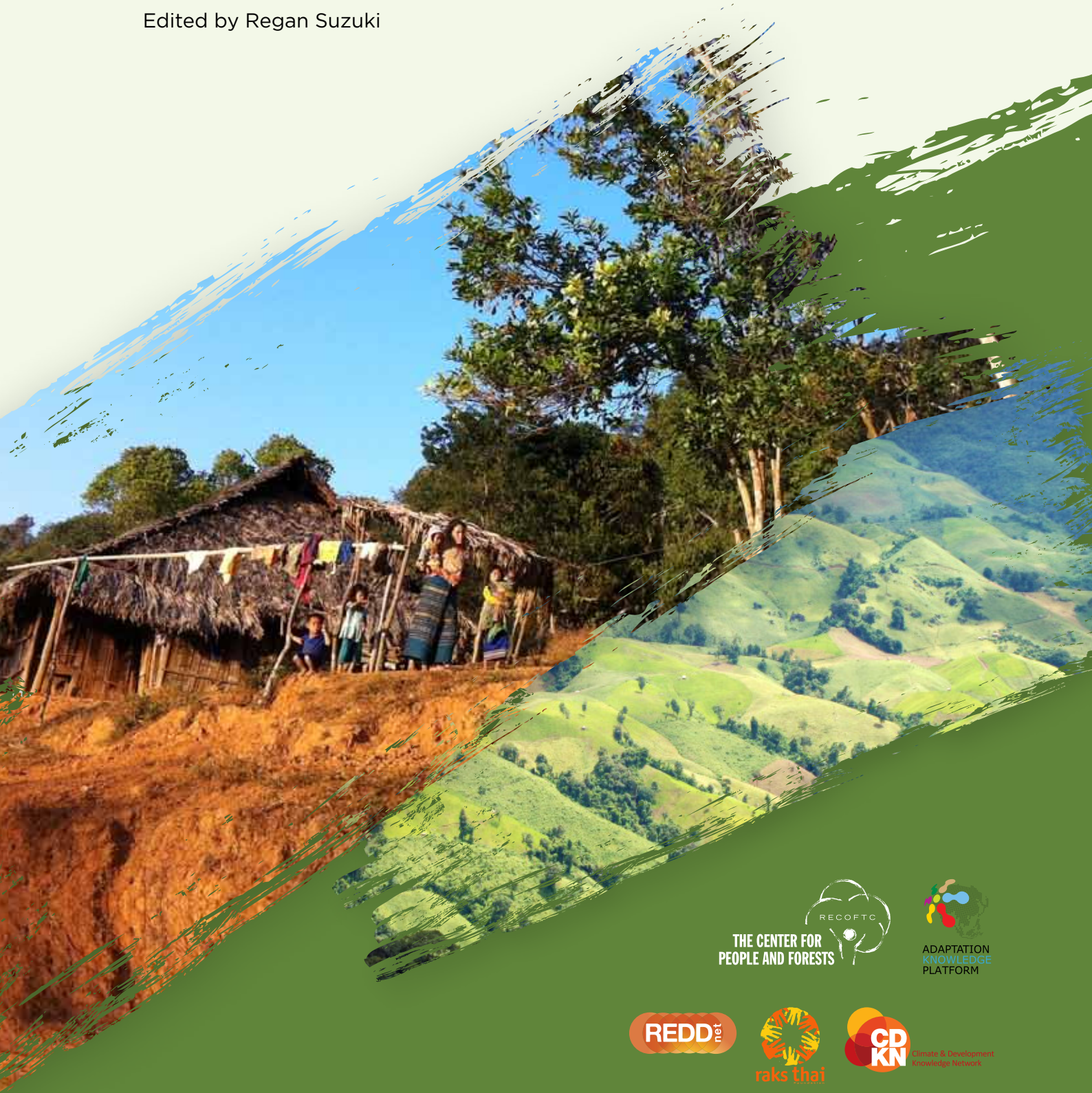
# Linking Adaptation and Mitigation through Community Forestry

## Case Studies from Asia

Edited by Regan Suzuki



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The authors take full responsibility for the views expressed here. They do not necessarily reflect the views of RECOFTC.

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# Acronyms

| | |
|---|---|
| ANR | Assisted Natural Regeneration |
| BAU | Business As Usual |
| CBMR | Community Based Mangrove Reforestation |
| CCBS | Climate Community Biodiversity Standards |
| CFM | Collaborative Forest Management |
| CFUG | Community Forest User Group |
| CHULI | Churia Livelihood Improvement Program |
| DANIDA | Danish International Development Agency |
| ELCs | Economic Land Concessions |
| FECOFUN | Federation of Community Forestry User Groups |
| FORDA | Forestry Research and Development Agency |
| FPIC | Free Prior Informed Consent |
| ITTO | International Tropical Timber Organization |
| JAKETRESI | Jaringan Kerja Petani Rehabilitasi (Farmers Forest Rehabilitation Network) |
| JOMPA | Joint Management of Protected Areas |
| LATIN | Lembaga Alam Tropika Indonesia |
| MAFF | Ministry of Agriculture, Fisheries and Forestry |
| MARD | Ministry of Agriculture and Rural Development |
| MBNP-REDD+ | Meru Betiri National Park Reducing Emissions for Deforestation and Degradation+ |
| MERI | Mekong Environment Resource Institute |
| MoU | Memorandum of Understanding |
| MRV | Measurement, Reporting and Verification |
| NGO | Non Governmental Organization |
| NTFP | Non-Timber Forest Product |

| | |
|---|---|
| PAR | Participatory Action Research |
| PLUP | Participatory Land Use Planning |
| PRA | Participatory Rural Appraisal |
| REDD+ | Reducing Emissions from Deforestation and Degradation + |
| ROI | Return On Investment |
| SPF | Seima Protection Forest |
| UNDRIP | United Nations Declaration on the Rights of Indigenous Peoples |
| UN-REDD | United Nations Collaborative Initiative on REDD |
| VCM | Voluntary Carbon Market |
| VCS | Voluntary Carbon Standard |
| VDC | Village Development Committee |
| VER | Verified Emission Reduction |
| WCS | Wildlife Conservation Society |

# 1 Introduction

## Overview

Given the role that forests play in mitigation and adaptation to climate change, there are potential synergies between REDD+ and the ability of populations to adapt to the impacts of climate change. To date there has been relatively limited attention to how these synergies can be achieved. However, there is a growing interest in both linking adaptation to mitigation and to adaptation activities generally. In 2010 at COP 16 in Cancun, it was agreed that adaptation needed to be addressed with the same priority as mitigation and required appropriate institutional arrangements to enhance action and support (AWG-LCA, Article 2b).

As many countries in the region develop their national adaptation strategies, explicit incorporation of forests within these plans needs to be ensured. Conversely, mitigation activities such as REDD+ rarely include explicit references to adaptation or the development of adaptive capacity (FAO, 2012).

Given the significant role of forests in local livelihoods (Angelsen, 2011; Chao, 2012), understanding the relationship between mitigation and adaptation activities and forest-based communities is vital. Failure to consider mitigation and adaptation in the context of forests and forest based communities may result in an undermining of sustainable forestry practices and a loss of rights and livelihoods among vulnerable communities. Exploring the role of forests for mitigation, adaptation, and livelihoods can identify potential synergies and trade-offs.

## Objectives and Approach

These case studies are based on local experiences in Cambodia, Indonesia, Nepal, Thailand, and Vietnam in an attempt to explore how community forestry may contribute to adaptation and mitigation goals. They are exploratory and descriptive in nature and although not purporting to be representative of the region, they provide a foundation for a better understanding of these relationships.

Specifically, the objectives are:

- To better understand the potential role of community forestry to contribute to both climate change adaptation and mitigation goals.
- To illustrate not only the positive contributions of community forestry to these goals, but also where and under what conditions trade-offs between adaptation and mitigation, and other objectives may occur.

