

Chapter 8

Climate Change Adaptation Roadmap of the Lao People's Democratic Republic

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Climate Change Adaptation Roadmap of the Lao People's Democratic Republic

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8.1 Introduction

The Lao People's Democratic Republic (Lao PDR) set out its long-term goal for national development in its Eighth Five-Year National Socio-Economic Plan (2016–2020), with a Vision 2030. According to this vision, the goal for the Lao PDR is to transition from a least developed country to a middle-income country by 2030 supported by inclusive, stable, and sustainable economic growth while alleviating poverty. The Lao PDR recognises the strong link between sustainable economic development and the need to mainstream environmental considerations, including action on climate change, into its development plans. This recognition is reflected clearly in the Eighth National Socio-Economic Development Plan 2016–2020, the Socio-Economic Development Strategy until 2025, and the Vision to 2030.

The National Strategy on Climate Change of the Lao PDR (NSCC) was approved in early 2010, and was followed by the Climate Change Action Plan 2013–2020 in April 2013. The country subsequently submitted its intended nationally determined contribution (INDC) to the United Nations Framework Convention on Climate Change on 30 September 2015.

8.1.1 | Vision, Goals, and Key Initiatives

The objective of these initiatives is to secure a future in which the Lao PDR is capable of mitigating and adapting to changing conditions in a way that promotes sustainable economic development, reduces poverty, protects public health and safety, enhances the quality of the Lao PDR's natural environment, and advances the quality of life of all of the country's inhabitants.

The overarching goal is to facilitate sustainable development and increase the resilience of key sectors to climate change and its impacts such as natural disasters, while enhancing national and international cooperation, alliances, and partnerships, and improving public awareness and understanding of climate change, vulnerability, and economic impacts.

To achieve these goals, the Lao PDR will seek to:

- (i) establish and upgrade its policies, strategy, work plans, and legal documents related to climate change and its impact, as well as managing, monitoring, and reporting on the climate change situation on a regular basis;
- (ii) increase and upgrade the organisational structure of agencies responsible for climate change, and ensure both the quantity and quality of human resources;
- (iii) establish information and knowledge management, and exchange climate change information at the domestic, regional, and international levels;
- (iv) build capacity on climate change through domestic, regional, and international cooperation;
- (v) increase investment related to climate change through the use of the government budget, other domestic funding sources, and international funding sources;
- (vi) establish an integrated school curriculum and raise public awareness on climate change nationwide; and
- (vii) strengthen bilateral and multilateral cooperation with other countries and international organisations to access funding, transfer technology, gain more knowledge and experience, and strengthen regional and international linkages on climate change.

8.2 Target Projects and Activities

These objectives will be pursued under four key initiatives:

- (i) strengthening institutional and human resource capacities on climate change,
- (ii) enhancing adaptive capability for coping with climate change,
- (iii) mitigating the impacts of climate change by reducing greenhouse gas (GHG) emissions, and
- (iv) strengthening education and raising public awareness of climate change.

In addition to the overarching strategy set out in the NSCC, climate change action plans for the period 2013–2020 define mitigation and adaptation actions in the sectors of agriculture, forestry, land use change, water resources, energy, transportation, industry, and public health.

The Lao PDR is highly climate-vulnerable, and the country's GHG emissions were only 51,000 gigagram (Gg) in the year 2000, which is negligible compared to total global emissions. Despite this, the Lao PDR has ambitious plans to reduce its GHG emissions while at the same time increasing its resilience to the negative impacts of climate change. For example, the National Forestry Strategy to the Year 2020 sets out an ambitious target to increase forest cover to 70% of land area by 2020, and maintain it at that level going forward. This will reduce the risk of floods and prevent land degradation, while substantially and lastingly mitigating GHG emissions. In terms of the Lao PDR's large-scale electricity generation, the electricity grid draws on renewable resources for almost 100% of its output. The Lao PDR also aims to utilise unexploited hydropower resources to export clean electricity to its neighbours such as Cambodia, Singapore, Thailand, and Viet Nam, thus enabling other countries in Southeast Asia to develop and industrialise in a sustainable manner. The Government of the Lao PDR has also laid the foundations for the implementation of a renewable energy strategy that aims to increase the share of small-scale renewable energy to 30% of total energy consumption by 2030.

Climate change is already causing economic loss and affecting the livelihoods, food security, water supply, and health of much of the country's population. As the frequency and intensity of climate-related hazards such as droughts and floods are expected to increase in future, the Lao PDR must urgently take steps to build its resilience by boosting adaptation efforts across all sectors. A more detailed summary of the country's vulnerabilities to climate change and the adaptation actions proposed to address them are discussed further in section 3 of the Lao PDR's INDC.

The Lao PDR is committed to implementing its NSCC and sectoral climate change action plans for the benefit of the nation, region, and the world. However, to deliver the identified mitigation and adaptation actions, it will require technical and financial support. Such support will make it possible to implement the NCCS efficiently, optimise the identified potential GHG reductions, and adapt effectively to the negative and immediate effects of climate change.

As set out in the Vision for 2030, the Lao PDR intends to balance its need for development without compromising its environment. With respect to climate change adaptation, this translates into the following goals, which are articulated in the NSCC:

- (i) increase the resilience of key economic sectors and natural resources to climate change and its impacts;
- (ii) enhance cooperation, and build strong alliances and partnerships with national stakeholders and international partners to achieve national development goals; and
- (iii) improve public awareness and understanding of various stakeholders about climate change, vulnerabilities, and impacts to increase stakeholder willingness to take actions.

The Lao PDR's economy is already experiencing the impacts of climate change, and the majority of the population remains highly vulnerable to climate hazards, especially floods and droughts. This is because the Lao PDR's economy and more than 70% of the population depend on natural resources, both for their livelihoods and to ensure food security. The agriculture sector is responsible for 29.9% of gross domestic product, and approximately 70% of the population depend on this sector for their livelihoods. Increasing climate resilience and food security with respect to agriculture is therefore a high priority. Another high priority is the provision and management of water resources, as this contributes to social wellbeing, economic productivity, and water supplies for agriculture, industrial processes, and energy production.

