Partner Report Series No 6

Scoping Assessment of Climate Change Adaptation Priorities in the Lao PDR

EcoLao

ADAPTATION KNOWLEDGE PLATFORM

REGIONAL CLIMATE CHANGE ADAPTATIONKNOWLEDGEPLATFORM for Asia

The Partner Report Series highlights the insights and outcomes of studies, assessments and other field activities that our national implementing partners have undertaken in their countries to mainstream adaptation into plans, policies and programmes. The intention of the series is to disseminate their findings to partners and relevant professionals in Asia.

We welcome suggestions or comments.

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About the author

EcoLao is a Lao-owned Rural Development Contractor registered with the Ministry of Agriculture and Forestry for the provision and management of Lao counterpart technical services in rural development management; natural resources management; environmental, ecological and social impact management; and geographically based district and provincial development planning.

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Preface

During the last three years, the Regional Climate Change Adaptation Knowledge Platform (AKP) has worked towards building bridges between existing knowledge on adaptation to climate change and the governments, agencies and communities that need this knowledge to inform their adaptation to the impacts of climate change, while working to reduce poverty and sustain the environment. AKP's work has been carried out following three key objectives:

1. Promoting dialogue and improving the exchange of knowledge, information and methods within and between countries on climate change adaptation, and linking existing and emerging networks and initiatives.

2. Generating new climate change adaptation knowledge, promoting understanding and providing guidance relevant to the development and implementation of national and regional climate change adaptation policy, plans and processes focused on reducing vulnerability and strengthening the resilience of the poor and women: the most vulnerable segments of society in most Asian countries.

3. Synthesizing existing and new climate change adaptation knowledge and facilitating its application in sustainable development and poverty reduction practices at the local, national and regional levels.

This publication is a result of these objectives. AKP supported thirteen countries in the Asian region to strengthen their capabilities to mainstream adaptation, introduce effective adaptation measures and assess their needs and priorities for adaptation. Lao PDR is one of the thirteen countries. This publication highlights the results of the scoping assessment conducted in the Lao PDR to identify the country's adaptation needs and priorities. This scoping assessment was conducted by EcoLao, a Lao-owned Rural Development Contractor.

AKP is implemented by the Stockholm Environment Institute (SEI), AIT's Regional Resource Centre for Asia and the Pacific (AIT RRCAP), and the United Nations Environment Program Regional Office for Asia and the Pacific (UNEP ROAP) with funding provided by the Swedish Government through the Royal Swedish Embassy in Bangkok and the Swedish International Development Agency (Sida). The former Swedish Environmental Secretariat for Asia (SENSA) was also instrumental in setting up and supporting AKP.

AKP's publications provide insights on adaptation in the region. A consolidated initiative, known as the Asia Pacific Adaptation Network (APAN), has been established and will be fully implemented starting in 2013. Its ultimate objective is to assist the region in building the climate resilience of human systems, ecosystems and economies through the mobilization of knowledge and best practices, enhanced institutional capacity, informed decision making processes, and facilitated access to finance and technologies.

The outcomes of AKP have been made possible by the active participation of partners and various stakeholders. SEI acknowledges the editorial assistance provided by Marion Davis and Skye Turner-Walker. SEI also expresses heartfelt thanks to John Soussan, Lailai Li, Kai Kim Chiang, Lisa Schipper, Sabita Thapa, Tatirose Vijitpan, Muanpong Juntopas, Nantiya Tangwisutijit, Chanthy Sam, and Dusita Krawanchid for their contributions to AKP.

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Executive Summary

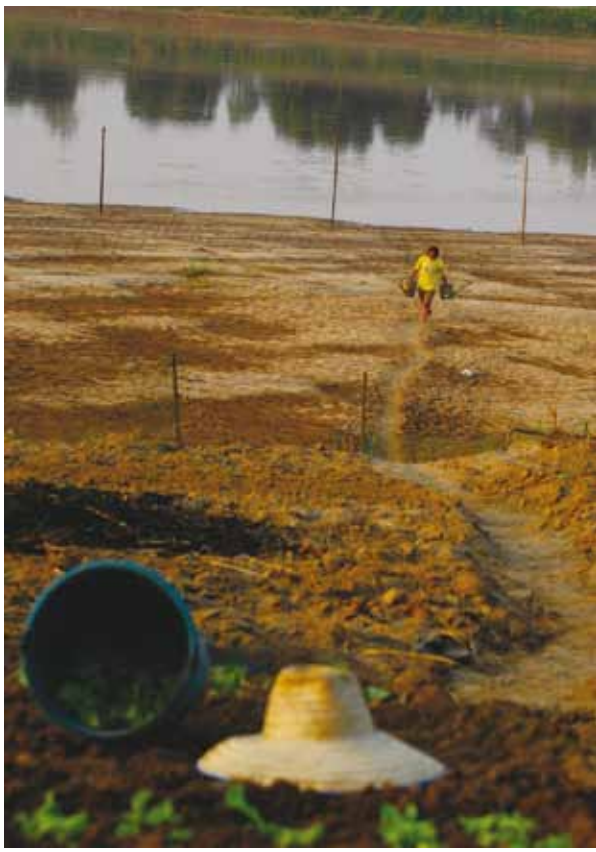
This study evaluates the knowledge of climate change impacts and adaptation needs in Laos, formally known as the Lao People's Democratic Republic (PDR), and recommends measures to expand that knowledge, build local adaptive capacity, and strengthen the resilience of the country's most vulnerable populations. The study was conducted in September-November 2011 by EcoLao under the auspices of the Regional Climate Change Adaptation Knowledge Platform for Asia (AKP). The project included a review of official documents and research literature as well as semi-structured interviews with key stakeholders, including representatives from government, non-governmental organizations (NGOs), and academia. The study examined the current state of climate change adaptation in Lao PDR and its integration into planning and policy processes, looking specifically at:

- Institutions, their mandates and mechanisms, and climate-related policies;
- Mechanisms and policies concerning adaptation;
- Lao PDR's strategy for building capacity for adaptation; and
- Recommendations for the development of the AKP's strategy for Lao PDR.

Our analysis indicates that although the level of awareness and knowledge of climate change and adaptation is still generally low in the Laotian government, staff at many national agencies interviewed for this study have attended workshops, conferences and training courses on these topics and initiated adaptation relevant projects. However, in many cases, these staff have not had further opportunities to use and build upon their new knowledge, and they require more capacity-building once this training has been completed. Meanwhile, at the provincial, district and community levels, awareness and knowledge of climate and adaptation are generally very low, and there are few people who have had any training on these issues.

Capacity-building is thus needed at all levels, but especially at the provincial, district and local levels. For the most immediate relevance and impact, it is recommended that efforts be made to address specific needs within ongoing adaptation projects. In addition, there is a need for training on basic project planning and management skills, in order to ensure that project funding can be successfully obtained from the various adaptation funding sources. Courses and pilot projects on adaptation and on assessing vulnerability (within and across the various sectors) are also needed, at all levels.

One useful strategy would be to partner Laotian government agencies with regional or international institutions with significant climate and adaptation-specific expertise. Staff in key government agencies also need to improve their English language skills, so they can better access information on climate change and adaptation, most of which is in English. In addition, educational materials on climate change and adaptation must be made available in the Lao language, presented simply so they can be easily understood by a wide audience.



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The study also identified several research priorities, including:

- Improved, more reliable, information on projected climate changes and their potential impacts on Laos.
- Assessment of what people at the community level are already doing, and what more they could do, to build their resilience to the impacts of climate change and climate variability.
- Pilot tests of promising adaptation policies, strategies and actions.
- Research on how to develop integrated land use systems and farming systems with greater resilience to climate variability and climate change.
- Research on climate change and water resources in Lao PDR, specifically with regard to the sustainability of groundwater withdrawals and potential adaptation needs.
- Research to identify appropriate and sustainable renewable energy sources and technologies for Lao PDR and gauge their impact on land and water resources and their socio-economic impact.
- Research on ways to enhance the protection of human health in the face of climate change.

The study also identified several ways in which the AKP could contribute to adaptation efforts in Laos, based on needs and wishes expressed by stakeholders. For example, the AKP could organize workshops or training courses similar to those held in other partner countries; it could also help raise awareness of key resources, including the AKP's own materials, since these resources are little known and thus under-utilized in Laos. There is also a need for educational materials in the Lao language, and for assistance in developing an English-Lao glossary of climate and adaptation terms. In addition, the government could use help in making its climate and adaptation related policies, publications and reports available on the internet.

The AKP is encouraged to establish a relationship with the Department of National Disaster Management and Climate Change (formerly the Climate Change Office) in the Ministry of Natural Resources and Environment as its entry point for Laos. This department is the principal cross-sectoral coordination mechanism for climate change activities in the Laotian government, along with the National Environment Committee and sectoral 'Technical Working Groups' on climate change.

1. Introduction

Climate change poses particular hurdles for developing countries and communities as they work towards sustainable development. The key issue for millions of people in Asia is how to adapt to the uncertainties posed by climate change, across multiple sectors. International attention has largely been focused on mitigating future impacts by reducing greenhouse gas emissions. However, adaptation is now gaining more attention, with an emphasis placed on ensuring access to crucial knowledge through networks and other sharing mechanisms.

In the context of development, the challenge is to understand how planning and decision-making need to change in order to strengthen resilience and reduce climate-related risks. This, in turn, requires extensive knowledge and capacity-building. That is the focus of the Regional Climate Change Adaptation Knowledge Platform (AKP) for Asia, which was launched in 2009 by the Swedish International Development Cooperation Agency (Sida) and several partners, including the Regional Resource Centre for Asia and the Pacific, the United Nations Environment Programme's Regional Office for Asia Pacific, and the Stockholm Environment Institute's Asia Centre.

The AKP is a three-year programme that supports research on climate change adaptation, policy-making, capacity-building and information-sharing for countries in South and Southeast Asia and the Greater Mekong Sub-region. It seeks to facilitate climate change adaptation at the local, national and regional levels, and to strengthen the adaptive capacity of countries within the region by working with existing and emerging networks and initiatives. Key goals include building bridges between current knowledge on climate change adaptation and the governments and agencies that require it; strengthening linkages between adaptation and the sustainable development agenda in the region; and enhancing institutional and research capacity.

The Lao People's Democratic Republic (Lao PDR) is one of 13 countries involved in the AKP. As part of the programme, from September to November 2011, EcoLao conducted a scoping assessment of adaptation issues in Lao PDR using a combination of literature reviews and semi-structured interviews with key stakeholders. The study had the following objectives:

- To assess policies and institutions, including existing climate-related policies, institutional mechanisms and mandates, as well as specific programmes for adaptation and the existing state of knowledge and initiatives related to adaptation;
- To identify research priorities, including key knowledge gaps and key development needs, based on explicit consultation with the intended users of knowledge; and
- To develop a strategy to build adaptive capacity based on a needs assessment that clearly prioritizes 1) the types of capacity to be developed, 2) the stakeholders whose capacity should be built, and 3) the approaches to be taken for optimal results.

Photo Credit: Roengchai Kongmuang

The study included extensive discussions about these issues with stakeholders from government, non-governmental organizations (NGOs) and academia, who shared their own views, priorities and concerns. The findings reported here reflect their insights. Consultations will also remain an important part of the AKP's work in Laos in the future. The documents consulted for this scoping assessment are listed, grouped by sector, in the References section at the end.