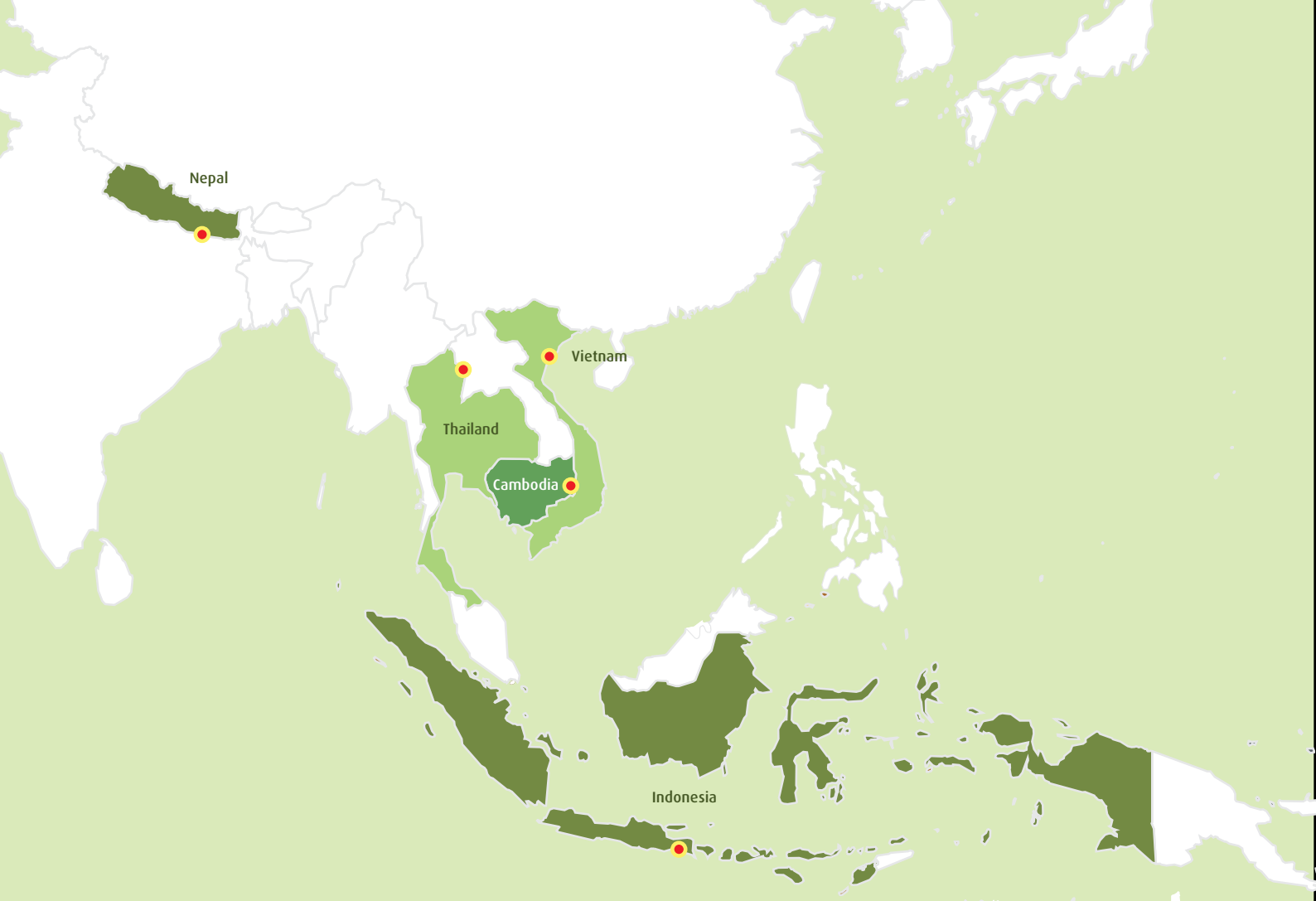



Table 1: Case Study Sites and Contexts

| Country | Context |
|---|---|
| Cambodia | A REDD+ pilot site located in the Seima Protection Forest, Mondulkiri Province, where indigenous communal land titles are in the process of being issued. |
| Indonesia | A protected area REDD+ project site in Meru Betiri National Park where local communities have played a key role in managing buffer zone forestry sites. |
| Nepal | Explores the role of community forestry and its contributions to adaptive strategies in Sarlahi District of the Terai. |
| Thailand | Focuses on Ban Huay Win community, details community forestry in the context of a national park and the resulting ambiguities over rights with implications for adaptive capacity. |
| Vietnam | Da Loc commune in Vietnam represents an effort to respond to natural disasters, such as typhoons, through the reforestation of mangroves and the resulting impacts that this has had on local livelihoods and social dynamics. |

As community forestry is an increasingly recognized approach in all of the countries studied, it is a valuable entry point for understanding how adaptation and mitigation may be jointly addressed. It is recognized for its role in sustainable forest management, biodiversity conservation, and increasingly as a key approach for mitigation initiatives such as REDD+ (UN-REDD, 2011).

Much of the information is based on discussions with communities and so reflects their perceptions, for example, of changes that they are experiencing in their environment and the resulting impacts on their livelihoods.

## Case Studies

The case studies focus on local-level sites in Cambodia, Indonesia, Nepal, Thailand, and Vietnam. The selection of case study sites, while not attempting to be entirely representative, covers a range of forest types and geographies, as well as a diversity of policy and social contexts. Community-managed forest resources are present in all cases, ranging from established Community Forestry User Groups (CFUGs) in Nepal to informal recognition of community management in the buffer areas of a national park in Indonesia. Finally, as CARE International was one of the cooperating partners in the development of the case studies, preference was given to sites in which it had pre-existing activities (i.e., for the case studies in Nepal, Thailand, and Vietnam).

# 2 Conceptual Framework

## Climate Change in Asia

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) depicts clear climate change trends in Asia (IPCC, 2007). While there is variation from country to country, for the region as a whole these trends include temperature increase, declining days of precipitation, and an increase of extreme weather events and natural disasters, such as typhoons. Temperature increases of 0.1 to 0.3°C have been reported from 1951 to 2000 (IPCC, 2007) and increasing numbers of hot days and decreasing numbers of cold days are being recorded (Manton *et al*., 2001). The frequency of more intense rainfall events with high amounts of total rainfall in short periods of time in many parts of Asia has increased, causing severe floods, landslides, and mud flows (Gruza and Rankova, 2004; Zhai, 2004). Finally, sea level rise in Asia is slightly greater than the global average at 1 to 3 mm/year (Woodworth *et al*., 2004; Rignot *et al*., 2003) and appears to have accelerated over the past decade (Arendt *et al*., 2002).

## Climate Change Mitigation

Climate change mitigation refers to efforts to reduce human-induced greenhouse gas emissions, such as reducing emissions from the transport, energy, and land-use sectors, or increasing the level of storage and sequestration of carbon in sinks such as forests. The IPCC defines it as "anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases" (2001). As between 12 to 17%[1] of global greenhouse gas emissions are attributed to land-use changes and the loss of forest (IPCC, 2007), there has been growing momentum over the last decade to develop policies and measures to reduce emissions from forests.

Reducing Emissions from Deforestation and Forest Degradation (REDD) aims to place a financial value on reductions in forest carbon emissions, creating incentives for developing countries to reduce emissions from forests. REDD+ expands upon this concept to incorporate the conservation of forest carbon stocks, sustainable management of forests, and enhancement of forest carbon stocks. As well as contributing to climate mitigation goals, REDD+ has the potential to contribute to other environmental and developmental goals in the form of 'co-benefits.'

## Climate Change Adaptation

In contrast to mitigation activities, climate change adaptation deals with the consequences of climate change that are already occurring or likely to occur. In its assessment of challenges to climate change adaptation in the region, the IPCC identifies poverty as the most significant barrier to developing capacity to cope and adapt to climate change (IPCC, 2007).

[1] The exact percentage of emissions due to land-use change and forest loss is under debate. It is currently considered to potentially range from 10 to 17%.

The poor are typically characterized by low adaptive capacity due to limited access to information, technology, and other capital assets, making them highly vulnerable in this context.

Key adaptation concepts used throughout the case studies are listed below:

**Adaptive capacity** is defined as "the ability of a system [human or natural] to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" (IPCC, 2001).

**Vulnerability** is the extent that a system,[2] country, community, or individual is likely to experience harm as a result of exposure to a hazard or stress. Vulnerability to climate change is a complex combination of exposure, sensitivity, resilience, and adaptive capacity (Turner *et al.,* 2003; Yusuf and Francisco, 2009).

**Resilience** is defined as the ability of an exposed system, society, or community to adapt or recover from potential hazards while maintaining an acceptable level of its structure and function (UN/ISDR, 2004).

The Sustainable Livelihoods Approach (SLA) outlined in CARE's Climate Vulnerability and Capacity Analysis Handbook (2009) provides a conceptual framework, whereby livelihoods comprise the capabilities, assets, and activities required for securing a living. Under the CARE definition, a livelihood is sustainable when it is able to cope with and recover from external shocks and stresses, as well as maintain or enhance its capabilities and assets now and in the future (CARE, 2009). Five core asset categories are typically identified in the SLA: human, social, physical, natural, and financial (Table 2).

Table 2: Sustainable Livelihood Assets

| Type | Examples |
|---|---|
| **Human** | Knowledge of climate risks, conservation agriculture skills, good health to enable labor. |
| **Social** | Women's savings and loans groups, farmer-based organizations, traditional welfare and social support institutions. |
| **Physical** | Irrigation infrastructure, seed and grain storage facilities. |
| **Natural** | Reliable water sources, productive land, vegetation and trees. |
| **Financial** | Micro-insurance, diversified income sources. |

Source: CARE (2009).

## Synergies between Adaptation and Mitigation

Although mitigation and adaptation aim to avoid or limit the potential damage from climate change, they approach the problem from different perspectives; mitigation aims to address the causes of climate change, while adaptation responds to its impacts. The IPCC argues that neither mitigation nor adaptation measures alone are sufficient to respond to climate change impacts and that greater attention to the inter-relationships, synergies, and trade-offs between them are required (IPCC, 2007).

[2] A system is defined as "a set of things working together as parts of a mechanism, an interconnecting network or a complex whole." Oxford English Dictionary: http://oxforddictionaries.com, accessed 1 October 2011.

While forests have largely been overlooked in climate change adaptation discussions, this has recently been changing. An increasing number of studies are examining the linkages between mitigation and adaptation in relation to forests (FAO, 2011; FAO, 2010; Locatelli *et al.,* 2008; Robledo *et al.,* 2005) and as pressure grows in international fora to couple REDD+ and climate change adaptation measures[3] the foundations are being laid for a more integrated approach to climate change and forests.