Flooding and droughts are major climate risks in the country, threatening livelihoods almost every year. Since 1995, 14 of 17 provinces as well as the capital, Vientiane, have experienced floods. The country's annual rainfall is expected to become increasingly variable and, accompanied by rising temperatures, could significantly impact water resources, ecosystems, and agricultural production. In addition, floods adversely impact housing, health and education, industrial activities, and infrastructure (e.g. transportation, water, and sanitation). For example, flooding in 2005 caused widespread disruption with an estimated economic cost of \$29 million.

The Lao PDR is also experiencing increasingly frequent episodes of drought, with severe droughts occurring in 1996, 1998, and 2003. It is estimated that 6 out of 17 provinces are already at high risk of droughts. Droughts adversely affect water resources, hydroelectricity generation, and agricultural production, resulting in widespread economic losses.

The National Adaptation Programme of Action (2009) maps out a country-driven programme to address immediate and projected climate change adaptation requirements in the agriculture, forestry, water resources, and public health sectors. The adaptation programme was further

developed in the NSCC to cover the main economic sectors—agriculture and food security, forestry and land use change, water, energy and transport, urban development, industry, and public health—targeted for implementation by 2020.

One of the guiding principles of the NSCC is to develop and implement integrated, low-cost adaptation and mitigation solutions, improve energy efficiency, promote cleaner production, and provide adaptation and mitigation synergies as well as economic, environmental, and socioeconomic benefits. Hydroelectricity has great potential in the Lao PDR to provide clean energy and reduce GHG emissions, while meeting other objectives such as flood, irrigation, and water supply management. The forestry sector contributes to both the national economy and the livelihoods of many Laotians. Sustainable forest management therefore improves the resilience of communities and ecosystems while reducing GHG emissions by absorbing carbon dioxide.

To work towards achieving the NSCC’s vision and goals and to implement climate change action plans effectively for all sectors, it is immediately necessary to develop a monitoring and evaluation system for the Lao PDR. Table 8.1 reflects the nation’s adaptation priorities given the current understanding of expected climate impacts. These actions will be continuously assessed and improved when monitoring and evaluating data, and when new information about climate change and its impacts become available.

Table 8.1: Focus of Climate Change Adaptation Projects in Key Sectors

Sectors	Focus of Projects and Programmes
1. Agriculture	<ul style="list-style-type: none"> Promote climate resilience in farming systems and agricultural infrastructure.
2. Forestry and land use change	<ul style="list-style-type: none"> Promote climate resilience in forestry production and forest ecosystems. Promote technical capacity in the forestry sector for managing forests for climate change adaptation.
3. Water response	<ul style="list-style-type: none"> Strengthen water resource information systems for climate change adaptation. Manage watersheds and wetlands for climate change resilience. Increase water resource infrastructure resilience to climate change. Promote climate change capacity in the water resource sector.
4. Transportation and urban development	<ul style="list-style-type: none"> Increase the resilience of urban development and infrastructure to climate change.
5. Public health	<ul style="list-style-type: none"> Increase the resilience of the public health infrastructure and water supply system to climate change and natural disaster. Improve public health services for climate change adaptation and coping with climate change-induced impacts.

Source: Authors.

The following target projects and activities will be implemented to achieve the climate change goals, objectives, and key initiatives mentioned above, with a focus on promoting climate change adaptation and mitigation, and managing impacts, such as natural disasters. Below we identify key ministries that will implement a detailed plan, including funds, effectively in the future.

**Table 8.2: Key Sectors for Climate Change Adaptation to 2030
(the Lao PDR’s Intended Nationally Determined Contribution, 2015)**

A: Agriculture Sector		
No.	Action plan focus outputs	Responsibility = Ministry of Agriculture and Forestry
A.1	Objective 1 and related activities	<p>Promote climate resilience in farming systems and agriculture infrastructure:</p> <ul style="list-style-type: none"> • Improve appropriate resilient agricultural farming system practices and technologies to address climate change impacts. • Develop and improve crops and animal diversification and resilience especially in areas at risk of flooding and drought.
A.2	Objective 2 and related activities	<p>Promote appropriate technologies for climate change adaptation:</p> <ul style="list-style-type: none"> • Promote and enhance the development of appropriate technologies to cope with climate change. This may include the conservation of agricultural soil, animal health and disease outbreak monitoring and control, long-term feed storage improvement, climate-resilient crops, efficient water-use cropping systems, short rotation cropping, and maximising the use of indigenous climate-resilient knowledge. • Upgrade agricultural research and extension services to define and promote existing agricultural practices to reduce the negative effects of climate change. • Promote two seasons of rice cultivation in flood-prone areas through the use of adaptive and short-rotation rice varieties. • Promote appropriate techniques for crop and animal production, as well as meteorological and agricultural technologies in areas at risk of natural disasters.
A.3	Main barriers to implementation	<ul style="list-style-type: none"> • Limited knowledge, capacity, and technology on appropriate conservation farming systems, integrated and sustainable agriculture, agro-forestry, soil degradation and quality restoration, pest outbreak management, tolerant crops, and different animal varieties • Limited information, knowledge, and capacity on the vulnerability assessment of conservation farming systems, as well as integrated and sustainable agriculture to support mitigation and adaptation • Ineffective law enforcement, especially land concession, conversion, chemicals, and environmentally friendly agriculture • Lack of comprehensive land development policy, including effectiveness • Limited budget for the promotion of and investment in climate-resilient agriculture

