmers at various levels across the country.

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	Enhance the capacity of relevant staff in response and management the spread of animal disease during floods and droughts.	MAE: DLF, DoA	✓	✓	At least 1000 technical staff have been trained in response and management of animal disease outbreaks at various levels throughout the country.
	Provide trainings to farmers in tree pest and disease management practices, both with natural methods and on the correct use of pesticides.	MAE: NAFRI, DoA	✓	✓	At least 100 farmers trained a year in tree pest and disease management practices
	Expand capacity building to farmers, including animal health management training and food safety awareness in hot conditions.	MAE: NAFRI, DoA	✓	✓	At least 100 farmers trained a year in animal health management training and food safety awareness
Strategy 4: Promote communication tools to raise awareness on climate risks for the agriculture sector.[167] [168]					
Objective 1: Increase public awareness within the agriculture sector with a particular focus on vulnerable farming communities in rural areas.	Design and develop a communication plan for awareness raising on climate risks for the agriculture sector in collaboration with relevant stakeholders.	MAE: DPC	✓		At least one national communication plan and 18 plans for provincial level developed
	Establish an ICT information sharing platform at all levels - the central, provincial and district.	MAE: DPC	✓		At least one national information system and five local information systems created
	Develop and improve the establish ICT with supporting communication tools (Mobile phone App) to convey weather	MAE: Department of Environment, DMH, and all relevant	✓		At least one national communication tool developed, such as a mobile

[167] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)
[168] MAF (2021). 5-Year Development Plan for Agriculture and Forestry Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	forecast advice to farmers, including emergency response to pest outbreaks, storms and animal diseases.	technical departments			application to deliver weather forecast advice to farmers that links to the national ICT.
	Disseminate information on disaster response, agriculture and livestock technical skills, and livestock and crop disease prevention.	MAE: DLF, DOA	✓		At least 10 dissemination events conducted a year across the country
	Disseminate information on surveillance in case of livestock and crop disease outbreaks, preparation of vaccines and medicines for livestock and pesticides.	MAE: DLF, DOA	✓		At least 10 dissemination events conducted a year across the country
	Update and develop information, education and communication materials (i.e., manuals, guidelines, and posters) for awareness raising on climate-related disaster preparedness and response in the agriculture sector.	MAE: DPC, Department of Environment	✓		At least five projects with components or activities of developing communication tools and related teaching materials have been implemented
	Introduce the concept of climate risk management planning (including emergency response and recovery plans) for the agriculture sector to personnel at central and local levels (provinces, districts, and villages) in collaboration with international partners.	MAE: DPC and all relevant technical departments	✓		At least 100 staff have been trained for risk planning throughout the country
	Provide awareness raising to farmers on the economic risks related to contract farming and land leasing.	MAE: NAFRI, DoA, Department of Land Management and Development	✓		Number of awareness raising activities conducted a year or number of people engaged in the awareness raising activities

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
Strategy 5: Improve information management systems and strengthen the development of early warning systems within the agriculture sector.[169] [170]					
Objective 1: Develop and improve climate-related databases and early warning systems at all levels within the agriculture sector.	Expand the agricultural meteorological system in all regions (North, Central and South) and the main value-added chain to reach every province that is at risk.	MAE: Department of Environment, DMH, and all relevant technical departments	✓	✓	At least 6 systems expanded a year in all regions (two per region)
	Establish an agricultural climate risk database system that is modern, accurate and appropriate to the local context plus embraces the importance of EbA measures in future decision making (linked to GEF 8 project for Northern Laos).	MAE: DPC	✓		At least five database systems developed at the provincial level as the model to support a national EbA "Tool"
	Establish a database to monitor the occurrence of animal and aquatic diseases.	MAE: DLF	✓		At least one database developed or improved at the national level for the agriculture sector
	Study and create a plan to monitor and warn in advance about weeds, pests, insects and epidemic diseases in livestock.	MAE: DPC, DoA, NAFRI	✓	✓	One for the national level and 18 provincial levels
	Implement monitoring and early warning plans regarding weeds, pests, insects and epidemics in livestock.	MAE: DPC, DoA, NAFRI	✓	✓	At least six provinces developed and piloted the plans
	Provide preparedness and emergency warnings equipment and advice to rural communities, allowing them to have access to sources of information in a timely manner (e.g: loudspeakers, mobile speakers, amplifiers, and Agro-met Bulletin/Forecasts).	MAE: DAEC, NAFRI	✓		The number of related equipment or devices provided in 18 provinces across the country

[169] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)
[170] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	Improve guidelines and develop Standard Operating Procedure (SOP) on early warning system/message delivery mechanism for the agriculture sector.	MAE: DAEC, DPC; NAFRI, DMH, Department of Environment	✓		At least 18 guidelines or SOPs developed (one guideline for one province)
	Establish a system for monitoring, forecasting, and assessing disaster risks for agriculture, linking with various departments within the Ministry of Agriculture and Environment (MAE) and other related ministries such as MAE, MIC (dams), provinces, districts, and villages. The system should provide sufficient and real-time information.	MAE: NAFRI, DPC, DMH, MIC	✓		At least one monitoring system in the agricultural sector has been developed at the central level
	Establish a National Trainers Team (NTT) comprising of personnel from MAE and MAE, and provide them with training of trainers (ToT) to promote climate change adaptation in the agriculture sector.	MAE: DPC, Department of Environment	✓		At least 100 trainers are trained for ToT on adaptation topics annually
Strategy 6: Improving tools, mechanisms, and facilities for better preparedness.[171] [172]					
Objective 1: Strengthen tools and mechanisms, including communication channels among authorities that integrate climate change adaptation into the planning process down to farmers at the village level.	Develop manuals and guidelines on how to build livestock shelters (such as goat cage, cowsheds, fish ponds, or frog farms) with enhanced safety standards, or align with technical principles as well as develop and use modern tools in related work such as drones, satellite images and aerial photos and create the ability for personnel to use such equipment.	MAE: DLF	✓		At least one national manual and guideline developed on building livestock shelters
	Organize awareness-raising activities for local communities at risk of disasters to increase understanding of risks, allowing them to cope with climate-related disasters.	MAE: DAEC, and its line ministry	✓		At least 20 activities organized at the provincial and district levels
	Conduct a pilot study in selected districts to develop a standardized estimation of the value of loss and damage in agriculture.	MAE: DPC, DoA, DLF	✓		At least 6 pilot studies conducted at the district level

[171] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)
[172] MAF (2020). Plan of Action for Livestock and Fishery Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	Develop manuals, guidelines and posters on basic knowledge of climate change and disaster risk management for agriculture.	MAE: DAEC, DoA, DLF, NAFRI	✓		At least one manual, guideline and poster developed at the national level, and five for the provincial level for agriculture sector
	Develop technical standards, manuals, guidelines on animal disease research in accordance with regional and international.	MAE: DLF, NAFRI	✓		At least one manual and guide on animal disease research with regional and international organizations developed
	Organize trainings on information sharing and understanding of climate change and disaster risk management in agriculture for national, provincial and district staff within the Ministry of Agriculture and Environment and staff from other ministries.	MAE: DPC	✓		At least 10 training events organized across the country a year
	Allocate sufficient budget for the implementation of climate change adaptation activities at provincial, district and village levels.	MAE: DPC	✓		The budget figure or percentage of the budget allocated to the implementation of climate change adaptation activities at the provincial, district and village levels.
	Conduct feasibility studies on agriculture insurance, micro-finance, and establishment of Emergency Reserve Fund for Agricultural Disasters.	MAE: DPC, DAEC, DoA, DLF	✓		At least one study or feasibility study on the insurance and one disaster reserve fund at the national level has been developed
	Strengthen monitoring, evaluation, and reporting of activities in the agriculture sector, and develop SOPs for regular and	MAE: DMH, NAFRI, DoI	✓		Capacity building activities on monitoring, evaluation

Strategies and Objectives	Adaptation Activities	Main responsibility party	2025-2030	2030-2035	Indicators and targets
	timely transmission of seasonal, monthly and weekly weather and climate information, and early warnings from MAE (DMH) to MAE departments.				and reporting in the agricultural sector are organized twice a year at the central or ministerial level
	Provide financial support for poor farmers to invest in seeds, machinery, irrigation, fertilizers, pesticides, and livestock care. These can be facilitated through access to credit, loans, risk insurance, and community-managed funds for sustainable agricultural activities and rural development.	MAE: NAFRI, DoA, DPC	✓	✓	Amount of financial supported for poor farmers to invest in seeds, etc.
	Improve infrastructure to connect rural and urban areas, providing essential facilities and services like roads, electricity, healthcare, and markets to enhance agricultural productivity and food security.	MAE: DPC, DAEC, NAFRI MPWT	✓	✓	Number of improved infrastructure to connect rural and urban areas, providing essential facilities and services like such as roads.

2. Forestry and Land-use Planning

2.1 Sector Policy Linkages and Implementation Considerations

Forest and forest resources play an important role in delivering the NSEDP. This includes the need to implement environmental protection and biodiversity conservation to support addressing climate change. Therefore, the GoLPDR has given a high priority to sustainable forest management and protection, in parallel with improving the livelihoods of multi-ethnic people, who depend on forest resources. The current NDC (2021) of Lao PDR also identifies forests as an important sector for emission reductions.[173]

GoL attaches great importance to forest management, forestland and forest resources. The GoLPDR has, thus, set important policies and goals on forest and forest resources management for the next ten years including allocating 16.5 million hectares to forestland (or 70% of the country's total land area) and setting a target to increase the forest cover rate to 70% of the country's area. In order to sustainably manage forest and forestland, and achieve these targets, the Ministry of Agriculture and Environment (MAE) has been at the centre of implementing various forest management projects, including developing a National REDD+ Strategy (NRS) to 2025 and Vision to 2030.[174] The overall objectives of the NRS are to determine directions for the development of REDD+ and develop these into action plans and projects for implementation in each period, aiming for reducing emissions from deforestation and forest degradation, along with promoting restoration and plantation to increase CO^2 absorption, and contributing to the NSEDP and livelihood improvement.

Regarding land management, the Constitution of Lao PDR in 2015 states that natural resources, including land are the property of the national community. The State is the designated authority to centrally manage natural resources in a uniform manner throughout the country, and promotes the sustainable protection, restoration and development of land, as embodied in Articles 19 of the Constitution.[175] Apart from the Constitution, the National Master Plan for Land Allocation was also approved in 2018, which is another important piece of legislation on land management with clear scope, categories and use of lands to manage, protect, develop and use lands in accordance with sustainable practices. This National Master Plan defines land to be reserved and conserved to be forestland covering 70% of the country's land area, including wetland. The designated land consists of Protection Forest, Conservation Forest and Production Forest, including forest plantation. Land allocation and land use planning is aimed to be implemented at multi-levels, based on the National Master Plan for Land Allocation, and coordinated with all relevant stakeholders.[176]

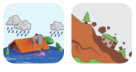
Presently, the MAE is translating this National Master Plan into plans at the sub-national level that will cover an integrated management of natural resources and environment including climate change. Participatory sustainable forest management – especially bringing rights and responsibilities closer to forest resources has seen some progress. The revised National Forestry Strategy incorporated with the National Master Plan for Land Allocation will also be enhanced efforts in promoting climate resilience and establishing a clear link between adaptation co-benefits and climate mitigation efforts.

2.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

[173] GoL (2021). Lao PDR Nationally Determined Contribution (NDC)
[174] GoL (2021). National REDD+ Strategy (NRS) to 2025 and Vision to 2030
[175] GoL (2015). Constitution of Lao PDR
[176] GoL (2018). National Master Plan for Land Allocation

Forestry and Land-use Planning		
Flooding	Increased temperature	Decreased precipitation
Climate Change Impact	Loss of forest cover due to fire	Loss due to landslides and soil erosions

Climate Change Impact	Adaptation Strategy	Sample Adaptation Activities
	1. Development of sustainable agriculture in coordination with forest protection and land-use planning (Agro-forestry).	Develop and update climate risk and vulnerability maps for the forestry and land-use planning sector to support the adoption of agro-forestry as a technique to better integration of climate change adaptation into Participatory Land Use Planning and Forestry Development Plans at all levels.
		Implement, improve, and expand forest landscape management and participatory land use planning, and agriculture area expansion, in accordance with allocated areas, taking into consideration social and environmental impacts
	2. Promotion of sustainable tree plantation (afforestation) and forest restoration.	Promote and manage sustainable tree planting for both commodity production and conservation purposes, in accordance with regulations and standards, and land and forest allocation plans, and review participation and partnership models between stakeholders, especially communities and investors.
		Promote forest restoration in accordance with specific targets or management objectives of each forest category, through the review and improvement of participation and investment of all stakeholders.
	3. Linking infrastructure development with protection of forest and forest resources.	Formulate and improve legislation on land conversion, by granting infrastructure development, land leases or concessions through a bidding or auction process, which is based on land and forest use maps and field surveys provided by the forestry sector.

		Improve and expand the implementation of forest landscape management, including integrated land use planning in coordination with the sectors of energy and mines, public works and transport and others, in order to determine possible areas for infrastructure development, mining and other land uses.
	4. Stabilizing uncontrolled shifting cultivation (slash and burn) by promoting integrated agriculture production and sustainable land management to control forest fires and reduce land degradation.	Enhance capacity to implement existing policies, laws and regulations to reduce and address issues related to uncontrolled shifting cultivation, along with promotion of sustainable forest and land management, and livelihood improvement of people relying on forests
		Develop and update Community-Based Forest Fire Management Guidelines.

2.3 Adaptation Activities and Action Plan

The following summary table develops further the adaptation "strategies" highlighted above into more details "activities" of importance for the sector. It also presents the sectoral strategies and objectives towards achieving climate resiliency, whom is responsible for its delivery and indicative timeframe for activity completion as well as indicators and targets to be achieved.

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
Strategy 1: Development of sustainable agriculture in coordination with forest protection and land-use planning.[177] [178] [179]					
Objective 1: Address the issue of clearance of forest areas for agriculture land expansion, which is in line with relevant laws and regulations, and with sustainable forest management and land-use planning.	Mainstream climate change adaptation in forestry and land-using planning strategy and action plan including through results-based management framework.	MAE: DPC, Department of Forestry (DoF)	✓		Five-year ministerial development plan integrated including the National Forestry Strategy and the National Land Management Strategy have been revised and integrated adaptation
	Develop and update climate risk and vulnerability maps for the forestry and land-use planning sector to support the integration of climate change adaptation into the Participatory Land Use Planning and Forestry Development Plans at all levels.	MAE: Department of Land Management and Development DoF, NAFRI	✓		CRVA of the forestry and land sector assessed at least once in every 5 years
	Enhance the capacity for the implementation of existing policies, laws and regulations, in order to address challenges related to the climate change as well as the implementation of contract farming and environmentally friendly agriculture production, in a way that is consistent with green and sustainable development principles.	MAE: DPC, DoF	✓	✓	At least 10 seminars and dissemination workshops of related policies and laws throughout the country organized per year or the number of staff participated in such meetings at all levels
	Implement, improve, and expand forest landscape management and participatory land use planning, and agriculture area expansion, in accordance with allocated areas, taking into consideration social and	MAE: DPC, DoF, Department of Land Management and Development	✓	✓	4.5 million hectares of agricultural land surveyed and approved in each

[177] GoL (2021). Lao PDR Nationally Determined Contribution (NDC)
[178] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)
[179] GoL (2021). National REDD+ Strategy (NRS) to 2025 and Vision to 2030

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	environmental impacts, including the control of the use of harmful pesticides, herbicides and chemical fertilizers.				province throughout the country and is planned to be used according to the national land allocation master plan that has been determined at the macro and micro levels.
	Expand good practices and develop diverse livelihood models, based on local potential, together with the provision of opportunities for local people to have access to financial sources for the promotion of agriculture production and alternative livelihoods.	MAE: DoF, Department of Rural Development, Poverty Reduction Fund	✓	✓	The number or percentage of the population with a diverse livelihood according to local potential, along with creating opportunities for local people to access capital to promote agricultural production-
	Improve near real-time monitoring systems and participatory field-based monitoring on the implementation of concession agreements, contract farming and agriculture land expansion.	MAE: DPC, DoF, Department of Natural Resources and Environment Inspection	✓	✓	At least 1 national monitoring system updated
	Enhance study, development and implementation of adaptation plans in the field of forestry and land use, monitor and assess the vulnerability, risks and impacts of climate change and disasters on forest resources including ecosystems and biodiversity.	MAE: NAFRI, DoF, Department of Land Management and Development, Department of Environment	✓		A national adaptation plan developed and approved for the forestry sector
	Promote reforestation in areas exposed to high-risks of floods, storms, landslides, and the like.	MAE: DoF	✓		Hectare of reforested areas in areas or provinces that are vulnerable to floods and droughts

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Strengthen regulations on land leases and concessions to prevent deforestation and land degradation, and increase land and forest restoration efforts.	MAE: DoF, Department of Land Management and Development	✓		Number of regulations on land leases and concessions to prevent deforestation and land degradation improved or created
	Address resilience to landslide events within land management plans, ensuring that construction, mining, and agriculture do not destabilise slopes. To this end, encourage EbA actions where suitable such as maintaining a dense and biodiverse tree cover to offer protection against soil erosion.	MAE: DoF, Department of Land Management and Development	✓	✓	Number of developed land management plans integrating landslide resilience development measures.
	Apply sustainable forest and land management in the planning process to ensure local adaptation as well as national mitigation.	MAE: DoF, Department of Land Management and Development	✓		Number of new policy or planning documents considered sustainable forest and land management
	Address logging bans and enforce the relevant regulations for special-use forests and quotas set for other areas.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓		Forest areas increased by enforcing the relevant regulations for logging bans (70% by 2025)
	Enhance transboundary biodiversity conservation cooperation to help address biodiversity decline in specific areas, such as in the Special Economic Zones.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓		Number of biodiversity conservation sites increased or identified in the Special Economic Zones
	Strengthen regulations for biodiversity conservation, embracing NbS and EbA solutions within forest management plans, land leases and/or concessions.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓		Number of biodiversity conservation sites/forest areas increased or identified in the project development

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
					concession areas such as hydropower projects
Strategy 2: Promotion of tree plantation and forest restoration.[180] [181] [182]					
Objective 1: Protect and prevent tree plantation area development, which is not lawfully sanctioned, or against laws, regulations and technical standards leading to deforestation or clearance of natural forest and degradation of forest resources, eco-	Promote and manage tree planting for both commodity production and conservation purposes, in accordance with regulations and standards, and land and forest allocation plans, and review participation and partnership models between stakeholders, especially communities and investors.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓	✓	The total area of forest plantations for both commercial and conservation purposes throughout the country (in hectares)
	Implement existing policies, laws and regulations related to forest restoration and restoration, in order to achieve forest strategy targets, together with public awareness raising; and, formulate and improve handbooks and technical guidelines for both natural and assisted forest restoration.	MAE: DPC, DoF	✓	✓	Target to achieve 70% of forestry cover across the country in 2025 according to the National Strategy on Forestry
	Promote forest restoration in accordance with specific targets or management objectives of each forest category, through the review and improvement of participation and investment of all stakeholders.	MAE: DoF	✓	✓	The amount of land (in hectares) of forest restoration promotion or the number of participating companies at least 5 companies
	Analyze and develop forest restoration models, based on local potential and actual positive experiences, including support to access	MAE: DoF	✓	✓	At least three models demonstrated a year across the country