2. About Lao PDR

The Lao PDR is a small, landlocked nation at the centre of the Mekong region that is bordered by Thailand, Vietnam, China, Myanmar and Cambodia. In 2010, its population was roughly 6.26 million (Lao Statistics Bureau, 2012), growing at a rate of about 2.2% per year. It is an ethnically diverse country; the 2005 Census found 55% of the population is Lao, 11% Khmou, and 8% Hmong; the remaining 26% is made up of more than 100 smaller ethnic groups. The official language is Lao, but some French, English, Thai and various ethnic languages are also spoken.

Laos is considered a Least Developed Country (LDC); its per capita GDP in 2010 was $1,088 USD, according to official figures (Lao Statistics Bureau, 2012); the World Bank's estimate (using Gross National Income, Atlas method) for 2011 is slightly lower, $1,010, but this is enough to now qualify it as a 'lower-middle-income' economy; with projected economic growth of 7.6 percent per year in 2011-2015, Laos is expected to 'graduate' from LDC status by 2020 (The World Bank, 2012).

Geographically, about 80% of the surface area is mountainous and originally thickly forested, with a few plains and plateaus. The Mekong River forms the country's western boundary with Burma and a large part of the western border with Thailand. Lao PDR has a tropical climate with two distinct seasons: a dry season from mid-October to mid-April, and a rainy season, dominated by the southwest monsoon, with high rainfall, high humidity and high temperatures between mid-April and mid-October. Annual average rainfall is 1,300-3,000 mm, with significant regional variations; temperatures vary considerably, dropping as low as 15°C and below in December/January, and going well above 30°C in March-May. There are three climatic zones:

- The **northern mountains**, with elevations above 1,000 m, have average temperatures under 25°C and average rainfall of 1,500-2,000 mm.
- The **central region** areas are hotter, get 2,500-3,500 mm of rain per year, and are very vulnerable to droughts during the driest months, from January to March.
- The **tropical lowland plains and floodplains** in the south (including the Mekong River Basin) are home to most of the population. Average rainfall is 1,500-2,000 mm, but with major variations, so droughts are common in dry months, while in the rainiest months, September and October, with about 400 mm of rain, floods are common.

Natural disasters are common in Laos – from droughts, to river basin floods, flash floods and storms. From 1970 to 2010, 33 natural hazard events were logged, mostly floods and droughts; they affected almost 9 million people and caused economic damages of over US$400 million. Some areas are particularly exposed: Phongsali, Houaphan, and Louang Namtha are considered 'hotspots' for multiple hazards, including floods, droughts, landslides, and sea-level rise (The World Bank, 2011, p.7). There are also several man-made threats, including floods from the uncoordinated operation of reservoirs, unexploded ordnance (land mines), deforestation, soil erosion, and a lack of access to potable water (CIA, 2012).

Laos' development challenges are many – most notably, limited infrastructure, especially in rural areas. However, the World Bank (2012) notes that over the last half-century, the country has made significant strides, delivering electricity, schools and roads and becoming an energy exporter. Laos, the World Bank finds, 'is on an increasingly sustainable development path' (ibid.). Since 1990, the United Nations Development Programme (UNDP) reports, Lao PDR has improved its Human Development Index by 39%, to 0.524 in 2011, and its global ranking has also gradually risen, to 138th out of 187 in 2011 (UNDP, 2012). While Lao PDR has made significant improvements in several sectors and is on track to achieve some of the Millennium Development Goals (MGDs), it remains off track on others, such as malnutrition (40% of children under 5 are stunted) and measles immunization (The World Bank, 2012). There are also concerns about the country's heavy reliance on overseas development assistance (ODA), with about 70% of its public investment financed by external resources (UNDP, 2012).

The one-party government of Lao PDR began decentralizing control and encouraging private enterprise in 1986, which has led to strong foreign investment in hydropower, mining and construction, and to overall growth of about 6% per year from 1988 to 2008, and more than 7% per year in 2008-2011 (CIA, 2012). The official poverty rate declined from 46% in 1992 to 26% in 2010 (ibid.). Natural resources are central to Laos' economy; hydropower and mining alone produced about one-third of the economic growth between 2005 and 2010 (The World Bank, 2012). Overall, assessments of Laos' economic prospects are optimistic, due both to trends within the country, and the regional outlook.

[1] Information on Laos' climate is drawn from the Global Facility for Disaster Reduction and Recovery's recent country profile (The World Bank, 2011), with some additional content from Inagaki et al. (2011), an AKP report.

3. Climate Change Hazards and Adaptation in Lao PDR

As noted above, Laos has a naturally variable climate in which disasters are common, and in recent decades, the hazards have increased. Average temperatures rose by 0.1-0.3°C per decade between 1951 and 2000, with a record average temperature of 30°C in 1998; that year was also the driest on record, with rainfall averaging only 800 mm across Lao PDR (The World Bank, 2011). Overall, rainfall decreased between 1961 and 1998, while the number of droughts and floods has increased (ibid.).

Population trends have exacerbated disaster risks. In 1990, the population of Lao PDR was 4.2 million (per World Bank data); by 2010, as previously noted, it had surpassed 6.2 million. Although the birth rate has sharply declined, from 42 to 23 births per 1,000, the population is still growing rapidly at 2.2% per year as of 2010, per official statistics. Given that most of the landscape is forested and mountainous, this means there will be increased population pressure both on urban areas and on marginal land, much of it exposed to flooding, erosion or landslides. In addition, much of the expansion of agriculture has been at the expense of the forests that protect the hillsides and watersheds. Furthermore, the country's road network expansion, while important, has also aggravated the risk of landslides. Meanwhile, due to widespread degradation of catchment areas, floods in recent years have tended to become more severe. All of these factors mean that even in the absence of climate change, the people of Laos would be quite significantly exposed to environmental hazards.

Climate change projections

A recent AKP review (Inagaki et al., 2011) that draws on Asia-specific projections in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (Cruz et al., 2007) and other research summarizes the expected climate change impacts in Lao PDR thus:

- Annual mean temperatures will continue to rise by 0.1-0.3°C per decade, and the number of days with temperatures above 33°C will increase;
- The number of cooler days with temperatures below 15°C will drop by two to three weeks per year;
- Dry seasons will get longer;
- There will be more intense rainfall events, and more frequent and severe droughts and floods; and,
- Maximum monthly flows in the Mekong Basin will increase by 35-41%, while minimum monthly flows will drop by 17-24% by 2100, further exacerbating flood and drought risks.

Photo Credit: Roengchai Kongmuang

A country profile by the Global Facility for Disaster Reduction and Recovery (GFDRR), meanwhile, notes that country-specific data are very limited, and for Lao PDR, which has such distinct climatic zones, it is even more difficult to extrapolate from regional models, which also differ amongst themselves (The World Bank, 2011). The review finds that mean average temperatures are projected to increase by 1.4°C – 4.3°C by 2100. The models differ on whether warming will also be similar across all of Laos' regions, or less pronounced in the south than in the north and north-central zones. Mean annual rainfall is projected to increase, particularly in the wet season. More wet days are also expected across the southern Mekong River Basin. All models, this review finds, project an increase in the magnitude and frequency of extreme events.

For a country that is already hard-hit by extreme weather, this means climate change is likely to make a bad situation worse. Food security is expected to decrease as agriculture – especially rice production – is affected by rising temperatures and shifts in rainfall, evaporation, run-off water, and soil moisture (The World Bank, 2011). An estimated 188,000 households in Lao PDR are at risk of food insecurity caused by drought, and with climate change, droughts are expected to become longer and more severe. The agricultural lands along the Mekong River and its tributaries, meanwhile, are expected to be harder-hit by floods, which have already destroyed vast areas of rice paddy in recent years. The risk of epidemics could also increase: in the past four decades, Laos has experienced eight epidemics, including a cholera outbreak in 1994 that killed 500 people and affected 8,000; these epidemics are associated with floods and droughts. Rising temperatures will increase the incidence and range of pests and, and water supplies may be affected. Disasters and increased poverty, in turn, could lead to increased migration and displacement.

Box 1 : Key terms

Climate change is a measurable change in climate – in either its mean and/or its variability – that persists for an extended period, typically decades or longer. The IPCC definition includes changes due to either natural internal processes or external factors, including human changes to the composition of the atmosphere or in land use. The UNFCCC definition is narrower, referring only to change 'attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability'.

Adaptation is an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory (or proactive) adaptation; autonomous (spontaneous) adaptation; and planned adaptation (due to deliberate choices or policy decisions).

Adaptive capacity is the ability of people or systems to adjust (adapt) to climate change. It can be affected by a wide range of socio-economic, institutional, cultural and other factors.

Vulnerability is the degree to which a person, community or system is susceptible to, and unable to cope with, adverse effects of climate change – either long-term effects, or individual hazards, such as natural disasters. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Sensitivity is the degree to which a person, community or system is affected, negatively or positively, by climate variability or change. The effect may be direct (e.g. a change in crop yield in response to a temperature change) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to sea-level rise).

Resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

Source: Adapted from the IPCC Fourth Assessment Report glossaries, available at http://www.ipcc.ch/publications_and_data/publications_and_data_glossary.shtml#.T_4U6fVQSwF.

Photo Credit: Roengchai Kongmuang

How well can Lao PDR adapt to climate change?

How different societies fare in dealing with a changing climate has as much to do with political, social, and economic factors as it does with the physical manifestations of the change in weather patterns. Box 1 explains key terms used in assessing climate impacts and people's ability to respond to them. As noted above, Lao PDR has high exposure to climate change impacts, and it also has high sensitivity to those impacts: the majority of its population lives in the most disaster-prone areas, climate impacts directly affect food security, and although agriculture's share of the GDP has sharply declined (from 61% in 1990 to 33% in 2010, per World Bank data), it is still a critical economic sector. Furthermore, despite the major strides made in recent decades, Laos still has a fairly low level of socio-economic development, which undermines its adaptive capacity (The World Bank, 2011, p.7).

If we wish to improve Lao PDR's resilience and adaptive capacity, it is imperative to recognize what makes a community 'climate-fit' and how to improve the resilience of 'climate-weak' populations. Geography is an important consideration; the challenges are inherently greater in places that are more exposed to disasters such as drought, floods, landslides or typhoons, and in areas with many endemic diseases. However, the strength of a society is also crucial: the people's resilience, ingenuity, and flexibility, as well as the quality of governance.

Effective governance is essential to enhancing a society's climate fitness. This includes removing the barriers that prevent people and communities from improving their own lives and overcoming caste, income and ethnic inequalities, and enabling them to legally secure permanent access to land and resources. In recent years, the National Assembly has commenced a suite of measures concerning various aspects of governance considered to be essential prerequisites to relieving poverty and building adaptive capacity. These include: decentralizing the administrative apparatus; strengthening of the rule of law; introducing peri-urban land titling and the improvement of the tax collection system; land allocation and registration in rural areas; revision of the system for issuing land concessions to the private sector; anti-corruption measures; and raising the salaries of government personnel.

Sustainable practices can also greatly increase a community's resilience. Communities that are self-reliant and live within the limits of their available resources will be better able to withstand any changes. Roughly 80% of the people living in Lao PDR are subsistence farmers and fishermen, supplementing their cultivated harvest with naturally occurring food items that, until recently, were abundant in nearby forests and streams. Villagers traditionally collect nearly everything, ranging from construction materials to fibres and fuel, medicines and food such as insects, herbs, fruit, nuts and edible fungi from the forests. Meanwhile, the Mekong River and its many tributaries and wetlands provide an abundant source of aquatic protein. If rural communities had continued to live this way, Laos would probably be better able to cope with the impacts of climate change autonomously. However, population growth, environmental degradation, and an overall increase in resource consumption (associated with recent rapid economic growth) have all undermined the country's climate fitness, and will make it even more vulnerable if these trends continue.