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Table 8.2: Continued

A: Agriculture Sector		
No.	Action plan focus outputs Responsibility = Ministry of Agriculture and Forestry	
A.4	Support required	<ul style="list-style-type: none"> Capacity building including research on appropriate conservation farming systems, integrated and sustainable agriculture, agro-forestry, soil degradation and quality restoration, pest outbreak management, and tolerant crops and different animal varieties. Financial support to pilot and promote appropriate conservation farming systems, integrated and sustainable agriculture, agro-forestry, soil degradation and quality restoration, pest outbreak management and tolerant crops and different animal varieties.
A.5	Estimated cost	\$709 million (2007–2030) (Government of the Lao PDR, 2015)
B: Forestry and Land Use Change Sectors		
No.	Action plan focus outputs Responsibility = Ministry of Natural Resources and Environment Ministry of Agriculture and Forestry	
B.1	Objective 1 and related activities	<p>Promote climate resilience in forestry production and forest ecosystems:</p> <ul style="list-style-type: none"> Develop and enforce appropriate laws and regulations, and implement guidelines for sustainable forest management. Strengthen capacity in integrated land use planning and watershed forest management, and reduce slash and burn practices to increase the resilience of forests to cope with climate change. Promote integrated actions on watersheds, reservoir management, water storage for agro-forestry, wildlife management, fisheries and tree varieties, and the prevention of drought. Conduct forest surveys and allocation for sustainable management and rural development. Strengthen the capacity of technical staff and village forest volunteers to enable optimal planting, management, and utilisation of community forests in response to climate change. Promote forest seed and seedling production for reforestation and forest restoration. Research and select forest species resilient to pests, diseases, drought, and soil erosion.
B.2	Objective 2 and related activities	<p>Promote technical capacity in the forestry sector to manage forests to adapt to climate change:</p> <ul style="list-style-type: none"> Increase awareness and technical capacity of village forest volunteers on climate-resilient natural forest management, agro-forestry, and plantation technologies. Assess capacity limitations and needs in the management of the forestry sector in relation to climate change adaptation.

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Table 8.2: Continued

B: Forestry and Land Use Change Sectors		
No.	Action plan focus outputs Responsibility = Ministry of Natural Resources and Environment Ministry of Agriculture and Forestry	
B.3	Main barriers to implementation	<ul style="list-style-type: none"> • Limited knowledge and capacity on climate change impacts on the forest sector, on adaptation technologies such as ecosystem-based approaches, on climate-resilient flora and fauna species, and on sustainable forest management for addressing climate change impacts and wood demand management. • Capacity on sustainable production forest and ecosystem management is limited. • Sustainable production forest law enforcement and management is ineffective. • Lack of financial support and investment
B.4	Support required	<ul style="list-style-type: none"> • Strengthening capacity building on the planning and establishment of information management systems; the development of an action plan for different types of forests and technologies; climate change adaptation technologies (e.g. ecosystem-based approaches, and resilient species and forest systems); sustainable production forests and ecosystem-based forest management techniques; and access to international finance and systematic sector investment planning. • Strengthening capacity building for access to international finance and systematic sector investment planning. • Financial support and investment in commercial forest carbon projects including a financial mechanism, the market, technology, calculation, and monitoring.
B.5	Estimated cost	\$40.5 million (until 2020) (United Nations Development Programme, Water Resources and Environment Agency, and Global Environment Facility, 2009)
C: Water Resources		
No.	Action plan focus outputs Responsibility = Ministry of Natural Resources and Environment	
C.1	Objective 1 and related activities	<p>Strengthening water resource information systems for climate change adaptation:</p> <ul style="list-style-type: none"> • Strengthen information gathering, modelling, and vulnerability assessment for climate change in priority river basins in the Lao PDR. • Develop and implement reliable early-warning flood systems, reporting, and information disseminating services.
C.2	Objective 2 and related activities	<p>Managing watersheds and wetlands for climate change resilience:</p> <ul style="list-style-type: none"> • Strengthen the protection of watersheds to safeguard and moderate downstream flow during periods of high and low flow. • Study and promote the conservation of wetlands as part of a climate-resilient, ecosystem-based approach.
C.3	Objective 3 and related activities	<p>Increasing water resource infrastructure resilience to climate change:</p> <ul style="list-style-type: none"> • Develop and strengthen standards and procedures to ensure the safety of dams and other water resource related infrastructure; and prepare investment plans for upgrading and safeguarding infrastructure for water resource management. • Design and build multi-purpose dam and reservoirs to ensure sufficient water supply in drought-prone areas and seasons. • Construct and/or rehabilitate dykes and enhance river bank protection and irrigation systems to increase climate resilience.

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Table 8.2: Continued

C: Water Resources		
No.	Action plan focus outputs Responsibility = Ministry of Natural Resources and Environment	
C.4	Objective 4 and related activities	<p>Promotion of climate change capacity in the water resource sector:</p> <ul style="list-style-type: none"> • Increase awareness and technical capacity of staff regarding climate change impacts on water resources, appropriate technologies, and wetland management. • Increase water resource management capacity for climate change adaptation. • Study the impacts of water treatments on groundwater and the ecosystem.
C.5	Main barriers to implementation	<ul style="list-style-type: none"> • Knowledge and capacity with regard to climate change impacts on water resources, early warning systems, wetland management, climate-resilient technologies, and financial assessments are limited and inadequate. • Early warning systems and flood risk management are limited and inadequate. • Integrated watershed management is not effectively promoted due to a lack of comprehensive water storage and a water quality plan. • Lack of a financial mechanism to access finance, mobilise resources, and support investment.
C.6	Support required	<p>Capacity and financial support for:</p> <ul style="list-style-type: none"> • Flood/drought management and early warning systems • Development of a policy for dam safety and a multipurpose water supply • Climate-resilient water resources infrastructure • Law enforcement
C.7	Investment for adaptation	\$44 million (until 2030) (Government of the Lao PDR, 2015)
D: Transport and Urban Development		
No.	Action plan focus outputs Responsibility = Ministry of Public Work and Transport	
D.1	Objective 1 and related activities	<p>Increasing the resilience of urban development and infrastructure to climate change:</p> <ul style="list-style-type: none"> • Conduct climate risk audits for key infrastructure services. • Ensure that flood protection and drainage design for urban infrastructure (roads, drains, flood protection works, water and wastewater facilities, landfills, hospitals, and other public buildings) are adequate for climate change conditions. • Ensure that urban water supply systems have adequate design and operational standards for climate change impacts, including access to low flows in water sources, water treatment capability, and flood protection. • Build storm surge and flood protection works for urban infrastructure.
D.2	Main barriers to implementation	<ul style="list-style-type: none"> • Research, information, and capacity on sustainable and climate-resilient urban planning and development technologies • Limited knowledge and capacity on sustainable and climate-resilient urban planning and development, and technologies • Lack of financial mechanism, access to finance, and resource mobilisation