## Forests and Local Communities

There is a growing recognition of the contributions of forests and forest products to the lives of rural communities. The Center for International Forestry Research, in its Poverty Environment Network research collection initiative in 33 countries, is revealing that the global livelihood contributions of forests are much higher and more significant than previously anticipated. Its research indicates that forest products provide, on average, one-fifth to one-quarter of household income in rural areas globally (Angelsen, 2011). It is necessary to better understand how local communities rely on forests, in particular during times of duress, how their forest-use patterns change under various climate change scenarios, and how sustainable forest management strategies can support the resilience of local communities. It is also important to understand how approaches to reduce emissions from forests affect local livelihoods.

## Community Forestry

Community forestry is used here broadly to include all aspects, initiatives, sciences, policies, institutions, and processes that are intended to increase the role of local people in governing and managing forest resources. It consists of informal, customary and indigenous, and formal or government-led initiatives. Community forestry covers social, economic, and conservation dimensions in a range of activities including indigenous management of sacred sites of cultural importance, small-scale forest-based enterprises, forestry outgrower schemes, company–community partnerships, and decentralized and devolved forest management (RECOFTC, 2008). In addition to having a potential role in mitigation initiatives, such as REDD+, community forestry has strong potential to respond to recommendations in the Stern Review (2007) for strengthening adaptation in Asia. These include improving access to information about climate change, reducing the vulnerability of livelihoods, and empowering communities and other local stakeholders for active participation in decision-making processes.

[3] Subsidiary Body for Scientific and Technological Advice – agenda item for 36th session in May 2012.

# 3 Methodology

The methodology for the study is qualitative and exploratory. There was a deliberate capacity-building element to the study as local partner institutions and national researchers were sought out and engaged. The development of national-level knowledge and skills was an important goal. As such, the partner organizations ranged from universities, local development NGOs, and national research institutes. In all cases, the linking of community forestry, climate change adaptation, and mitigation research introduced new information, concepts, and practices to the research partners.

## Methodology and Approach

Participatory Rural Appraisal (PRA) methodologies facilitated the collection, presentation, and analysis of the data with rural community members.

Research questions that directed the focus group discussions and interviews generally addressed:

- What have been the physical changes in the local environment over the recent past?
- What have been the impacts of any such changes on local communities and their livelihoods?
- What are the sustainable livelihood assets possessed by the community, particularly linked to forests, which might contribute to adaptive capacity?
- How are community forestry management strategies contributing to adaptation and mitigation needs?
- How are forest management strategies, including mitigation initiatives, potentially adversely impacting the adaptive capacity of local communities?

Case study authors attended an inception workshop in Bangkok from 1 to 3 August, 2011, and were introduced to the proposed methodology and process for the study. Investigative methodologies were drawn from common PRA tools, alongside more climate change-specific tools developed by RRC.AP (2011) and CARE (2009), including:

- Focus group discussions
- Natural resource flow and spot maps
- Extended livelihood profiles
- Hazard, vulnerability, and action profiles
- Ecosystem services' change matrix
- Risk reduction development service profiles RRC.AP (2011)
- Supplemental seasonal calendars, hazard mapping, and vulnerability matrix (CARE, 2009)

All researchers visited the case study sites on at least two occasions. Focus group discussions and semi-structured interviews were employed, along with other tools adapted to the context. In general, community participants were divided into groups of no more than 20 people for the

PRA exercises. In-depth interviews with individual households, village leaders, local authorities, and selected relevant professionals (such as veterinarians and health care providers) were conducted at all of the sites. In addition, secondary data from official documents were accessed. Finally, small workshops were conducted to summarize, share, and validate information collected.

The data and information collected from primary and secondary sources were compiled and analyzed qualitatively. The investigators critically reflected on observations and data collected, followed by analysis, synthesis and organization according to emerging themes and patterns.

## Challenges for the Methodology

Knowledge of climate change was not assumed and direct references to climate change were avoided in favor of enquiries into observations of environmental pattern changes.

Generally it was observed that documentation of perceived climate change impacts has both risks and benefits. In particular, as the documentation of site-level climate change impacts is still in early stages, impacts must be qualified and often cannot be attributed directly to climate change. However, community experiences and perceptions can offer valuable information and directions for further research and provide a first step in beginning to draw out the linkages among forest use, local communities, and environmental stress.

# 4 Lessons Learned for Maximizing Adaptation and Mitigation Impacts in Community Forestry

## What Can We Learn from the Case Studies?

The case studies provide important lessons on the role of community forestry in Asia in contributing to both climate change adaptation and mitigation needs. The cases provide glimpses into the various ways community forestry supports community resilience not only through the sustainable management of natural resources, but also through the enhancement of social and human capital. They also offer valuable lessons on community uses and management of forests in a variety of contexts and the complex interplay between local livelihoods and the physical environment. Finally, in addition to the positive contributions, the case studies highlight potential trade-offs between mitigation and adaptation objectives, and local livelihoods and development needs; recommendations are made on how to address these issues.

## Environmental Change and Possible Relationship to Climate Change

Environmental changes are observed in all of the case study sites. Their causes are a complex mixture of land-use changes, including deforestation and intensified agriculture, and potential changes as a result of climate change. Many of the environmental phenomena being experienced are in keeping with anticipated climate trends for the region and at national scales. In most of the case studies, water shortages and drought are being experienced and this coincides with trends in rainfall patterns, with the number of rainy days becoming fewer but with more intensity, hence contributing to soil erosion and landslides. Greater temperature extremes are reported in all cases with a gradual upward rise in regional temperatures, with hot days becoming hotter, and cold spells also being more extreme. Finally, changes in the onset of seasons by up to several months and the unpredictability of seasons are identified in most of the sites.

Rising incidence of natural disasters is also widely reported. Following expected climate change trends of more extreme weather events, the Seima communities in Cambodia report increasing frequency and intensity of windstorms, while the typhoons impacting coastal areas such as Da Loc in Vietnam are also of growing severity and frequency. Changes in type and range of pests are being noted. For example, malaria is re-emerging in the Terai of Nepal, having previously been eradicated. Crops and livestock are being affected by previously unknown parasites and disease.

## Impacts on Local Communities and Livelihoods

For the agricultural communities in these studies, a critical factor is shifts in seasonality with the unpredictability of rainy seasons affecting both planting and harvesting of crops. Apart from having to alter cultivation schedules, the types of crops are also transitioning towards

less water-dependent crops, such as rice – which is grown in much of the region for household consumption. Growing challenges with rice cultivation have coincided with powerful socio-economic pressures to engage in cash crop cultivation, with case study sites switching to maize, sugarcane, and cassava.

Water scarcity is a general complaint, for example communities in Cambodia and Vietnam resorting to purchasing water for consumption and household use. In the Nepal, water scarcity has triggered conflict, with upland communities covertly trying to use the well water of downhill communities during the night.

Finally, with regard to forests, the impacts of environmental and possible climatic changes are less obvious than they are in the agriculture sector, but are occurring nonetheless. The ranges of forest species are shifting and in certain cases, such Nepal, certain species are now limited to upland areas or disappearing altogether. Efforts are being made in many of the studied countries to enhance biodiversity and experiment with planting of less water-dependent species. Declines in various types of fruit, medicinal plants, and forest wildlife are impacting communities in general.

## Adaptation and Local Responses

Various responses to changes in the environment are apparent. These range from immediate coping measures, such as rebuilding homes destroyed by windstorms, to longer-term, planned adaptations, such as changes in crops and the development of community adaptation plans. The strongest responses appear to be those where external support has provided technical and financial assistance. This is the case in Vietnam with Government and CARE initiatives to establish mangrove forests as buffers against typhoons; in Thailand, with Raks Thai Foundation support for improved agricultural practices such as terracing; in Cambodia with livelihood development support; in Nepal via assistance in developing adaptation plans; and in Indonesia through support for forest rehabilitation.

However, there are questions regarding the degree that adaptation is incorporated within development and forest management efforts and concerns that, at times, externally-led interventions may be undermining adaptive capacities or leading to inappropriate adaptation. A case in point is the strong promotion of maize as a cash crop in Ban Huay Win in Thailand, where dependence on markets and middlemen combined with loss of subsistence crops may be leading to increased vulnerability. Stringent restrictions on forest use in the case study site in Nepal also seem to have disproportionately affected poorer segments of society and, in particular, women.

In all cases communities rely heavily on livelihood assets to cope with external shocks. Financial assets for coping with environmental and economic shocks are critical and, where a buffer of savings either individually or at the community level does not exist, debt and further impoverishment often result. Conversely, social assets and strong community solidarity are a powerful advantage in responding to change – allowing experimentation, asserting common approaches, and advocating for stronger rights and development service support.

## Potential Role of Community Forestry in Contributing to Adaptation and Mitigation

Community forestry offers the potential to contribute to both adaptation and mitigation goals. It offers an integrated package of benefits. By placing communities at the center of management strategies, community forestry is an appealing approach for initiatives, such as REDD+, which seek to maximize mitigation while ensuring social and environmental safeguards are upheld.