[180] GoL (2021). National REDD+ Strategy (NRS) to 2025 and Vision to 2030
[181] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)
[182] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
systems and environments.	potential financing modalities, such as domestic and international cooperation and private investment.				
	Improve efficient systems for the management of forest information, monitoring, inspection and reporting of forest status and changes, with a focus on the establishment of technical capacity, especially at local levels;	MAE: DoF, Department of Natural Resources and Environment Inspection	✓	✓	At least build one monitoring system using GIS and create capacity for at least 100 staff to use this system throughout the country.
	Improve SOPs, handbooks, guidelines on information management, monitoring, inspection and reporting systems, in line with capacity building for participatory field-based monitoring by all stakeholders in society.	MAE: DPC, DoF, Department of Natural Resources and Environment Inspection	✓	✓	At least one SOPs developed or improved every three years, and a guideline developed at the national and local levels
	Enhance, develop and use technology for forestry and land use, especially the use of forest ecosystems, forest land, special features of the landscape, sustainable forest and forest management, protection, restoration and expansion of forest areas, forest ecosystem services, forestry business, agriculture-forestry system, management techniques and the use of local knowledge.	MAE: DoF, Department of Land Management and Development	✓	✓	At least develop and approve at least 2 projects that use technology for the use of forests and land, especially the use of related forest ecosystems
	Build capacity for local government agencies and the private sector to participate in adapting and building resilience to climate change and disasters.	MAE: DPC, DoF, Department of Environment	✓	✓	At least 20 capacity-building activities for local government agencies and the private sector in adaptation and resilience organized (per year)
	Design and develop a communication plan for awareness raising on climate risks for the forestry and land-use planning sector in collaboration with relevant stakeholders and private sector.	MAE: DPC, DoF	✓		At least one communication plan for awareness raising of the forestry sector and

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
					land use planning sector at the central level developed
	Increase arable land in rural areas, through the continued removal of Unexploded Ordnance can prevent deforestation needed for new agricultural areas.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓	✓	Number of Unexploded Ordnance areas decreased
	Promote the conservation of forests and wetlands by establishing payments to local farmers and communities for ecosystem services.	MAE: DoF	✓		Number of conservation areas of forests and wetlands increased or protected by establishing payments to communities for ecosystem services
Strategy 3: **Linking infrastructure development with protection of forest and forest resources.**[183]					
Objective 1: Improve and address outstanding issues related to conversion of forest areas for infrastructure development.	Formulate and improve legislation on land conversion, by granting infrastructure development, land leases or concessions through a bidding or auction process, which is based on land and forest use maps and field surveys provided by the forestry sector.	MAE: DPC, DoF	✓	✓	Formulate legislation on land use transformation or amend the current version
	Improve and expand the implementation of forest landscape management, including integrated land use planning in coordination with the sectors of energy and mines, public works and transport and others, in order to determine possible areas for infrastructure development, mining and other land uses**.**	MAE: DPC, DoF	✓	✓	At least 2 projects implemented per year related to the forest landscape management including integrated land use planning
	Define land category zoning that help to register the land for infrastructure development in detail; and, establish a centralized information system on land and forest uses.	MAE: DPC, DoF, Department of Land Management and Development	✓	✓	Complete the identification of areas for raising animals, planting rice, planting

[183] GoL (2021). National REDD+ Strategy (NRS) to 2025 and Vision to 2030

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
					crops, etc. (in hectares) in the country including railway corridors, economic corridors connecting regional countries
	Protect biodiverse forest areas by enhancing the reforestation efforts in contrast to monocrop plantations.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓	✓	Areas of biodiverse forest increased by enhancing the reforestation efforts in contrast to monocrop plantations
Strategy 4: Stabilizing uncontrolled shifting cultivation by promoting integrated agriculture production and sustainable land management to control forest fires and reduce land degradation.[184] [185]					
Objective 1: Address drivers and underlying causes of forest degradation due to uncontrolled shifting cultivation and forest fires.	Enhance capacity to implement existing policies, laws and regulations to reduce and address issues related to uncontrolled shifting cultivation, along with promotion of sustainable forest and land management, and livelihood improvement of people relying on forests.	MAE: DPC, DoF, Department of Natural Resources and Environment Inspection			At least 20 capacity building workshops on the implementing of policies, laws and legislations throughout the country organized annually.
	Promote use of integrated agriculture production and sustainable land management (SLM) practices in order to reduce shifting cultivation and land degradation. Some good examples include coffee cultivation under the cover of big tree, integrated rice-fish system, intercropping cassava and peanuts for soil improvement, forage production for livestock management, broom grass cultivation to prevent soil erosion on sloping areas, broom grass cultivation in land degradation, intercropping system, etc.	MAE: NAFRI, Department of Land Management and Development, DoF	✓	✓	At least three good model activities in integrated agricultural production and sustainable land management implemented annually

[184] GoL (2021). National REDD+ Strategy (NRS) to 2025 and Vision to 2030
[185] MAF (2022). Plan of Action for Disaster Risk Management in the Agriculture and Forestry Sector (2022-2025)

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Review and determine the boundaries of the three forest categories at national, province, district and village levels, according to the National Master Plan for Land Allocation, as well as formulate a forestland allocation plan according to the target and objectives of management and use of each category of forestland.	MAE: DPC, DoF, Department of Land Management and Development	✓	✓	Determining the boundary to reach 80-90% of the number of villages lying in the border area of three types of forest
	Expand good practices and develop diverse livelihood models based on local potential; promote and develop local livelihood alternatives through income-generating activities, including eco-tourism.	MAE: DoF	✓	✓	At least 10 activities to promote good practice about a variety of livelihood including generating income for local people to prevent encroachment and destruction of forests implemented annually
	Improve near real-time monitoring systems of shifting cultivation and forest encroachment and participatory field-based monitoring, by all stakeholders in society.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓	✓	Develop at least one system or improve the monitoring system (initiated at the central level) against shifting cultivation and forest encroachment
	Raise public awareness on legal aspects and implementation on the use of natural resources, impacts of slash and burn, forest fire prevention, development of warning, reporting and control system of forest fires, with participation of local communities.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓	✓	At least 20 outreach activities on raising awareness about the related laws and regulations and implementation regarding the use of natural resources and the effects of deforestation for agriculture organized.

Strategies and Objectives	Adaptation Activities	Main responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Develop and update Community-Based Forest Fire Management Guidelines.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓		At least one forest fire management guideline for the community level developed
	Conduct land surveys to improve the national land management database.	MAE: Department of Land Management and Development	✓		Number of land surveys conducted
	Provide data and monitoring for land degradation and landslides to inform plans and develop early warning systems.	MAE: Department of Land Management and Development	✓		Number of early warning systems for land degradation and landslides provided or built
	Provide more trainings to the government officials to enforce land rights and prevent illegal logging and forest fires.	MAE: DoF, Department of Natural Resources and Environment Inspection, Department of Land Management and Development	✓	✓	At least 100 relevant staff trained to enhance land rights and prevent illegal logging and forest fire
	Increase personnel to prevent illegal logging and also address forest fire risks are crucial to implement policies.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓	✓	At least 100 relevant staff trained to prevent illegal logging and forest fire
	Disseminate information about forest fire risks and prevention, the role of forests in preventing landslides, and their ecosystem services to increase compliance and support from the local population.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓	✓	Number of dissemination events conducted on forest fire risks and prevention
	Use satellite imagery to inform data-driven policy formulation and support enforcement by monitoring forest degradation and deforestation.	MAE: DoF, Department of Natural Resources and Environment Inspection	✓		Number of projects used satellite imagery to inform data-driven policy development

3. Public Works and Transport

3.1 Sector Policy Linkages and Implementation Considerations

The public works and transport sector plays a crucial role in contributing to socio-economic development. It ensures land transportation (including railways), air, and water transport connectivity, enabling regional and international linkages, serving as a transit hub to reduce urban-rural disparities, establishing domestic economic foundations, alleviating poverty, and providing citizens with access to transportation services and improved livelihoods. Additionally, it contributes to socio-economic development linked to rural development and poverty eradication through infrastructure such as roads, water supply, and sanitation systems.

However, this sector in Lao PDR faces significant challenges, particularly regarding the prevalence of contemporary key infrastructure that lacks climate resilience design criteria. Current design, construction, and maintenance practices often fail to embrace changing climate change impacts, potentially increasing vulnerability to extreme weather events such as road flooding, erosion, bridge damage, and other hazards that are becoming increasingly severe and frequent due to climate change. Furthermore, non-resilient infrastructure that does not account for climate change impacts results in increased maintenance, repair, or reconstruction costs. Therefore, improved consideration of how best to select climate-resilient materials, equipment, technologies, and construction techniques is required.

In parallel with the 9th Five-Year National Socio-Economic Development Plan (2021-2025) (NSEDP) preparation process in July 2019, the Ministry of Public Works and Transport (the MPWT) developed its Five-Year Development Plan 2021-2025 through a series of the dialogue process with the committee members from all the MPWT departments, institutes and state enterprises. The Plan sets out a logical policy framework structure to contribute achieving the 9th NSEDP, with the updated Vision 2030 of the sector: ***"Develop Public Works and Transport Sector to be a leading, specific priority, highly effective, modern, safe, Climate Resilience, integral and sustainable sector".***[186]

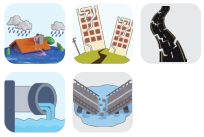
To translate and support the implementation of the 9th NSEDP and the Vision, MPWT set 10 Overall Goals for the public works and transport sector. In particular, Goal 4 – climate resilience focuses on developing the public works and transportation to be stable and resilient to disasters. This goal aims to improve the quality and resilience of infrastructure development for climate resilience to ensure that public works and transport networks are built and maintained with the standards that provide safe and reliable facilities in all weathers.[187] While the Goal 6 is related to the Sustainable Urban Development – which focused on developing integrated infrastructure in urban areas to be safe, green, comfortable, environmentally sustainable, integrated with regional and internal connectivity, and following criteria ensuring empathy with local characteristics while balancing development between urban and rural areas, reducing environmental pollution, greenhouse emissions, waste, and the impacts of natural disasters.[188]

3.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

[186] MPWT (2021). 5-year Development Plan for Ministry of Public Works and Transport (2021-2025)
[187] Ibid
[188] MPWT (2022). National Strategy on Housing and Urban Planning 2022-2030 and Vision towards 2030

Public Works and Transport		
 **Flooding**	 **Road damage**	 **Bridge damage**
 **Increased damage to non-travel related infrastructure**	 **Drainage system damage**	

Climate Change Impact	Adaptation Strategy	Sample Adaptation Activities
	1. Development of resilience infrastructure to prevent climate change impacts.	Develop and implement regulations, standards and plans for adaptation and investment in the field of public infrastructure and transportation.
		Enhance research and transfer of technologies and techniques for adaptation and building resilience to climate change.
		Promote the development of multimodal transportation systems, infrastructure, urban design that is resistant to climate change and disasters.
	2. Development of smart city plans with environmentally friendly, and urban settlements, public works and transportation to be resilient to climate risks and disasters.	Improve and build urban drainage systems and prevent floods in cities, along with the protection of protected areas, lakes, riverbanks, and wetlands to ensure that cities have good ecosystems and resilience to climate change.
		Build resilience for cities to adapt to climate change by managing and using the potential of ecosystems in vulnerable provinces to reduce the damage and destruction caused by climate change.
	3. Developing road-bridge infrastructural works to be effective, resilient to climate change, safe and sustainable.	Create and update manuals for highway construction management, maintenance and repair, management system and technical standards for road bridge sector work to deal with climate change and improve the quality of transportation road infrastructure to withstand the effects of climate change and natural disasters such as storms, landslides, floods, earthquakes, etc.

3.3 Adaptation Activities and Action Plan

The following summary table develops further the adaptation "strategies" highlighted above into more details "activities" of importance for the sector. It also presents the sectoral strategies and objectives towards achieving climate resiliency, whom is responsible for its delivery and indicative timeframe for activity completion as well as indicators and targets to be achieved.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
Strategy 1: Development of resilience infrastructure to prevent climate change impacts.[189] [190] [191]					
Objective 1: Strengthen the resilience and adaptability to climate change of infrastructure, ensuring that infrastructure is built and maintained to a standard that is resilient to the effects of climate change.	Integrate climate change adaptation into the strategy and action plan including through results-based management framework as well as the activities and functions of programs and projects for the construction and upgrading of infrastructure proactively and concretely.	Ministry of Public Works and Transport (MPWT): Department of Planning and Finance (DPF), Public Works and Transport Institute (PWTI), and other relevant departments	✓		The Ministry's 5-year development plan and strategic plan related to public works and urban development developed, improved and integrated with adaptation
	Coordinate with potential development partners to implement model projects related to climate change resilience, such as the World Bank Flood Risk Reduction Project and others.	MPWT: DPF, Department of Road (DoR), Department of Housing and Urban Planning (DHUP), Department of Waterway (DoW), PWTI	✓		At least five climate resilience building model projects implemented
	Research on setting up interactive or actionable manuals in the event of a disaster as a basis for preparing for and mitigating the effects of climate change, such as storms, floods, earthquakes, etc.	MPWT: PWTI, DoR MAE: Department of Environment, Department of Meteorology and Hydrology (DMH) MLSW: Department of Social Welfare	✓		At least five actionable manuals for response or implementation in disaster events for public works developed and approved.
	Study and develop standards and techniques for the construction, and maintenance of infrastructure related to the integration of standards for ensuring and resilient to climate change.	MPWT: DPF, PWTI, DPF, DoR, DHUP, Department	✓		At least one technical standard and techniques for the construction and maintenance

[189] GoL (2021). Lao PDR Nationally Determined Contribution (NDC)
[190] MPWT (2021). 5-year Development Plan for Ministry of Public Works and Transport (2021-2025)
[191] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
		of Waterway (DWW), Department of Railway			of basic infrastructure developed and approved for use.
	Assess the impact of climate change on the sector of public infrastructure and transportation, as well as build organizational and personnel capacity to develop and manage infrastructure to be resilient and able to adapt to climate change.	MPWT: DPF, PWTI, DoR MAE: Department of Environment	✓	✓	At least one CRVA on the public works and transport sector evaluated or conducted
	Assess the risks and impacts of climate change and disasters in the field of rural development and human settlement, including education, planning, relocation of people at high risk and severely affected by climate change and disasters in an appropriate and sustainable manner.	MPWT: DPF, PWTI, DHUP MAE: Department of Environment	✓		At least one CRVA for the rural development and human settlement.
	Develop and implement regulations, standards and plans for adaptation and investment in the field of public infrastructure and transportation.	MPWT: DPF, PWTI, DoR, DHUP	✓		At least one standard and one regulation related adaptation and investment developed or improved
	Enhance research and transfer of technologies and techniques for adaptation and building resilience to climate change that embracing the suitability of EbA principles and NbS measures throughout.	MPWT: PWTI	✓	✓	At least two researches on new technologies and techniques for the adaptation of the public works sector studied and transferred
	Promote the development of multimodal transportation systems, infrastructure, urban design that is resistant to climate change and disasters.	MPWT: Department of Transport (DoT), PWTI	✓	✓	Develop at least two transportation systems, infrastructure, and urban design that are resilient to climate change and disasters

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Build strength, create, implement, monitor and report on the implementation of climate change adaptation and resilience plans, rural development and mapping.	MPWT: DPF, PWTI, DHUP MAE: Department of Environment	✓	✓	Develop at least one system to monitor and report on the implementation of adaptation plans and building resilience to climate change for the public works sector
	Improve currently inadequate drainage and flood defence systems by increasing the percentage of paved roads, and using durable materials, embracing NbS where possible in all designs	MPWT: DPF, PWTI, DHUP, DoR	✓	✓	Number or percentage of inadequate drainage and flood defence systems improved using durable materials
	Strengthen policy and planning frameworks and governance structures to support resilient infrastructure. This includes building codes, integrating climate risk assessments into infrastructure planning, and ensuring adequate funding for maintenance and disaster response[192].	MPWT: DPF, PWTI, DHUP	✓		At least one building code developed or revised
	Conduct awareness raising activities about climate risks and involving communities in resilience-building efforts to improve the overall effectiveness of adaptation strategies.	MPWT: PWTI, DHUP MAE: Department of Environment	✓		At least 10 awareness raising activities conducted about climate risks and involving communities in resilience-building efforts
	Develop specialised training programmes and enhance technical expertise within the sector are critical steps to improve climate risk management.	MPWT: DPF, PWTI, DHUP MAE: Department of Environment	✓		Number of specialised training programmes developed to improve climate risk for the sector

[192] Seismic assessment should be included to support in calculating structural design especially within high risk landslide areas of Laos.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
Strategy 2: Development of smart city plans with environmentally friendly, and urban settlements, public works and transportation to be resilient to climate risks and disasters.[193] [194] [195]					
Objective 1: Promote the management, implementation, and development of the city in accordance with the sustainable urban plan and improve public investment and financial management:	Improve and build urban drainage systems and prevent floods in cities, along with the protection of protected areas, lakes, riverbanks, and wetlands to ensure that cities have consider EbA resilience measure to address climate risks.	MPWT: DPF, DUHP, DoW	✓		At least five pilot projects implemented
	Build resilience for "green cities" by adapting to climate change by managing ecosystems in vulnerable provinces to reduce the damage and destruction caused by climate change.	MPWT: DHUP, PWTI	✓	✓	At least four cities adopted
	Diversify the sources of funds from government, development partners and financial institutions to enable a climate resilience policy in line with sector and national policy.	MPWT: DPF	✓		At least from two different sources of fund
	Develop climate-resilient coordination mechanisms with line agencies and provinces for emergency responses and alert systems.	MPWT: DPF	✓		At least one mechanism set up
	Develop mandatory Climate Resilience Management Plans with other relevant ministries – at all levels.	MPWT: DPF MAE: Department of Environment MAE: MPC	✓		At least one plan developed
	Establish alternative financing mechanisms, such as public-private partnerships and international grants in order to support infrastructure development without exacerbating debt issues.	MPWT: DPF	✓		Number of public-private partnership developed to support infrastructure development (at least five projects or activities a year)

[193] MPWT (2021). 5-year Development Plan for Ministry of Public Works and Transport (2021-2025)
[194] MoNRE (2021). 5-year Development Plan for Ministry of Natural Resources and Environment (2021-2025)
[195] MPWT (2022). National Strategy on Housing and Urban Planning 2022-2030 and Vision towards 2030