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Table 8.2: Continued

D: Transport and Urban Development		
No.	Action plan focus outputs Responsibility = Ministry of Public Work and Transport	
D.3	Support required	Strengthen human resources capacity and financial capacity on: <ul style="list-style-type: none"> • Develop financial and investment plans for the implementation of climate-resilient urban planning and development and deployment of technology. • Mainstream appropriate, climate-resilient technologies in the environmental impact assessment. • Strengthen cooperation and partnership, financial mechanism, access to finance, and resource mobilisation.
D.4	Investment for adaptation	\$190 million (until 2020)
E: Public Health Sector		
No.	Action plan focus outputs Responsibility = Ministry of Public Health	
E.1	Objective 1 and related activities	Increasing the resilience of public health infrastructure and the water supply system to climate change: <ul style="list-style-type: none"> • Develop climate-resilient, health-related infrastructure and facilities such as health care centers, laboratories, rural water supply, and sanitation systems. • Increase capacity on climate change impact assessments, estimate financial needs, and implement resilience plans in the health sector.
E.2	Objective 2 and related activities	Improving public health services for climate change adaptation and coping with climate change-induced impacts: <ul style="list-style-type: none"> • Improve education, research on climate change-induced disease and health impacts, its treatments (by both modern and traditional methods), monitoring, and reporting. • Improve access to human resources and increase service coverage in vulnerable communities. • Improve medical and food supplies, nutritional surveillance, and drinking water by better managing the water supply network. • Increase public and vulnerable community awareness on climate change-induced health risks, provide advisories and warnings, enhance first aid, and promote self-help and access to health care services in communities. • Develop policies to increase the ability of vulnerable groups and the poor to access health services.
E.3	Main barriers to implementation	<ul style="list-style-type: none"> • Inadequate capacity to conduct climate change vulnerability and impact assessments • Inadequate capacity and human resources • Limited budget, quality, and quantity of human resources

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Table 8.2: Continued

E: Public Health Sector		
No.	Action plan focus outputs Responsibility = Ministry of Public Health	
E.4	Support required	<ul style="list-style-type: none"> • Capacity building on disease outbreak monitoring, response plans, and human resource development planning. • Technical and financial support to raise awareness of climate change impacts and health risks. • Capacity and financial support to develop monitoring centers, laboratories, mobile teams and stations, and treatment centres.
E.5	Investment for adaptation	\$5 million (until 2020)

Lao PDR = Lao People's Democratic Republic.

Sources: Government of the Lao People's Democratic Republic (2015), *Lao PDR's Intended Nationally Determined Contribution (INDC)*. United Nations Framework Convention on Climate Change. <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Laos/1/Lao%20PDR%20INDC.pdf> (accessed 1 October 2018); United Nations Development Programme, Water Resources and Environment Agency, and Global Environment Facility (2009), *National Adaptation Programme of Action*. New York: United Nations Development Programme. <https://unfccc.int/resource/docs/napa/laos01.pdf> (accessed 10 October 2018).

8.3 Mitigation Contribution in the Lao People's Democratic Republic

The Lao PDR has identified a number of actions that it intends to undertake to reduce its future GHG emissions, subject to the provision of international support. These are outlined in Table 8.3, together with preliminary estimates of the projected emissions reductions that will occur as a result. These estimates have been drawn from a variety of sources and should be reviewed and updated to address consistency and accuracy in analytical methods once more reliable data and information are available. The Lao PDR's GHG emissions are very low in the global context, and its historic contribution to climate change has been minimal. Despite this and its status as a least developed country, the government intends to implement policies that support the long-term goal of limiting global GHG emissions in line with the objectives of the United Nations Framework Convention on Climate Change and the findings of the Intergovernmental Panel on Climate Change's Fifth Assessment Report. This represents the first time that the Lao PDR has made an international undertaking to take action on mitigation, and therefore fulfills the requirements of the Lima Call for Climate Action to go beyond existing efforts.

Table 8.3: Climate Change Mitigation through the Reduction of Greenhouse Gas Emissions in 2015–2030