Additional recommended measures

There are several additional measures that could help reduce Lao PDR's vulnerability to the impacts of climate change, particularly from extreme weather and disasters.

Floods

An important first step is to compile accurate maps of flood-prone areas to prioritize preventative or remedial actions. Forest and river catchment areas in particular should be protected, with special attention to maintaining deep-rooted trees on steep hillsides. As infrastructure is built, efforts should also be made to avoid blocking natural waterways, and new structures should be built to divert flood waters harmlessly through irrigation schemes. Dwellings that are in hazardous zones should be strengthened or relocated, and buildings and agricultural infrastructure should be retrofitted as needed to withstand floods. Crops and crop varieties to be planted in flood-prone areas should be selected to ensure they can tolerate immersion in water.

In the event of a flood, reserve stocks of food, fodder and drinking water should be set up close to, but not directly in, flood-prone locations. Arrangements should be made to remove livestock to higher ground during high rainfall events, and there should be reserve stocks of seeds for replanting crops that are damaged by floods during the early growing season. In addition, there is a need for flood-risk insurance schemes, possibly in association with community-level microfinance schemes.

As previously noted, not all floods in Lao PDR are natural disasters; there are also frequent floods due to the uncoordinated operation of reservoirs and cascades. This problem needs to be corrected. The operational rules of each large dam should be reviewed, taking into account changes in catchment characteristics and climate forecasts to prevent flooding. Economic analyses should also be conducted for each hydropower and irrigation scheme, giving equal weighting to the potential social, environmental and/or economic impacts downstream of electricity production. Finally, governmental river basin organizations should be strengthened, enabling them to plan and supervise the management and operation of multi-enterprise cascades.

Other useful measures to reduce flood impacts include establishing community plantations that produce trees for use in low-cost local human and livestock housing, fencing and boat-building; installing community radio and cell-phone-based early warning systems in flood-prone rural areas; improving farming techniques; and improving land-use management.

Photo Credit: Roengchai Kongmuang

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Droughts

Several measures could help reduce the impact of droughts on agriculture and food security. Crops and varieties should be selected that can tolerate periods of drought during the growing season, and new drought-tolerant crops from drier zones of Southeast and South Asia should be introduced. As with floods, reserve stocks of seeds should be established for replanting crops which fail to germinate due to an early drought. There should also be drought-risk insurance and microfinance schemes.

In addition, well-designed, well-built lowland irrigation systems should be installed, and existing systems should be upgraded, with raised main canals, gate-served secondary, tertiary and quaternary distributaries and drainage systems. 'Water harvesting' systems (terraces, gully stops, farm tanks and ponds, foot-slope ditches, bunds, etc.) can also be extended to upland farming areas, to provide supplementary water for crops during droughts.

Forest fires

Droughts and rising temperatures are likely to increase the risk of forest fires. Thus it is important to raise public awareness of the dangers of uncontrolled burning in terms of watershed damage, air pollution, forest quality and regeneration. This can be achieved through the mass media (including ethnic language radio) and through enhanced school curricula. The government should also make it illegal to burn grasslands, and it should compel those who burn clearings for agricultural purposes to clear perimeter fire-breaks before burning, to burn only in the late afternoons, and to organize a community team of fire-fighters to control any fires that may escape. In addition, each village should set up a water supply that is readily available to fight any fire that may threaten residences or rice barns.

Other major risks

Land degradation, the increased use of marginal lands, and the impacts of floods and droughts could all increase the risk of landslides. To identify the most exposed areas, a watershed-by-watershed landslide risk map should be produced by combining GIS overlays for slope and forest cover. In addition, province-level roadside landslide risk maps should be produced, combining satellite imagery with visual observations made while traversing each road route; these maps can also be used for prioritizing and budgeting for slope stabilization.

Finally, a warmer climate threatens to extend the habitats of mosquitoes harbouring malaria, dengue fever and viral hepatitis. Therefore, it is crucial to reinforce the ongoing campaign to popularize the use of insecticide-treated bed nets, and to intensify the campaign to eradicate mosquito breeding sites.

Photo Credit: Roengchai Kongmuang

4. Institutions and Policies Review: Agriculture and Forestry

The main goal of adaptation measures in agriculture is to ensure the continued production of food and other products for domestic consumption. The focus with forestry, meanwhile, tends to be on the climate change mitigation value of forest conservation and reforestation, but there is also a strongly held view that rural communities' resilience depends heavily on free or low-cost access to both timber and non-timber forest products for dietary supplementation, as well as their use for fuel and house- and boat-building. In addition, forestry is an important component of watershed management that can contribute to adaptation via the regulation of water flows – plus forests and deep-rooted trees can reduce flash flood and landslide hazards.

Relevant institutions and their mandates

Representatives of the following institutions were interviewed for this scoping study:

National Agricultural and Forestry Research Institute (NAFRI)

Established in 1999 under Laos' Ministry of Agriculture and Forestry, NAFRI is mandated to undertake research for development (applied research) on rice and other cash crops, livestock, fisheries, forestry, agricultural land, and related topics, and to provide information services. NAFRI is involved in several donor/lender-supported research projects on climate change adaptation:

- Developing multi-scale climate change adaptation strategies for farming communities in Cambodia, Laos, Bangladesh and India (with several partners); this project aims to help policy-makers deliver more effective climate adaptation programmes relevant to farmer livelihoods and food security. At the same time the project will help to build capacity of farming households in Savannakhet and Champasak provinces of Lao PDR, enabling them to adapt their rice-based cropping systems to accommodate climate variability and climate change.
- Improving the resilience of the agriculture sector in Lao PDR to climate change impacts, with UNDP and the Global Environmental Facility (GEF).
- Improving the resilience of the agriculture sector in Lao PDR to climate change impacts, a follow-up to Laos' National Adaptation Programme of Action (NAPA), is funded by UNDP/GEF and implemented by NAFRI. The project objective is to minimize food insecurity resulting from climate change in Lao PDR and reduce vulnerability of farmers to extreme flooding and drought events. It aims to improve resilience by 1) strengthening the knowledge base on climate change and impacts in Lao PDR, specifically as it relates to agricultural production, food security and vulnerability; 2) capacity-building among sectoral planners at the national, provincial, and district levels; 3) demonstrating community-based adaptive agricultural practices and off-farm income generating opportunities in two provinces (Savannakhet and Xayaboury) and four districts; and 4) adaptation learning and monitoring to ensure that lessons learned benefit the local population and are reflected in national policies and international climate change adaptation efforts.

The International Centre for Tropical Agriculture (CIAT)

CIAT has a research group based on the NAFRI campus in Vientiane. CIAT's mission is to reduce hunger and poverty, and improve human health in the tropics through research aimed at increasing the eco-efficiency of agriculture. This includes topics such as the provision of feed for livestock, cassava production, linking farmers to markets, and cross-cutting issues such as land management and soil and land-use research. CIAT is also the lead centre of the CGIAR Global Research Program on Climate Change, Agriculture and Food Security (CCAFS). Some improved technologies are already available, such as hardier crop varieties and more efficient ways to manage water, trees, soils, livestock, fish, and forests, which can all make significant contributions to adaptation.

In 2010, CIAT published the results of its study on the potential impacts of climate change on land use in Lao PDR, which assessed the bioclimatic suitability of 17 crops/trees against the current and anticipated 2050 climate scenario. Current crop suitability matches current cropping patterns for most, but not all crops. The change in bioclimatic suitability for the predicted 2050 climate was positive for some crops (sugarcane, cassava, rubber, banana, teak, and paddy rice), negative for some crops (maize, soybean, chilli, common bean, sweet corn, Arabica coffee, jatropha, and eucalyptus), unchanged for some crops (peanuts and upland rice), and positive and negative in different parts of the country for crops such as Robusta coffee. Notably, the study found no evidence that climate change has directly affected land use in Lao PDR so far, and concludes that it is unlikely to play a major role in land-use changes going forward.

Department of Planning, Ministry of Agriculture and Forestry (MAF)

Through its Centre for Statistics and Information, the Department of Planning monitors and evaluates programmes and projects in the agricultural and forestry sectors. It also hosts several multi-disciplinary rural development projects funded by external donors or lenders, including the Asian Development Bank, the European Commission, and the Food and Agriculture Organization of the United Nations (FAO), among others.

Although these projects are not adaptation projects per se, they focus on building the overall resilience of rural communities and the agriculture and natural resources sectors, which should also help with future climate change impacts.

Faculty of Forestry, National University of Laos

The Faculty of Forestry is mandated to develop and apply tertiary-level curricula in all aspects of forestry. Some joint research is conducted in connection with foreign assistance projects, usually in collaboration with NAFRI. A new Research Centre for Natural Resource Management and Climate Change has been created in the Faculty of Forestry. Currently, the limited climate change activities in the Faculty have been focused on mitigation, and REDD in particular.[2] However, aspects of climate change adaptation as it relates to watershed management and land-use planning are relevant to the Faculty, as it provides teaching and training in these areas. Climate change issues are gradually being introduced into the teaching curriculum, and one Faculty member is a member of the government's Agriculture and Forestry Technical Working group on climate change.

Food and Agriculture Organization of the United Nations (FAO)

FAO has a programme on 'climate-smart' agriculture, which focuses on the linkages between climate change and food security, and opportunities to transform the agricultural sector towards climate-smart systems that address both of these. In Lao PDR, FAO coordinates the project 'Linking Information and Decision-Making to Improve Food Security'. One component of the project works towards improving understanding and analysis of climate information, as well as the potential climate change impacts on agriculture, food security and livelihoods. The goal is to foster a better understanding of seasonal agricultural disaster risks and those associated with climate change.

Other key agriculture and forestry institutions that were not interviewed for this scoping include:

Department of Irrigation (DoI), MAF

The DoI designs and supervises the construction of all large irrigation systems nationwide. It also signs and supervises contracts with the private sector for the construction and rehabilitation of both diversion and pumped irrigation systems. This would be the key national agency for flood-proofing or upgrading and expanding irrigation infrastructure in response to climate change impacts.

The DoI is involved in a new project, 'Mainstreaming disaster and climate risk into investment decisions' (2012-2015), which is being implemented with the Ministry of Planning and Investment as the lead agency. The objective of the project is to strengthen the national government's capacity to mainstream disaster risk management and climate change adaptation into public infrastructure investments, with a certain focus on the irrigation sector. More details about this project can be found in section 11. The DoI will also be implementing a component of the new project 'Mekong Integrated Water Resources Management' that addresses irrigation, and has a focus on climate change impacts. More details about this project can be found in section 5.

National Agriculture and Forestry Extension Service (NAFES), MAF

Established in 2001, NAFES is responsible for the extension of information to the farming community via the Provincial and District Agriculture and Forestry Offices. It is also involved in implementing a component of the NAFRI project 'Improving the resilience of the agriculture sector in Lao PDR to climate change impacts', described previously.

[2] REDD is the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. The basic idea is to reward governments, companies or forest owners for keeping their forests intact instead of cutting them down. To learn more, visit http://www.un-redd.org.

Photo Credit: Roengchai Kongmuang

Department of Forestry (DoF), MAF

This department is mainly responsible for the management of forests and plantations; it also focuses on aspects of climate change mitigation through REDD. The potential availability of REDD funding has led the Laotian government to pay more attention to aspects of land tenure and community forestry. Apart from producing important timber, non-timber, food and non-food products, forests absorb carbon dioxide, conserve biodiversity and maintain watershed integrity, thereby helping protect against natural disasters (flash floods, landslides, etc.). The solution to Lao PDR's reforestation and conservation issues lies with invoking the full participation of local communities as well as reinforcing their rights over forest land and resources. With secure rights and adequate incentives, local communities have proven in many places to be capable stewards of their forests, benefiting both the environment and society at large.