Using the livelihood assets framework to approach community forestry will help to ensure adaptive capacity is safeguarded in the context of forest management and that the balance between livelihoods and conserving ecological assets is maintained. To undermine any of the natural, physical, human, financial, or social assets is to diminish adaptive capacity and, therefore, preventing this can and should form the foundation of community forestry.

There are multiple examples in the case studies of the role of community forestry in adaptation. In the community-managed mangrove forests in Vietnam, the strengthening and diversification of livelihoods through associated aquaculture has compensated for declining agricultural yields. In the Nepal case, the CFUGs are one of the most important entry points for development service providers to offer a range of services including health, education, and micro-financing. Cambodia's indigenous people in Seima have retained strong customary approaches to forest management, which support its resilience in times of ecological hardship. In the Indonesian site, community forestry and associated community mobilization form the basis for negotiating access and use rights to the national park's forested buffer area. Finally, in the Thai case, community forestry institutions provide the structure for communicating and organizing with other community forestry groups in the national park's watershed.

## Trade-offs between Objectives and Approaches

Despite the numerous contributions that forest management approaches can make to strengthening adaptive capacity, there are still potential pitfalls and points of tension. It is important to identify where the fault lines may lie between different objectives and approaches – including forest management, local livelihoods, conservation, adaptation, and mitigation – and possible trade-offs. Community forestry seeks to ensure both social interests and sustainable management of forests. Mitigation initiatives, such as REDD+, while articulating safeguards and giving high value to protection of local rights, ultimately aim at maximizing carbon sequestration in forests. This goal may conflict with other interests, such as sustaining livelihoods, so it is important that current and anticipated trade-offs are identified and taken into consideration during project design and implementation.

As many of the conservation measures developed in community forestry and protected area management plans are relevant to climate change projects, lessons learned on the trade-offs in these contexts are valuable. Throughout all the case studies an underlying theme is the need for livelihoods to be protected and enhanced. Where conservation measures impinge on forestland use, whether for agricultural expansion, timber, or non-timber forest product (NTFP) harvesting, the impacts must be compensated for soon after the imposition of restrictions. Failure to do so will inevitably lead to a loss of community support for the intervention and conservation efforts will be undermined in the interest of meeting basic needs.

Some specific incidences of these trade-offs emerge in the case studies. In the Nepal case study site, the strict conservation regulations in the forest management plans lead to poorer groups and women being disproportionately affected by restricted access to NTFPs and regulations for the stall-rearing of livestock. In Seima in Cambodia, alternative livelihood development initiatives have been only partially successful due to limited market links, which may have implications for community support for REDD+. Designation of the protected forest in Thailand has led to rigid land classification which has limited the ability of the Ban Huay Win community to get development service support. In Indonesia, given pressing livelihood and food security needs, unless REDD+ is able to incorporate agroforestry within its design, economic pressures for land conversion may win out. Finally, in the Vietnam case study, the mangrove forests have increasingly come under threat as the incentives offered by unsustainable aquaculture harvesting are outweighing the perceived benefits from the mangroves.

# 5 Conclusions

The contributions of community forestry to mitigation objectives are well established. The main argument for community forestry, in the context of REDD+, is that it responds to multiple interests. With regard to adaptation, while community forestry can support adaptive capacity, it does not inherently do so. Restrictions on forest use in favor of conservation can limit livelihood options and the design of decision-making and benefit-sharing arrangements may serve to undermine the interests of particularly vulnerable groups. It is therefore essential that community forestry be undertaken using a sustainable livelihoods approach that focuses on the enhancement of assets to strengthen adaptive capacity. While community forestry does not automatically guarantee improved resilience to climate change, if mainstreamed in its approach, it could be a highly effective approach. Community forestry supports livelihood assets such as social capital and community organization, as well diversified livelihoods and the protection of the natural resource base on which they depend.

## Recommendations

**For Policy Makers**

- A climate change adaptation lens needs to be mainstreamed within national and sub-national development planning. Community forestry demonstrates the potential role for decentralized local institutions in responding to environmental and climate change adaptation needs.
- Clear and integrated national guidelines for REDD+ and community forestry should be created, including guidance on stakeholder rights, roles, responsibilities, and returns.
- Land tenure reform processes should be accelerated and expanded, with a particular emphasis on indigenous and communal land-titling processes as a means of securing long-term community commitment.
- Collaboration and coordination among government agencies horizontally and vertically should be ensured. This is particularly needed across different levels, such as district and provincial levels, and to involve agencies responsible for protected area management where this is not the purview of the forestry department.
- Good governance and transparency across agencies as well as concerted forestry law enforcement, especially on timber trafficking, is needed for sustainability and to reduce mistrust.
- Carbon rights and the benefits accruing from them is a complex issue and needs to be addressed at national levels in order to ensure community support and the fair recognition of contributions.
- Policy-makers should identify models of successful mitigation-adaptation initiatives and scale up, where appropriate, prioritizing the documentation of lessons learned.

## For Practitioners and Project Proponents

- Financial resources are vital to increase the adaptive capacity of vulnerable communities. In addition to promoting income diversification options, CFUGs should continue to support micro-credit and the linking of development banks with the local level.
- Efforts are needed to build up local technical forestry expertise in order to have skilled people embedded within communities that are able to facilitate forest-based adaptation and mitigation strategies.
- Adaptive capacities should be developed through capacity building targeted at local-level government and the communities themselves, with special emphasis on vulnerable groups. Part of this should be a common understanding of REDD+ and how it will complement existing forestry structures.
- Payment for Environmental Services options, with carbon sequestration being seen as one environmental service within a broader package, should be explored.
- Incorporating local knowledge will help to increase effectiveness of adaptation and mitigation practices and promote sustainable local adoption. Engaging communities in participatory action research to identify solutions ensures buy-in and may yield useful and innovative approaches.
- 'Low-hanging fruit' where adaptation actions have additional mitigation benefits and vice versa should be sought. Synergies can be deliberately planned for and incorporated in adaptation and mitigation project design.
- Rural communities are also among the poorest. Poverty alleviation and livelihoods' development are critical to community support for mitigation and conservation initiatives. An important part of livelihoods' development, given the remoteness of many forest-based communities, will be facilitating market access and building capacities for product processing and adding value.
- Local communities need incentives for forest protection through commensurate financial and non-financial support for activities such as patrolling and collecting inventory information, in order for communities' roles in protected forest to be sustainable.

## For Further Research

- As changing climate affects forest ecosystems, species composition will also be impacted. There is a need to test and prepare for forestry activities using low water-consuming and indigenous species. This should be done jointly with local communities.
- It is important to be able to assess the costs and benefits of adaptation and mitigation actions to communicate expected tangible and non-tangible benefits and trade-offs.
- One finding from the development of the case studies is the dearth of quantifiable data in many of the countries. It should be high priority to document and track environmental changes that might be associated with climate change in order to strengthen and clarify the impacts and role of activities in mitigating and adapting to climate change.
- Development of knowledge sharing and network exchanges within and between countries should be supported. There is an urgent need for capacities to be built and intra-regional sharing is an important part of this.

CAMBODIA

# Indigenous Communities, Conservation, and Climate Change in Cambodia: Securing Livelihood Options for Sustainable REDD+

The Cambodia Rural Development Team

## Key Lessons

Indigenous communities living in Seima Protection Forest (SPF) in Cambodia are vulnerable to changes in the local environment, such as drought, flooding, and other extreme weather events. Unsustainable land-use patterns, high levels of poverty, lack of basic infrastructure, and low levels of education limit their capacity to respond effectively and adapt to these changes. Despite Seima's protected forest status and the communal indigenous land titling process that is underway, illegal logging and pressures from agro-industrial companies for economic land concessions have persisted. These pressures and land use restrictions have generated insecurity among local people that threatens long-term investment in sustainable forest management. To ensure the success of the REDD+ pilot project in Seima, the following issues need to be addressed:

- The communal indigenous land titling process must continue and be scaled up; the capacities and awareness of indigenous communities must be raised in the context of entitlements and rights.
- Local livelihoods must not be impacted negatively by conservation or forest management activities. Rather, projects such as REDD+ should strive not only to compensate for losses but also to enhance livelihood options. This should come through strategic development of alternative livelihood options and better market access for local products.
- There should be incentives for local communities to protect forests that result in rapid realization of financial and non-financial benefits. This may involve payments for Measuring, Reporting, and Verification (MRV) activities, forest patrolling, and the collection of inventory data.

## Timeline

2001 Provision for registration and titling of indigenous community lands recognized under the 2001 Land Law.

2002 Cambodia's forestry sector experiences reform following suspension of all logging concessions by the Government.

2003 The Forest Administration and Wildlife Conservation Society facilitates Participatory Land Use Planning (PLUP) in the SPF.

2006 Cooperation initiated among the Forest Administration (FA), Wildlife Conservation Society (WCS), and the Cambodian Rural Development Team (CRDT) for work in the SPF.