No.	Name of Activity	Objectives of the Activity	Estimated CO ₂ Equivalent Reductions
1	Implementation of the 'Forestry Strategy to the Year 2020' of the Lao PDR	To increase forest cover to 70% of land area (i.e. 16.58 million hectares) by 2020. Once the target is achieved, emission reductions will carry on beyond 2020.	60,000 kt–69,000 kt of CO ₂ equivalent (once the target has been met, from 2020 onwards)
2	Implementation of the Renewable Energy Development Strategy	To increase the share of renewable energy to 30% of energy consumption by 2025 (note that large-scale technologies with installed capacity equal to or greater than 15 MW are not included in this policy's target). For transport fuels, the objective is to increase the share of biofuels to meet 10% of the demand for transport fuels by 2025.	1,468,000 kt of CO ₂ equivalent (by 2025).
3	Implementation of the Rural Electrification Programme	To make electricity available to 90% of households in rural areas by 2020. This will offset the combustion of fossil fuels to produce power where there is no access to the electricity grid.	63 kt of CO ₂ per year (once the target has been met in 2020)
4	Implementation of transport-focused NAMAs	In one NAMA feasibility study, road network development is identified as the primary objective, which will reduce the number of kilometers travelled by all vehicles. The second objective is to increase the use of public transport compared to business as usual. In addition to reducing greenhouse gas emissions, this activity will lead to a reduction in nitrous oxide and sulfur oxide emissions, which will have significant co-benefits such as improved air quality that will in turn positively impact human health.	Road network development = 33 kt of CO ₂ per year, and 158 kt of CO ₂ per year for public transport development
5	Expansion of the use of large-scale hydroelectricity	The objective of this activity is to build large-scale (> 15 MW) hydropower plants to provide clean electricity to neighbouring countries. The total installed capacity of the hydropower plants will be approximately 5,500 MW by 2020. In addition, 20,000 MW of additional hydroelectric capacity is planned for construction after 2020.	16,284 kt of CO ₂ per year (2020–2030)
6	Implementation of climate change action plans	To build capacity to monitor and evaluate policy implementation success, with the aim of producing new policy, guidance, and data. The objective is to develop and implement effective, efficient, and economically viable climate change mitigation and adaptation measures.	To be estimated as part of the implementation plan
7	Estimated cost	\$180 million This is assuming that the cost for forest management is approximately \$10.84/hectare (this does not include costs related to plantations and therefore provides a lower bound of the total cost related to this measure).	Ends in 2030.

CO₂ = carbon dioxide, kt = kilotonnes, Lao PDR = Lao People's Democratic Republic, MW = megawatt, NAMA = nationally appropriate mitigation action.

Source: Government of the Lao PDR (2015), *Lao PDR's Intended Nationally Determined Contribution (INDC)*. United Nations Framework Convention on Climate Change. <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Laos/1/Lao%20PDR%20INDC.pdf> (accessed 1 October 2018).

To maximise the ambition of its mitigation contribution while taking into account the need for economic development, the Lao PDR has prioritised mitigation actions that both address the main causes of future increases in emissions and also have significant development co-benefits. This is considered a fair approach to the nation's first INDC. Forestry-based actions will not only increase the amount of GHG sinks in the Lao PDR, but will also provide adaptation co-benefits contributing to the prevention of flooding, soil erosion, and landslides; and the protection of biodiversity and ecosystem services. Improving public transport will not only result in lower GHG emissions as a result of travel, but will also improve air quality and support more sustainable economic growth. The rural electrification programme will reduce GHG emissions, promote rural development, and reduce poverty. Finally, the export of hydropower to other countries in the region will allow these economies to grow in a more sustainable manner, by replacing consumption of fossil fuels.

Table 8.4: Implementation of 'Forestry Strategy to the Year 2020' of the Lao People's Democratic Republic

No.	Action Plan Focus	Outputs
1	Description	Trees and forests are greenhouse gas sinks, that is, they absorb CO ₂ . They also preserve land quality, mitigating the risk of flooding and landslides. Increasing and maintaining total forest cover therefore has significant mitigation impacts and development co-benefits.
2	Objectives	The objective of this activity includes increasing total forest cover to 70% of land area (16.58 million hectares). Once this target is achieved, emission reductions will carry on beyond 2030 as forest cover is maintained.
3	Base year	2000
4	Methodology for assessing base year and anticipated future emissions	See the calculations presented in the Lao PDR's Second National Communication to the United Nations Framework Convention on Climate Change, Chapter 4, sections 4.4.2 and 4.4.5, and the Technology Needs Assessment (2013). The base year of 2000 is selected, as this is when the latest emissions inventory was calculated as part of the process of compiling the Second National Communication.
5	Anticipated emission reductions	If these measures are implemented effectively, the country will successfully increase its natural forest coverage to 70% (about 16.58 million hectares), with an additional 500,000 hectares of plantation, logging, and conversion forest under control until 2020. In this scenario, the forests in the Lao PDR would be able to sequester about 60,000 kt–69,000 kt of CO ₂ equivalent by 2020.
6	Plan to achieve the goal	<ul style="list-style-type: none"> Implement the plans set out in the Forestry Strategy to the Year 2020 of the Lao PDR. As the strategy runs until 2020, the Lao PDR will begin revising the next set of action plans to maintain forest cover at 70% after the target date of 2020. Work on developing the new strategy will begin in 2018.

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Table 8.4: Continued

No.	Action Plan Focus	Outputs
		<ul style="list-style-type: none"> • Implement the REDD+ programme, which has provided a framework for the development of the forestry sector in the Lao PDR since around 2007. As early as 2009, a number of REDD+ pilot activities and projects supported by development partners were initiated, and in 2010, the Lao PDR became one of the first pilot countries under the Forest Investment Program, a multilateral programme under the Climate Investment Funds. • Implement the voluntary partnership agreement, which is a bilateral trade agreement between the EU and a timber-exporting country outside the EU. The Government of the Lao PDR announced its interest in negotiating a voluntary partnership agreement in February 2012. • Continue to carry out the Forest Law Enforcement, Governance and Trade Action Plan, which began in October 2013, with support from Germany's Deutsche Gesellschaft für Internationale Zusammenarbeit.
7	Main barriers to implementation	<ul style="list-style-type: none"> • Ineffectiveness of existing forest management systems, including law enforcement, especially on forest harvesting, conversion as a result of development projects, collection, and management of forest funds. • Forest inspection system is not systemised or effectively enforced. • Resources and capacity for forest inventory, planning, and restoration is limited. • Poverty and limited livelihood options lead to forest encroachment. • Unclear or lack of policies and guidelines to promote forest restoration and reforestation
8	Support required	Capacity building, technology transfer, and financial support on: <ul style="list-style-type: none"> • law enforcement; • forest monitoring and inspection system; • forest restoration and rehabilitation; • sustainable community forest management and agro-forestry for mitigation and poverty reduction; • policy for investment in forest restoration; • forest inventory and planning system; and • research on forest ecosystem, economic, and best practices in relation to climate change mitigation.
9	Estimated cost	<p>\$180 million</p> <p>This is assuming that the cost for forest management is approximately \$10.84 per hectares. This does not include costs related to plantations and therefore provides a lower bound of the total cost related to this measure.</p>

CO₂ = carbon dioxide, EU = European Union, kt = kilotonnes, Lao PDR = Lao People's Democratic Republic, REDD+ = Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries.