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
Objective 2: Create and update laws and legislations to manage and promote urban development and planning.	Create building management regulations (Building Code) and improve waste management regulations.	MPWT: DHUP	✓	✓	At least one building code for building management and one for waste management created
	Develop urban drainage planning and management standards for maintaining the environment in the construction and renovation areas.	MPWT: DHUP	✓	✓	At least one standard developed
	Guide to planning and developing cities that are resilient to climate change.	MPWT: DHUP	✓	✓	At least one guiding document developed
	Create a strategy for the sanitation sector that is related to the promotion of the private sector in sanitation work to prevent the effects of disasters.	MPWT: Department of Water Supply Ministry of Health (MoH)			Develop and endorse at least one strategy for the sanitation sector related to public works such as providing clean water
	Create a water supply strategy and promote the private sector to participate in the development and water supply services in order to combat and address the effects of disasters.	MPWT: Department of Water Supply (DWS)	✓	✓	Develop and endorse at least one water supply strategy for public works
	Integrate building resilience to climate change into the activities and tasks of plans and projects to build and upgrade urban infrastructure in a timely and efficient manner.	MPWT: DPF, DHUP, DoR	✓	✓	At least 10 activities or projects in the sector of public works integrated adaptation and resilience
	Develop a guideline on disaster response in order to be a basis for preparing and reducing the damage caused by climate change such as: storms, floods, earthquakes, etc.	MPWT: DPF, PWTI, DoR	✓	✓	Develop or update at least one national disaster response manual for the public works sector
	Develop manuals on technical standards for managing the construction and repair of public works and transport infrastructure to cope with climate change.	MPWT: DPF, PWTI, DoR, DWW, DHUP	✓		Develop at least one manual on technical standards for managing the construction and repair of public infrastructure to cope with climate change.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Update current standards and regulations to include climate-adaptive designs in urban infrastructure planning as inadequate urban planning and governance exacerbate issues such as traffic congestion, waterlogging, and urban flooding.	MPWT: DPF, DHUP	✓		At least five standards and regulations in urban infrastructure planning included or considered climate-adaptive designs
	Improve urban planning to mitigate the impacts of climate risks linked to transport. For example, by developing new roads and housing in areas less exposed to landslides and floods.	MPWT: DPF, DHUP	✓	✓	Number of new roads and housing in areas less exposed to landslides and floods
Objective 3: Develop and improve infrastructure and urban environment as well as residential facilities and crowded community areas.	Improve and build model landfills in small towns, second-ranked towns and big towns.	MPWT: DPF, DHUP, PWTI	✓	✓	At least 10 landfills in small towns, four in second-ranked towns and two landfills in big-towns
	Improve and build drainage systems and flood prevention in various cities, along with the protection of ponds, swamps, riverside areas and wetlands to ensure that cities have a healthy ecosystem and are resistant to climate change.	MPWT: DHUP, DoW	✓	✓	Improve and build drainage systems in at least five cities
	Study and collect data on drainage ditches within the city that are prone to floods during the rainy season in areas across the country.	MPWT: DHUP	✓	✓	At least four studies conducted across the country
	Study the possibility of conserving ponds, swamps, waterside areas and wetlands that is seen as necessary to maintain the ecological system of the city.	MPWT: DHUP, DoW MAE: Department of Water Resources (DWR)	✓		At least four studies conducted across the country
	Study and pilot the use of assessment of the elasticity of the city (City Resilience Index) in the municipal cities of the province and the capital.	MPWT: DHUP	✓	✓	At least four studies conducted across the country
	Study and research about the methods of urban development evaluation (such as the City Development Index and other methods)	MPWT: DHUP	✓	✓	At least four studies conducted across the country

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	to apply in the creation indicators on evaluating urban development in Lao PDR.				
	Encourage and promote the reduction of air pollution by promoting the use of vehicles that are friendly to the environment, the use of alternative energy.	MPWT: DoT	✓	✓	Number or percentage of vehicles that use friendly to the environment
	Improve and reallocate land in overcrowded community areas, areas at risk of natural disasters and community areas that cannot access basic infrastructure.	MPWT: DHUP MAE: Department of Land Management and Development	✓	✓	Improve and re-allocate land implemented at least three projects
	Improve and manage of areas that are vulnerable to natural disasters in urban areas.	MPWT: DHUP	✓	✓	Improve and manage of areas that are vulnerable to natural disasters in urban areas in at least 45 districts
	Apply EbA and/or NbS measures in urban areas in order enhance water infiltration, prevent soil erosion and mitigate the Urban Heat Island effect.	MPWT: DHUP	✓		At least three EbA related projects implemented for the urban development sector a year
Objective 4: Create an information system to improve the administrative system and urban service mechanism.	Create a database on information on the effects of natural disasters related to the environment and urban planning that can be accessed through multiple channels.	MPWT: DPF, DHUP	✓	✓	Develop at least 1 database
	Create an information system about integrated urban development across the Country.	MPWT: DPF, DHUP, PWTI	✓	✓	Develop an information system for at least one system on integrated urban development
	Create a geographic database and city map with a digital geospatial system (ArcGIS) that can be accessed in many channels in urban development.	MPWT: DPF, DHUP, PWTI	✓	✓	Develop at least one digital database and urban map database

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Encourage cities that are member cities in the pilot project ASEAN Smart City Network (ASEAN Smart City Network) including Vientiane Capital and Luang Prabang and Kaisone, Phomvihane	MPWT: DPF, DHUP	✓	✓	Encourage the participation of cities in the pilot projects at least 4 cities
	Encourage and promote the implementation of the Urban Environment Improvement Investment Projects in the municipalities of the provinces and Vientiane Capital.	MPWT: DPF, DHUP	✓	✓	Encourage and promote the implementation of the Urban Environment Improvement Investment Projects in the municipalities of the provinces and Vientiane Capital at least four projects
Strategy 3: Developing road-bridge and transport sectoral works to be effective, resilient to climate change, safe and sustainable.[196]					
Objective 1: Develop and improve road-bridge infrastructure to be climate resilient, safe and sustainable	Use technical standards and technologies that are suitable for the country's environmental and geographical conditions.	MPWT: DPF, DoR,	✓	✓	At least one technical standards and technologies that are suitable for the country's environmental and geographical conditions developed and applied
	Create and update manuals for highway construction management, maintenance and repair, management system and technical standards for road bridge sector work to deal with climate change and improve the quality of transportation road infrastructure to withstand the effects of climate change and natural disasters such as storms, landslides, floods, earthquakes, etc.	MPWT: DoR,	✓		Create and approve at least two manuals, such as the use of the algorithmic structure for calculating the unit price of road construction and repair activities and regulations or measures on safety during the

[196] MPWT (2021). 5-year Development Plan for Road-Bridge Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
					construction and maintenance and repair of highways
	Maintain and repair the existing road infrastructure for long-term and sustainable use by using the management mechanism of the highway maintenance and repair work and using tools that have been improved.	MPWT: DoR,	✓	✓	Number of road infrastructures that maintained and repaired
	Improve the implementation mechanism in post-disaster reconstruction in a planned, efficient, effective and timely manner.	MPWT: DoR, MLSW: DWS	✓		Improve or develop mechanisms for rebuilding after a disaster
	Manage, monitor and inspect the implementation of the maintenance and repair work of the existing highway so that it can be used regularly throughout the year and is resilient to climate change in order to facilitate travel and transportation from the center to the local area, and with the neighbouring countries to contribute strongly to the national socio-economic development, in a green and sustainable direction.	MPWT: DPF, DoR, DoI	✓	✓	Implementation of maintenance and repair work for roads and bridges (in kilometer)
	Create a capacity development plan for central and local government officials aimed at raising the quality, capacity, gender roles and developing skills in the implementation of actual work efficiently and effectively,	MPWT: DoR,	✓		A capacity development plan developed and approved at least one plan in the sector of public works
	Organise training on road bridge techniques to enhance the capacity of road bridge sector staff at the central and local levels in research, improvement and development of tools for managing construction, maintenance and repair of highways such as surveys, data collection, construction and repair methods, technical standards, road maintenance procedure manuals to determine the design of risk prevention plans, prioritize vulnerable areas to identify and prevent the effects of climate change on the transport infrastructure.	MPWT: DPF, DoR, and other relevant departments	✓	✓	The number of training activities at least 5 times organized per year related to learning the lessons of maintenance and repair of roads/highways and bridges.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Create and update the database, statistical system of the road bridge sector in each phase to be accurate and in accordance with the actual situation to be the basis of data for analysis, planning in a scientific, effective and continuous system.	MPWT: DPF, DoR,	✓		Create or update the statistical database of roads and bridges from time to time at least one database at the national level
	Improve the coordination mechanism with the National Disaster Management Committee and the National Climate Change Management Committee to be effective in order to coordinate the work of the road bridge sector in dealing with climate change at all levels by improving technical specifications, technical standards and manuals for the construction, maintenance and repair of highways to be resilient to the climate change.	MPWT: DPF, DoR, MAE: Department of Environment MLSW: DSW	✓		Coordination consultation workshops/ meetings organized at least once a year
	Provide regular road maintenance to reduce seasonal road closures due to natural disasters involve	MPWT: DPF, DoR	✓	✓	Number of roads or length of roads regular maintain
	Develop robust disaster preparedness and response systems, along with community-based early warning systems, as this will enhance resilience against climate impacts in the transport sector.	MPWT: DPF, DoT	✓	✓	Number of disaster preparedness and response plans developed for the road and transport sector
	Promote and support public transport such as electric buses as it can lower traffic and pollution in cities, positively affecting the incidence of respiratory diseases.	MPWT: DPF, DoT	✓	✓	Number of used electric buses increased or number of electric bus projects increased
	Invest in low-carbon public transport, such as electric buses and trains as well as in renewable energy sources and energy-efficient technologies as it helped reduce the dependency and enhance transport resilience.	MPWT: DPF, DoT	✓	✓	Number of electric bus projects invested by the government increased

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Address gender aspects of transport access to overcome social and cultural norms that restrict women's mobility and their participation in the economy and decision-making.	MPWT: DPF, DoT Lao Women Union (LWU)	✓		Percentage or ratio of equality of men and women in transport access increased
	Implement gender-sensitive transport planning, collect gender-disaggregated data, and facilitate women's active participation in community meetings and decision-making processes related to infrastructure development towards inclusive transport solutions.	MPWT: DPF, DoT LWU	✓		Gender-disaggregated data collected or number of women participated in the decision making processes increased

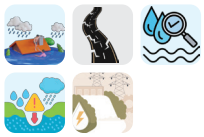
4. Energy and Mining

4.1 Sector Policy Linkages and Implementation Considerations

The Lao PDR recognizes that access to reliable, secure, and affordable electricity is essential to powering economic growth and development and becoming a major regional power provider. The GoLPDR, therefore, prioritized energy and mining development as a key element of its NSEDP including the 09th NSEDP (2021-2025). Prioritization of hydropower was achieved through planning and efforts to attract international investment. The Ministry of Industry and Commerce (MIC) is the lead government agency responsible for energy and mining sector.[197] The Ministry developed the 8th Five-Year Development Plan for the energy and mining sector (2016-2020) and the 9th Five-Year Development Plan for energy and mining sector (2021-2025) to contribute to the 9th NSEDP. The 5-Year Development Plan has set the vision: "*The development of the energy sector is a priority and mining is important on the basis of consistency with the overall development trend in the region and internationally, contributing significantly to the increase of an income, with the pace of quality growth according to the goals of sustainable and green development*." The Development Plan has been developed according to the overall trend of development and in line with the potential of the sector by defining in detail the expectations and focus areas of the energy and mining sector.[198]Apart from this Plan, the GoLPDR also plans to establish and implement a new five-year Power Development Plan (PDP) and, as a result, the current hydropower-dominated generation mix is likely to become more diversified with both renewable and non-renewable resources such as solar power, wind power, biomass energy and so on to complement existing hydropower in the medium to long term.

4.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

Energy and Mines		
 Flooding	 Less water available for mining production	 Reduced water quality
 Climate Change Impact		 Increased road damage for mining transport
Climate Change Impact	**Adaptation Strategy**	**Sample Adaptation Activities**
	1. Strengthening the resilience and adaptability to climate change of energy and mining sectors.	Develop standard operating procedures and continuity of operation plans for extreme events – including staffing plans, prioritised repowering of networks, and aid agreements with neighbouring countries.

[197] USAID (2020). Lao Power Sector Vulnerability Assessment and Resilience Action Plan
[198] MEM (2021). 5-Year Development Plan for Energy and Mining Sector (2021-2025)

		Assess and map climate risks and disasters in the energy and mining sectors, such as investment projects and activities related to hydroelectric power plants, transmission line system, solar energy, wind energy, mining and mineral processing.
	2. Promoting the use of clean and renewable energy in transportation, building and industrial sectors.	Promote the development of electric vehicle charging station system in the Northern, Central, and Southern regions.
		Promote the use of renewable and clean energy such as solar panels and lights in the buildings and factories.
	3. Promoting energy saving and conservation.	Create regulations and manuals for the implementation of energy saving and conservation for industrial plants, office buildings, and energy-consuming equipment.
		Promote the energy management system in buildings and factories as well as focus on encouraging, promoting, spreading and raising awareness for the people of all ethnic groups to be alert and be responsible for contributing to saving and conserving energy.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
Strategy 1: **Strengthening the resilience and adaptability to climate change of energy and mining sectors.**[199] [200] [201] [202]					
Objective 1: Develop and implement resilient energy and power system policies.	Mainstream climate change resilience in energy and mining strategy and action plan including through results-based management framework.	• Ministry of Industry and Commerce (MIC): Department of Energy, Department of Policy, Planning and Assessment • Electric De Lao (EDL) • Ministry of Labor and Social Welfare: Department of Labour and Social Welfare • Ministry of Agriculture and Environment (MAE): Department of Environment	✓		Five-year development plan and the National Strategy for Energy and Mines has integrated climate change adaptation
	Develop standard operating procedures and continuity of operation plans for extreme events – including staffing plans, prioritised repowering of networks, and aid agreements with neighbouring countries.		✓		At least two SOPs developed and improved for energy and mine sector at different levels
	Develop climate projections and geospatial data for hydropower analyse potential hydropower development for future climate predictions, map watersheds and water flows, and develop national hazard zone map.		✓	✓	At least one study report on climate projections developed for energy and mining sector
	Assess and map climate risks and disasters in the energy and mining sectors, such as investment projects and activities related to hydroelectric power plants, transmission line system, solar energy, wind energy, mining and mineral processing.		✓	✓	At least one CRVA conducted at the national level for the energy and mining sector
	Conduct climate impact studies to ensure resilience against droughts		✓		Number of climate impact studies conducted to ensure resilience against droughts
	Develop standards and improve regulations for dam design and construction in accordance with Lao PDR's technical standards,		✓		At least one design and construction standards for

[199] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)
[200] GoL (2021). Lao PDR Nationally Determined Contribution (NDC)
[201] USAID (2020). Lao Power Sector Vulnerability Assessment and Resilience Action Plan
[202] MEM (2021). 5-Year Development Plan for Energy and Mining Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	including the establishment of disaster preparedness plans for anticipated hazards (such as floods, storms, and erosion) in high-risk areas.				hydropower projects developed and approved
	Improve community preparedness for extreme events that may impact the power sector, and develop a curriculum and plan for community engagement and training that includes key messages for various stakeholders for community readiness as well as the training on community readiness.		✓	✓	At least one emergency response plan developed and at least 10 training activities implemented in the energy sector.
	Improve enforcement of dam design and construction codes – including planning for expected hazards (e.g., floods, storms, landslides) where these cannot be avoided.		✓		At least one design standard and/or regulations for the construction of hydropower projects developed and approved
	Include resilience provisions within annual operating budgets of relevant agencies.		✓		Adaptation and resilience building is integrated into the periodic/5-year budget plan of the energy and mining sector
	Develop, increase the implementation, monitor and report on the implementation of regulations, standards and adaptation plans in the energy and mining sector.		✓	✓	At least one regulation or requirement regarding monitoring and reporting of the implementation of legislation in the sector of energy developed
	Build organizational and personnel capacity to develop and manage energy and mining to be resilient and able to adapt to climate change.		✓	✓	At least 10 capacity-building activities for organizations and personnel on management of energy and

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
					mines to be sustainable have been organized or 1000 people have been built the capacity
Objective 2: Improve power system flexibility and resilience	Reduce dependence on hydropower by diversifying energy mix by identifying targets that increase geographic, fuel-supply, and water-use diversification in the national electricity generation mix and developing power-sector policies that incentivize diversification of the electricity generation mix such as solar energy, wind energy, biomass energy, and mining and minerals.	• MIC: Department of Energy, Industry and Energy Institute, Department of Industry • EDL • Ministry of Finance	✓		New types or options of energy (at least two) applied
	Improve planning for medium voltage (22 kV) and low voltage (0.4 kV) electricity grid systems, which face the highest risk of natural disaster impacts compared to high voltage transmission systems (115 kV). This includes studying and forecasting potential emergency disaster events and climate change impacts on these grid systems, alongside assessing renewable energy potential for future development to ensure safe energy development and production while reducing climate change impacts.				
	Improve existing infrastructure against main hazards (storms, floods, and landslides), and incorporating climate risk considerations into new infrastructure planning to improve the resilience of energy and mining infrastructure.		✓		Number of existing infrastructures against main hazards improved
Objective 3: Facilitate better sedimentation management in	Develop incentive and enforcement structures to ensure users or areas that are upstream from hydropower dams protect watersheds located upstream from hydropower dams.	• MIC: Department of Energy, Industry and Energy Institute.	✓	✓	At least 20 activities to disseminate and create good understanding in the management and protection of upstream areas in the

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
hydropower watersheds		• Ministry of Agriculture and Environment (MAE): Department of Water Resources			watershed area of the hydropower project have been organized throughout the country in the watershed areas of various projects.
	Create educational campaign and community awareness for watershed protection upstream from hydropower dams.		✓	✓	The plan to educate and create a good understanding of the community for the use, management and protection of watershed in the upstream area of the power dam has been developed and published at least 4 times per year
	Enhance sediment management to boost energy output, and fitting dams with bypasses to protect biodiversity and rural livelihoods.		✓	✓	Number of projects had effective sediment management to boost energy output
Strategy 2: Promoting the use of clean and renewable energy in transportation, building and industrial sectors.[203] [204]					
Objective 1: Reduce the import of fuel and gas, as well as environmental pollution and	Collaborate with related sectors to research legislation and policies to promote the use of vehicles powered by clean energy.	• MIC: Department of Energy, Industry and Energy Institute, Department of Industry • MAE	✓		At least two policy research conducted in collaborating with other sectors
	Promote the development of electric vehicle charging station system in the Northern, Central, and Southern regions (Over 100 stations).		✓		About 100 charging stations for electric vehicles and biomass fuel pumps have

[203] Ibid
[204] Ibid

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
greenhouse gas emissions that are the cause of climate change.		• MPWT: Department of Transport • Private Sector			been installed across the country.
	Promote the use of renewable and clean energy such as solar panels and lights in the buildings and factories.		✓		The project on promoting the use of renewable and clean energy has been piloted at least 20 projects (large, medium and small) across the country.
	Promote the demonstration project of the production process of methane gas (CH4) for the transport sector and industry to replace oil imports from abroad.		✓		At least five model projects in the development of biofuels and production of methane gas (CH4) have been implemented.
	Develop a biofuel factory from oil palm, coconut and cassava.		✓		At least 2 prototype biomass fuel plants have been implemented and tested
	Optimise agricultural residue extraction for bioelectricity by using biomass residues for bioethanol, implementing financial incentives and subsidies, workforce retraining, and community involvement.		✓		Number of projects on agricultural residue extraction for bioelectricity increased
	Diversify electricity production from mostly hydropower to solar, implement tariff reforms to support this shift, and increase public awareness of energy efficiency.		✓	✓	Number of solar plant projects increased
	Promote private sector involvement in renewable energy generation investment at sufficient scale such as solar power.		✓	✓	Number of private sector investment projects in renewable energy generation