Department of Livestock & Fisheries (DLF), MAF

The main activities of DLF with respect to adaptation are improving large livestock nutrition and health, and enabling the animals to be more resistant to extremes of heat and cold; and promoting small livestock production, as well as promoting aquaculture in areas unable to take part in wild fish capture activities.

The DLF will be implementing a component of the new project 'Mekong Integrated Water Resources Management' which addresses fisheries management, and has a certain focus on climate change impacts. More details about this project can be found in section 5.

Provincial and district agricultural and forestry offices

The provincial offices house the technical expertise, while the district offices serve as the links between the national government and rural communities. However, limited technical skills coupled with low salaries (and in turn, a motivational barrier) have been reported as potential obstacles in achieving the effective transfer of adaptation and other relevant knowledge.

Vocational agricultural and forestry colleges

These institutions provide new recruits for the provincial and district offices. At present, climate change is not included in their curricula. However, a new project funded by the German Agency for International Cooperation (GIZ), 'Climate change awareness and environmental education' (2011-2014), aims to change this through education and training in cooperation with vocational training schools. These schools could also provide in-service training on climate change topics to provincial and district office staff.

World Food Programme (WFP)

The WFP Lao PDR Country Strategy for 2011-2015 focuses on under-nutrition and its debilitating impacts on human potential and national development. The specific priorities are preventing and reducing wasting,[3] reducing stunting, and reducing micronutrient deficiencies. Wasting results from a combination of inadequate food intake and disease. In the Lao context, severe decreases in food intake usually result from natural disasters. Storms, floods, droughts and pests can lead to extensive damage to crops. As a result, many households affected by natural disasters do not have adequate food to meet their needs through the next harvest. The high burden of diseases such as diarrhoea, especially in the rainy season, exacerbates the problem. This combination can lead to high spikes in the rate of acute malnutrition. The increased frequency of disasters due to climate change could exacerbate this life-threatening problem.

[3] The medical term 'wasting', or 'acute malnutrition' is the process and/or debilitating disease whereby muscles and fat tissues 'waste' away.

Current state of knowledge on adaptation

There is a general consensus within the agencies of the Ministry of Agriculture and Forestry (MAF), that adaptation should be concerned primarily with diversifying and selecting crop and plantation varieties that can adapt to extremes of temperature and water availability (floods and droughts), and shifts in seasonal cycles. In addition, the livelihoods of the rural people should be enhanced, so that they can be more resilient to climate-induced stresses.

Photo Credit: Roengchai Kongmuang

Most of the pertinent tactical knowledge does not lie in the government community, or even in the donor community; rather, it lies in the villages and the NGO community. Therefore, it is often scattered amongst scores of small projects and missions throughout the region. Throughout Lao PDR and its neighbours, numerous NGOs are introducing drought- and heat- or cold-tolerant, high-protein food crops, as well as orchard and plantation crops capable of adapting to different climates. They are also procuring and demonstrating European-style hand tools for expediting terracing, and for easy handling of crop and animal wastes for composting instead of burning. With the ongoing proliferation of online knowledge-sharing platforms, this information is becoming much more accessible, particularly to younger government officials.

The NGO community and some donor/lender-supported agricultural and community development projects advocate a mix of socially responsive participatory measures to promote the appropriate technical tactics to rural communities. These are primarily aimed at improving livelihoods and enhancing food security; building resilience to climate change is generally regarded as an auxiliary outcome.

Following moves to improve the salaries of governmental extension and development workers, there is now hope that technical knowledge can be shared with Lao PDR's rural communities through the National Agriculture and Forestry Extension Service and provincial and district agricultural and forestry offices network via strategic participatory methodologies promoted by NGOs and community based organizations. Examples include 'farmer field schools', overseen by the NGO World Concern and the FAO, which have had widespread impact in the dry and mountainous zones of Myanmar. Other examples include "community learning centres", which have been influential in Northeast Thailand in mainstreaming sustainable agricultural practices that can improve rural communities' resilience to climate change.

Key agriculture and forestry development needs

Several additional measures involving agriculture and forestry could help improve climate resilience across Lao PDR:

- Reforestation/forest conservation of all lands with an incline greater than 45%;
- Conservation of biodiversity on at least 10% of all forested land in each village territory, plus critical habitats on lower slopes;
- Piloting of Nucleus Estates and Smallholders[4] frameworks for expansion of fast-growing plantation forestry concessions in shifting cultivation communities;
- Contouring/terracing of all cropland with slope of 5% to 25% for soil conservation and water harvesting;
- Confinement of livestock to fenced grazing and cut-and-carry land; and
- Improvement of irrigation systems to facilitate dry-season cropping and prevent salinization.

The main priority is for community forestry to move beyond forest regeneration and protection alone, to incorporate the sustainable use of forest resources, not only for subsistence purposes, but also for domestic and international markets. Community forestry can help slow and even reverse deforestation. Constrained by restrictive regulatory frameworks and contradictory policies, local people are often denied the opportunity to help plan and sustainably manage their forests.

[4] This refers to a crop development scheme wherein a large part of the landscape is set up as a nucleus estate surrounded by several small holdings known as the 'plasma'. For more discussion, see Cramb, R. A. and P. S. Sujang (2012) 'Pathways through the Plantation: Oil Palm Smallholders and Livelihood Strategies in Sarawak, Malaysia'. http://ageconsearch.umn.edu/bitstream/124277/2/2012AC%20Cramb%20CP.pdf.

Research priorities

There is a need for assessments of community-level adaptation as it is occurring, as well as for more research into developing integrated land use systems and farming systems with greater resilience to climate variability and climate change. In order to develop adaptation measures for agriculture and forestry that are likely to be adopted by the various ethnic groups within Lao PDR, 'action research' is required that combines technical work to select and introduce more climate-resilient crops with sociological research to identify the most appropriate ways to introduce these measures at the community level. In particular, there is a need for more research on community forestry, including sustainable use of forests and enterprise development and more practical and applied research. Communities should also be engaged and compensated for their contributions to this research.

There is also plenty of scope for further research aimed at developing new and more effective agronomic solutions, guided by a better understanding of climate change and its impacts. The modelling of climate change and bioclimatic suitability of agro-forestry species and enterprises to a changing climate are other important topics.

Legal and policy issues

Experiences in Africa, China and Vietnam indicate that 'farmer-managed reforestation' is the most effective way of achieving reforestation and conservation objectives. This requires an enabling policy environment that allows farmers to own the land upon which the trees are planted, or at the very least, to own the trees. To encourage the planting of valuable, slow-growing species, inheritance rights should also be a part of the policy package.

In addition, environmental laws and regulations should be modified so that it becomes an offence to:

- Remove a native tree without ensuring that it is replaced with two saplings of the same species;
- Cultivate sloping farmland without ensuring that erosion-control measures are installed; and
- Light fires without ensuring that adequate fire-breaks are in place beforehand.

Asia-wide, many governments are now realizing the multiple contributions that forests can make to the economy; this should be reflected in national development plans. Governments must emphasize the importance of community forestry in regional initiatives that deal not only with climate change, but also with natural disasters, the Millennium Development Goals (MGDs), world trade, devolved governance and the recognition of the rights of minorities and indigenous people.

Photo Credit: Roengchai Kongmuang

5. Institutions and Policies Review: Natural Resources Sector

Relevant institutions and their mandates

Representatives of the following institutions were interviewed for this scoping study:

Ministry of Natural Resources & Environment (MoNRE)

MoNRE was created in 2011 to centralize the management of natural resources in order to better protect the environment and ensure sustainable development. It was formed by merging the Water Resources and Environment Authority, the National Land Management Authority (NLMA), and several portfolios from other ministries including forestry management and protection, disaster management, and geology. MoNRE focuses on the management, monitoring and assessment of the use of natural resources, and the contribution they make towards poverty reduction and economic growth in Lao PDR. The NLMA, which has become two MoNRE departments, is engaged in land surveying, mapping, allocation, and certification; it also determines and collects land taxes. As populations with insecure land rights and/or food supply are often more vulnerable to climatic impacts, NLMA has a prominent role to play in adaptation within Lao PDR. Other important issues concerning land management involve biodiversity and conservation, such as who has the rights to occupy land and access its botanical and zoological resources.

Several MoNRE departments and their activities related to adaptation are described in subsequent sections. It is also important to note that MoNRE is the lead implementing agency for the Lao PDR national activities in the new project 'Mekong Integrated Water Resources Management' (2012-2017), supported by the World Bank. The project has some focus on climate change impacts for water resources, particularly flood and drought events.

International Union for Conservation of Nature (IUCN), Lao PDR Country Office

Photo Credit: Roengchai Kongmuang

IUCN is the world's oldest and largest global environmental network. It is a democratic membership union with more than 1,000 government and NGO member organizations, and almost 11,000 volunteer scientists in more than 160 countries. Its mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

Within the area of adaptation in Lao PDR, IUCN is focusing on 'ecosystem-based adaptation', an approach that integrates biodiversity and ecosystem services in adaptation strategies as a key way of building resilience. The sustainable management, conservation, and restoration of ecosystems is seen as a way to preserve vital ecosystem services (such as air and water purification, pollination, natural flood barriers, etc.) and thus make people more resilient, while protecting the ecosystems themselves. This approach can generate significant social, economic and cultural co-benefits, contribute to the conservation of biodiversity, and build on the traditional knowledge and practices of indigenous peoples and local communities, including the important role of women as custodians of local knowledge.

IUCN is developing a project, to be funded by the GEF/UNDP, on 'Effective governance for small scale rural infrastructure and disaster preparedness in a changing climate', which has a partial focus on ecosystem-based adaptation, particularly in relation to watershed management.

Current state of knowledge on adaptation

There is a widespread sense that a great deal of traditional knowledge that could help the people of Laos adapt to climate change and increased climate variability has been lost and needs to be restored. New livelihood modalities are more vulnerable to climate impacts; population growth has pushed agricultural activity into marginal lands, and more and more houses have been built in flood- or landslide-prone areas.

Also, as noted in the previous section, the existing knowledge is scattered. In some cases, farmers at the community level know more about appropriate adaptation tactics than the provincial and national government staff. In other cases, the requisite knowledge is in the hands of a few internationally educated specialists, but has not spread across the various layers of government. Private-sector individuals (e.g. construction engineers, plantation operators) may also be more technically aware and experienced in terms of infrastructure integrity and social or environmental compliance than the government officials assigned to regulate their activities.

All this has resulted in numerous infrastructure projects being allowed to proceed with inadequate provision for community resettlement and livelihood support – which, in turn, increases communities' vulnerability to climate impacts (especially disasters). MoNRE staff therefore requires training in the planning of resettlement design and the land development measures necessary to support the livelihoods of communities displaced by infrastructure projects.

Photo Credit: Roengchai Kongmuang

Irrigation schemes also require more regulatory attention. Many of the existing irrigation schemes are poorly designed and constructed, are unable to supply water efficiently, and are unable to resist flooding without damage.

Regarding biodiversity management, the following aspects require attention:

- Integrating knowledge on existing local-level coping strategies and local know-how into provincial and district plans, to then be integrated into national strategies;
- Upgrading knowledge of effective budgeting procedures and how to identify climate-induced risks;
- Overcoming the lack of centralized information concerning activities in the provinces (many projects do not produce progress reports);
- Addressing the lack of information regarding state and provincial planning concerning private sector land concessions;
- Making data and information from donor-assisted projects available at a single centralized location, including comprehensive information on planned projects; and
- Making all data easily accessible by interested organizations and the public.