Source: Government of the Lao PDR (2015), *Lao PDR's Intended Nationally Determined Contribution (INDC)*. United Nations Framework Convention on Climate Change. <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Laos/1/Lao%20PDR%20INDC.pdf> (accessed 1 October 2018).

Table 8.5: Implementation of Renewable Energy Development Strategy

No.	Action Plan Focus	Outputs
1	Description	The Renewable Energy Strategy (2011) outlines actions and plans to increase the use of small-scale hydropower, solar energy, biomass, biogas, municipal solid waste to energy, and wind technologies, as well as transport fuels (bioethanol and biodiesel), to provide clean energy to consumers.
2	Objectives	<ul style="list-style-type: none"> • To increase the share of renewable energy to 30% of energy consumption by 2025. • To increase the share of biofuels to meet 10% of the demand for transport fuels by 2025.
3	Base year	2011
4	Methodology for assessing base year and anticipated future emissions	For further information, please see the Renewable Energy Development Strategy (2011) of the Lao PDR. These are preliminary estimates, which will be reviewed and updated once technical capacity has been built and more reliable data are made available.
5	Anticipated emission reductions	1,468,000 kt of CO ₂ equivalent (by 2025)
6	Plan to achieve the goal	<p>The Renewable Energy Strategy was approved at the national level in 2011. The Ministry of Energy and Mines is the main agency responsible for renewable energy coordination, and its main functions include the following:</p> <ul style="list-style-type: none"> • Develop an overall renewable energy policy and support the achievement of sustainable development goals. • Set up objectives and goals based on resource potentials, and develop a renewable energy database. • Carry out studies and demonstration projects utilising renewable energy technologies. <p>Other ministries with responsibilities under the Renewable Energy Strategy include the following:</p> <ul style="list-style-type: none"> • The Ministry of Agriculture and Forestry, in collaboration with the Ministry of Natural Resources and Environment and provincial authorities, will determine and develop policies related to the most effective use of lands for planting crops for fuel and industrial uses, carry out participatory land use planning and local land use zoning, and monitor and enforce the implementation of the policy. • The Ministry of Natural Resources and Environment is responsible for undertaking research on the use of water resources, and will collaborate with the Ministry of Energy and Mines on studies concerning the production of hydrogen fuels. Further, they are responsible for developing and enforcing requirements and guidelines, and minimising the environmental and social impacts of renewable energy development through overseeing initial environmental examinations and carrying out environmental impact assessments. • The Ministry of Science and Technology conducts research and pilots tests on science and technologies developed from different countries, for renewable energy applications. • The Ministry of Industry and Commerce facilitates the importation of equipment and machinery, seeds, and vehicles related to the development of renewable energies, as well as supporting the construction of gas stations for biofuel distribution.

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Table 8.5: Continued

No.	Action Plan Focus	Outputs
		<ul style="list-style-type: none"> • The Ministry of Public Works and Transportation will be responsible for introducing policies that promote the use of alternative fuels in individual vehicles, public transportation systems, freight, and air transport. • The Ministry of Finance determines appropriate tax and duties policies for land use, vehicles, and equipment to be used for renewable energy projects, while at the same time helping to raise funds for renewable energy development. • The Central Bank of the Lao PDR will consider carbon credits and low-interest loans as sources of financing for renewable energy projects and activities, agricultural promotion and fuel crop plantation development, and projects carried out by small and medium-sized enterprises. <p>Regarding implementation, the first step is to assess and update the Renewable Energy Strategy, including the analysis of:</p> <ul style="list-style-type: none"> • Resources available, identifying gaps and opportunities for improvement in technology selection and sources. Specifically, the gaps that require analysis in the Lao PDR include: <ul style="list-style-type: none"> (a) political, legal, regulatory, and institutional gaps; (b) economic, financial, and market gaps; and (c) technology, human capacity, and infrastructure gaps. • Current levels of deployment and their management. • Current supply targets and how they are aligned with demand forecasts. • Support policies, such as feed-in tariffs, tax incentives, and import duties. • Market readiness to encourage investment by the private sector. <p>As a result, the Lao PDR's energy focal points and related organisations will be able to comply with all related international agreements with respect to energy supply and trading. Its regulatory system would be strengthened, giving the Lao PDR a more organised and authoritative voice when negotiating with potential partners.</p>
7	Main barriers to implementation	<ul style="list-style-type: none"> • Lack of reliable data on renewable energy including its subsectors, that is, the actual potential and feasibility of each renewable energy source and optimal locations. • Knowledge and capacity on renewable technologies are limited. • Promotion and investment are limited. • Lack of policy to promote renewable energy technology development, import–export, and subsidy mechanisms.
8	Support required	<ul style="list-style-type: none"> • Strengthen capacity for research on the potential and feasibility of each renewable energy source and location. • Strengthen financial mechanisms, policy promoting the development of renewable energy, and technologies including its supply chain.
9	Estimated cost	\$658.75 million (2007–2030) including investment costs, operation and management costs, and financial costs.

CO₂ = carbon dioxide, kt = kilotonnes, Lao PDR = Lao People's Democratic Republic.

Source: Government of the Lao PDR (2015), *Lao PDR's Intended Nationally Determined Contribution (INDC)*. United Nations Framework Convention on Climate Change. <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Laos/1/Lao%20PDR%20INDC.pdf> (accessed 1 October 2018).