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
Strategy 3: Promoting energy saving and conservation.[205] [206]					
Objective 1: Ensure that limited energy and natural resources are sustainable, green and environmentally friendly.	Create regulations and manuals for the implementation of energy saving and conservation for industrial plants, office buildings, and energy-consuming equipment.	• MIC: Department of Energy, Industry and Energy Institute, Department of Industry • EDL	✓		Create and approve at least one legislation and one manual at the national level in the implementation of energy saving and conservation in offices and factories
	Promote the energy management system in buildings and factories as well as focus on encouraging, promoting, spreading and raising awareness for the people of all ethnic groups to be alert and be responsible for contributing to saving and conserving energy.		✓		At least one energy management system in buildings and factories promoted or set up
	Implement of energy saving and conservation model projects in buildings and factories.		✓		A model project on saving and conserving energy in buildings and factories piloted.
	Encourage and promoting buildings and industrial plants to participate in the energy saving competition in the framework of ASEAN cooperation.		✓		Activities to encourage and promote buildings and industrial plants to participate in the energy saving competition are organized at least twice a year
	Develop human resources to become trainers on energy audit and energy saving management.		✓		About 1000 staff have been trained as trainers in energy

[205] GoL (2021). Lao PDR Nationally Determined Contribution (NDC)
[206] MEM (2021). 5-Year Development Plan for Energy and Mining Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
					audit and energy saving management.
	Establish a mechanism to manage the importation of low-quality electric		✓		At least one mechanism set up
Strategy 4: Integrating Sustainable Development Goals (SDG), climate resilience building and Green Growth (GG) into mineral and mining development plans.[207]					
Objective 1: Ensure that limited mines and minerals are sustainable, green and climate-environmentally friendly.	Create an action plan for the implementation of the Sustainable Development Goals (SDG), climate resilence development, green growth in the development of mining related infrastructure by promoting the use of new technologies and innovations, to contribute to SDG, NDC and GG of the mining sector.	• MIC: Department of Policy, Planning and Assessment, Department of Energy, Department of Geology and Minerals, Industry and Energy Institute of Energy, Department of Industry • MoF • MAE: Department of Environment, Department of Environment	✓	✓	Create at least 1 energy and mining action plan for SDG
	Create and update geological and mining databases, waste disposal, pollution emissions, environmental restoration and mine closure, use of labor as a basis for evaluating and determining measures to prevent and reduce negative effects on the environment and climate change.		✓		Create and update geological and mineral databases at least one
	Increase responsibility for the environment and society, especially reducing, preventing and solving the impact on the environment as well as giving importance to the safety and health of the workers and the local communities.		✓	✓	Organize activities to disseminate the importance of safety for energy sector at least 2 times a year by the related department under the MIC
	Survey of geology and minerals at the basic level to continue to improve geological-mineral, geological-disaster-information and study and exchange information with neibouring countries, as well as a database of geological tourist spots (Geo Site)		✓	✓	Conduct geological and mineral surveys at least three times a year at the basic level

[207] MEM (2023). National Strategy on Mining Sector to 2030 and Vision to 2040

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Assess resources and determine mineral sources, mineral categories or types of minerals that must be reserved or protected and mineral development areas.		✓	✓	Assess resources and determine mineral resources at least once a year
	Promote the use of modern techniques and technologies in the mining and processing of minerals to ensure and reduce the impacts on the environment and society.		✓	✓	At least two new techniques and technologies in mining and processing minerals have been piloted
	Develop a mechanism to monitor, manage social, environmental and health impacts that may arise from mining exploration, producing process and after mine closure period.		✓		At least one mechanism to monitor and manage environmental and social impacts has been developed
	Create legislation under the law, regulations and technical standards to be a tool to manage mining business operations		✓		At least one legislation under the law has been created or amended, and one technical standard has been created and approved for use
	Strengthen the monitoring and evaluation process of the infrastructure and mining projects through Environmental and Social Impact Assessment (ESIA); and Environmental and Social Management, and Monitoring Plan (ESMMP) implementation.		✓	✓	At least 20 related activities on building capacity in monitoring and or evaluating various construction projects are organized annually.

5. Education

5.1 Sector Policy Linkages and Implementation Considerations

In recent years, Lao PDR's education sector has undergone significant development and improvements in both quality and quantity, including: developing basic infrastructure; teaching and learning materials; and formulating national policies and strategies for the education sector. Particular emphasis has been placed on developing early childhood care and education programs for children aged 3-36 months, along with curricula, orientation programs for kindergarten teachers, and teacher manuals. Additionally, education quality standards have been developed, including water and sanitation standards for educational facilities, and basic education quality standards for kindergarten, primary, and secondary education. Furthermore, enabling conditions have been created to improve educational access for children in remote areas through various approaches.

Recently, the education sector has been development the 5-year Development Plan (2021-2025) according to the 9th National Socio-Economic Development Plan (2021-2025), which defined priority areas for the education sector development. The Plan aims to provide institutional strengthening to the schools to enhance their quality, efficiency, effectiveness and accountability through re-aligning their mandates, roles and responsibilities; establishing systems to allocate human and financial resources according to needs; enhance learning outcomes and reduce disparities through more effective and efficient management of resources through targeting improved education performance across the sector with priority to the 40 most disadvantaged districts; provide good care, sanitation and healthy nutrition to children, and develop in accordance with age-group as well as Lao language skill, good discipline, moral and preparedness prior to attending primary Grade 1; as well as construct and renovate school infrastructure, provide teaching-learning and play materials in learning facilities.[208]

With regard to climate change, in 2018 the education sector has disseminated the developed National Strategy on Education and Awareness on the Environment and Climate Change (2018–2025) and Vision to 2030. The Strategy aims to contribute to the achievement of the Vision towards 2030 of the natural resources and environment sector, especially promoting the quality of the urban environment development: green, clean, beautiful, rich in natural resources on the basis of green economic development; to achieve sustainable development and become a modern industrial country, as well as to ensure the ability to prepare to deal with climate change and natural disasters. The Strategy also focused on the integration of environmental education and climate change into the education system (in both formal school and informal school systems) as well as enhancing the public awareness of the environment and climate change throughout the country.[209] Apart from the strategy development, the Faculty of Environmental Science, the Faculty of Water Resources, and the Faculty of Forestry of the National University of Laos have included climate change subjects in their curriculum. Further, education and public awareness-raising on climate change by sectors and projects are implemented periodically.[210]

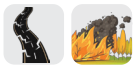
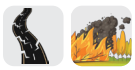
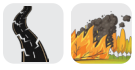
5.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

[208] MES (2021). 5-Year Development for Education and Sports Sector (2021-2025)
[209] MAE (2018). National Strategy on Education and Awareness on the Environment and Climate Change 2018-2025 and Vision towards 2030
[210] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)

Education

 **Reduced access to schools**	 **Increased damage to school infrastructure**	 **Increased injuries of children from extreme weather**

Climate Change Impact	Adaptation Strategy	Sample Adaptation Activities
	1. Strengthening educational organizations and personnel in climate change.	Develop and implement capacity building plans for teachers to teach subjects related to climate change and disasters.
		Build organizational strength related to education and create environmental awareness and climate change.
	2. Development of curriculum and teaching materials on climate change in formal schools.	Develop education curricula, specific training programs and public participation on climate change management for formal education system at all levels.
		Build green, clean, beautiful and resilience schools to climate change and disasters such as floods and storms that may affect educational facilities and schools in the vulnerable province.
	3. Development of curriculum and teaching materials on climate change for informal school.	Develop curriculum and teaching materials on the environment and climate change for the informal education system.
		Develop curriculum and teaching materials for extra-curricular education;
	4. Promoting education, and creating public awareness and participation on climate change	Develop curriculum, guidelines, content and methods for communication, dissemination, awareness and public participation as standards.
		Develop and promote a mechanism to mobilize the participation of the masses, such as posters, messages, websites, etc.
	5. Enhancing coordination and cooperation among parties	Create a database and compile activities related to education and awareness of the environment and climate change throughout the country.
		Build a network of cooperation with regional, sub-regional, ASEAN, international organizations, social organizations and various educational institutions regarding education and climate change.

5.3 Adaptation Activities and Action Plan

The following summary table develops further the adaptation "strategies" highlighted above into more details "activities" of importance for the sector. It also presents the sectoral strategies and objectives towards achieving climate resiliency, whom is responsible for its delivery and indicative timeframe for activity completion as well as indicators and targets to be achieved.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
Strategy 1: Strengthening educational organizations and personnel in climate change.[211] [212] [213]					
Objective 1: Ensure better understanding and awareness on climate change and risks for educational organisations and personnel throughout the country.	Assess risks, vulnerability and effects of climate change and disasters, the need for building the capacity to implement climate change management in the education sector.	• Ministry of Education and Sports (MES): Cabinet Office, Department of Planning, Department of Formal Education, Educational Science Research Institute, Department of Science Management • National University of Laos • Ministry of Agriculture and Environment (MAE): Department of Environment	✓		At least CRVA in the sector of education conducted
	Develop and implement capacity building plans for teachers to teach subjects related to climate change and disasters.		✓	✓	At least one national capacity building plan developed for the education sector
	Build organizational strength related to education and create environmental awareness and climate change.				Organize capacity building workshops for educational organizations twice a year on climate change.
	Enhance the knowledge of the technical staff in terms of education and climate change by providing trainings on climate change management, particularly scientific knowledge of climate change, adaptation, technology and effective implementation.		✓	✓	Organize training sessions for technical staff on education and climate change at least four times a year
	Develop guidelines for implementing education and climate change awareness creation activities.		✓		Develop at least two manuals or guidelines on the implementation of education and climate change.
	Develop guidelines on being a trainer in education and climate change awareness creating as well as guidelines for building a green school.		✓		At least one training guideline on being trainer for education sector regarding climate change developed
	Promote higher education research on climate change and its impacts on the education and sports sector, while enhancing the		✓		At least one national-level research study on climate

[211] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)
[212] MAE (2018). National Strategy on Education and Awareness on the Environment and Climate Change 2018-2025 and Vision towards 2030
[213] MES (2021). 5-Year Development for Education and Sports Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	potential, tools, and capacity of education sector personnel to conduct such research.				change in the education and sports sector.
	Monitor, evaluate and report on the implementation of capacity development plans and activities related to education, climate change and disasters.		✓	✓	A monitoring and evaluation report on the implementation of capacity development plans and activities related to education, climate change and disasters developed
Strategy 2: Development of curriculum and teaching materials on climate change in formal schools.[214]					
Objective 1: Ensure the integration of education and climate change in the education system (formal) and strengthen resilience of educational infrastructure across the country.	Develop education curricula, specific training programs and public participation on climate change management for formal education system at all levels.	• MES: Cabinet Office, Department of Planning, Department of Formal Education, Department of Vocational Education, Educational Science Research Institute, Department of Science Management • National University of Laos • MAE: Department of Environment	✓		Create education curriculum, specific training courses and public participation on climate change management for formal education system at all levels at least one course.
	Develop curriculum and teaching materials on environment and climate change to be suitable for pre-school education, primary education, and secondary education.		✓		Develop curriculum and teaching materials on climate change that are suitable for different levels of education, at least one course per level
	Develop the curriculum and teaching materials in the system of vocational education institutions and universities.		✓		Develop curriculum and teaching materials in the system of vocational education institutes and universities at least one course.

[214] Ibid

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	Build and retrofit green, clean, beautiful and resilience schools to climate change and disasters such as floods and storms that may affect educational facilities and schools in the vulnerable province, incorporating climate-smart building practices and selecting locations with geographical safety in mind.		✓	✓	Build at least 10 model schools that are environmentally friendly, green, clean and resistant to climate change and natural disasters throughout the country.
	Develop standards and improve regulations for the design, site selection, and construction of educational facilities and schools in accordance with Lao PDR's technical standards, including the establishment of preparedness plans for anticipated natural disasters such as floods, storms, and erosion in vulnerable and high-risk areas.		✓		Develop at least one standard and improve at least one school design and construction regulations
	Develop a preparedness plan on disasters related to climate change for the education sector in case of emergencies that may affect the infrastructure of the education sector such as schools, as well as create a response plan at the local level and provide training to teachers at all levels to be able to prepare and deal with disasters such as floods and storms.		✓		Develop at least one disaster preparedness plan for the central level and 18 provinces of the education sector
	Integrate and include the building resilience to climate change in the annual budget plan of the education sector and related organizations at the local level.		✓		Integrate climate change resilience building into the 2025/2026 annual budget plan of the education sector
	Build the capacity of organizations, educational personnels and teachers in terms of preparedness on the climate events both before and after, including enhancing knowledge and a good understanding of building resilience and adapting to climate change.		✓		Build capacity of 10,000 academic personnel in terms of preparedness on the climate events both before and after events nationwide.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	Enhance digital learning infrastructure ensuring educational continuity during disruptions, requiring investments not just in technology but also in training educators and providing students with necessary resources.		✓		Number of digital learning infrastructure created
	Support poor families to buy school materials (uniforms, books, notebooks) when climate shocks hit.		✓	✓	Number of school materials provided to poor families or number of projects on provisions of school materials
	Monitor, evaluate and report on the implementation and integration.		✓	✓	Develop a monitoring and evaluation report on the implementation of the development, integration and improvement of the curriculum and teaching-learning materials in the school at least one report
Strategy 3: Development of curriculum and teaching materials on climate change for informal school.[215]					
Objective 1: To ensure public awareness of the environment and climate change be raised throughout the country in the	Develop curriculum and teaching materials on the environment and climate change for the informal education system and for extra-curricular education.	• MES: Cabinet Office, Department of Planning, Department of Informal Education, Educational Science Research Institute, Department of Science Management	✓		Develop curriculum and teaching materials on climate change for formal and informal education system at least one curriculum
	Invest in community-based educational programmes that can adapt to environmental uncertainties, especially in primary schools and rural areas.		✓		Number of investment projects in community-based educational programmes

[215] MAE (2018). National Strategy on Education and Awareness on the Environment and Climate Change 2018-2025 and Vision towards 2030

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
informal school system.	Include the sustainable practices and climate education in the relevant curricula to empower students with the knowledge and skills to address future challenges.	• MAE: Department of Environment	✓		Number of sustainable practices and climate education included in the relevant curricula
	Monitor, evaluate and report on the implementation.		✓	✓	Number of monitoring reports
Strategy 4: Promoting education, and creating public awareness and participation on climate change.[216]					
Objective 1: Ensure the public awareness and participation on climate change be enhanced for the public sector organizations (mass media, civil society organisations).	Develop curriculum, guidelines, content and methods for communication, dissemination, awareness and public participation as standards.	• MES: Cabinet Office, Department of Planning, Department of Formal Education, • National University of Laos • MAE: Department of Environment • Other relevant Ministries	✓	✓	Develop content, guidelines to communicate, disseminate, create awareness in climate change at least one guideline
	Develop the content and mechanism of mass communication through television, radio, newspapers, magazines and others.		✓		Develop content and communication mechanisms with the masses at least one mechanism
	Develop and promote a mechanism to mobilize the participation of the masses, such as posters, messages, websites, etc.		✓		Develop at least one mass participation mechanism
	Develop and improve the process of creating awareness through public sector and civil society organizations.		✓		Awareness building activities through public sector organizations and social organizations organized through various programs
	Provide more special attention to girls and ethnic minorities, who are currently disadvantaged.		✓	✓	Percentage or ratio of girls and ethnic minorities engaged in the education programmes increased

[216] Ibid

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
Strategy 5: Enhancing coordination and cooperation among parties.[217]					
Objective 1: Ensure good domestic and international networking, coordination and cooperation.	Create a database and compile activities related to education and awareness of the environment and climate change throughout the country.	• MES: Cabinet Office, Department of Planning, Department of Formal Education, Education and Sport Statistics Center • National University of Laos • MAE: Department of Environment • Other relevant Ministries	✓	✓	Develop at least one database summarizing activities on climate change education and awareness
	Build a network of cooperation with regional, sub-regional, ASEAN, international organizations, social organizations and various educational institutions regarding education and climate change.		✓		Cooperation with at least five organizations in different countries
	Create a joint process with related sectors to disseminate climate change information by organizing and creating opportunities to share good lessons, model projects, model communities, model products and other processes.		✓	✓	Create climate change information dissemination activities with various organizations and create opportunities to share lessons, model projects and model schools at least 10 related activities
	Develop robust financial strategies, including disaster risk insurance, climate resilience funds, and leveraging international aid.		✓		Number of disaster risk insurance schemes increased

[217] MAE (2018). National Strategy on Education and Awareness on the Environment and Climate Change 2018-2025 and Vision towards 2030

6. Water Resources

6.1 Sector Policy Linkages and Implementation Considerations

The Lao PDR has a total area of about 236,800 square kilometers, about 90% of the country's area is in the Lower Mekong Basin. Lao PDR is rich in water and water resources, with the Mekong River Basin, the Mekong River's tributary basins and other river basins flowing from north to south. In which, 32% of the total amount of water in the Mekong River flows from Lao PDR. Every year, the total water source is 190 cubic kilometers (equal to 1,7% of the total volume of the Asian continent); the average per capita is equal to 34,435 cubic meters (almost 10.6 times the average level in the Asian continent, 10.5 times that of Thailand, 7.5 times that of the Republic of Vietnam, and 3.9 times that of Cambodia). Of this amount of water, only 11% or 20 billion cubic meters/year is used in various sectors. In Lao PDR, water and water resources are used for many purposes and in different amounts, such as the use of water in the agricultural sector is 82%, industry sector about 10%, household use and others about 8% of the total use volume. In addition to the surface water, Lao PDR also has a large number of underground water sources. In 2018, it was estimated that the area with abundance of groundwater covers about 50% of the country. The groundwater is widely used in areas far from water supply for consumption, agriculture, industry, construction and others.[218]

Based on the strategic direction of the NSEDP of the Lao PDR in each period, and the importance of water and water resources for living and socio-economic development, especially water resources for sustainability, the natural resources and environment sector has set a vision for the year 2030 and its 10-year strategy as follows: "*Lao PDR is green, clean, beautiful and rich in natural resources, based on the development of a green economy to achieve sustainable development and advance the country's industry and modernity, as well as ensuring the ability to prepare for climate change and natural disasters.*"[219] Specifically, the GoLPDR has set a vision on water sector until the year 2040 and developed the National Water and Water Resources Management Strategy with the aim in protection and use of water and water resources efficiently and sustainably.