Key development needs

Due to the substantial flow of foreign direct investment in recent years, Lao PDR is currently experiencing a 'patchwork' pattern of development, with more progress in some sectors than in others. For example, the transportation network cannot keep up with demand for new feeder roads and maintenance of existing routes. Meanwhile, Lao PDR's family planning programme, rural primary education and health services are not meeting their targets. These factors have potentially negative implications for rural adaptive capacity. To address this problem, a comprehensive country-wide development gaps analysis is required, based on geospatial planning that takes into account the capability of each category of landscape to sustainably support the target population. The analysis should also identify and quantify what infrastructure and services are needed to enable the population to follow safe and secure livelihoods, together with the associated costs.

Over the past few decades, the bulk of biodiversity-oriented foreign funding has gone into exploration and research devoted to the discovering and documenting of rare and threatened wildlife, or policing to reduce poaching. However, the fact is that many rural communities living in the vicinity of biodiversity conservation areas have become impoverished, and the required developments to reduce people's dependence on natural resources have often been overlooked, as most wildlife specialists have little knowledge of, or interest in, agriculture. In these cases, development finances could perhaps be sourced from international payments for ecological services (PES) funds or, alternatively, from other existing sources of funds, whether governmental or quasi-governmental, such as the Poverty Relief Fund, the Environment Fund, or the Reforestation Fund.

Research priorities

There is a need for more Laos-specific information on projected climate change impacts, especially as they may differ from the climatic variations experienced so far. In addition, there is a need for a viable methodology to ensure that Lao PDR can make the most of opportunities to attract PES and REDD-related financing. As funds become available for remunerating rural communities for their participation in reforestation/biodiversity conservation schemes, it is crucial to ensure that livelihood support funds actually reach the hands of the villagers who are in direct daily contact with the trees and wildlife. This not only provides incentives to protect biodiversity, but also strengthens adaptive capacity.

Another mechanism to be examined is whether to authorize the private sector and/or NGOs and foundations to lease tracts of protected forest for conservation (and possibly eco-tourism) purposes.

Legal and policy issues

The national government has set a goal of bringing all households over the poverty line by 2015, and to meet UN Millennium Development Goals and enable the country to emerge from its Least Developed Country (LDC) status by 2020. This is directly relevant to natural resources and climate change adaptation in that there are two competing visions for development in Lao PDR, with very different implications. The 'old school of thought' favours maximizing industrialization, including the industrialization of agriculture by converting smallholder farms to mechanised estates. There is also a push to maximize the construction of hydropower schemes to convert Laos into the 'battery of Asia'. On the other hand, some of the younger generation give greater priority to sustainability and social, ecological and environmental issues. It is significant that China, a major foreign investor, has recently seen some of its senior economists cautioning against growth-oriented development with only GDP maximization in mind.

6. Institutions and Policies Review: Water Resources Sector

Relevant institutions and their mandates

Representatives of the following institutions were interviewed for this scoping study:

Department of Water Resources (DWR), Ministry of Natural Resources & Environment (MoNRE)

Photo Credit: Roengchai Kongmuang

DWR is responsible for the planning, management, conservation, and development of national water resources, including surface water and groundwater. It also tracks the quantity and quality of the water in rivers, streams, ponds and wetlands, as well as the aquatic life and mineral resources in the water. DWR is also responsible for integrated river basin management and the issues of each river basin such as flood, drought, and the impacts of climate change on water resources. The mission of DWR is to ensure sustainable development and management of water resources, and to minimize negative impacts on water resources, the broader environment and society.

DWR is a key implementing agency for the National Integrated Water Resource Management Support Project (2011-2015), supported by the Asian Development Bank, which aims to establish IWRM practices within Laos. IWRM promotes the coordinated development and management of water, land and related resources, in order to maximize economic and social welfare and promote equity while protecting vital ecosystems.[5] IWRM and integrated river basin management are considered crucial to mainstreaming adaptation into natural resource management generally in Lao PDR, and to fostering adaptation within the water sector in particular. The project will help MoNRE and DWR identify entry points for mainstreaming climate change concerns in water resources planning and management at both the policy and operational levels.

[5] For a more detailed explanation of IWRM, see Global Water Partnership, 'What is IWRM?' http://www.gwp.org/The-Challenge/What-is-IWRM/.

International Water Management Institute (IWMI) – Southeast Asia Regional Office

IWMI, which has its regional office at NAFRI, is one of 15 international research centres collectively known as the Consultative Group on International Agricultural Research (CGIAR).[6] IWMI targets water and land management challenges faced by poor communities in developing countries and through this contributes towards the achievement of the MDGs of reducing poverty, hunger and maintaining a sustainable environment. IWMI's mission in Southeast Asia is to improve the productivity of water and land resources in the region's river basins for sustainable livelihoods, food and environmental security.

IWMI's activities in Southeast Asia are diverse and include research into climate change and other social, economic and environmental factors which, combined, 'will have impacts which will be comparable to, or greater than, the direct effects of climate change', according to IWMI's regional brochure.[7] IWMI has been engaged in the following climate-related studies:

- Adaptation options to reduce the vulnerability of Mekong water resources, food security and the environment to impacts of development and climate change, with the Mekong River Commission (see below) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO);
- Studies for livelihood improvement with water storage infrastructure;
- Developing research options to mainstream climate adaptation into farming systems in Cambodia, Laos, Bangladesh and India, collaborating with CSIRO, with a focus on Savannakhet in Lao PDR;
- Exploring Mekong region futures - sharing water in Northern Lao PDR with a focus on Nam Ngum Basin with MoNRE and CSIRO/AusAID;
- Improving the productivity of degraded agricultural production systems in Lao PDR in the face of increased climate change/variability: the potential role of soil based interventions in increasing productivity and enhancing carbon sequestration with experiments in Vientiane plain; and,
- Managing water in rain-fed agriculture for food security in the Greater Mekong Sub-region, funded by Sida.

Other key water resources institutions that were not interviewed for this scoping include:

Lao National Mekong Committee (LNMC)

This committee acts as an advisory body to the national government, serves as a liaison between the Mekong River Commission (including member and dialogue partner countries) and the government, and coordinates MRC-related activities at the national level. The Department of Water Resources serves as the Secretariat of the LNMC. The LNMC collaborates with the MRC in its adaptation activities in Lao PDR.

Mekong River Commission (MRC)

The MRC is an intergovernmental body responsible for cooperation on the sustainable management and development of water and related resources of the Lower Mekong Basin countries by implementing strategic programmes and activities and providing scientific information and policy advice. The MRC is governed by its four member countries: Cambodia, Lao PDR, Thailand and Vietnam.

The Mekong River Commission also works to determine, with greater certainty, the impacts of climate change on the region, and how countries can better adapt to these changes. Its Climate Change and Adaptation Initiative (CCAI) is a collaborative effort among MRC member countries to demonstrate and share adaptation strategies. With its emphasis on a basin-wide approach, the CCAI ensures that climate change adaptation is harmonized with effective strategies and plans at various levels, and is applied at priority locations throughout the basin. The initiative it is described in more detail later.

Current state of knowledge regarding adaptation

Knowledge of climate change impacts and adaptation in the water resources sector is strong within IWMI and the MRC, but is still quite limited in the national-level institutions, the DWR and the LNMC. A key knowledge gap is that although there have been theoretical training courses, they have not been followed up with practical applications, particularly with regard to water resource management methodology.

[6] IWMI has a substantive Southeast Asia-specific website, http://sea.iwmi.org/.

[7] See http://sea.iwmi.org/Data/Sites/14/Documents/pdfs/iwmi_south_east_asia_brochure.pdf.

Key development needs

In Lao PDR, the people most vulnerable to stresses and disasters induced by climatic extremes are those who live in rural areas and depend on agriculture and natural resources for their livelihoods. Due to continued population growth and the government's policy of resettling people out of the hills into the lowlands has led to more people living in flood- and landslide-prone areas than ever before. There is a need to relocate human settlements away from riverbanks and flood-prone areas, and to redesign and retrofit buildings to be flood- and typhoon-proof. As previously noted, reforestation of hillsides and soil conservation measures on sloping arable lands would help reduce landslides.

Water harvesting structures and irrigation schemes must also be upgraded and expanded. Many existing irrigation systems are inefficient; therefore, there is a need to refine the basin-wide irrigation systems database to incorporate information not only on location but also on type of diversion works, type of distribution and drainage systems, water availability, service area and user population.

Furthermore, inadequately planned urbanization and industrialization around Vientiane and large riverside towns downstream threaten to exacerbate peri-urban flooding as natural waterways become constricted. In addition to mapping areas prone to floods, landslides and droughts (as already recommended), a basin-wide sustainable development gaps analysis should be conducted to produce an action plan based on future land use zones. This can be derived from GIS manipulation of slope, land use and population density maps combined with a land capability assessment.

Research priorities

There is a need for research into the potential and sustainability of using groundwater as a resource. A more detailed analysis and research into historical data and records is also required, along with an assessment of the potential cumulative impacts of individual interventions, e.g. dam construction and stream diversions. More research should also be conducted on wetlands biodiversity, transboundary issues, and agricultural planning for 'wet' (early onset) years versus 'dry' (late onset) years.

Finally, as in other sectors, there is a need to gather information on adaptation and coping strategies toward climate variability from local communities, and to further evaluate potential adaptation measures.

Policy issues

The proposed and already ongoing construction of dams along the Mekong and its tributaries in China, Lao PDR, Thailand, Cambodia and highland Vietnam will have a profound effect on riparian areas of Lao PDR, lowland Cambodia and the Mekong Delta, particularly in terms of streamflow regimes (which in turn influences the intrusion of saline water and sediment deposition). This would affect the supply of nutrients for rice fields, vegetable gardens and fish ponds. It could also lead to significant displacement of people and migration into urban areas and marginal rural areas such as upland zones, and even neighbouring countries in the long term. Changes in the flow of the river and its tributaries could also influence the migration of fish. These issues could thus have major implications for adaptation in affected communities. It is no surprise, therefore, that the policy on dam construction and operation is currently such a hotly debated trans-boundary issue within the Lower Mekong Basin.

A protocol for controlling releases from multi-operator dam cascades by river basin organizations in times of severe drought and peak floods is needed to help balance downstream community needs and risks with electricity-generating demands. Also under review are demand-side management strategies, such as tariffs for non-essential electricity consumption, to reduce the need for damming more rivers for power generation purposes.

Photo Credit: Roengchai Kongmuang

7. Institutions and policies review: Energy Sector

Relevant institutions and their mandates

Representatives of the following institutions were interviewed for this scoping study:

Department of Electricity (now Department of Renewable Energy), Ministry of Energy and Mines (MEM)

This department manages the electricity sector and is responsible for all government activities related to electricity, including planning, restrictions and regulations. Specific tasks include energy regulation, rural electrification, monitoring of the National Policy on the Environmental and Social Sustainability of Hydropower, adopted in 2005, as well as promotion of renewable energy development.[8]

Hydropower is Laos' main source of electricity, which, in turn, accounts for 12% of total energy consumption. Climate change and adaptation are directly relevant to the planning and design of hydropower dams and associated infrastructure, both to ensure that there will be sufficient water for future electricity production, and to ensure that other important needs, such as water for human consumption, agriculture, and ecosystems are met. In addition, hydropower and other types of energy production can have negative social, economic or environmental impacts that can exacerbate vulnerability to climate-induced shocks. Accordingly, climate change aspects are being incorporated into the Department of Electricity's action plans, along with aspects such as renewable energy, pico-hydropower (very small-scale generation, under 5 KW), off-grid generation, and ways to hold down electricity demand.