Table 8.6: Expansion in the Use of Large-Scale Hydroelectricity

No.	Action Plan Focus	Outputs
1	Description	The Lao PDR has great potential for hydroelectricity generation and has been referred to as ‘the battery of Southeast Asia.’ Exporting clean energy powers green growth in neighbouring countries and provides foreign exchange earnings and employment in the Lao PDR (e.g. CDM, bilateral offset credit mechanism, and nationally appropriate mitigation actions).
2	Objective	The objective of this activity is to build large-scale hydropower plants to provide clean electricity to neighbouring countries. 2.3 GW will be added by 2020 and total hydropower electricity production will be increased to approximately 5.5 GW by 2020. In addition, the Lao PDR has over 20 GW of additional hydroelectricity capacity to be constructed after 2020.
3	Base year	2015
4	Methodology for assessing base year and anticipated future emissions	The estimate is based on the following assumptions: 85% of hydroelectricity is exported to Thailand and Viet Nam, 1 MW generates 3.5 GWh, 1 GWh produces 3.6 TJ, and the default emission factor is 0.67 tonnes of CO ₂ per MWh. This is a preliminary estimate and will need to be reviewed and updated to address consistency and accuracy in analytical methods once more reliable data and information are available.
5	Anticipated emission reductions	16,284 kt of CO ₂ per year, once the target is reached in 2020.
6	Plan to achieve the goal	Implementation of the electricity export agreement along with the development of a NAMA, and preparedness for a future carbon market mechanism
7	Main barrier to implementation	Limited budget and access to finance
8	Support required	Capacity building and financial support for strengthening environmental safeguard systems, resettlements, dam safety, climate resilience, and the development of multipurpose financial mechanisms
9	Estimated cost	\$320 million

CDM = clean development mechanism, CO₂ = carbon dioxide, GW = gigawatt, GWh = gigawatt-hour, kt = kilotonnes, Lao PDR = Lao People’s Democratic Republic, MW = megawatt, MWh = megawatt-hour, NAMA = nationally appropriate mitigation action, TJ = terajoule.

Source: Government of the Lao PDR (2015), *Lao PDR’s Intended Nationally Determined Contribution (INDC)*. United Nations Framework Convention on Climate Change. <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Laos/1/Lao%20PDR%20INDC.pdf> (accessed 1 October 2018).

Table 8.7: Rural Electrification Programme

No.	Action Plan Focus	Outputs
1	Description	<ul style="list-style-type: none"> Rural communities require a clean and secure source of energy, particularly when there is no access to the electricity grid. By increasing the level of rural electrification, reliance on wood fuel and fossil fuels will be reduced.
2	Objective	The Lao PDR has set a target of making electricity available to 90% of households by 2020. Electrification has already improved from 15% in 1995 to 73% in 2010.
3	Base year	2010
4	Methodology for assessing base year and anticipated future emissions	<ul style="list-style-type: none"> Assessing base year and anticipated future emissions: the Nationally Appropriate Mitigation Action (NAMA) on Rural Electrification in Lao PDR, produced with the support of the United Nations Development Programme, lays out plans for the implementation of the NAMA, which will allow the Lao PDR to meet its goal of 90% electrification by 2020. Emissions are estimated based on the following assumptions: 1,108,609 households (90%) will be electrified by 2020; 60% of the households are in rural areas and consume, on average, 30 liters of kerosene and diesel per year. Therefore, achieving the rural electrification goal would reduce the use of kerosene and diesel by about 19.95 million liters. With the use of default value for net calorific value and emission factors, electrification in the Lao PDR would reduce CO₂ emissions by about 63 kt of CO₂ per year. This is a preliminary estimate and will need to be reviewed and updated to address consistency and accuracy in analytical methods once more reliable data and information are available.
5	Anticipated emission reductions	63 kt of CO ₂ per year
6	Plan to achieve the goal	<p>Implementation of the NAMA, with support from the United Nations Development Programme and measures on rural electrification, based on the following five concepts in particular:</p> <ul style="list-style-type: none"> Maintenance and expansion of the power supply based on economic efficiency, reliability, and sustainability, to promote economic and social development; Promotion of electric power development and expansion of electricity exports, to secure finances targeted by the government; Development and strengthening of laws and regulations to develop the electricity sector effectively through the government, the private sector, or public-private partnerships; Increasing the nation's capabilities, while developing international-standard techniques, expertise, and experience; and Achieving sustainable development by identifying impacts and responsibilities related to society and the environment.
7	Main barriers for implementation	<ul style="list-style-type: none"> Limited access, scattered resettlement, and lack of an integrated rural infrastructure development plan. Existing transmission networks are limited. Limited finance for developing rural electricity systems. Lack of comprehensive policy and facilitation to access finance and private sector investment.

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Table 8.7: Continued

No.	Action Plan Focus	Outputs
8	Support required	<ul style="list-style-type: none"> Capacity building and financial mechanism for accessing finance and resource mobilisation Financial support and investment in electricity grid expansion, system, and facilities
9	Estimated cost	\$160 million (for transmission lines only) for the next 5 years.

CO₂ = carbon dioxide, kt = kilotonnes, Lao PDR = Lao People's Democratic Republic.

Source: Government of the Lao PDR (2015), *Lao PDR's Intended Nationally Determined Contribution (INDC)*. United Nations Framework Convention on Climate Change. <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Laos/1/Lao%20PDR%20INDC.pdf> (accessed 1 October 2018).

8.4 Implementing Measures

The responsibilities of stakeholders include accomplishing the goals and objectives included in the programmes, projects, and focal tasks of this action plan.