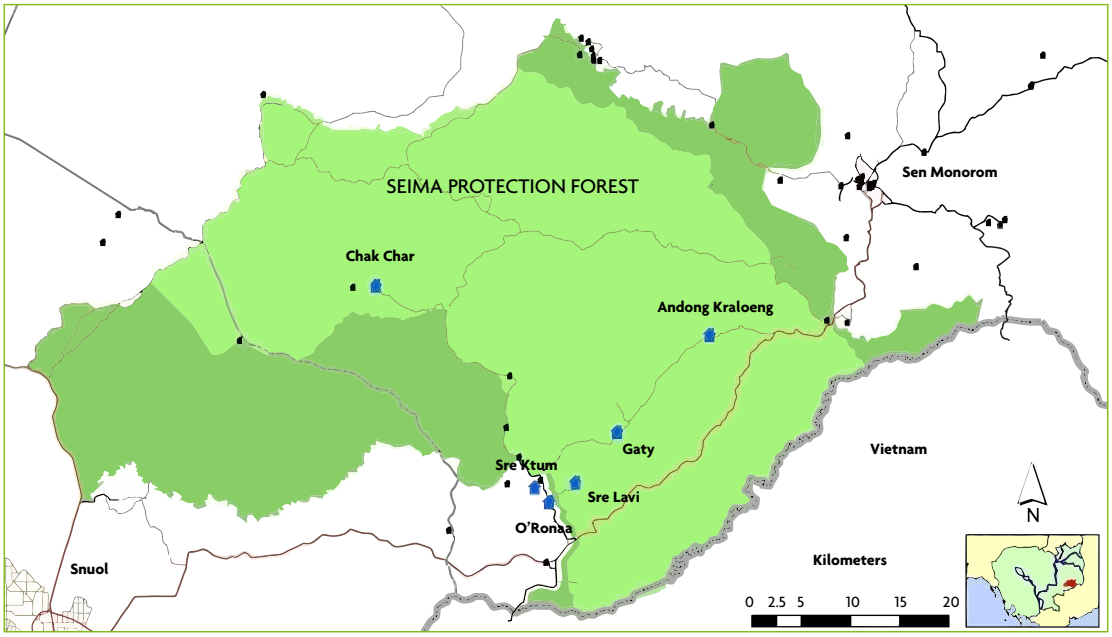
A similar agreement is signed by the same parties to launch an alternative livelihood development project.

2008 The Seima Protection Forest–REDD+ demonstration site is formally initiated.

2009 Market crashes for cassava and cashew nuts negatively affect indigenous communities in the Seima area.

Declaration of Seima's Protected Forest status due to globally important biodiversity.

## 1. Background




Seima Protection Forest, Mondulkiri Province, Cambodia

Cambodia is rich in forest and wildlife, but reliance on agriculture and susceptibility to flooding make the country highly vulnerable to the impacts of climate change (RGC, 2006). The expansion of unsustainable land-use patterns and significant levels of deforestation (at 0.8% per year from 2002 to 2005 [FA, 2007]) compound this vulnerability. The Government of Cambodia has prioritized sustaining the existing forest cover; owing to its forest management and conservation efforts, Seima was awarded protected forest status in 2002.

Located in Mondulkiri Province of eastern Cambodia, the SPF is one of the most important forest areas remaining in Cambodia. Covering 298,250 hectares, it has extensive evergreen, semi-evergreen, and deciduous tree cover (Evans *et al*., 2011) and exceptional biodiversity with more than 40 species found in the IUCN Red List (Pearson *et al*., 2008). The Bunong indigenous peoples have lived in the area for more than 100 years.

Nineteen communities are located within and around the core area of the SPF. This study focuses on three of the villages: Andong Kraloeng village in O'rang District and O'ronaa and Gaty villages in Keo Seima District. These communities comprise 246 families or 1,237 people. The Bunong are the predominate group and historically have been highly dependent on the forest for both subsistence and income (Thuon, 2010).

Livelihoods of the villagers depend on non-timber forest products (NTFPs) from the SPF that provide, among other resources, food, traditional medicines, construction material, and income from resin tapping. Resin tapping alone in Mondulkiri is estimated to generate household incomes of approximately US$340/year – equal to the cost of purchasing rice for a family of five for a year (Evans *et al*., 2003). Their heavy dependence on natural resources and reliance on a limited number of cash crops, make the communities highly vulnerable to changes in the environment; in particular climate change impacts that have adverse affects on agriculture, such as drought, flooding, and insect attack.

## REDD+ Pilot Project in Seima

In 2008, the FA under the Ministry of Agriculture, Fisheries and Forestry (MAFF) partnered with the WCS to pilot REDD+ activities in the SPF, in cooperation with the CRDT and the Community Legal Education Center. The project aimed to stimulate sustainable cash flows via access to the voluntary carbon market.

Prior to the launch of the REDD+ pilot project in 2008, the FA and WCS began Participatory Land Use Planning (PLUP) [1] activities in the SPF as early as 2003. The PLUP approach has had a pivotal role in raising awareness of community rights and served as an important instrument for introducing REDD+.

Before the onset of the REDD+ pilot project, the FA, WCS, and CRDT initiated alternative livelihood development activities in 2006. First piloted in the village of Andong Kraloeng, this included training on improved agricultural techniques and small-scale agricultural production for sale in local markets. These activities were intended to reduce pressure on forests in addition to improving local livelihoods. In 2008 the project was scaled up to include the villages of O'ronaa, Sre Lavi, and Gaty. CRDT data indicate that as a result, household incomes have risen by an average of US$30-70/year, a 10-15% increase, and time spent on collecting forest products has decreased from 8.7 days to 3.8 days a month (CRDT, 2009).

The REDD+ pilot project is currently in its third phase in the process of obtaining consent (Table 1). During the first two phases, largely focused on discussion and raising awareness, local communities and authorities were fully supportive. However, as the REDD+ pilot project advances and trade-offs with respect to livelihoods become apparent, maintaining support and buy-in among all stakeholders has become increasingly challenging, although still considered feasible.

[1] In the context of this study, PLUP is synonymous with what is commonly known as community forestry.

Table 1: REDD+ awareness raising and FPIC in the SPF

| | |
|---|---|
| **Phase I:**<br>Awareness Raising on Climate Change and REDD+ | The WCS and CRDT conducted focus group discussions and mini-workshops with forest communities on climate change and REDD+. Topics included:<br>▪ Causes of climate change;<br>▪ Greenhouse gas emission reductions;<br>▪ The role of forests in reducing emissions;<br>▪ Generating REDD+ carbon credits;<br>▪ Livelihood development. |
| **Phase II:**<br>REDD+ and Community Engagement | The WCS and CRDT facilitated:<br>▪ Multi-stakeholder focus groups on REDD+ rights, roles, responsibilities, and possible benefits;<br>▪ Community-level focus groups on REDD+ design and concerns;<br>▪ Workshops to raise community awareness of national community forestry law and relevance to REDD+ pilot project agreement; and<br>▪ Free, Prior, and Informed Consent (FPIC) focus groups to determine consent to the REDD+ pilot project. |
| **Phase III:**<br>Processing FPIC Results | The WCS and CRDT is continuing FPIC discussions:<br>▪ Reviewing REDD+ pilot project implementation agreement, and<br>▪ Collecting further consent of community members for involvement in the REDD+ pilot project. |

Today, the SPF is one of two pilot REDD+ sites in Cambodia, along with the pilot site in Oddar Meanchey Province. The Oddar Meanchey REDD+ project is now selling carbon credits, while the SPF is working towards verification with the Voluntary Carbon Standard (VCS) and the Climate, Community and Biodiversity Standard (CCBS).

## 2. Climate Change Impacts in Cambodia and Seima

Climate change impacts are already being experienced throughout Cambodia. Temperatures have risen steadily over the last 50 years with the average temperature increasing by 0.8°C since 1960 (McSweeney *et al*., 2008); rainfall patterns have also become irregular (MoE, 2010; Eastham *et al*., 2009).

Participatory rural appraisal exercises reported a number of changes in the local environment. Andong Kraloeng, O'ronaa, and Gaty communities all indicated that the weather is becoming more extreme with greater heat and aridity in the dry seasons. They also noted rising storm and flooding frequency and intensity, with Cambodia's worst flood in recent history occurring in 2000 (UNDP, 2011).

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### Variability in Rainfall Patterns

The Bunong define drought as a delay of the wet season by two months. Since 1997, the villagers have observed increasing delay in the arrival of the wet season – formerly it arrived at the end of April but this has changed to the beginning of June. The extended dry period puts stress on water resources; recently, some villagers resorted to purchasing water through micro-finance loans in order to meet domestic and livestock needs. Villagers have witnessed increased variability in rainfall intensity and, since the 1990s, severe soil erosion and flood events that damage agricultural crops (McAndrew and Il, 2008).

Flooding used to be rare in the Seima uplands, but SPF communities have experienced severe flooding four times in the past two decades. Heavy storms result in flash floods that inundate areas for two to three days. Apart from the negative effects of soil erosion and destroyed crops, water-borne diseases are on the rise and there is a growing risk of insufficient potable water in villages.

### Windstorms

Communities in Andong Kraloeng, O'ronaa, and Gaty claimed that the strongest windstorms in 30 years had occurred in 2011; they asserted that the frequency and intensity of these events was increasing. Fortunately, damage to houses was not extensive and most homes have remained intact. However, crop damage and soil erosion are major concerns.