The Vision towards 2040 and the National Water and Water Resources Usage and Management Strategy towards 2030 has defined the vision based on the following aspects: "*Management and use of water and water resources according to the principle of integrated management, ensuring good quality and sufficient quantity to meet the consumption and sustainable development as well as reduce the damage caused by water*" to achieve the vision, the Strategy has defined three main targets, including:[220]

- Target 1: Implement the management and use of water and water resources according to the principle of integrated water resources management effectively by coordinating with the government stakeholders at the central and local levels, the private sector and other stakeholders;
- Target 2: Protect and restore water and water resources to abundance;
- Target 3: Promote the development of infrastructure related to the sustainable use of water. In order to achieve this Vision, the Strategy has defined 8 strategic plans as follows: (1) integrated water resources management; (2) Management of the database-information system for water and water resources; (3) protection and restoration of water and water resources; (4) groundwater management; (5) Development of the infrastructure related to water use to cope with climate change; (6) creation of financial mechanisms; (7) human resource development; (8) International cooperation. In addition, detailed targets, focused tasks and activities have also been defined in the Strategy.

[218] MAE (2023). The Vision towards 2040 and the National Strategy on Water and Water Resources Usage and Management towards 2030
[219] MoNRE (2021). 5-Year Development Plan for Ministry of Natural Resources and Environment (2021-2025)
[220] Ibid

6.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

Water Resources		
 **Flooding**	 **Less water available**	 **Reduced water quality**

Climate Change Impact	Adaptation Strategy	Sample Adaptation Activities
	1. Development of the integrated water resources management and river basin management plan, policy and guideline	Create and implement an integrated water resources management plan to adapt and be resilient to climate change by managing and protecting water catchments, water sources, water gathering areas, ponds, water reservoirs, water area soils and aquatic biodiversity.
		Create large and medium river basin management plans of the main rivers across the country.
	2. Protection and restoration of water and water resources (wetland, peatland, aquatic biodiversity, aquatic ecosystems and groundwater).	Enhance the study and assessment of the climate vulnerability of water areas and water resources such as: wetlands, aquatic biodiversity, ecosystems, habitats, water quantity and water supply.
		Identify water and water resources protection zones.
		Create and improve legislation and plans on groundwater management and protection, including the implementation of such legislation and plans.

	3. Improvement and development of water related infrastructure, information system and early warning systems.	Improve the irrigation systems to be more efficient and resilient to the climate change and disasters.
		Develop, improve and expand the system of forecasting, monitoring and early warning of dangers from water and changes in water by coordinating with the fields of meteorology, energy, agriculture and others.
	4. Development of human resources.	Create a personnel development plan in the field of water resources management and climate change adaptation.
		Provide training in integrated water resource management and climate change.

6.3 Adaptation Activities and Action Plan

The following summary table develops further the adaptation "strategies" highlighted above into more details "activities" of importance for the sector. It also presents the sectoral strategies and objectives towards achieving climate resiliency, whom is responsible for its delivery and indicative timeframe for activity completion as well as indicators and targets to be achieved.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
Strategy 1: Development of the integrated water resources management and river basin management plan, policy and guideline.[221] [222] [223]					
Objective 1: Ensure that river basin management plans and information related to water resources are well developed and managed.	Create and implement an integrated water resources management plan to adapt and be resilient to climate change by managing and protecting water catchments, water sources, water gathering areas, ponds, water reservoirs, water area soils, aquatic biodiversity, ecosystem services, water quantity, ensuring supply and access to water sources for all sectors and communities, and women group.	Ministry of Agriculture and Environment (MAE): Department of Water Resources (DWR)	✓	✓	Develop at least one plan related to the Ministry's 5-year development plan and the province's 5-year strategic plan with integrated climate change adaptation
	Create large and medium river basin management plans of the main rivers across the country at District (watershed) levels.	MAE: DWR, Lao National Mekong River Commission Secretariate (LNMCS)	✓		At least 14 plans developed for the large level river basin and 14 plans created for the medium level river basin
	Consolidate and improve legislation on integrated water resources management and river basin management.	MAE: DWR, LNMCS, Department of Meteorology and Hydrology (DMH)	✓		At least four legislations on integrated water resources management and river basin management developed and improved including the Law on Water and Water Resources and the Law on Meteorology and Hydrology, the Decree on the Establishment of Meteorology and Hydrology Stations, etc.

[221] MoNRE (2023). National Strategy on Climate Change towards 2030
[222] MoNRE (2023). The Vision towards 2040 and the National Strategy on Water and Water Resources Usage and Management towards 2030
[223] MoNRE (2021). 5-Year Development Plan for Ministry of Natural Resources and Environment (2021-2025)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	Improve and expand water and water resources monitoring network.	MAE: DWR, DMH	✓	✓	Build 126 automatic monitoring stations, 147 ordinary stations and 119 rain level measuring stations
	Develop and manage the information system related water and water resources.	MAE: DWR, Department of Meteorology and Hydrology (DMH)	✓		At least one information system related to water resources developed
	Expanding meteorological and hydrological networks and stations across the country.	MAE: DWR, DMH	✓	✓	Expand the network of meteorological stations increasing from 52 to 147 stations
	Survey, collect data and make an inventory on water quantity, water use, land around water, wetland and peatland.	MAE: DWR, LNMCS, DMH	✓	✓	Water inventories developed covering 18 provinces by providing all information until 2023 including information on water quantity, water quality, water use, meteorological information, temperature, rainfall, sunlight, evaporation and wind
	Create technical guidelines on development of the river basin management plan	MAE: DWR, LNMCS,	✓		Develop a technical guideline on the development of river basin management plan, at least one guideline

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	Disseminate the legislation and technical manuals/guidelines on water and water resources management, and river basin management plan	MAE: DWR, LNMCS,	✓		At least 20 dissemination events/activities conducted
	Establish a coordination mechanism and committee on integrated river basin management	MAE: DWR, LNMCS, DMH	✓		At least one Coordinating Mechanism and Coordinating Committee on Integrated River Basin Management mechanism has been developed
Strategy 2: Protection and restoration of water and water resources (wetland, peatland, aquatic biodiversity, aquatic ecosystems and groundwater).[224]					
Objective 1: Protect and restore the degraded wetlands and water areas.	Review and develop regulations on the identification of river basin criteria that are still rich and degraded.	MAE: DWR	✓		Develop at least one regulation on the identification of criteria for river basin that remain fertile and degraded
	Enhance the study and assessment of the climate vulnerability of water areas and water resources such as: wetlands, peatlands, aquatic biodiversity, ecosystems, habitats, water quantity, water supply and health at the national level or affected main water basins, high risk or can help in adaptation in sub-water basins, etc.	MAE: DWR, Department of Environment	✓	✓	At least one CRVA report developed for water and water resources sector at the national level
	Identify water and water resources protection zones.	MAE: DWR	✓		At least 10 water protection zones are identified across the country

[224] Ibid

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	Protect the water areas, high-value wetlands and peatlands by creating legislation on the management of wetlands and peatlands.	MAE: DWR, Department of Land Management and Development	✓		Create and improve legislation on the management of wetlands and peatlands at least one related legislation
	Develop a land management plan that embraces clear strategies to protect peatlands.	MAE: DWR, Department of Land Management and Development			Create at least one related management plan for water land areas including peatland
	Apply broader social and environmental based approaches for water management, such as by developing Ecosystem-based Adaptation (EbA) that focuses on ecosystem conservation and restoration of wetlands and riverbanks, which play a vital role in maintaining water quality and regulating flows.	MAE: DWR, Department of Environment	✓		At least three EbA related projects implemented or applied for water management
Objective 2: Rehabilitate forests in the watersheds and groundwater areas.	Survey and determine the forest protection area and develop the plan on the restoration of the forest in the headwaters area.	MAE: DWR, Department of Forestry	✓		Survey and determine forest protection areas in headwater areas and riverside areas to cover at least 14 river basins
	Create and improve legislation and plans on groundwater management and protection, including the implementation of such legislation and plans	MAE: DWR	✓		Create and improve legislation on groundwater management and protection at least one legislation developed
	Create a technical guidance manual on groundwater management.	MAE: DWR	✓		Create at least one technical guidance manual on groundwater management
	Identify areas at climate risk for groundwater quantity.	MAE: DWR	✓		At least four main areas of ground water sources

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
					identified for climate risk across the country
	Build basic infrastructure and develop community water supply to cope with floods and droughts	MAE: DWR MPWT: Department of Water Supply	✓	✓	The number of community water infrastructures to cope with the floods and droughts has been developed in each province.
	Build capacity and raise awareness for the community in participation in groundwater management against climate change	MAE: DWR	✓		At least 20 capacity and awareness raising activities organized for communities to participate in groundwater management.
	Create a report on the overall status of groundwater for the country	MAE: DWR	✓		Develop a report on the status of groundwater in the country
	Provide and support local equipment to collect basic groundwater data and monitor groundwater quantity and quality to adapt to climate change		✓	✓	The amount of equipment provided to local communities on collecting groundwater data and monitoring the quantity and quality of groundwater.
Strategy 3: Improvement and development of water related infrastructure, information system and early warning systems.[225] [226]					
Objective 1: Improve water related	Improve the irrigation systems to be more efficient and resilient to the climate change and disasters.	MAE: DWR, Department of Irrigation	✓	✓	A number of water-related infrastructures including irrigation have been improved throughout the

[225] MAE (2023). The Vision towards 2040 and the National Strategy on Water and Water Resources Usage and Management towards 2030
[226] MAE (2023). National Strategy on Climate Change towards 2030

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
infrastructure is resilient to climate change and develop information system.					country to be more effective and resilient to climate change
	Develop a plan to use water in the reservoir for multiple purposes and ensure gender equality.	MAE: DWR, Department of Livestock and Fishery	✓		At least five water usage plans for the reservoir has been created as the model
	Upgrade and maintain water infrastructure to withstand extreme weather events, for example by incorporating climate-smart construction practices and choosing locations with geographical safety considerations.	MAE: DWR, DoI MPWT: DWW	✓	✓	Number of water infrastructure to withstand extreme weather events maintained
	Establish a network to exchange information among hydropower project developers across the country and the public and private sectors in water management and water use plans for each dam.	MAE: DWR Ministry of Industry and Commerce (MIC)	✓	✓	Exchange network in water management and water use plan in each hydropower project has been created at least one network
	Adjust dams and reservoir operations to cope with future hydroclimatic scenarios, such as modifying water release schedules and storage capacities to ensure a fair share of the resources across sectors and communities.	MAE: DWR MIC	✓	✓	Number of dams or hydropower projects had an effective water management
	Develop information system and database on water and water resources across the country to ensure that all parties have access to information related to water resources including gender equality	MAE: DWR, DMH, LNMCS	✓		Develop a database system on water and water resources at the national level, at least one database to be an online database system, which is currently an Excel file system.
	Develop, improve and expand the system of forecasting, monitoring and early warning of dangers from water and	MAE: DWR, DMH	✓	✓	Create and improve at least two forecasting systems

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	changes in water by coordinating with the fields of meteorology, energy, agriculture and others.	Ministry of Labour and Social Welfare: Department of Social Welfare			with three times daily warning systems including satellite monitoring systems; LaCSA system (www.lacsa.net is in use); The website (dmhlao.la is being updated) where the data is obtained from actual data in the stations, meteorological radar, URBS and Regression forecast.
	Expand meteorological and hydrological stations across the country	MAE: DWR, DMH, LNMCS	✓	✓	Expand meteorological and hydrological stations up to 148 stations across the country (1 station per district)
Objective 2: Ensure the sustainable maintenance and use of water-related infrastructure.	Design water-related infrastructure to be more resilient to the climate change and disasters that may occur in the future.	MAE: DWR, DMH Ministry of Public Works and Transport (MPWT): Department of Waterway, Department of Housing and Urban Planning MIC	✓	✓	Expand meteorological and hydrological stations to 148 districts across the country (one station per district)
	Assess the climate risk and vulnerability of the water infrastructure to the climate change and focus on improving the water-related infrastructure.	MAE: DWR, Department of Environment, DMH MPWT: Department of Waterway, Department of Housing and Urban Planning, Department of Water Supply MIC	✓		Conduct CRVA of water infrastructure in at least 14 large and medium-sized reservoirs

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	Train for provinces and districts to assess the risk and vulnerability of water infrastructure to climate change with the aim of improving the infrastructure.	MAE: DWR, Department of Environment MIC	✓	✓	Train for provinces and districts on assessing CRVA for 1000 personnel nationwide
	Design and develop water reservoirs standards for the hydropower projects for safety.	MAE: DWR MIC	✓	✓	Design and develop reservoir standards for hydropower safety projects at least two
	Assess the risk of floods and droughts in the lower part of the river basin.	MAE: DWR, Department of Environment	✓		Assess the flood and drought risk in the lower part of the river basin for at least 14 river basins (large and medium-sized)
	Create safety standards for dams and create a national water management centre.	MAE: DWR MIC			Safety standards for dams and building the National Water Management Center developed at least one standard or one center
	Encourage law enforcement and the implementation of measures that violate and cause damage to infrastructure, facilities, ecosystems for adaptation and resolution of conflicts in the use of water and water resources.	MAE: DWR MIC	✓	✓	Publish the law and the related regulations at least twice a year
	Involve communities, both in urban and rural areas, for developing and implementing integrated water management strategies that benefit all stakeholders.	MAE: DWR MIC	✓		Number of model communities or villages involved in implementing integrated water resources management activities
	Engage local populations in implementing integrated water management activities to ensure that the solutions are tailored to	MAE: DWR MIC	✓	✓	Number of local populations engaged in

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	their specific needs and circumstances, fosters a sense of ownership and responsibility, and enhances the effectiveness and sustainability of the initiatives.	MPWT			implementing integrated water management activities
	Secure sufficient financing for integrated water management activities that connects efficiently with other sectors can deliver win-win solutions and value for money.	MAE: DWR MIC MPWT MoF	✓	✓	Amount of financial support provided for integrated water management activities
Objective 3: Provide clean water for people to use in general to cope with the climate change impacts.	Create and implement an investment plan for water supply infrastructure in response to droughts.	MAE: DWR MPWT: Department of Water Supply	✓		Create and implement an investment plan for the water supply system for at least one investment plan
	Survey, collect data and assess water shortages and suitable areas for building water supply infrastructure.	MAE: DWR MPWT: Department of Water Supply	✓		Survey, collect data and assess water shortage in 18 provinces across the country
	Create and implement an investment plan for infrastructure that collects and supplies water in urban and rural areas during dry seasons.	MAE: DWR MPWT: Department of Water Supply, Department of Housing and Urban Planning	✓		Create and implement an investment plan for infrastructure that stores water and supplies water for at least 10 plans (model)
	Build small, medium and large-scale community water supply systems in drought-prone and water-scarce areas in both urban and rural areas to be able to provide water during the dry season	MAE: DWR MPWT: Department of Water Supply,	✓	✓	Build small, medium and large community water supply systems in 18 provinces across the country
	Implement the adaptation measures against natural disasters to ensure the quality of water resources in the face of floods and	MAE: DWR, Department of Environment MPWT	✓		At least 10 climate adaptation projects related

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	droughts, such as investing in water treatment facilities and sewage networks.	MLSW			to water management implemented
Strategy 4: Development of human resources					
Objective 1: Build capacity in water resources and climate change management.	Create staff development plans (for all relevant Departments within key Ministries) in the field of water resources management and climate change adaptation.	MAE: DWR, Department of Environment	✓		Create at least one personnel development plan in the sector of water resource
	Provide training in integrated water resource management and climate change.	MAE: DWR, Department of Environment	✓	✓	Provide bi-annual training in integrated water resource management and climate change
	Provide training on determining the boundaries of areas that are at risk of water related disasters such as floods, droughts, soil erosion.	MAE: DWR, Department of Environment	✓	✓	Provide bi-annual training on determining the boundaries of areas that are at risk of water related disasters
	Provide training on assessing the risk and vulnerability of water-related infrastructure to climate change.	MAE: DWR, Department of Environment	✓	✓	Provide bi-annual training on assessing the risk and vulnerability of water-related infrastructure to climate change.
	Provide training on creating a river basin management plan.	MAE: DWR	✓	✓	Provide quarterly training on creating a river basin management plan
	Promote research in various topics related to water and water resources.	MAE: DWR	✓	✓	At least five research topics have been studied related to water and water resources

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	Create awareness and disseminate information on water and water resources management for relevant stakeholders and in public including promoting the participation of society, especially the community, the private sector and students to participate in the implementation of the management of protection, development and restoration of water and water resources	MAE: DWR	✓	✓	Activities to raise awareness and disseminate information about water management and water resources to the relevant groups are organized at least twice a year.
	Integrate gender into water and water resources management plan and activities	MAE: DWR Lao Women Union	✓		Gender have been integrated into the 5-year development plan, the national water strategy and the water resources management plan.
	Create a curriculum and integrate water management and water resources into teaching and learning at each level such as primary, secondary, university and adapting to climate change more.	MAE: DWR MES National University of Laos	✓	✓	Curriculum and integration of water management and water resources into teaching and learning has been developed or integrated at least one curriculum developed or at the national level

7. Health

7.1 Sector Policy Linkages and Implementation Considerations

Overall, the 9th 5-year National Socio-Economic Development Plan (2021-2025) emphasized the importance of the health sector for the country development and poverty graduation. The Plan aimed at achieving the conditions to lead the country out of the least developed country (LDC) status in 2024, preparing to have a high-medium income nation and achieve universal health coverage in 2025 and achieve the goal of sustainable development by 2025. Specifically, the priority areas of the health sector for the 9th NSEDP is the establishment and implementation of the strategies of the health sector by taking sanitation-disease prevention and health promotion as the main strategy; taking treatment and providing health services universally, with quality, justice and equality; creating a good health service system that takes people as the centre, and cares for people's health both physically and mentally; creating a social protection system for health to make society stronger and helping people with health insurance that protects everyone in terms of disease prevention, making all people healthy from the unborn child to the elderly by focusing on primary health care; and creating a new lifestyle plan that does not pose a health risk and raise awareness on health care.[227]

The health sector in Lao PDR is one of the most progressive sectors in termsof integrating climate change matters into its policies. A primary achievement to demonstrate this includesthe endorsement of the Strategy on Climate Change and Health Adaptation 2018–2025 and Action Plan 2018 – 2020 which was developed according to the 2015 Operational Framework for Building Climate Resilient Health Systems of the World Health Organization. It consists of 6 strategic directions including: 1) Enhancing leadership and governance; 2) Building strong organizational and staff capacity; 3) Improving health information system and climate change; 4) Building climate resilience and sustainability of technology and infrastructure; 5) Improving health service provision; and 6) Financing public health and climate change.[228]

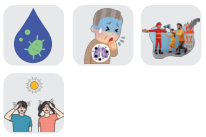
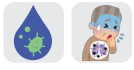
7.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

Health		
Increased diseases (water and vector borne)	**Increased malnutrition**	**Increased injuries from extreme weather**
Increased respiratory illness	**Increased heat stress**	**Human health emergency and death**

Climate Change Impact	Adaptation Strategy	Sample Adaptation Activities
	1. Strengthening and building the organizational and staff capacity	Enhance the capacity of the staff in implementing the adaptation plans of the health sector by providing the relevant trainings to target staff within the Ministry of Health on climate change and health. Create teaching courses on climate change and health at the National University and the University of Health Sciences.