The Ministry of Natural Resources and Environment (MONRE) shall take a leading role in climate change adaptation and GHG reduction in the Lao PDR, while serving as a focal point for coordination to consider partnerships and discussion with international organisations. The MONRE, in addition to being the ultimate authority, shall convert the projects and focal tasks of this action plan into detailed actions to actualise implementation within the ministry. The MONRE will also collaborate and coordinate with other line ministries to execute the projects and focal tasks while ensuring comprehensive understanding within each sector, professional capacity building, planning, mobilising international official development assistance, monitoring, and producing progress reports with regard to project and activity implementation. Moreover, the MONRE will play a role in reducing disaster risk, as the departments under the umbrella of the MONRE are highly important for data and information support. These departments include the Department of Hydrology and Meteorology, Department of Land Management, Department of Climate Change, Department of Water Resource Management, Department of Environment Quality Promotion, Lao National Mekong Committee Secretariat, Natural Resource and Environment Research Institute, and Department of Pollution Control.

Table 8.8: Implementation of Transport-Focused Nationally Appropriate Mitigation Actions

No.	Action Plan Focus	Outputs
1	Description	The systematic development of a road network and provision of buses to meet increasing demand for travel will mitigate GHG emissions while promoting economic development.
2	Objective	The objective of road network development is to provide better networks so that vehicle kilometres travelled will be reduced against business as usual. In addition to a reduction in GHG emissions, the activity will lead to a reduction in nitrous oxide and sulfur oxide emissions, which will have significant co-benefits such as improved air quality that in turn has positive implications for human health.
3	Base year	2007
4	Methodology for assessing base year and anticipated future emissions	The reference scenario is determined as business as usual, that is, the scenario reflecting traffic volume trends between 2007 and project start. The scenario is predetermined and based on transport demand forecast surveys conducted prior to the project's implementation. The Japan International Cooperation Agency-supported NAMA document from which projections are taken employs the 'activity-structure-intensity-fuel' approach to calculate emission reductions ex ante.
5	Anticipated emission reductions	A feasibility study for a Japan International Cooperation Agency-proposed NAMA estimates that emission reductions due to road network development are approximately 33 kt of CO ₂ equivalent per year, and emission reductions due to public transport development are 158 kt of CO ₂ equivalent per year against business as usual by 2025, using 2007 as a base year for comparison.
6	Plan to achieve the goal	The actions are to be completed as part of a NAMA. Projects in road network development, public transport development, and transport management sectors are planned to be implemented in three phases: short, medium, and long term.
7	Main barriers to implementation	<ul style="list-style-type: none"> • Uncertain or unclear carbon market and mitigation incentives • Limited budget for road network and transport system improvement • The existing road network is rather complicated and has not been integrated into sustainable urban planning. Improving an existing one might take time and be costly.
8	Support required	<ul style="list-style-type: none"> • Capacity building on: <ul style="list-style-type: none"> – Sustainable and integrated urban planning – Law enforcement – Financial models for road planning – Traffic controls – Sustainable and climate-resilient transport and technologies • Access to favourable terms for infrastructure funding
9	Estimated cost	\$105 million (until 2020)

CO₂ = carbon dioxide, kt = kilotonnes, Lao PDR = Lao People's Democratic Republic, NAMA = nationally appropriate mitigation action.

Source: Government of the Lao PDR (2015), *Lao PDR's Intended Nationally Determined Contribution (INDC)*. United Nations Framework Convention on Climate Change. <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Laos/1/Lao%20PDR%20INDC.pdf> (accessed 1 October 2018).

8.4.1 | Line Ministries

Identified line ministries shall take key responsibilities in the implementation of projects and focal tasks included in the action plan to integrate various programs from different ministries into the strategies, plans, and budgeting of their own sectors with regard to strengthening organisational functions and work methods focused on effective implementation under its authority. During this initial stage, once the action plan is endorsed, it is necessary to coordinate with the MONRE to convert the proposed projects and focal tasks into detailed actions while mobilising financial sources, seeking technical assistance, and sharing lessons learned from other countries.

8.4.2 | Local Authorities, Mass Organisations, the Private Sector, Universities, Development Partners, and the Public Sector

Local authorities shall participate actively in planning and implementing various climate change-related activities within their local areas. The MONRE shall support local authorities in prioritising these activities while addressing constraints in building capacity to respond to climate change and alternative initiatives for GHG reduction and climate change adaptation. Local authorities shall consolidate various projects and focal tasks related to climate change, and integrate them into their socio-economic development plans, followed by participation and reasonable involvement in executing, monitoring, and reporting. Mass organisations and local authorities will conduct outreach programs to disseminate information to the public on topics related to climate change in general, particularly the national strategy and programme on climate change. The private sector should invest more in climate change-related projects, which are priorities assigned by the government for adaptation, and contribute to GHG reduction. The MONRE and other line ministries will collaborate with the private sector in raising public awareness of climate change adaptation by promoting activities such as financial and technological support. Universities and colleges shall endeavour to integrate climate change-related issues into formal curricula and research. The MONRE and other line ministries shall collaborate with universities and colleges in building capacity, ensuring information accessibility, and providing international technical support.

Government line ministries concerned include the National Assembly of Lao PDR, Ministry of Natural Resources and Environment, Ministry of Agriculture and Forestry, Ministry of Public Works and Transport, Ministry of Planning and Investment, Ministry of Education

and Sports, Ministry of Energy and Mines, Ministry of Industry and Commerce, Ministry of Finance, Ministry of Foreign Affairs, Ministry of Health, Ministry of Education and Sport, Ministry of Labour and Social Welfare, and Ministry of Technology and Science.

International development partners (e.g. donors and international organisations) should consider and integrate key messages of this action plan into their cooperation plans with government agencies. The government shall promote firm collaboration and coordination with international development partners in implementing climate change-related activities at the national, regional, and international levels. The general public shall enhance knowledge and understanding of climate change-related topics, natural disaster management, and other environmental issues, and should be actively involved in mitigating the adverse impacts of climate change while contributing reasonably to reducing GHGs.

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