### Declining Yields

Interviews with villagers pointed to declines in upland rice yields of between 20 and 50% since 2005, which they associate at least in part with extreme weather patterns. Overall, agricultural production in the three villages was reported to have dropped by approximately 10 to 15% during the same period. Similarly, traditional forest-based sources of food and livelihoods have been steadily declining; wild vegetables and fruits, honey, wildlife, and fish are reported to have diminished by an estimated 30 to 40% over the past six years. While difficult to link directly to climate change it underscores the importance of activities to conserve and sustainably manage the forest as well as the need for livelihood development.

## 3. Assessing Adaptive Capacity and Resilience

While the three villages appeared to enjoy a relatively strong natural resource base and improved land tenure, the predominance of market middle men and limited direct access toir access to information and education, as well as to markets, present significant challenges to sustainable management of the SPF and to the overall resilience of the communities.

**Table 2: Community Assets in Andong Kraloeng, O'ronaa, and Gaty Villages**

| Type | Assets | Effects on Adaptive Capacity |
|---|---|---|
| Natural Assets | ▪ Fuel and (restricted) timber<br>▪ Wild animals and fish<br>▪ Forest vegetables and fruit<br>▪ Bamboo, rattan, and resin<br>▪ Fodder for livestock<br>▪ Water from streams, wells | ▪ Abundant natural resources are strong assets for Seima communities. Reliance on them, however, leaves villagers vulnerable to environmental changes. |

| Type | Assets | Effects on Adaptive Capacity |
|---|---|---|
| Physical Assets | ▪ Road and track access of varying quality<br>▪ Availability of housing (though vulnerable to natural disasters)<br>▪ Primary schools<br>▪ Posts for healthcare, health education and awareness, and mid-wife and birthing services | ▪ Such infrastructure, though limited, is a critical asset during natural disasters and extreme weather events. |
| Financial Assets | ▪ Saving groups offering micro-credit<br>▪ Access to markets through middlemen<br>▪ Contract farming investors provide low-interest agriculture input loans (5-8% monthly)<br>▪ Commune Investment Fund – Government program for local development activities | ▪ While financial and borrowing options exist, the predominance of middlemen and limited direct access to markets seriously curtail the communities' capacity to generate income and invest in adaptive strategies. |
| Social Assets | ▪ Indigenous community land titling<br>▪ Community-based organizations engaged in marketing support for small-scale production initiatives<br>▪ PLUP processes<br>▪ Development service providers support capacity development | ▪ Communities benefit from a range of development services. However, it remains unclear to what degree programming and capacity development is sustained. |
| Human Assets | ▪ Effective community councils, with able members<br>▪ Village elders with a wealth of indigenous knowledge, cultural practices, and experience in community decision-making<br>▪ Multiple service providers, including traditional healers, Government service providers e.g. teachers, veterinarians | ▪ Vibrant indigenous knowledge systems in place. However, educational levels and access to information remain a critical constraint to adaptive capacity. |

## Adaptive Capacities

### Indigenous Community Land Titles

Under indigenous land titling, the provision for which was established in the 2001 Land Law, a group of indigenous people is able to acquire collective ownership rights over forest land -private- or state-owned. The provision also stipulates that the indigenous community or individuals within the community cannot sell the land.

As the indigenous communities of Seima were perceived to be highly vulnerable to loss of their land, they became one of the first pilot communities to be involved in the communal land titling process. The applications for titles are ongoing for most of the communities but Andong Kraloeng was awarded a title in March 2012 (WCS, 2012).

### Traditions of Sustainable Resource Management

The communities involved in this study highly value the forest ecosystem and view it as a critical backdrop to their lives and culture. The Bunong are animists and believe that the stability of their lives depends on the proper conduct of ceremonies related to nature. Every part of the

forest is believed to house the spirits of their ancestors and requires permission before any disturbance or harvesting. They believe that sacred lands within the forest, where the dead are buried, provide spring water throughout the year, that shifting cultivation ensures soil quality, and that fish populations are preserved by forest spirits. These cultural links to the forest result in village management of the surrounding natural environment for specific purposes intended to ensure sustainability and prosperity.

### Strong Social Fabric

Despite many changes over the past decade, the Bunong's cultural practices and strong community relationships have remained largely intact. People customarily share food with their neighbors, especially when one family successfully kills a wild animal, such as a wild pig or deer. Such practices provide a social safety net for the poorest people in the villages. While the increased influence of the market economy is having an impact, strong social and cultural solidarity continues.

### Geographic Buffers

Due to the geographic characteristics of Seima, the villages have experienced less severe drought, flooding, and other extreme weather events than their counterparts in other parts of the country (UNDP, 2011). Despite being relatively buffered, the communities report that natural disasters have increased over the past decade, disrupting traditional livelihood practices and threatening human health and well-being.

# 4. Vulnerabilities

## Poverty

A 2010 Millenium Development Goal gap analysis (MoP, 2010) identified Mondolkiri as one of three key provinces that are behind the national agenda for poverty and hunger reduction. At 59%, poverty is much higher than the national average of 36% (McKenney *et al*., 2004; CSD, 2001) and poverty rates are even higher for the indigenous populations, such as those in Seima (NSDP, 2010; AAH, 2003). The United Nations Development Programme (UNDP) highlights the importance of poverty indicators as they are closely associated with climate change vulnerability (UNDP, 2011).

## Food Insecurity

The Andong Kraloeng, O'ronaa, and Gaty communities endure chronic food insecurity (CRDT, 2011). Sufficient agricultural productivity remains a significant challenge, particularly in the face of ecological and climate changes. The Bunong depend on upland rice farming, which yields approximately 800 kg/hectare in comparison to the 1,000 to 3,000 kg/hectare for lowland wet paddy farmers (AAH, 2003). Typically the rice harvest is sufficient to meet the needs of the Bunong for an average of only four to six months per year.

Recently, some families have become involved in commercial cassava and cashew farming. This has had mixed results. While diversifying income sources, potentially there are increased vulnerabilities via impacts on the local ecology and deepening dependence on middlemen and markets. These cash crop markets can be highly volatile and. in 2009, many cassava and cashew farmers suffered when the market crashed.

### Water Scarcity

Food security is closely linked to water availability, which is claimed to be increasingly insufficient for agriculture, livestock, and household use in the villages. Extended dry seasons and deforestation have affected the water supply. Farmers now need to carry water from sources one to three kilometres away, further exacerbating the burden of food production.

### Unsustainable Resource Use

Pressure on NTFPs has increased considerably as the local population grows and agricultural lands expand. The communities and project proponents need to develop strategies for sustainable NTFP management, harvesting, and promoting practices that add value.

### Limited Education

Community members and leaders have low levels of education; primary school is the highest educational level of most villagers. More than 50% of the population is illiterate, so development service providers spend considerable time disseminating relevant legislative or policy information, keeping records, and raising awareness on various issues.

### Remoteness and Market Access

The Bunong are disadvantaged by their isolated upland location, low educational levels, limited infrastructure, and service delivery compared to lowland Khmer communities. As the communities move from subsistence to market-based livelihoods, these disadvantages are emerging as significant hurdles. While livelihood development activities have supported the production of perishable vegetables and other produce, due to challenges in accessing the market, some value has been lost, compromising interest in small-scale agricultural production initiatives in particular.

## 5. Responses to Environmental Changes and Development Needs

The Bunong have engaged a number of adaptive strategies to cope with losses presented by ecological and climate changes (UNDP, 2011), although with limited success to date. Efforts to respond to changes have led to immediate coping strategies, while development service interventions are increasingly seeking to foster long-term planned adaptation.

### Exploitation of NTFPs and Other Forest Resources

In times of crisis Bunong communities rely more heavily on the forests to meet basic needs. During extended dry periods, crop and livestock production declines and villagers compensate for lost food sources and income through increased hunting and the extraction of NTFPs, such as manioc tubers, resin, wild potato, wild banana, and other forest fruits.

### Mixed Responses to Forest Protection

Over the past few years, powerful economic incentives, in the form of high prices for particular cash crops and steep price rises for hardwood timber, have been major hurdles to the

sustainable management of Seima's natural resources. To some degree, this has been balanced by growing awareness and security of land rights, which, along with traditional conservation practices, is motivating investment in the land and protection of forest resources.

### Seeking External Support

Although SPF communities seek support from Government emergency services and relief organizations, such as the Cambodian Red Cross, many families are still forced to take loans to compensate for losses incurred in rice harvests. Some families have also turned to wage labor on plantations in order to generate income.

In response to rising health threats, which may be linked to climate change, such as malaria, dengue fever, diarrhea, and cholera (ADB 2009), Bunong communities have shifted from traditional medicinal practices to modern medical assistance.

### Alternative Livelihood Development

The livelihoods project supported by the CRDT, WCS, and the FA includes a range of interventions intended to support adaptation and resilience. It has provided villagers with fast-growing upland rice seed which has helped compensate for reduced yields caused by erratic weather patterns. The project has also introduced multiple-cropping systems in order to minimize yield losses. Investments in home garden development and fruit trees, along with training in small-scale animal husbandry, have simultaneously supported livelihood diversification as well as forest enhancement.

### Improved Water Collection and Distribution Systems

Development service providers have supported the installation of rainwater collectors and a water distribution system connected to nearby springs to improve water access during the dry season.