Lao PDR is actively pursuing several options for renewable energy production, including solar power, biogas and biofuels, but there is a need for more renewable energy pilot projects.[9]

Current state of knowledge on adaptation

The level of knowledge concerning adaptation is still low. To date, the energy sector has been more concerned with mitigation rather than adaptation, as well as with addressing the indirect impacts of energy generation (e.g. resettlement, fisheries and food security, biodiversity integrity programmes, plus catchment management projects that include a consideration of water flows, erosion and sedimentation).

Research priorities

There is a need for more research to determine appropriate and sustainable renewable energy sources and technologies for Lao PDR, including bioenergy; their impact on land and water resources, and their socio-economic impact. There is also a need for more research on water resources for better flood and drought prediction.

Photo Credit: Roengchai Kongmuang

[8] Hydropower development is considered very important to Laos' economic growth, but it has also been mired in controversy over its potential environmental impacts. The planned Xayaburi dam on the Mekong River has raised particularly significant concerns; in early July 2012, the Lao PDR government announced it had halted work pending further studies (for Reuters coverage, see: http://www.reuters.com/article/2012/07/13/us-laos-dam-idUSBRE86C0GI20120713). These issues are beyond the scope of this report, however; for a look at major environmental concerns raised around hydropower in Laos, see: International Rivers (2008) Power Surge: The Impacts of Rapid Dam Development in Laos. http://www.internationalrivers.org/resources/power-surge-the-impacts-of-rapid-dam-development-in-laos-3964.

[9] For a concise, albeit informal, overview of renewable energy development in Lao PDR, see 'Laos: a quiet, green revolution', an interview with Edward Allen, technical programme coordinator for the Lao Institute for Renewable Energy. Asian Solar magazine, March/April 2012. http://www.lao-ire.org/data/documents/data_research/general/LIRE-2012-03-Quiet_energy_revolution.pdf.

8. Institutions and Policies Review: Infrastructure

Relevant institutions and their mandates

Representatives of this institution were interviewed for the scoping study:

Photo Credit: Roengchai Kongmuang

Public Works and Transport Institute, Ministry of Public Works and Transport (Environmental and Social Division)

As previously noted, infrastructure is a significant concern in the context of climate change adaptation, both because it is essential to ensure that new infrastructure is 'climate-proof' – able to withstand projected climate change impacts such as more-severe floods and droughts – and because, when infrastructure is poorly built, it can exacerbate vulnerability and the risk of disasters such as landslides. The Public Works and Transport Institute plans and monitors the environmental and social development aspects of infrastructural projects and programmes, especially resettlement and compensation issues. Key priorities are flood and drought impacts, landslide prevention, and improved wastewater management, especially during floods. The institute also collaborates and coordinates with the environment/social divisions of other agencies; it participates in the Inter-Ministerial Climate Change Working Group (further discussed below) and helps disseminate climate information to the community.

The Ministry of Public Works and Transport is involved in a new project led by the Ministry of Planning and Investment, 'Mainstreaming disaster and climate risk into investment decisions' (2012-2015), that aims to strengthen the government's capacity to mainstream disaster risk management and climate change adaptation into public infrastructure investments, especially in the transport sector. More details are provided in Section 11.

Ongoing activities for this project include helping to climate-proof urban development plans; formulating climate-proofing strategies under the national climate change policy and action plan; conducting climate risk audits for key infrastructure; designing and supervising construction of storm surge barriers for waste-water treatment plants and landfills; elaborating new design criteria for infrastructure that reflects non-stationary hydrologic processes; collaborating with the Department of Irrigation to establish farm ponds in drought-prone areas; and incorporating an adaptation component into all relevant activities.

Current state of knowledge on adaptation

Staff members' knowledge concerning adaptation mainly comes from reading and independent study (books, papers, etc.) but only some institute staff do this. Most training courses have been donor-driven, rather than being based on rigorous staff or community training needs assessments. There is plenty of foreign expertise, but it has been difficult to disseminate the knowledge more widely. Other specific knowledge gaps include:

- There is a lack of detailed geospatial knowledge on soil conditions concerning roadsides and steep farmlands at a high risk of landslides.
- There has been a lack of public outreach on the need to protect buildings from tropical storms and flood damage. (Old-style houses built on stilts were flood-tolerant with families retreating to sleep above the water line; nowadays, there is a tendency to insert concrete block walls between the stilts, and serious flood damage can ensue.) There is a general awareness of the problem, but no action has been taken to educate the public.
- Although there is a policy that people should not build houses close to roads, this is largely ignored; planning for new roads or road upgrading in rural areas should incorporate enforcement of this policy and 'sites and services' support to help people comply.
- More information is required on protective action against all risk types including those connected with site selection for rural settlements/housing. Currently this is not planned properly.
- More information is needed on landslide risks, especially along main roads (for example, the Vientiane to Luang Prabang highway was closed for three days during the 2011 wet season due to landslides).

9. Institutions and Policies Review: Public Health Sector

Relevant institutions and their mandates

Representatives of this institution were interviewed for the scoping study:

Environmental Health Division, Department of Hygiene and Prevention, Ministry of Health

Climate change can affect health directly due to exposure to climatic extremes, such as high temperatures that cause dehydration and heat stroke, or through bodily injuries inflicted by tropical storms. Health can also be affected indirectly, as a result of climate-induced changes in biological and geochemical systems, e.g. warmer, wetter weather favouring the life cycle of mosquitoes, influencing the spread of malaria, dengue, etc. Within the Ministry of Health, climate issues are addressed by the Environmental Health Division, which oversees water supply quality, sanitation and hygiene, and water and sanitation sector assessment.

The division's involvement in adaptation is built around the Climate Change and Health Adaptation Strategy in Lao PDR, prepared with support from the World Health Organization and currently in draft form. The document includes a climate change and health vulnerability assessment study carried out in 2011, the strategy itself, and a five-year action plan (2012-2016). The objectives are to assess climate change impacts; improve disease monitoring systems and the control of infectious diseases; prepare and respond to food emergencies and to extreme weather events; strengthen health education and communication; and empower people to take actions to reduce individual and community vulnerability to climate change.

Funding is still required to implement the action plans.

Current state of knowledge on adaptation

Improving adaptive capacity will require building on current public health policies and practices in order to make them more effective, and/or to target particularly vulnerable populations. These activities could include the monitoring of infectious disease and emergency preparedness and planning. The Climate Change and Health Adaptation Strategy has increased institutional-level knowledge of adaptation issues in the health sector, but there is little knowledge or awareness about climate change within the population, and there is also a shortage of data. Part of the problem is that hospitals are not recording the relevant data on diseases, e.g. diarrhoea, water-borne diseases, malaria, dengue, etc.

Improved communication channels are needed to convey knowledge and expertise from the national government to the community level. There also needs to be more media outreach in order to publicize climate-related health and sanitation measures.

In addition, there is a need for more research to support enhanced promotion/protection of human health in light of climate change, including cross-sectoral strategies. Locally appropriate measures must be investigated for control of water-, food-, vector- and rodent-borne diseases, as well as for health care waste management.

Photo Credit: Roengchai Kongmuang

10. Institutions and Policies Review: Disaster Response and Risk Reduction

Relevant institutions and their mandates

Representatives of the following institutions were interviewed for this scoping study:

National Disaster Management Office (NDMO), Ministry of Labour and Social Welfare (now Department of National Disaster Management and Climate Change, MoNRE)

The NDMO was established in 1997 with support from UNDP; it serves as the secretariat for an inter-ministerial National Disaster Management Committee (NDMC) created in 1999. The agency's responsibilities include providing expert advice to the NDMC; promoting coordination with ministerial focal points; promoting disaster mitigation and preparedness activities at the local level; implementing community awareness activities; providing training, guidelines and plans to make disaster risk management more effective; and establishing disaster management implementation teams at the national, provincial and district levels.

The NDMO's work on climate change adaptation involves disaster risk reduction, such as preparation for the impacts of disasters exacerbated by climate change. A key aspect of this work was drafting Lao PDR's first National Disaster Management Plan (2012-2015), with financial and technical support from UNDP.

Other NDMO work that is relevant to adaptation includes awareness-raising at the province, district and community levels and building capacity to minimize disaster risks, such as by relocating houses away from high-risk areas, strengthening and reinforcing buildings, and creating emergency food reserves and stocks of emergency equipment. The NDMO has also encouraged farmers to plant drought-tolerant crops out of reach of flood waters and to prepare for the moving of large livestock to emergency grazing lands.

Department of Meteorology & Hydrology (DMH), Ministry of Natural Resources and Environment

Photo Credit: Roengchai Kongmuang

The DMH compiles observation data from all outlying meteorological stations, synthesizes the data and forwards it to the World Meteorological Organization (WMO) centre in Bangkok. The data collected includes air temperature, humidity, wind speed and direction, precipitation, sunshine, soil temperature and evaporation. The DMH also issues weather forecasts, including a 24-hour forecast for each province, a three-day forecast for the four main cities, and a one-week, one-month and three-month forecast for the five main regions. In addition, the DMH issues severe weather alerts, conveyed through the media. The DMH is also responsible for recording, analysing, and researching trends and reporting these to higher authorities and to the public.

The DMH is involved in the establishment of early warning systems in the vulnerable areas for flood and drought (e.g. Sekong river basin) to support the implementation of the National Strategy for Disaster Management. It will also be implementing a component of the Mekong Integrated Water Resources Management project, which involves upgrading the hydro-meteorological system in Lao PDR, and has a certain focus on climate change impacts. In addition, the DMH has an ongoing climatic/weather research programme on regional integrated multi-hazard early warning systems, in conjunction with an FAO study. Finally, a DHM officer is responsible for providing updated climate information on a regular basis to the Climate Change Office in the Ministry of Natural Resources and Environment.

Current state of knowledge on adaptation

An adequate state of disaster preparedness could be defined as having the resources (knowledge, personnel, equipment, financing) to meet the challenges of any natural or human-induced disasters that may occur, whether caused by climate change or other factors. Currently, there is still much uncertainty amongst experts regarding detailed climate change knowledge, (for example, the amount of increase or decrease in temperature, or the expected severity and frequency of rain and wind storms). As a result, both the public and the civil servants are confused. The difference between climate change and natural variation is not well known or understood. There is an emerging public awareness of droughts and high temperatures (mostly among rural communities rather than in urban areas). For instance, a recent change in the timing of the cold season in Xieng Khouang Province in March 2011 caused many cattle to die.

A certain level of knowledge, especially on institutional structures that may be applicable to Lao PDR, has been gained through interaction with people from other countries and organizations during international courses, workshops or seminars. The challenge is sharing this knowledge throughout all organizations, across all sectors and with all stakeholders, rather than having it remain within a single institution. Currently there is a general lack of awareness of these issues at the provincial and district levels and in the media. Thus there is a need for more outreach; this material should also be incorporated into the curricula of primary, secondary and vocational schools.

It should be noted that foreign donors and NGOs are providing both financial support and technical expertise to Lao PDR in this area. For example, the European Union and Oxfam (Australia) are sponsoring several Remote Area Disaster Risk Reduction Projects (in Ta Oy District, Salavan Province; and in Maet District and in Kasy District, Vientiane province). The NGO World Vision sponsors a similar project in Khammouane province, and the Global Fund for Disaster Risk Reduction is sponsoring a disaster response planning and implementation exercise in Attapeu, Sekong and Salavan provinces. This includes disaster recovery from the Ketsana tropical depression of 2009.

One important remaining gap is the lack of meteorological data recording in remote areas. Currently, NGOs involved in promoting adaptation at the community level (especially with agricultural aspects) frequently request meteorological data from the government that is not available.