[227] MoH (2021). 5-Year Development Plan for Health Sector (2021-2025)
[228] MoH (2017). National Strategy on Climate Change and Health Adaptation to 2025

		Create teaching courses on climate change and health at the National University and the University of Health Sciences.
		Create and update legislation, policies and action plans related to the adaptation of the public health sector to climate change.
	2. Assessment of climate vulnerability and adaptation capacity in health sector.	Identify the communities that are most vulnerable to climate variability and change and related health risks based on available data.
		Map public health information needs especially for safe and at-risk areas from extreme climate events.
	3. Integrating risk monitoring and warning systems.	Collect and analyze data on some key climate variables (such as maximum temperature, rainfall, humidity, morbidity and mortality from diseases sensitive to climate change) associated with infectious diseases, insects and other risks.
		Monitor early warning systems using satellites and weather data.
	4. Research on climate change and health.	Conduct research studies with many stakeholders to study the sensitivity factors affecting health such as water, sanitation and hygiene, food, diseases caused by insects, non-communicable diseases, nutrition including mental and social illnesses caused by climate change.
	5. Building resilience to climate change and sustainability of technology and infrastructure.	Maintain and improve public health service facilities, additional installation or renovation to ensure clean water, electricity, communication, equipment and medicine.
		Use new technologies such as E-Health or satellite images to improve the efficiency of the public health system.
	6. Creating public health programs from climate change information.	Create a plan for water, sanitation and hygiene in the vulnerable communities.

7.3 Adaptation Activities and Action Plan

The following summary table develops further the adaptation "strategies" highlighted above into more details "activities" of importance for the sector. It also presents the sectoral strategies and objectives towards achieving climate resiliency, whom is responsible for its delivery and indicative timeframe for activity completion as well as indicators and targets to be achieved.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
Strategy 1: Strengthening and building the organizational and staff capacity.[229] [230] [231] [232]					
Objective 1: Ensure health workers have sufficient technical capacity to deal with health risks caused from climate change and able to implement the relevant policies.	Implement health sector related climate change adaptation plans, in particular the National Strategy on Climate Change and Health Adaptation to 2027.	• Ministry of Health (MoH): Department of Hygiene and Health Promotion, Center for Health Statistics and Information (CHSI) and related departments. • University of Health Sciences • Ministry of Agriculture and Environment (MAE): Department of Environment	✓		To achieve 80% of the implementation of adaptation measures identified in the climate change adaptation plan of the health sector by 2027
	Enhance the capacity of the staff in implementing the adaptation plans of the health sector by providing the relevant trainings to target staff within the Ministry of Health on climate change and health.		✓	✓	Build the capacity of 100 health personnel per year (50% women)
	Create and revise technical guidelines on diagnosis, investigation, control, prevention and treatment of diseases (malaria, diarrhoea, typhoid fever, rat urine disease) injuries and foodborne diseases.		✓		Create and revise at least five technical guidelines
	Create teaching courses on climate change and health at the National University and the University of Health Sciences.		✓		Create at least three teaching-learning courses on climate change
	Create and update legislation, policies and action plans related to the adaptation of the public health sector to climate change		✓		Legislation, policies and action plans related to the adaptation of the health sector have been created and updated at least 1 one document

[229] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)
[230] GoL (2021). Lao PDR Nationally Determined Contribution (NDC)
[231] MoH (2017). National Strategy on Climate Change and Health Adaptation to 2025
[232] MoH (2021). 5-Year Development Plan for Health Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Create a communication strategy plan related to climate change and health (such as prepare, print and distribute health education advertising tools, broadcast television and radio programs that show the effects of climate change and appropriate responses, preventive measures during high/low temperatures, floods and droughts and other measures to prevent diseases that are sensitive to climate change with special attention to vulnerable groups (elderly, children, women) and high-risk areas for epidemics).		✓		Create a communication strategy at least 1 strategy in particular creating a communication strategy on climate change and health and at least one communication plan developed, including the printing of 10,000 brochures with broadcasts on television, social media and radio at least twice a month
	Create a gender plan related to climate change and health.		✓		At least one gender promotion plan related to climate change and health has been developed
	Develop policy intervention to prevent the projected increase in local emission of pollutants that cause cardiovascular and respiratory diseases		✓		Number of policy documents developed to prevent the projected increase in local emission of pollutants that cause cardiovascular and respiratory diseases
	Train provincial and district trainers on the use of water, sanitation and hygiene tools at health service facilities (WASH FIT).		✓	✓	Provide training for provincial and district level personnel for 100 people per year (50% for women)
	Practice simulated events to prepare health workers from vulnerable areas to deal with communicable diseases after natural disasters and epidemics.		✓		Practice simulated events to prepare health workers from vulnerable areas to deal with

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
					communicable diseases after natural disasters and epidemics at least 2 times
	Enhance capacity of technical staff of health sector in climate change adaptation, monitoring, and risk management at all levels.		✓	✓	Number of technical staff of health sector built capacity in climate change adaptation, monitoring, and risk management
Strategy 2: Assessment of climate vulnerability and adaptation capacity in health sector.[233] [234] [235]					
Objective 1: Ensure that there is an understanding of the main health risks caused by climate change within the most vulnerable population groups of the country.	Assess risks and impacts of climate change and disasters in the health sector.	• MoH: Department of Hygiene and Health Promotion, Department of Treatment, Hospital, University of Health Sciences • MAE: Department of Environment • Ministry of Labour and Social Welfare: Department of Social Welfare	✓		CRVAs conducted in every 3-5 years for the health sector
	Identify the communities that are most vulnerable to climate variability and change and related health risks based on available data.		✓		100 communities identified each year that are most vulnerable to climate variability and change with related health risks and strategies identified and communicated
	Create a mapping for public health information in safe and at-risk areas from extreme events.		✓		At least one climate risk map for health sector developed per province

[233] MAE (2023). National Strategy on Climate Change towards 2030 (Final Draft)
[234] MoH (2017). National Strategy on Climate Change and Health Adaptation to 2025
[235] MoH (2021). 5-Year Development Plan for Health Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
	Assess the capacity of the public health system to cope with health risks from climate change and make plans to carry out appropriate activities (e.g. capacity for diagnosis, treatment and analysis).		✓		At least one capacity assessment report on public health and climate change risk developed
	Assess public health structures at all levels (especially in disaster areas) to respond to diseases that are sensitive to climate conditions (malaria, diarrhoea, typhoid and rat urinary tract).		✓	✓	At least one report on assessing public health structures in response to the climate and disaster risk for the national and 18 reports for the provincial level
	Promote specific prevention action and cures as climate change will affect cardiovascular, respiratory and water-borne and vector-borne diseases.		✓		Number of health projects related climate change implemented
Strategy 3: Integrating risk monitoring and warning systems.[236]					
Objective 1: Collect, analyze and interpret information about risks that are sensitive to climate change and epidemiological	Collect and analyze data on some key climate variables (such as maximum temperature, rainfall, humidity, morbidity and mortality from diseases sensitive to climate change) associated with infectious diseases, insects and other risks.	• MoH: Department of Hygiene and Health Promotion, Department of Infectious Disease Control, and Centre for Epidemiological Analysis, • MAE: Department of Meteorology, Department of Environment	✓		Collect and analyze data on climate variables at least once a month
	Create and test a website reporting system for symptoms, research labs, and environmental hygiene work of diseases that are sensitive to climate conditions;		✓		At least one website reporting system for symptoms, research labs, and environmental hygiene developed

[236] Ibid

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
trends in order to respond to risks in a timely manner; and to disseminate information on climate change impacts, vulnerabilities, responses and emergency preparedness needs.	Provide strong support for disease surveillance, reporting, monitoring and activities to control and reduce diseases caused by insects and rodents.		✓	✓	Create a reporting and monitoring system for activities to control and reduce diseases caused by insects and rodents at least one system
	Create, implement, monitor and report on the implementation of systems and programs on monitoring and addressing the spread of diseases and illnesses related to climate change such as: malaria, diarrhoea, epidemics and other illnesses.		✓	✓	Reporting on monitoring and addressing the spread of disease once a month
	Monitor early warning systems using satellites and weather data.		✓	✓	Create a warning system three months in advance
	Improve reliable information on climate change and health impacts, particularly regarding insects, air pollution, and underground water.		✓		Number of existing health information systems improved regarding reliability
Strategy 4: Research on climate change and health.[237] [238]					
Objective 1: Ensure that multi-sectoral research studies on climate	Conduct research studies with many stakeholders to study the sensitivity factors affecting health such as water, sanitation and hygiene, food, diseases caused by insects, non-communicable diseases, nutrition including mental and social illnesses caused by climate change.	• MoH: Department of Hygiene and Health Promotion, related departments and centers, and	✓	✓	Conduct joint research with various related parties on studying the sensitive factors that affect health at least three research studies developed a year

[237] MoH (2017). National Strategy on Climate Change and Health Adaptation to 2025
[238] MoH (2021). 5-Year Development Plan for Health Sector (2021-2025)

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
change and health are identified.	Explore collaboration in research studies in a multi-sector participatory network to build existing financial resources and create training opportunities.	• University of Health Sciences	✓	✓	Create a research paper or project proposal for health sector with several sectors to access climate financial resources at least two research papers per year
Strategy 5: Building resilience to climate change and sustainability of technology and infrastructure.[239]					
Objective 1: To improve the current health infrastructure, technology and processes as well promoting new technologies.	Maintain and improve public health service facilities, additional installation or renovation to ensure clean water, electricity, communication, equipment and medicine.	• MoH: Department of Hygiene and Health Promotion, related departments and centers. • Provincial Health Departments and Hospitals	✓	✓	Public health service facilities in 10 district hospitals and 50 village health centres maintained and improved
	Improve climate-resilience of infrastructure and access to health supplies.		✓	✓	Number of climate-resilience of infrastructure and access to health supplies improved
	Build new clean water, sanitation, nutrition and public health systems across the country.		✓	✓	New clean water, sanitation, nutrition and public health systems established in 10 district hospitals and 50 village health centres
	Use new technologies such as E-Health or satellite images to improve the efficiency of the public health system.		✓	✓	New technologies such as E-Health or satellite images to improve the efficiency of the public health system

[239] Ibid

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
					developed and used in 10 district hospitals and 50 village health centres
	New health service facilities will be located in areas that are not vulnerable to climate change and are accessible.		✓	✓	At least 10 health service facilities are re-located to the safe areas
	Develop project proposals to access funds on developing green health facilities, safe and modern hospitals.		✓	✓	At least three project proposals for health sector developed
	Provide field health equipment, utility equipment to help with clean water, safe and portable sanitation during disasters.		✓		At least 30 related equipment provided and set up across the country
Strategy 6: Creating public health programs from climate change information.[240]					
Objective 1: Strengthen the coordination and reporting on matters related to disease caused by changing climate conditions in order to create effective and	Create a plan for water, sanitation and hygiene in the vulnerable communities.	• MoH: Department of treatment, Department of Infectious Disease Control • Centre for environmental sanitation and provision of clean water • Malaria Control Centre and Epidemiological Analysis Centre • Nutrition Centre • Mother and Child Centre	✓		At least 20 relevant plans for water, sanitation and hygiene in the vulnerable communities developed
	Create a plan for women's health, reproductive health and children in vulnerable communities.		✓		At least 20 relevant plans for women's health, reproductive health and children in vulnerable communities developed
	Create a plan for tropical diseases in the sub-community.		✓		At least 10 relevant plans for tropical diseases in the sub-community developed

[240] MoH (2017). National Strategy on Climate Change and Health Adaptation to 2025

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025 - 2030	2030 - 2035	Indicators and Targets
timely remedial activities.	Create a plan for mental health and in vulnerable communities	• Secretariat and Medical and Health Education Information Centre	✓		At least 20 related plans a plan for mental health and in vulnerable communities developed
	Create a standard implementation procedure for disaster and emergency risk management with relevant departments inside and outside the Ministry of Health.		✓		At least 3 standard implementation procedure documents for climate and disaster risk management with relevant departments of MOH developed

8. Tourism

8.1 Sector Policy Linkages and Implementation Considerations

The tourism industry has long been recognized as a vital sector for economic growth in Lao PDR. By 2016, tourism was designated as one of the GoLPDR's eight priority programs for socio-economic development and was so acknowledged in the National Tourism Strategy for 2016–25.[241] The 9th NSEDP also emphasizes the importance of tourism sector to contribute to the country's economic growth. In tourism sector, the main climate change initiatives in Lao PDR are related to eco-tourism and community-based tourism, which are predominantly rural activities. For urban tourism, the main activities are related to recycling and installing solar panels to increase efficiency and decrease their carbon footprint in addition to sourcing and using sustainably produced goods. Eco-tourism and green tourism are already a large and important part of the Lao PDR tourism sector. The eco-tourism in the Lao PDR is perceived as the major opportunity for integrating into climate change policies moving forward.[242]

8.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

Tourism		
 **Reduced access to tourist sites**		 **Increased damage to tourist infrastructure**
Climate Change Impact	**Adaptation Strategy**	**Sample Adaptation Activities**
	1. Delivering a climate resilient tourism industry.	Promote eco-tourism value chains to preserve environmental and cultural integrity, benefit local communities economically, and promoting sustainable and green tourism practice. The main activities are related to recycling water bottles and installing solar panels to increase efficiency and decrease their carbon footprint.

8.3 Adaptation Activities and Action Plan

The following summary table develops further the adaptation "strategies" highlighted above into more details "activities" of importance for the sector. It also presents the sectoral strategies and objectives towards achieving climate resiliency, whom is responsible for its delivery and indicative timeframe for activity completion as well as indicators and targets to be achieved.

[241] MICT (2017). Statistical Report on Tourism in Lao PDR 2017
[242] GGGI (2020). Promoting Private Sector Engagement and Investment in Green Growth and Climate Change

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
Strategy 1: Delivering a climate resilient tourism industry					
Objective 1: Supporting climate resilient Tourism Resources in Lao PDR in tandem with strengthening the market for climate-resilient Nature-Based Tourism.	Promote eco-tourism value chains to preserve environmental and cultural integrity, benefit local communities economically, and promoting sustainable and green tourism practice. The main activities are related to recycling water bottles and installing solar panels to increase efficiency and decrease their carbon footprint.	Ministry of Culture and Tourism (MCT), Ministry of Agriculture and Environment (MAE), Ministry of Industry and Commerce.	✓	✓	At least three pilot activities related to eco-tourism promoted and implemented
	Assess, create risk maps and adaptation plans to climate change and disasters specific to the tourism and culture sector, especially tourism resources and conservation tourism, including cultural, historical and natural tourism resources.	MCT Ministry of Agriculture and Environment (MAE)	✓		At least one climate risk map related study (CRVA) and one national adaptation plan developed for tourism sector
	Improve, conserve and rehabilitate cultural, historical, and archaeological areas that are vulnerable to climate change or disasters.	MCT	✓	✓	At least three projects on improving, conserving and rehabilitating the cultural, historical, and archaeological areas that are vulnerable to climate change or disasters are implemented
	Develop and offer sustainable and inclusive tourism products, e.g., homestays or eco-resorts.	MCT	✓	✓	At least five model projects on promoting sustainable and inclusive tourism products, e.g., homestays or eco-resorts initiated and implemented
	Provide climate adaptation training activities in vulnerable tourism infrastructure, inadequate planning and implementation of resilience strategies.	MCT MoF	✓	✓	Number of climate adaptation training activities in vulnerable tourism infrastructure conducted

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	Enhance public awareness regarding climate impacts and adaptation options results in low community preparedness for extreme weather events and community engagement and the effectiveness of collective responses to climate challenges in the tourism sector.	MCT Ministry of Public Works and Transport	✓	✓	Number of public awareness activities conducted regarding climate impacts and adaptation options for tourism sector
	Develop, and manage the information system, and report the situation, events (warning) and effects of climate change and disasters of the specific tourism sites such as through social media.	MCT MAE	✓		At least one information system reporting the situation, events (warning) and effects of climate change and disasters of the specific tourism sites or tourism sector developed and piloted
	Develop, implement, monitor and report on the implementation of climate change adaptation plans in the fields of culture and tourism.	MCT MAE	✓	✓	At least one monitoring report on progress of adaptation plans and activities for the tourism sector developed at least once every two-year
Objective 2: Enhancing climate resilience for the tourism infrastructure and developing financial mechanisms for the tourism sector	Develop a long-term strategy for tourism which includes the consideration of climate change by enhancing engagement between government and private sector. Focus elements should include increase climate resilience of tourist infrastructure and the increased role of eco-tourism and nature-based tourism, which provide a revenue stream to support EbA in the land and water sectors.	MCT MAE	✓		Number of long-term strategies for tourism developed which included or considered climate change
	Construct or retrofit hotels, guesthouses, resorts restaurants and other tourist infrastructure are to withstand prevalent climate change hazards such as floods and landslides.	MCT MAE MPWT	✓	✓	Number of hotels, guesthouses, resorts restaurants and other tourist infrastructure constructed or

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
					retrofitted to withstand climate change
	Improve drainage systems to divert excess rainfall and avoid flash floods in key tourism sites.	MCT MAE MPWT	✓	✓	Number of drainage systems improved to divert excess rainfall and avoid flash floods
	Integrate or consider climate change in building practices and siting of new key tourist infrastructure.	MCT MPWT	✓		Number of building practices integrated climate change
	Incentive domestic or foreigner investors to construct or improve the climate resilience of tourism infrastructure.	MCT MoF MPWT	✓	✓	At least three projects on to constructing or improving the climate resilience of tourism infrastructure to incentive domestic foreigner for tourism sector
	Strengthen the resilience, the ability to adapt to climate change of sectors supporting to tourism sector such as infrastructure, services, eco-systems and communities that are at risk and affected by climate change.	MCT MAE MPWT	✓	✓	At least three projects on strengthening the resilience, the capacity to adapt to climate change of sectors supporting to tourism sector developed and implemented
	Develop the robust financial mechanism, including developing compensation policies to support the recovery of tourist infrastructure damaged by climate change or disasters and the reduction of business taxes and import duties on construction material for rehabilitation.	MCT MAE MoF	✓	✓	Number of compensation policies developed to support the recovery of tourist infrastructure damage
	Allocate funding for the repair and maintenance of the key and valuable tourist sites both during and post-extreme weather events, for preserving natural tourist sites and their future use as well as	MCT MAE MoF	✓	✓	Amount of allocated funding for the repair and maintenance of the key and

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	improving service sectors and conserving tourist sites, including developing a platform for eco-tourism; and focusing on attracting investors to sustainable tourism and nature-based tourism.				valuable tourist sites both during and post-extreme weather events
	Increase funding for marketing of Lao PDR as a tourist destination, increasing focus on stimulating new markets, such as the domestic market to supplement international demand, and the development of communication strategies.	MCT MoF	✓	✓	Amount of funding for marketing of Lao PDR as a tourist destination increased

9. Labour and Social Welfare

9.1 Sector Policy Linkages and Implementation Considerations

The impact of natural and man-made disasters on people's health, lives, property, and economic, social, and environmental infrastructure is substantial. These events affect livelihoods, damage businesses, and disrupt the food supply chain. Over the past decade, the frequency and severity of such disasters have increased, resulting in significant impacts on health, life, property, economy, society, and the environment. The floods in 2018 and 2019 stand out as particularly impactful historical events, causing loss of life and extensive damage to economic, social, and environmental infrastructure. The importance of disaster risk reduction was underscored in the 9th NSEDP (2021-2025).