## 6. Adaptation, Mitigation, and Community Forestry Linkages

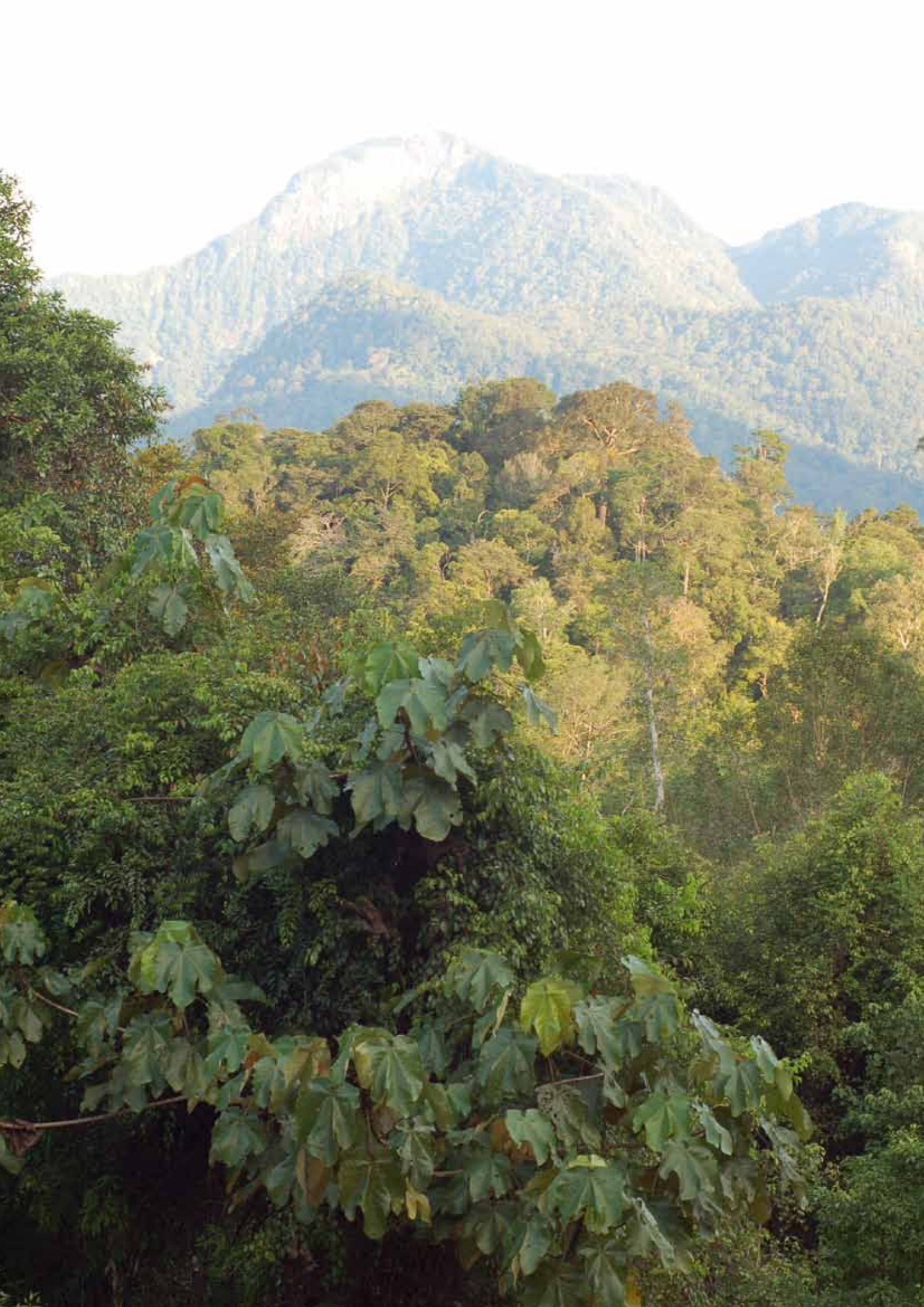
The REDD+ pilot project in the SPF has contributed to advancing communal land title claims and as such is supporting the safeguarding and strengthening of indigenous and local community rights. While the communal land titling process has offered significant opportunities for local-level engagement in boundary demarcation and project implementation, it remains unclear whether these communal land titles will allow for community ownership over forest carbon (Evans *et al*., 2011).

Climate change adaptation is a national priority (RGC, 2006). Investing in community forestry structures has strong potential to support livelihood assets that will strengthen adaptive capacity. The forest and forest-based activities provide a critical safety net for the Bunong. However, without addressing their vulnerabilities, in particular the need for secure livelihood options, sustainable forest management is at risk.

There is evidence that over the long term the SPF REDD+ pilot project will strengthen rather than undermine access to important natural resources and land tenure (Evans *et al*., 2011). However it is essential that incentives reach communities in the short term to ensure their continued support. Project proponents' promotion of alternative livelihood development has gone some

way to achieving this; but gaps remain, particularly in direct market access, which need to be addressed. Without clear and immediate incentives to offset opportunity costs, there is the real threat of escalation in illegal logging and incursion of agro-industrial plantations.

In addition to the non-financial benefits the REDD+ pilot project is generating, such as improved tenure security, participatory processes, and livelihood development, the project also plans to generate direct financial benefits from the sale of Verified Emission Reduction credits. However, given uncertainties over the development of a compliance market and voluntary carbon market prices, project proponents have been prudent in focusing more on the non-financial benefits generated.



INDONESIA

# Community Forestry Supporting Resilience in Meru Betiri Park, Indonesia

Arif Aliadi, Lembaga Alam Tropika Indonesia

## Key Lessons

Natural resource management efforts within the core and buffer rehabilitation zones of Meru Betiri National Park ('the Park') have strengthened the adaptive capacity of surrounding local communities. Achieving community access to and involvement in rehabilitating forest plots within the Park have been important steps in enhancing livelihood assets. In the process, community forestry farmer groups have become well organized and engaged in forest management and conservation activities. This led to the signing of a Memorandum of Understanding (MoU) with Park management for community access to the buffer zones within the Park. With an increasingly robust set of livelihood assets, the community forest groups are now well positioned to take initiatives in managing the forest and surrounding areas.

The Park is also home to a REDD+ pilot site which, in conjunction with access to the rehabilitation forest plots, has supported much needed alternative livelihoods for local people as agricultural yields decline due to changing weather patterns. In addition to supporting access to forest products, the project holds potential for additional income to be generated from the sale of Verified Emission Reduction credits. This may be a critical tipping point in favor of forest conservation as livelihoods are becoming increasingly vulnerable to climate change impacts.

Some key findings from this study are:

- It is important not to view the REDD+ pilot site as a new and stand alone initiative separate from preceding conservation and sustainable forest management efforts. Instead these should provide the basis for any subsequent carbon projects, ensuring an integrated approach to mitigation squarely rooted in sustainable forest management.
- It is equally important that forestry activities are not treated in isolation from those associated with other land use, in particular, issues of food security, agriculture, and livelihoods. Efforts for the long-term success of forest management will be compromised if agricultural needs – through sustainable and complementary forms, such as agroforestry – are not addressed.

- Access rights enjoyed by communities surrounding the Park have been central to their investment in reforestation efforts. However, this remains informal and dependent on staffing changes and Park management discretion. Long-term, secure access is vital to ensuring continued buy-in and investment by the communities.

## Timeline

| | |
|---|---|
| 1994 | Lembaga Alam Tropika Indonesia (LATIN), the Forest Department of Bogor Agricultural University, and Curahnongko village establish a seven-hectare demonstration plot for medicinal plants and agroforestry within the Park. |
| 1998-2001 | Deforestation due to encroachment and illegal logging cause the loss of 2,500 hectares of forest within the Park. |
| 2001 | LATIN organizes local communities to implement a forest rehabilitation program in the Park, engaging 3,500 households from five adjacent villages (Curahnongko, Andongrejo, Sanenrejo, Wonoasri, and Curahtakir). |
| 2004 | Local organizations and communities begin reforestation of 2,250 hectares of land within the Park. |
| 2003-2007 | Frequent droughts induce heavy crop failures in Curahnongko. |
| 2010 | The Meru Betiri National Park Reducing Emissions for Deforestation and Degradation+ (MBNP-REDD+) project begins, covering 58,000 hectares of the Park, including 4,000 hectares of 'rehabilitation' lands established by LATIN. |
| 2011 | Seventeen community forestry farmer groups from Curahnongko under Jaringan Kerja Petani Rehabilitasi (JAKETRESI, also known as the Farmers Forest Rehabilitation Network) and the Meru Betiri National Park Board sign an MoU granting community access to buffer zones in the Park. |

# 1. Background

Meru Betiri National Park in East Java, Indonesia, is renowned for its wealth of biodiversity. The Park is home to many protected animals, including 29 species of mammals and 180 species of birds (MoF, 2012). Meru Betiri Forest was first designated as a protected area by the Dutch Colonial Government in 1931, largely with a view to protecting the Javan Tiger (now considered extinct), and eventually graduating to national park status in 1997.

Despite Indonesia's commitment to conserving its biological resources through the establishment of national parks, during the reform period of the late 1990s to the early 2000s, rates of deforestation in the Park were unprecedented (Casson *et al*., 2007). Meru Betiri lost approximately 2,500 hectares of forest during this period as companies and small-scale farmers competed for remaining forestland. However, as the Park's forest came under threat, an interesting experiment in its buffer area provided valuable lessons.