Research priorities include further work on weather forecasting, water level/flood forecasting, and early warning systems, as well as risk assessments to determine the nature and dimensions of the risks posed by climate change.

On the policy side, meanwhile, national policies should acknowledge the likely increase in demand for financing for adaptation measures. There should also be increased support for the media to better contribute to public outreach about disaster risks, preparedness, response and recovery.

Photo Credit: Roengchai Kongmuang

11. Institutions and Policies Review: Climate Change Adaptation (Cross-Sectoral)

Relevant institutions and their mandates

Representatives of the following institutions were interviewed for this scoping study:

Climate Change Office, Ministry of Natural Resources & Environment (MoNRE), now Department of National Disaster Management and Climate Change

The Climate Change Office (CCO) was established in 2008 to serve as the secretariat of the National Steering Committee on Climate Change (since replaced by the National Environment Committee). It acts as the 'national focal point' on climate change actions and initiatives, and coordinates a number of the national government's activities related to the UNFCCC. The various sectors' or line ministries' interests in climate change are represented by a number of technical working groups established in 2009:

- Agriculture and Forestry (Ministry of Agriculture and Forestry)
- Water Resources (Ministry of Natural Resources and Environment)
- Energy (Ministry of Energy and Mines)
- Urban Infrastructure (Ministry of Public Works and Transport)
- Public Health (Ministry of Health)
- Economics (Ministry of Planning and Investment)
- Finance (Ministry of Finance)
- Industry (Ministry of Industry and Commerce)

The Climate Change Office is currently involved in the drafting of Laos' Second National Communication on Climate Change, with support from UNDP and the GEF. The office is also currently leading a technology needs assessment (2011-2012) with support from UNEP-GEF. The project goal is to identify and prioritize technology needs for climate change mitigation and adaptation in selected sectors, and to develop a Technology Action Plan for mitigation and adaptation.

In addition, the Climate Change Office is executing the project 'Capacity enhancement for coping with climate change' (2010-2013), supported by the Asian Development Bank and the Nordic Development Fund. The project is addressing capacity constraints by providing policy support to the CCO and the ministries responsible for each technical working group. It will also raise public and policy-maker awareness on climate change and provide assistance for implementing pilot adaptation activities in the water resources, agriculture and forestry sectors. The expected outcome of the project will be an improved enabling environment to address climate change impacts, including integration of climate change strategies into selected sectoral policies and programmes, and enhanced ability to implement adaptation projects.

Ministry of Planning and Investment (MPI)

As noted above, the MPI leads the economics technical working group. Due to the influence of public and private sector investors, both national and international, its role is particularly important. As previously discussed, infrastructure and industrial developments, if not properly planned and monitored, could increase rather than reduce vulnerability of the community to climate change impacts. In recent years, under-budgeted and under-regulated interventions have led to increased, rather than reduced, susceptibility to climate change impacts. For instance:

- Water bodies have been constricted by urban sprawl or filled in for construction purposes.
- Poorly routed roads in hilly areas have induced landslides.
- Dams have been retaining or releasing water irrespective of downstream needs or damage.
- Logging in watersheds has occurred without replanting.

The MPI is the lead agency in the project 'Mainstreaming disaster and climate risk into investment decisions' (2012-2015), supported by the World Bank, which has been referenced in previous sections as well. The objective of the project is to strengthen the institutional authority and implementation capacity of the government at national and sub-national levels in order to mainstream disaster risk management and adaptation into public infrastructure investments (with a focus on the transport, and irrigation and drainage sectors), as well as to decrease the vulnerability of the population and national economy to climate change impacts and natural hazards.

Environment Unit (Climate Change Policy), UNDP

UNDP has provided strategic guidance to the government to develop a comprehensive and consolidated response to challenges related to climate change. It has assisted the government in developing Laos' First National Communication on Climate Change to the UNFCCC, and is currently providing support for development of the Second National Communication. It also has assisted with development of the National Adaptation Programme of Action (NAPA). These important documents, together with the Strategy on Climate Change of the Lao PDR (NSCC), are the backbone of Laos' climate policy framework.

The government, together with UNDP, is now implementing or developing several projects to address the priority sectors identified in the NAPA, including 'Improving the resilience of the agriculture sector in Lao PDR to climate change impacts' (2011-2015), described in Section 5 of this report; and 'Effective governance for small scale rural infrastructure and disaster preparedness in a changing climate', which is currently in preparation. UNDP, through the GEF Small Grants Programme, also is providing small grants for climate change responses developed by communities and local non-profit organizations.

In disaster risk management, UNDP works to develop national and local capacities to better prepare for and respond to recurrent natural disasters such as floods, drought, tropical storms and landslides.

Climate Change and Adaptation Initiative (CCAI), Mekong River Commission

CCAI is a collaborative regional initiative of the Lower Mekong Basin countries (Cambodia, Lao PDR, Thailand and Vietnam), aiming to support adaptation to the impacts and new challenges posed by climate change through improved planning, implementation and learning. It is a long-term initiative, running until 2025, and it aims to contribute to achieving the MDGs on poverty eradication and improved food security.

The CCAI has the objective of guiding adaptation planning and implementation through improved strategies and plans, with four areas of focus: (1) adaptation planning and implementation; (2) capacity-building; (3) development of adaptation strategies and plans; and (4) regional collaboration, networking and learning. Key activities of CCAI during its first phase (2011-2015) include a climate change database for the LMB, a series of reports on adaptation approaches and experiences in the LMB, triennial reports on the status of climate change and adaptation in LMB, a regional Mekong adaptation strategy and action plan, and the Mekong Regional Climate Change Forums.

Recent developments include an ongoing local demonstration project in Savannakhet province, with tests of adaptation planning methods, awareness and capacity-building, and demonstrations of adaptation practices. Two studies have looked at water and climate change, including a 2009 assessment that built two scenarios to gauge the impacts of climate change and development on Mekong flow regimes. Another project, in 2008, looked at local climate impacts and adaptation options in two pilot sites in Laos and Cambodia.

Photo Credit: Roengchai Kongmuang

Current state of knowledge on adaptation

Understanding of adaptation, which is a cross-cutting issue, may not be the same at different levels within and across institutions. Policy-makers sometimes do not understand all the issues, even though they support adaptation as a concept. There are still gaps in core functions. The difficulty is to combine all the results from disparate research and demonstration projects into meaningful policy, and to mainstream policy into effective action on the ground. Technical knowledge at the Lao PDR national level is lacking; there are a wide range of tools for adaptation planning, but it is still to be determined which ones are the best or most appropriate.

There are few explanatory texts concerning climate change in general or about adaptation in particular, and there is also a lack of knowledge concerning applicable software. The emphasis is too often on research rather than on practical application priorities. The NAPA is also not detailed enough to support actionable plans, and needs to be expanded.

As global concerns about climate change grow, it is important to discover what climate change will really mean to the people of Lao PDR in terms of changing water resources regimes and environmental impacts. These considerations are in addition to those brought about by population growth, intensified land use and infrastructure construction and operation, and should be a major topic for climate change research. In fact, all the agencies that EcoLao interviewed wanted to know more about the possible magnitude of climate-induced changes as well as the associated budgetary and manpower implications needed to address them. There is also need for improved reliability and understanding of the predicted climate changes and their impacts for LAO PDR, and action research to test promising adaptation policies, plans and actions.

Photo Credit: Roengchai Kongmuang

Policy issues

Improved governance is crucial to the actions needed to improve adaptive capacity. An ongoing UNDP project is helping the Ministry of Home Affairs and the Civil Service commission to address issues of decentralization and the de-concentration of governmental human resources. Salaries are an important consideration in this matter, especially for lower level government officers working in remote outposts. The identification of specific government policies for adaptation needs to be undertaken, such as the national strategy on climate change (up to 2020).

12. Mechanisms and Policies Concerning Climate Change Adaptation

Ongoing inter-agency collaboration for capacity building is an important way of fostering inter-sectoral coordination. However, there remains a need for the development of structures to ensure that pertinent data and information concerning adaptation is shared with concerned agencies on a regular basis.

Cooperation between agencies is not as smooth as it could be, as there are sometimes overlaps or gaps. This may be attributable to a reluctance to share data between agencies resulting from the low rates of remuneration for civil servants.

The people interviewed for this study reported several barriers to coordination, including low project and programme budgets, a lack of knowledge about how to obtain funding, lack of knowledge about climate change, projects with too short-term a vision, and lack of time due to other commitments of expert staff, such as at universities.

In the absence of better coordination, biodiversity issues are often overlooked in budgeting and project planning, and social, environmental and ecological issues resulting from the activities of the energy sector lie within the remit of other agencies, such as Social Welfare, Agriculture and Forestry, and Public Health. Yet construction and operation budgets, as well as revenues, remain with the energy sector. Much of the funding for energy infrastructure construction comes from private sector banks and construction firms whose primary aim is to maximize return on investment as quickly as possible.

These issues are being addressed by the Ministry of Natural Resources and Environment, the Mekong River Commission and the International Hydropower Association. However, due to the multi-disciplinary nature of the remedial measures necessary, and the considerable investment involved, there is still much progress to be made. Another issue that requires attention is the management of reservoir operation regimes (particularly in periods of floods or drought) due to the potential impact of water release/retention regimes on downstream communities. With the exception of hydropower projects that involve the international development banks, the downstream impact of dams has been largely ignored in Lao PDR.

13. Strategy for Building Capacity to Undertake Adaptation

Although the level of awareness and knowledge of climate change and adaptation is still generally low in the government of Laos, many of the agencies interviewed for this study have had staff attend workshops, conferences and training courses on climate change and adaptation, and a number of new projects are being initiated. However, in many cases there is no project or opportunity for the staff to utilize their new knowledge once the training has been completed. On the other hand, even staff involved in climate change projects or activities generally require additional capacity-building. At the provincial, district and community levels, awareness and knowledge of climate change and adaptation is generally very low, and few government employees or community members have had any type of awareness raising or training in climate change or adaptation.

Thus there is a need for targeted capacity-building to address specific needs within current adaptation projects for the most immediate relevance and impact, as well as for training courses and pilot projects in assessing vulnerability and planning adaptation at the national, provincial and district levels. Capacity-building in basic project planning and management skills is also needed to enable success in obtaining project funding from various adaptation funding sources.

It would help to build more partnerships between government agencies and regional and international organizations and institutions that have a greater expertise in climate issues. There is also a need for improved English-language skills for the staff of key government agencies and positions at central and provincial government levels, so they can better access information on climate change and adaptation, most of which is in English.

At the same time, there is a significant need for more educational materials on climate change and adaptation in the Lao language, and using simple terms, especially for dissemination at the village and district levels.

In order to determine what communities can do (and are often doing unaided), regarding adaptation requires a bottom-up, community-focused assessment. This can then be combined with a top-down analysis of government capacity at all levels in order to determine what the government can do to assist adaptation and a community's capacity to adapt. Thus capacity-building needs to be a 'two-way street': raising the awareness level of the local communities on the one hand and learning from their adaptation experiences on the other.

A strategy for capacity development should be developed around the following questions:

- What are the roles and responsibilities of each agency?
- What are people being trained for?
- What are the needs with respect to technical studies, planning, pilot activities, and awareness raising and what are the best ways to enhance capacities for each of these?

Photo Credit: Roengchai Kongmuang

Key target audiences for capacity-building

Affected communities

Particularly in the rural areas, public/community awareness on climate change and adaptation can be raised via use of mass media, particularly community radio, as most people take portable radios to the fields whilst planting, weeding and harvesting their crops. Better use could also be made of existing community radio stations and those broadcasting in ethnic minority languages.