Recognizing the significance of poverty reduction, improved living standards, and sustainable development, the government and the Ministry of Labor and Social Welfare are committed to enhancing operational capacity and resource availability. To address disaster risk, the focus is on preparedness, control, emergency response, and post-disaster recovery, as outlined in the 2019 law on disaster management. The emphasis is on improving laws and institutions to strengthen disaster management, encompassing prevention, preparedness, response, and rehabilitation with resilience to disasters. This aligns with the implementation of the 2019 Law on Disaster Management and international and regional policies and strategies on disaster risk reduction, including the Sendai Framework for Disaster Risk Reduction 2015-2030, the Paris Agreement on Climate Change, the ASEAN Agreement on Disaster Management and Emergency Response, the Action Plan for the ASEAN Agreement on Disaster Management and Emergency Response 2021-2025, the ASEAN Declaration on Unity in Disaster Response, and the Sustainable Development Agenda 2030 (Sustainable Development Goals or SDGs).

9.2 Adaptation Strategies of Relevance

The following summary table presents the relationships among the most relevant projected types of climate change impact (see Part II) and relevant related adaptation measure needs for the sector. This is then further elaborated within the following sub-section (Adaptation Activities and Action Plan).

Labour and Social Welfare		
 **Increased disease**	 **Increased risks of loss of lives and injuries**	 **Roads and infrastructure damage**

Climate Change Impact	Adaptation Strategy	Sample Adaptation Activities
	1. Develop and strengthen prevention, risk reduction and disaster preparedness systems.	Develop the capacity to collect and analyze data on the impact of disasters that are separated by age, gender and other factors, such as vulnerable groups to the extent possible, to meet the needs of national policy making and planning
	2. Develop and build strength for post-disaster recovery work	• Review previous Post Disaster Need Assessment (PDNA) tools, WHO health tools, and environmental needs assessment and provide recommendations on how to improve coordination and information sharing on needs and vulnerabilities in disaster-affected communities;

		• Develop methods and facilitate the smoothing of the roles and responsibilities of the sector in data collection and analysis and the preparation of PDNAs, including data analysis of the affected people separated by age, gender and other characteristics if possible, as well as the gender impact and assessment of needs.
	3. Upgrade education and training on disaster risk reduction at the national and local levels	Organize capacity building for government employees from central to village level, disaster management committee (central, provincial, district and village level), and local community leaders.

9.3 Adaptation Activities and Action Plan

The following summary table develops further the adaptation "strategies" highlighted above into more details "activities" of importance for the sector. It also presents the sectoral strategies and objectives towards achieving climate resiliency, whom is responsible for its delivery and indicative timeframe for activity completion as well as indicators and targets to be achieved.

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
Strategy 1: Develop and strengthen prevention, risk reduction and disaster preparedness systems					
Objective 1: To include disaster risk reduction (DRR) in national development and sector plans and	Determine the risks related to disasters and climate change in the short, medium and long term, including risk reduction work in the sector's action plan for the 9th, 10th national economic-social development plan and the 5-year planning framework of the sector.	MLSW, MOF	✓	✓	10th national socio-economic development plan integrated and determined the disaster risk reduction
Objective 2: To develop and implement DRR strategies and plans at the local level in high-risk areas along with capacity building and resource provision	• Determine provinces with high risk of disaster in the development of strategies and plans; • Establish a list of high-risk towns and villages to develop DRR plans; • Develop and implement strategies and plans for continuous provincial DRR and capacity building in priority provinces in accordance with the national capacity building framework for disaster risk reduction; • Coordinate and cooperate with the international community to develop and implement DRR plans at the local level and DRR programs based on communities in high-risk cities and villages.	MLSW, PLSW	✓		• 18 provinces assessed the disaster risk; • 145 districts identified the disaster risks • 10 provinces implemented the provincial disaster risk reduction strategy • At least five DRR programmes and projects implemented with international organizations
Objective 3: To develop the capacity to assess and create a risk map, manage and exchange information on disaster risk within the ministry, among ministries and agencies effectively as well as comply	• Create a 5-year national DRR plan with the goal of creating a risk map and risk assessment at the national and provincial levels; • Develop a plan for the development of disaster information and Lao-Di, including the goal of improving information and data in Lao-Di and ensuring that there are competent personnel and	MLSW, MOF	✓		• A 5-year national DRR plan with the goal of creating a risk map and risk assessment at the national and provincial levels (18 provinces) developed; • Develop and improve disaster information system at least one

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
with international reporting requirements.	information technology to maintain the system, analyze and use such information; • Conduct a national risk assessment and create a disaster risk map inventory; • Develop the capacity to collect and analyze data on the impact of disasters that are separated by age, gender and other factors, such as vulnerable groups to the extent possible, to meet the needs of national policy making and planning, as well as reporting requirements under the 2030 Agenda (SDGs), especially the 5th SDG on gender equality and data reporting under the Sendai Program monitoring framework; • Conduct institutional capacity and resilience assessments for high-priority provinces and districts.				system at the national level (Lao-Di is being developed) • At least one national disaster risk assessment report conducted • 200 staff trained on data collection and analysis in both national and local levels • Institutional capacity and resilience assessments conducted for at least 10 high-priority provinces • At least 200 staff trained and built capacity on disaster risk management at the provincial and district level
Objective 4: To build and restore infrastructure to be resilient to disasters and to strengthen people and community capacity that or are vulnerable, such as: disabled people, children, the elderly, pregnant women or mothers with young children.	• Provide technical support, capacity building for engineering and nature-based risk reduction, including civil engineering, natural and mixed infrastructure and use of natural assets, such as forests and watersheds; • Enhance inspection and quality control for resistance to climate change and disasters for new buildings, including the impact on the use of natural resources; • Reinforce maintenance and inspection plan of existing roads and building infrastructure; • Develop relevant contract terms for public-private partnerships and contracts with the private sector	MPWT, MAE, MIC, MIC, MOH, MES, MND, MNS	✓	✓	• Five model infrastructure related to nature-based risk reduction built or piloted • Inspection and quality control activities conducted twice a year • At least one plan on maintenance and inspection of existing roads and buildings developed • At least three relevant contract terms for public private partnerships developed or demonstrated in building and maintaining

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
	in building and maintaining infrastructure to be resilient to climate change and natural disasters.				infrastructure to be resilient to climate change and natural disasters
Objective 5: To reduce the loss of life, property and people's livelihood from various disasters, such as: floods, storms, droughts, landsides through the implementation of preventive measures, improvement of the weather forecasting system and early warning, supporting the preparedness of all levels and of the community in responding to emergencies.	• Develop more effective ways to alert communities to hazards, including information on risk levels and potential impacts on them, as well as issuing evacuation notices in conjunction with community-based awareness and internal displacement; • Strengthen the capacity of communities in high-risk areas, to ensure that communities can prepare and cope with evacuation warnings, including awareness-raising, evacuation drills, and local emergency plans for vulnerable groups such as the disabled and the elderly with limited mobility. • Develop guidelines and practical implementation procedures for disaster response to serve as a foundation for preparedness and mitigation of climate change impacts, including storms, floods, earthquakes, and other hazards.	MLSW, PLSW	✓	✓	• At least five alert systems set up or demonstrated in 10 high-risk communities across the countries • Capacity building and strengthening activities in high-risk areas conducted or initiated in at least 10 projects
Strategy 2: Develop and build strength for post-disaster recovery work					
Objective 1: To ensure that the socio-economic needs of the affected communities as well as the reconstruction of the material to increase the strength and durability in the future according to the obligation of the Sendai	• Review previous PDNA tools, WHO health tools, and environmental needs assessment and provide recommendations on how to improve coordination and information sharing on needs and vulnerabilities in disaster-affected communities; • Develop methods and facilitate the smoothing of the roles and responsibilities of the sector in data	MLSW, MOF	✓		• The review process on PNDA conducted at least once in every three-five year with recommendations. • Roles and responsibility of the sector in data collection and analysis and the preparation of PDNA developed established or improved

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
project framework "build back better".	collection and analysis and the preparation of PDNAs, including data analysis of affected people separated by age, gender and other characteristics if possible, as well as the gender impact and assessment of needs.				
Strategy 3: Upgrade education and training on disaster risk reduction at the national and local levels					
Objective 1: To increase DRR capacity for government personnel and community leaders in a sustainable manner by using educational and training resources available within the Lao PDR.	• Organize capacity building for government employees from central to village level, disaster management committee (central, provincial, district and village level), and local community leaders; • Support the participation of ethnic women from high-risk areas in their communities to build resilience; • Develop training of trainer in DRR and disaster management course materials in Lao language, for use within government entities in training for employees from the central level to the local level; • Provide training on disaster risk management for trainers at the central level and in provinces and/or priority districts; • Train community leaders in risk reduction and disaster management considering the importance of increasing women's participation in disaster risk reduction in decision-making roles, and the need to build resilience in the most vulnerable communities.	MPWT, MAE, MIC, MIC, MOH, MES, MND, MNS, PLSW	✓	✓	• Capacity building activities conducted at least three times a year in all levels • 50 percent of ethnic women across the country participated in the disaster resilience building activities • At least two national training course material on ToT developed in Lao language for staff at all levels • At least 10 ToT training events on DRR and DRM conducted a year at all levels • At least 50 percent of the high-risk community leaders trained on DRR across the country with women's participation

Strategies and Objectives	Adaptation Activities	Main Responsibility Party	2025-2030	2030-2035	Indicators and Targets
Strategy 4: Promote participation and inclusion of all stakeholders					
Objective 1: To develop a new mechanism for the inclusion of non-governmental stakeholders in DRR, to support an approach that includes all sectors of society that are consistent with the framework of the Sendai program, including the private sector, micro business units, small and medium enterprises, and others.	• Organize national and local support programme for the private sector to contribute to DRR and disaster response; • Empower women and vulnerable groups in decision-making roles in DRR and disaster management in Lao PDR; • Assess the priority needs of women and vulnerable groups working in the community.	MLSW, MOF, LWU	✓		• At least three pilot programmes with private sector implemented • At least 50 percent of women and vulnerable groups across the country encouraged in decision-making process in DRR and DRM • At least one national assessment of the needs of women and vulnerable groups conducted and the needs are identified

PART V: COORDINATION MECHANISM, MONITORING, REPORTING AND REVIEW

1. Coordination Mechanism for NAP Implementation

The coordination mechanism for the NAP implementation will feature representatives from Government agencies, development partners, as well as from the public and private sectors. The Decree on Climate Change assigns MAE to take a direct responsibility and coordination with relevant line ministries, organizations and local authorities. Moreover, the Provincial Department of Agriculture and Environment (PAE) has a role on reporting the climate change implementation progress to MAE, in coordination with relevant offices and parties concerned at its level.

The implementation of the Lao PDR NAP shall be initiated through MAE, who have a coordination function to ensure the integration of climate change adaptation into sectoral policies and development plans to be harmonious, comprehensive and consistent with each other. Currently, the National Steering Committee on Climate Change is being established for the NAP with the key role of providing guidance at the policy level to the development and implementation of climate change related policies and plans including NAP. Under MAE, the Department of Environment shall be the focal point for its implementation in coordination with line ministries including Ministry of Industry and Commerce, Ministry of Public Works and Transport, Ministry of Labor and Social Welfare, Ministry of Education and Sports, and Ministry of Health. Departments in line ministries shall provide information related to climate change from their sectors to Department of Environment and shall ensure mainstreaming of climate change into their activities, including through conducting studies, research and promoting the use of environmentally friendly technologies that increase resilience to climate change. The main functions of Department of Environment related to NAP implementation include the following:

- Disseminate and communicate this NAP to all stakeholders and target groups;
- Create programs, projects and detailed implementation plans including mechanisms and financial plans for implementation. The programs and projects must take into account the consistency and impact on the socio-economic and environmental aspects, including gender equality and vulnerable groups;
- Encourage, promote and work closely with ministries and organizations in all sectors and at all levels to create action plans or integrate climate change management into strategies and plans;
- Establish units or appoint people responsible for the implementation of their plans and coordinate the implementation of this strategy; and
- Develop budget plan for implementing the NAP which comes from the Climate Change Funds.

2. Monitoring and Reporting System for NAP

1) NAP MEL Framework Development

The current state of Monitoring, Evaluation and Learning (MEL)/Monitoring and Reporting (M&R) for adaptation in Lao PDR is fragmented, with existing MEL/M&R systems operating independently, leading to inevitable overlaps in reporting by different ministries on policies and agreements with common targets. While external support contributes to local capacity development in meeting M&R obligations, there is still much to be achieved, particularly in standardizing reporting mechanisms across ministries and normalizing M&R as an integral part of their service.[243]

To address the fragmented nature of the M&R/MEL systems, Lao PDR has adopted a sectoral approach, covering 9 key sectors, in developing its MEL system (Refer to Lao PDR MEL Framework for NAP for more details).[244] The primary objective of this system is to report on the

[243] GoL (2021). Nationally determined contribution (NDC). https://unfccc.int/NDCREG
[244] MAE (2024). Lao PDR Monitoring, Evaluation and Learning (MEL) Framework for NAP

progress of adaptation activities outlined in the NAP. The setup of this system involved identifying national-level/sectoral indicators and assessing the necessary information and data. Emphasis was placed on elaborating institutional arrangements and recognizing resource needs for the implementation of MEL. Communication pathways were identified to ensure that the system's information reaches the intended audiences, involving inputs from various stakeholders, including government institutions, international agencies, civil society, and the private sector.

Lao PDR's MEL system is expected to complement efforts to monitor and evaluate progress and results in the implementation of actions to achieve the Sustainable Development Goals, 9th NSEDP, NDC, and National Strategy on Climate Change and NAP. Alignment of the MEL system for adaptation with the processes of the MOF is crucial, as it is responsible for monitoring and evaluating government programs and donor projects. Significant capacity development at the country level is essential, as uniform MEL systems and data collection skills are currently limited among governments and partners.

2) Institutional Arrangement for the NAP's MEL

The MEL system for Lao PDR's NAP is expected to be under the mandate of various agencies and stakeholders, including MAE, Ministry of Public Works and Transport, Ministry of Industry and Commerce, Ministry of Education and sport, Ministry of Health, Ministry of Culture and Tourism, Ministry of Labor and Social Welfare, academic institutions, CSOs, International Organizations, private sectors, and local governments.

Specifically, MAE's responsibilities in relation to MEL include setting up coordination mechanisms among various ministries and development partners at both national and local levels. They are tasked with enhancing the policy and regulatory framework for MEL, and monitoring and evaluating adaptation activities. Moreover, they are responsible for building capacity from the central government down to local levels related to MEL implementation. MAE also bears the responsibility for coordinating the MEL of the adaptation related activities and required follow-up actions with sectoral government offices.[245]

Under MAE, the Department of Environment shall be the focal point for its implementation in coordination with line ministries, including Ministry of Industry and Commerce, Ministry of Public Works and Transport, Ministry of Labor and Social Welfare, Ministry of Education and Sports, and Ministry of Health. Departments in line ministries shall provide information related to the progress of the climate change adaptation activities from their sectors to Department of Environment.

The focal points have also been appointed since the beginning of the NAP process development. The sectoral focal points have been established from different departments of line ministries to collate sectoral data and report them to a national or central government (MAE) that is responsible for implementing the NAP as well as managing the MEL system. At the ministerial/sectoral level, the focal point for MEL is usually assigned to a departmental unit. For example, for the Ministry of Agriculture and Environment (MAE), it is the Department of Planning and Cooperation; for the Ministry of Public Works and Transport (MPWT), it is the Department of Planning and Finance. At the provincial level, the Provincial Office of Agriculture and Environment is the focal point for MEL of climate change adaptation activities.[246]

3) National NAP MEL Reporting

The national monitoring, and reporting system is being established in accordance with Lao PDR's obligations under the UNFCCC. MAE will review and prepare an annual report on implementation progress. In this review, MAE will coordinate closely with line ministries, local governments, development partners and international organizations. The final evaluation will consist of evaluating the effectiveness, efficiency, consistency and success of the implementation of the NAP. The tasks to be undertaken shall include the following:

[245] MAE (2022). Lao PDR NAP Roadmap
[246] Ibid

- Monitoring, reporting and verification of the progress and success of the implementation of the climate change adaptation plan of the sectors including progress in integrating the adaptation plan into the plans of the central and local sectors;
- Cooperate in the implementation of the NAP at the national, regional and international levels;
- Develop and review the monitoring and evaluation system at the local, central and sectoral levels;
- Prepare indicator definition sheets for each NAP indicators (definition, targets, metrics, data sources, frequency of data collection, methodology for analysis)
- Develop guidelines and training material for the application of the framework, and provide training sessions using those.
- Develop guidelines for NAP integration into the sectoral planning and state budget planning process.
- Collect recommendations and lessons learnt for next revisions of NAP including the need for and access to financial support, technology transfer and climate change adaptation capacity building.

MAE is set to commence the annual review and preparation of the NAP implementation progress report starting in 2025, followed by the NAPs mid-term review in 2028, and final evaluation in 2031. The findings from the final evaluation will serve as foundational information for updating the subsequent version of the NAP. This comprehensive assessment will involve close coordination between MAE, the Ministry of Finance, line ministries, local government entities, development partners, and international organizations. The final evaluation will encompass the efficiency, effectiveness, coherence, and overall success of the NAP implementation. Additionally, it will entail re-verifying the progress and achievements of the plan's implementation across all sectors at both central and local levels.

4) International NAP MEL Reporting

MEL systems for NAP processes inform national planning and decision making while also generating information for international reporting. They are a vital source of information for several processes under the Paris Agreement. MEL for NAP processes is key to inform the global stock take, which undertakes the assessment of countries' collective progress toward reaching the long-term goals of the Paris Agreement every 5 years. The global stock take draws on multiple sources for which MEL systems provide much-needed evidence and information. Reporting and communication instruments under the Paris Agreement and the UNFCCC include: The Paris Agreement (Article 7.9) highlights the role of adaptation MEL, which is operationalized through the Enhanced Transparency Framework that sets out reporting requirements, including for adaptation.[247]

Lao PDR's NAP MEL system will contribute to the country's reporting to the UNFCCC by providing information on the implementation of adaptation plans and actions, on further needs, and on progress assessment. Lao PDR's reporting to the UNFCCC shall take place through the following mechanisms (under the Paris Agreement) which included:

1. **Biennial Transparency Report (BTR):** Countries include Lao PDR are required to submit a BTR every 2 years (with discretion for LDCs and Small Island Developing States), submitting their first BTR at latest by December 31, 2024. BTRs consist of five sections, including a voluntary one on adaptation section.
2. **Adaptation Communications:** Lao PDR may opt to use Adaptation Communications in addition to BTRs to synthesize and share their priorities, efforts, needs, and actions for adapting to climate change. They were established to enhance the visibility and profile of adaptation, and its balance with mitigation.
3. **National Communications:** Lao PDR is also required to submit a National Communication every four years. These reports can include information on adaptation

[247] Beauchamp, E., Leiter, T., Pringle, P., Brooks, N., Masud, S., & Guerdat, P. (2024). *Toolkit for monitoring, evaluation, and learning for National Adaptation Plan processes.* NAP Global Network & Adaptation Committee. International Institute for Sustainable Development

and mitigation (and must include information on greenhouse gas emissions). Currently, Lao PDR submitted its Third National Communication in 2022, which included a chapter on vulnerability assessment and adaptation to climate change.

In addition, the UAE Framework for Global Climate Resilience (UAE FGCR) established in 2023 invites evidence and information from MEL systems for NAP processes. The aim of the UAE framework is to guide and strengthen efforts, including long-term transformational and incremental adaptation, towards reducing vulnerability, enhancing adaptive capacity and resilience, and ensuring the well-being of all people, the protection of livelihoods and economies, and the preservation and regeneration of nature for current and future generations, within the context of the temperature goal outlined in Article 2 of the Paris Agreement.[248]

[248] MAE (2024). Lao PDR Monitoring, Evaluation and Learning (MEL) Framework for NAP

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ANNEXES

1. Annex A: Key Stakeholder Roles and Responsibilities for the Lao PDR NAP

Organisation	Roles during the NAP Process
Ministry of Agriculture and Environment (MAE) • Department of Environment	The Department is the focal point and responsible for its coordination, oversight, and implementing the NAP advancing project as well as the climate related initiatives of relevance to NAP process. Under the Department, the Climate Change Adaptation Division will contribute its roles to: i) the appointment of the National Consultant; ii) the coordination of the Inception Workshop, the Validation Workshop, country missions and other stakeholder meetings; iii) providing inputs into the NAP process development; iv) helping collect data relating to climate change, capacities, and M&E, and so on.
• Department of Planning and Cooperation (DPC)	DPC acts as a coordinator on the MAE baseline situation and outline plans for the NAP advancing project.
• Department of Meteorology and Hydrology (DMH)	DMH is in charge of weather-related, climatic, and hydrological data, monitoring frameworks, and early warning systems, so DMH can play a role on providing the climate information system and inputs to the baseline situation relating to meteorology and hydrology information systems, capacities, mainstreaming and M&E; the gaps in those same areas; and other activities needed to consolidate the climate change support functions of DMH with climate scenarios downscaling to be finilised for the project.
• Department of Water Resources (DWR)	DWR has mandates on developing and management of water resources including surface water, wetlands, reservoirs, ground water, storage for water supply and water zoning; and researching on water discharges released from reservoirs to secure human requirement basis and eco-system sustainability. Under the NAP advancing project, DWR can play role on providing the baseline situation, gaps and needs regarding climate change adaptation in the water resource sector.
Ministry of Agricultre and Environment (MAE) • Research Centre for Resilience in Agriculture (RCRA) of the National Agriculture and Forest Research Institute (NAFRI) • Department of Agriculture • Department of Livestock and Fisheries • Department of Forestry • Department of Land Management and Development • Department of Planning and Cooperation	MAE is also responsible for crop, livestock, fisheries and forestry sectors and their publicly performed support activities. Under the NAP project, MAE can play a role on providing information specifically regarding: i) the forestry and agriculture programme; ii) the baseline situation relating to climate change knowledge and information, capacities, mainstreaming in the main MAE Departments; iii) the gaps in those same areas; and iv) the activities that are needed to build the capacity to enable better climate change mainstreaming within MAE.
Ministry of Finance • Department of National Budget • Department of Accounting	MoF is the final decision maker for government resource allocation, and has a mandate on managing the recurrent budget directly. MoF is responsible for the allocation of budget across all levels and sectors. The Departments of Accounting and Audit are

• Department of Audit • Department of Planning • Division of Economic Affairs • Department of International Cooperation • Department of Investment Promotion • The Lao Statistics Bureau (LSB)	responsible for the budget for the expenditure / financial tracking and reporting. MoF can play a role on providing inputs and recommendation on the national budget allocation for the NAP process as well as the financial mechanism to be taken place for the process. MoF also acts as the central coordination ministry for development and investment planning. The ministry can play a role on providing inputs into the NAP process regarding specific information on: i) Lao's planning, budgeting and policy processes; and ii) gaps in climate change adaptation knowledge and financing in the public and private sectors.
Ministry of Industry and Commerce • Department of Energy • Industry and Energy Institute • Department of Industry • Department of Policy, Planning and Assessment	MIC oversees the management of all energy-related activities in Lao PDR including hydropower; and the investment in the mining projects. The ministry can play a role in supporting and providing the information relating the energy investment and development projects, the baseline situation relating to climate change knowledge and information, capacities, mainstreaming in the energy and mining sector.
Ministry of Public Works and Transport (MPWT) • Public Works and Transport Research Institute • Roads Department • Department of Planning	MPWT's responsibilities include transport, urban planning and infrastructure development. Under the NAP project, MPWT can play a role on providing information specifically regarding: i) the public works and transport programme; ii) the baseline situation relating to climate change knowledge and information, capacities, mainstreaming in the main MPWT Departments; iii) the gaps in those same areas; and iv) the activities that are needed to build the capacity to enable better climate change mainstreaming within MPWT
Ministry of Health (MoH) • Department of Environmental and Occupational Health • Department of Planning • Department of Hygiene and Health Promotion	MoH is the main provider of health services to the Lao population. The ministry has a mandate in health policy development and de-centralisation of health services to provincial, district and health centre levels. Under the project, the ministry can play a role in supporting the information relating the public health, the baseline situation relating to climate change knowledge and information, capacities, mainstreaming in the health sector.
Ministry of Education and Sports (MES)	MES is responsible for the development and delivery of basic and higher education. The Ministry participated in the development of national Climate Change Strategies and policies and is currently mainstreaming climate change in higher education curricular. This has a potential of bringing climate change adaptation awareness students. The ministry can provide the significant input and information relating to climate change through the consultation meetings and activities.
Environment Protection Fund (EPF)	EPF has a mandate under the MAE to strengthen environmental protection, sustainable natural resources management, biodiversity conservation and community development. It is an autonomous national entity, both financially and administratively and currently channels financial resources from World Bank, UNDP and domestic sources. Under the NAP project, the EPF is to provide the specific information related to climate change projects and programmes; gaps in EPF - funded projects for climate change adaptation; ii) capacity needs assessment of EPF; iii) the baseline situation of climate change adaptation funding.
Provinces and Districts • Planning Divisions	Provincial and District offices of NRE and other climate sensitive Ministries is involved as partners in the NAP project to bridge the

• NRE Divisions	national level to subnational levels. Capacities will be built for the purpose of integrating climate change into strategic and action planning and budget processes through development of analytical skills so that they are better able to fulfil their mandate to advise at these levels.
Civil Society Organisations (CSOs)	CSOs in the Lao PDR are engaged in awareness raising, and advocacy for various thematic areas, including sustainable development, food security, natural resource management, climate change, human rights, gender inclusive and education. CSOs are important strategic partners in climate change, as they work mainly with the local communities. The CSOs also work with district offices, as well as directly with the communities. The key CSOs for the engagement of the NAP process will be the Lao Women Union and Lao Youth Union. Both can play roles on participating in the NAP process consultation activities and providing substantial inputs and feedback to the process.
Private Sector • Lao National Industry and Commerce Chamber (LNICC) • Bank Institutes	The private sector, particularly the banking sector and small and medium enterprises play an important role in driving the country's development, and hence climate change activities. However, the private sector is very undeveloped in relation to climate change. There are very few private companies delivering quality services for climate change adaptation. Their initial engagement and participation in the consultation meetings can provide substantial input for the NAP process. Through The NAP process, it will continuously create a conducive environment to support the private sector through activities such as the provision of data for robust decision-making, capacity development to conduct independent vulnerability assessments and adaptation plans, developing guidelines for incorporating climate risks, and facilitating access to affordable financing.
The Mekong River Commission (MRC) • Planning Division • Climate Change Adaptation Unit	MRC is a regional inter-governmental organisation working with the governments of Cambodia, Lao PDR, Thailand and Vietnam for joint management of the shared water resources and the sustainable development of the Mekong River. MRC acts as a regional knowledge hub for water resources management that helps to inform decision-making based on scientific evidence. As MRC has had extensive programmes dealing with climate change research for the LMB of which Lao forms a significant part. So, MRC can provide information on climate change science, modelling and forecasting and risk analysis for the NAP process.
Academic and research institutions • National University of Lao (NUOL)	NUOL is expected to provide the role on undertaking studies and research, and developing climate models, prediction and scenarios, and seasonal forecasts, clarifying the level of uncertainty and impacts of climate change in Lao, which can serve to populate some resilient activities indicators, through data base on impact of climate change for each climate zone and vulnerable groups.
UN Agencies: • UNEP • UN-Habitat • UNDP • FAO • WFP • Etc.	UN agencies have developed and implemented a number of climate change resilience projects in the last decades. Their participation on the consultation activities can provide inputs which provided orientation on linkages for the project with past, present and future donor sponsored climate change activities.
International Organisations: • World bank	International organisations through participation in the consultation workshop for NAP process can provide the

• ADB • GIZ • IUCN • Oxfam International • CARE • Etc.	significant inputs and information relating climate change projects and programmes.

2. Annex B: Gender Equality and Social Inclusion

A1) Context and background a Gender responsive NAP

Although Lao PDR ranks 137 (out of 189 countries) in UNDP Human Development Index (2020), when adjusted for gender equality, the ranking in UNDP Gender Inequality Index (2021) is at 120. In demographic terms, indicators for women appear to be positive for the country, with life expectancy for women being higher (69.7 years) than for men (66.1 years) and sex ratio at birth being 99.8/100 in favor of women (HDI, 2020). The 2021 Global Gender Gap Report of the World Economic Forum ranked Lao PDR overall at 36 out of 156 countries, second in ASEAN after the Philippines. Lao PDR's highest score was in economic participation and opportunity, where it ranked first in the world. Its lowest ranking is 112 for educational attainment.

Gender equality is a national agenda that the Party and Government of Lao PDR have embraced with consistent and impactful policies. Lao Women's Union and the NCAWMC are two national mechanisms driving and implementing this work to enable the country to realize gender equality breakthroughs in politics, economics, social aspects for the prevention and elimination of violence against women and children. For example, it created the Law on Gender Equality adopted by the National Assembly Resolution No.32/NA (28 November 2019) and promulgated through Presidential Ordinance No.029/POL (09 January 2020), its support for activities to accelerate realization of 2030 Vision, National Strategy for Gender Equality (2016-2025), Strategy for Mothers and Children (2016-2025), including the National Plan of Action for Preventing and Eliminating Violence against Women and Violence against Children.

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

A2) Gender Gap of Relevance to Lao PDR

Gender limitations are primarily caused by women's limited participation in decision-making and management at all levels to provide an enabling environment and lifetime opportunities for women and girls to access education, healthcare, equal employment and economic empowerment. This is especially the case for women and girls in remote areas to access capital and land for production to contribute and reap full benefits from socio-economic development in safe working, learning and living environments without sexual violation, harassment or violence. At the same time, there is a need for increased access to justice, responding to COVID-19 and preparation for disasters and climate change.

Gender gaps also continue to persist in Lao PDR. Although almost equal to men in labour force participation, women's average monthly income is just 77% of that of men, are overrepresented in low-skill occupations, and spend a disproportionate amount of time on unpaid family and care work. Just 21.9% of MICbers of Parliament are women and the number is even lower in subnational levels (less than 2% of village heads are women). More than one third of ever-partnered women in Lao PDR reported experiencing one form of violence (physical, sexual, or psychological) in their lifetime (VAW Study, 2014) and less than 2% of women report it to authorities.

Climate change substantially impacts upon the gender sector in the country, and the most impacted are women who have been living in rural areas as they lack knowledge in addressing a variety of climates. In addition, they also need more participation in decision-making due to a lack of opportunities for upgrading their knowledge, including attending meetings, training in new techniques, and interacting with society. Some areas also found that women worked harder during the drought as they walked long distances and spent more time collecting water. This impeded their daily living and their health, particularly for nursing mothers and pregnant women (PIL, 2022). Another found that drought-triggered women face more hurdles for foraging non-timber forest products (NTFP) in the forest, river, and stream owing to the depletion of affluence of natural resources. Starvation in the family also caused numerous students to drop out of school. In particular, marginalized groups of women who have lived in rural areas as their families cannot support them for their studies until graduation. Also, some migrated to other cities, such as Vientiane capital or Thailand, to underpin their family for income generation (GDA, 2023).

A3) What is a Gender Responsive Approach to the NAP

It is widely recognized that making climate action gender responsive leads to more effective outcomes. Ensuring the participation of stakeholders from government sectors and civil society in prioritizing, designing, and implementing adaptation-related initiatives is, furthermore, a crucial way for Lao PDR to pursue its gender equality- and human rights-based approach to climate action and development.

What Is a Gender-Responsive Approach?

It is an approach that carefully considers how gender norms and roles affect women, men, girls, and boys and addresses the inequalities they have created. It pursues gender equality and does not stop short at just examining the challenges.

Gender-responsive work is reflected in policies, strategies, and plans. But that is just the start. It also needs to be reflected concretely in adaptation actions at both community and national levels.

Source: NAP Global Network & United Nations Framework Convention on Climate Change (UNFCCC), 2019.

A gender-responsive approach to the NAP process addresses gender differences, promotes gender equality and actively challenges the biases, behaviors and practices that lead to marginalization and inequality. It recognizes that gender intersects with other socioeconomic factors to influence

vulnerability to climate change and adaptive capacity. A gender-responsive approach increases the likelihood that adaptation investments will yield equitable benefits for people of all genders and social groups, including those who are particularly vulnerable.
A gender-responsive NAP process focuses on three key considerations:

RECOGNITION OF GENDER DIFFERENCES IN ADAPTATION NEEDS AND CAPACITIES

It is well established that gender influences people's vulnerability to climate change. Gender intersects with other factors such as age, race, ethnicity, disability, class and sexual orientation to shape people's socially determined roles and responsibilities and their degree of marginalization in society. These interconnected factors also influence people's access to resources and information, their opportunities and their aspirations.

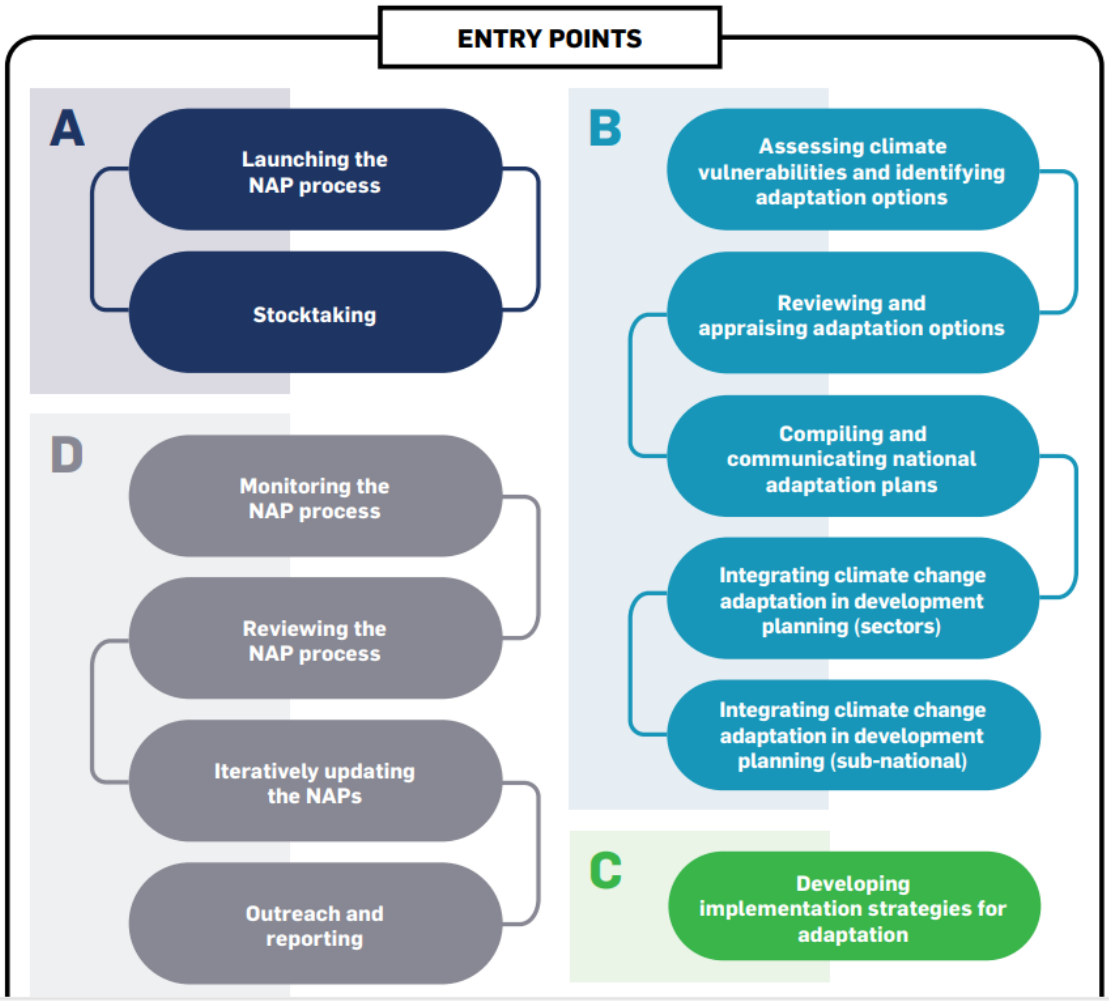
GENDER-EQUITABLE PARTICIPATION AND INFLUENCE IN ADAPTATION DECISION MAKING PROCESSES

People have a right to participate in decisions that affect them, their families and their communities. This is recognized in the Paris Agreement and other decisions under the UNFCCC that emphasize human rights and establish principles of participation and transparency in climate action. However, in reality, many people, particularly women and people in marginalized groups, face barriers to participation in decision making, from the household level to national policy making. This has implications for gender equity in participation and influence in adaptation decision-making processes.

GENDER-EQUITABLE ACCESS TO FINANCIAL RESOURCES AND OTHER BENEFITS RESULTING FROM INVESTMENTS IN ADAPTATION

The NAP process will channel resources to institutions and communities to implement adaptation actions. If done in a gender-responsive manner, this can serve to address inequalities while also enhancing adaptive capacities. This requires concerted action to tackle the persistent gender gaps in access to education, services, technologies and financial resources, ensuring that these are not reinforced or exacerbated by adaptation investments.

A4) Entry Points



To assist in this task, and to elaborate on key gender entry points, international guidance shall be reviewed and used to help support the NAP, notably from the following manual[249]:

[249] NAP Global Network & UNFCCC. (2019). Toolkit for a gender-responsive process to formulate and implement National Adaptation Plans (NAPs). Dazé, A., and Church, C. (lead authors). Winnipeg: International Institute for Sustainable Development. Retrieved from www.napglobalnetwork.org

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