Government and extension workers

Most government staff, particularly new recruits, require capacity building in the preparation and budgeting of project proposals, as well as in converting strategies into viable action plans. Capacity building programmes that create a better understanding of climate change and the funding opportunities it presents are required. Key target audiences include district-level agriculture and forestry extension personnel; NAFRI project staff who do not posses specific climate change knowledge; new recruits and technicians at key ministries; and the staff of the Department of Energy, for whom climate change is a new concept.

Photo Credit: Roengchai Kongmuang

For high-level administrators, short but concise 'advocacy training meetings' should be arranged, with external facilitators from major international agencies. District-level Vice Governors, who chair the District Disaster Committees, have a need to compare their experiences and exchange information with their peers in other districts. This could be achieved at the national level through forums such as workshops.

Currently at the Department of Meteorology Climate Division, most technicians are locally educated. There are only four staff who have graduated overseas. It is estimated that each year, four staff require scholarships for training/capacity building overseas. Yet currently, only three annual scholarships are available. Preferred venues include universities in Australia, France and Russia.

National academia

University graduates will eventually work at the province and district levels, so climate change should be included in their curricula. The government will eventually implement REDD programs and projects, so adaptation should be included in the teaching curricula along with aspects of mitigation. There are many temporary university teaching staff who teach various agro-forestry subjects, all of whom need further training in many aspects of climate change.

Types of capacity to be built

Capacity-building on climate change and adaptation is already occurring across Lao PDR (See Annex for a list of recent initiatives), but there is a need for significantly more capacity. Across all sectors, our analysis suggests that the priorities for capacity building in climate change and adaptation within Lao PDR should be:

- The capacity to compile and analyse the most relevant data;
- The ability to access and choose the appropriate information;
- Improved technical expertise in the hydrology, agriculture, forestry and vocational education sectors (for example, modelling, geospatial awareness and skills, management information systems, monitoring and evaluation, reporting, action planning and budgeting);
- Modelling the impacts of climate change on biodiversity, agriculture and water resources; and
- Metadata compilation.

Some sector-specific topics are outlined below.

Within agriculture and forestry, land capability assessment, post-allocation soil conservation and land development planning and budgeting capacities need to be built, with a focus on participatory processes. In addition, fertilizer recommendations need to be made based on the results of scientific soil analysis, and along with selection and husbandry of diversified drought/flood tolerant crops.

In concert with the establishment of community learning centres in each district, the curricula of Vocational Agriculture and Forestry Colleges, as well as refresher training courses for village volunteers and governmental agricultural and forestry extension technicians, should be enhanced with specific techniques that can reduce environmental impacts and improve climate resilience, as well as forest engineering, sustained-yield forest management, and nursery operation.

Guidelines and handbooks on water resources management need to be prepared and/or updated, including aspects of meteorology and hydrology related to climate change. There is also a need for capacity-building on efficient irrigation system design, costing, construction supervision, operation and maintenance, as well as on water harvesting, 'self-build' terracing and crop water management.

At the community level, there is a need for training on the English language, knowledge management and change management; on rural credit/crop insurance micro-finance mechanisms; on upgrading and operating early warning systems; and on community development and gender mainstreaming techniques.

Communities also need assistance to adjust town planning and building codes for flood and windstorm tolerance and disaster protection, ensure the safe selection of commercial and residential sites, and adapt buildings to withstand winds and floods.

14. Recommendations for an AKP Strategy for Lao PDR

The Department of National Disaster Management and Climate Change (formerly CCO), along with the National Environment Committee and the sectoral technical working groups on climate change, is the principal inter-sectoral coordinating mechanism for climate change activities in the national government. They should also be considered the best 'entry points' for the AKP's activities in Lao PDR. Specific recommended activities include:

- Awareness-raising and training workshops on the utility and use of the AKP and other adaptation knowledge platforms. The interviews conducted during this study have revealed that the AKP or other adaptation knowledge platforms are little-known and little-used in Lao PDR.
- Assisting the government in making its adaptation policies, publications and reports available on the internet in both Lao and English, on a government website and/or on the AKP sites.
- Organizing workshops or training courses in Lao PDR, similar to what the AKP has done in other countries.
- Assistance in developing awareness-raising information on climate change and adaptation in Lao language.
- Assistance in developing an English-Lao glossary of climate change and adaptation terms and associated technical or specialist terms, to harmonize terminology with a similar English-Thai glossary.

Photo Credit: Roengchai Kongmuang

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Also reviewed:

- Various brochures and posters regarding disaster management and preparedness (funded by the EU – currently in draft).
- Quarterly reports on climatic averages produced and transmitted to the Ministry of Agriculture and Forestry, to other ministries and to the provinces.

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Annex: Some recent developments in climate change adaptation in Laos

- The Mekong River Commission's Climate Change and Adaptation Initiative has an ongoing local demonstration project in Savannakhet province, which involves testing adaptation planning methods, capacity-building and awareness-raising of local authorities and communities raised, and demonstrations of adaptation practices.
- The Climate Risks & Rice Farming in the Lower Mekong River Countries Project (2006) was conducted through household interviews and focus group meetings to identify commonalities and differences in measures used for managing climate risks by farmers across the study sites.
- Impacts of Climate Change and Development on Mekong Flow Regimes - First Assessment 2009, by the Mekong River Commission, entailed comparing two scenarios to assess the impacts of climate change on the flow regime in the Lower Mekong Basin.
- In CCA in the Lower Mekong Basin (MRC-GTZ, 2008), two pilot sites in Laos and Cambodia were studied to evaluate local impacts of climate change and adaptation.
- The assessment Climate Change Vulnerability Mapping for Southeast Asia was carried out by overlaying climate hazard, sensitivity and adaptive capacity maps following the IPCC vulnerability assessment framework.
- Climate Change Impacts and Adaptation Strategies for the Rural Infrastructure Sector in Lao PDR, an assessment of flood risks and possible economic impacts of flooding, considered various scenarios for both climate change and socio-economic development in 2010-2011.
- Lao PDR: Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts, was the top priority programme identified in the Lao PDR NAPA, May 2009.

Key AKP Publications

Scoping Assessments

Date	Title	Lead Authors	Focus
October 2010	Scoping Assessment for National Implementation in Thailand - Summary	Louis Lebel	Assessment of adaptation needs
October 2010	Scoping Assessment on Climate Change Adaptation in Viet Nam - Summary	Bach Tan Sinh	Assessment of adaptation needs
October 2010	Scoping Assessment on Climate Change Knowledge Platform in Nepal: Summary	Ajaya Dixit	Assessment of adaptation needs
October 2010	Scoping Assessment for National Implementation in Cambodia- Summary	Robert W. Solar Toby Carson	Assessment of adaptation needs
October 2010	Scoping Assessment on Climate Change Adaptation in Bangladesh-Summary	Bangladesh Center for Advanced Studies (BCAS)	Assessment of adaptation needs
June 2011	Scoping Mission and Preliminary Assessment on Climate Change Adaptation in Sri Lanka	Serena Fortuna	Assessment of adaptation needs
October 2011	Scoping Assessment on Climate Change Adaptation in Malaysia -Summary	Robert W. Solar	Assessment of adaptation needs
October 2012	Scoping Assessment on Climate Change Adaptation in the Philippines - Summary	Jessica Dator-Bercilla	Assessment of adaptation needs

Collaborative studies

Date	Title	Lead Authors	Focus
October 2010	Adaptation Strategies for Water and Agricultural Sectors in Southeast Asia	Satya Priya	Review of adaptation priorities
February 2011	Climate Change Adaptation: Finding the Appropriate Response	Robert W. Solar Toby Carson Marona Srey	Rural livelihoods and multi-stakeholder participatory learning
February 2011	An Approach to Climate Research: Events Adaptation Change Adaptation Vents, Strategies, and Drivers	Robert W. Solar Toby Carson Marona Srey	Research methodology – sustainable livelihoods and resilience
July 2011	Desktop Study on Assessment of Capacity Gaps and Needs of Southeast Asia Countries in Addressing Impacts, Vulnerability and Adaptation to Climate Variability and Climate Change	Southeast Asia Network of Climate Change Focal Points (SEA-CC Net) Regional Climate Change Adaptation Knowledge Platform for Asia (Adaptation Knowledge Platform)	Review of adaptation priorities

March 2011	The Practitioners & Policy-makers Exchange on Climate Change Adaptation in Agriculture - Frequently Ask Questions booklet	Satya Priya Gernot Laganda Felicity Woodhams Shirley Kai Serena Fortuna Nicole Hansen Hiromi Inagaki Roopa Rakshit Kim Jihyun	Adaptation in agricultural systems
March 2012	Mainstreaming climate change adaptation into development planning	Louis Lebel Lailai Li Chayanis Krittasudthacheewa Muanpong Juntopas Tatirose Vijitpan Tomoharu Uchiyama Dusita Krawanchid	Review of experiences in mainstreaming adaptation in Asia
July 2012	Community Forestry: Responding to both Adaptation and Mitigation	RECOFTC	Importance of community forestry to adaptation and mitigation
July 2012	The Role of Community Forestry in Climate Change Adaptation and Mitigation: Case Studies from Asia	Regan Suzuki (editor) RECOFTC	Importance of community forestry to adaptation and mitigation

Policy briefs

Date	Title	Lead Authors	Focus
March 2011	Climate Change Resilience in Coastal Cambodia: Adaptive Capacity & Human Development	Robert W. Solar	Gaps in adaptive capacity
October 2010	Enhancing Adaptive Capacity in Bhutan and Nepal (Policy Brief 1)	Sabita Thapa John Soussan Satya Priya Phurba Lhendup Dusita Krawanchid	Assessment of adaptation needs
October 2011	Adaptation Knowledge (Policy Brief 2)	Louis Lebel	Role of knowledge in the adaptation to climate change
May 2012	Governance of Adaptation (Policy Brief 3)	Louis Lebel	Quality of governance as an important determinant of successful adaptation
July 2012	Institutional Responses to Local-Level Climate Change Adaptation in Nepal (Policy Brief 4)	JC Baral DR Bhuju DB Shrestha PY Shrestha	Complexity of adaptation planning

Proceedings

October 2010	Adaptation Forum 2010 Proceedings Report	AKP Secretariat	Summary of 2010 Forum
May 2012	Synthesis Report of the Second Asia-Pacific Climate Change Adaptation Forum - Mainstreaming Adaptation in Development: Adaptation in Action	Louis Lebel	Summary of 2012 Forum

Design Documents

Date	Title	Lead Authors	Focus
October 2010	Inception Summary Report	AKP	Design of AKP

Partner Reports

Date	Title	Lead Authors	Focus
July 2012	Integration of climate adaptation into development and conservation planning in Bhutan: issue identification and recommendations	Phurba Lhendup	Assessment of adaptation issues and planning
August 2012	A holistic approach to climate change vulnerability and adaptation assessment: Pilot study in Thailand	Suppakorn Chinvanno	Vulnerability and adaptation assessment
August 2012	Mainstreaming Climate Change into Community Development Strategies and Plans: A Case Study in Thailand	Suppakorn Chinvanno Vichien Kerdsuk	Adaptation mainstreaming
August 2012	Scoping Assessment of Knowledge Needs in Climate Change Adaptation in China	Lailai Li Xiaojing Fei Jiayi Xu Huw Slater	Assessment of adaptation needs
August 2012	Mainstreaming adaptation into local development plans in Vietnam	Bach Tan Sinh Vu Canh Toan	Adaptation mainstreaming
September 2012	Scoping Assessment of Climate Change Adaptation Priorities in the Lao PDR	EcoLao	Assessment of adaptation needs

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