In 1994, Curahnongko village (located in the buffer zone of the Park), LATIN, and the Forest Department of Bogor Agricultural University established a seven-hectare demonstration plot to cultivate medicinal plants and promote agroforestry practices. Despite the high rate of deforestation at the time, the demonstration plot near Curahnongko remained intact.

In an effort to stem further threats of deforestation, Park authorities approached LATIN to replicate the demonstration sites on additional plots throughout the park.

In 2001, 3,500 households from five villages (Curahnongko, Andongrejo, Sanenrejo, Wonoasri, and Curahtakir) were involved in a forest rehabilitation program. By 2004, after engaging local communities to reforest plots within the Park, some 2,250 hectares of land that had previously been encroached had undergone reforestation efforts. One hundred and four community forestry farmer groups in cooperation with a local NGO, Sustainable Nature Conservation of Indonesia (KAIL), were responsible for planting an initial 23,027 seedlings.

> "In my career, my greatest success has been my long-term involvement in the forest rehabilitation program here in Curahnongko. The land is now full of trees and medicinal plants. As a KAIL advisor, I have seen how illegal loggers can influence the community, police, and government officials, and this has been the program's biggest obstacle.
>
> *Kaswinto, LATIN Staff and KAIL Advisor*

An important component of the community's participation in forest rehabilitation was an informal 'access to land' agreement for agroforestry activities. At times, this agreement was fraught with tension but, in 2010, Park authorities reaffirmed their support for access to forest products to enhance livelihood options for the community.

While the primary aim of the rehabilitation lands was to support conservation and re-establish forestlands, the program produced a number of significant secondary benefits, especially for landless villagers. Landless villagers in Curahnongko are highly dependent on non-timber forest products (NTFPs) for their livelihoods and the rehabilitated forestlands provide substantial livelihood opportunities from the sale of NTFPs and medicinal plants.

> “In the past we were very poor, landless, without a home of our own, and without self-confidence. We worked hard in the rehabilitation lands, and I became a member of the Women’s Medical Plant Group, and later a teaching facilitator for the group in my community and other villages. [Now] I am not rich, but I am not poor either... I own land, a house, and I participate in decision-making confidently.
>
> *Siti Maemunah, Curahnongko village, Jember District*

### Meru Betiri REDD+ Pilot Project

In 2010, the MBNP-REDD+ pilot project was launched across 58,000 hectares of the Park, including 4,000 hectares of ‘rehabilitation’ lands established by LATIN. The project is a public-private partnership with the Research and Development Center, Ministry of Forestry (Badan Penelitian dan Pengembangan Kementerian Kehutanan), the International Tropical Timber Organization (ITTO), the Park, and LATIN, with financial support from Japan’s 7&i Holdings Limited.

With an end-date of 2013, the REDD+ project aims to prevent deforestation and forest degradation as well as biodiversity loss; improve livelihoods by developing alternative income sources; enhance forest carbon stocks; and build stakeholder capacity.

## 2. Climate Change Impacts in Indonesia and Meru Betiri

Indonesia is highly vulnerable to climate change impacts. As an estimated 96% of Indonesians live within 100 kilometres of the sea, the population is expected to be heavily impacted by sea level rise (EarthTrends/WRI, 2003). In addition to temperature changes of 0.2 to 0.3°C per decade in Indonesia (Naylor *et al*., 2007), there has been a decline in annual rainfall in the southern regions, including East Java (Boer and Faqih, 2004) with anticipated delays in the rainy season and significant decreases in dry season rainfall (Naylor *et al*., 2007). Therefore there is high risk of both drought as well as increasing floods and extreme weather events nationwide (Boer and Faqih, 2004).

Indonesia’s achievement of the Millenium Development Goals is expected to be affected by climate change, namely declining agricultural productivity with associated impacts on poverty reduction and health (University of Gothenberg, 2008). As the poorest and most marginalized groups of the population tend to live in hazard-prone areas, these same groups will be most vulnerable to climate change and generally lack the resources and information needed to adapt. There is a strong need for adaptation to be mainstreamed through all development activities but especially livelihood diversification (University of Gothenberg, 2008).

### Seasonal Variability and Temperature Change in Meru Betiri

From 2008 onwards, in keeping with forecasted regional climate change trends (Naylor *et al*., 2007), villagers have noted the dry season lengthening and increased storm intensity in the rainy season. They report seasonal hot spells becoming hotter and cold spells becoming colder, reducing the amount of time that farmers can spend in their fields and resulting in declining farm productivity. Short periods of atypically heavy rainfall are now regularly damaging cornfields, peanut fields, and chili and tomato farm plots. However, to date these changes do not appear to be prompting adjustments in crop species selection or other strategies.

### Pest incidence

Communities in the Meru Betiri area also report pest and invasive species infestations which they associate with changes in climate and weather patterns, including infestations of paddy fields by earthworms. The communities point to pests as a key factor, along with seasonal variability, in diminished rice production, which is reported to have declined by as much as 80% over the past five years. Farmers also report that a new banana-wilting virus (*Fusarium oxysporum* f. sp. *cubense*) has damaged fruit and vegetable crops.

## 3. Assessing Adaptive Capacity and Resilience

### Adaptive Capacity

Adaptive capacity in Curahnongko has been strengthened through access to the rehabilitation lands in the buffer zones of the Park and the social and livelihood benefits that this has generated.

Table 1: Assets in Curahnongko

| Type | Assets | Effects on Adaptive Capacity |
|---|---|---|
| **Natural Assets** | ▪ Timber and NTFPs grown on private lands<br>▪ NTFPs from the rehabilitation areas, including medicinal plants, fruit, rattan, bamboo, honey, and peppers<br>▪ Livestock fodder from rehabilitation lands<br>▪ Agricultural crops, including rice, corn, peanut, tobacco, and fruit | ▪ Agricultural products and NTFPs support income generation and subsistence<br>▪ Fuelwood for household energy supply |
| **Physical Assets** | ▪ Park rehabilitation lands, private agricultural and plantation lands<br>▪ Accessible water sources (ocean, rivers, streams, and groundwater)<br>▪ Road, bridge, telecommunication, and electricity infrastructure | ▪ Different typologies of land offering a range of potential livelihood and subsistence sources<br>▪ Infrastructure supports knowledge sharing and mobility for economic development and in disaster contexts |
| **Financial Assets** | ▪ Informal micro-finance institutions, credit for subsistence, wedding costs, upfront costs of labor migration<br>▪ Middlemen providing loans | ▪ Alternatives to high interest loans as forms of credit<br>▪ Capital theoretically available to support adaptive strategies |
| **Social Assets** | ▪ Mosque<br>▪ Elementary and junior high school<br>▪ Community forestry farmer groups<br>▪ Local NGOs: KAIL and LATIN<br>▪ Local government extension agencies<br>▪ Women's Medicinal Plant Group (Sumber Waras) | ▪ Focal site for social capital development<br>▪ Capacity development<br>▪ Service providers deliver adaptation knowledge and technical needs<br>▪ Market access through market chain linkages<br>▪ Gender-specific groups |

| Type | Assets | Effects on Adaptive Capacity |
|---|---|---|
| **Human Assets** | ▪ Farm labor<br>▪ Local forest patrols within the rehabilitation areas<br>▪ Local private health care providers | ▪ Capable workforce to engage in agricultural labor<br>▪ Strengthened capacity to respond to environmental and climate change impacts (e.g., increased incidence of fire) |

## The Forest as a Buffer Against Climate Change Impacts

While difficult to substantiate, the communities surrounding the Park are convinced of the role the forest plays in mitigating negative ecological and climate change impacts. In the early 2000s, Curahnongko village experienced serious flooding and mudflows resulting in the loss of property and infrastructure. This was followed by prolonged droughts resulting in dried-out water sources and crop failure, all with profound impacts on local livelihoods. However, while the villagers have reported intensification of extreme weather events and natural disasters since the rehabilitation efforts started, they also consider impacts on livelihoods to have been less severe due to the perceived role of forests as buffers.

Following forest rehabilitation, the communities claim that food insecurity, loss of income, water shortages, or threats to human safety from landslides and floods have been attenuated compared to preceding years. A major flood occurred in 2010, the most significant impacts of which were losses in agricultural crops and the destruction of an important warehouse located on the edge of the Curahnongko River. This was considered to be relatively minor damage for such an extreme event. As well as appearing to contribute to disaster risk reduction, the villagers assert that the volume and retention capacity of natural water systems, particularly in streams in and around the Park, have increased.

## Livelihood Alternatives from Forest Rehabilitation

Since 2001, villagers have experimented with agroforestry systems throughout the rehabilitation areas of the Park, planting native forest and fruit tree species, along with medicinal plants and crops. Through trial and error, they have learned that they can grow crops for four or five years before the forest canopy shuts out required sunlight. After five years, they transition to harvesting tree-based fruits and vegetables, such as jackfruit and *parkia* ('pete' or stinky bean). Currently, the 4,000 hectares of MBNP rehabilitation land have six different agroforestry typologies, each providing a diversified source of income for neighboring communities.

The agroforestry demonstration sites have provided landless villagers access to productive land as well as opportunities for capacity and skill development. Income from agroforestry has minimized forest exploitation and has become a source of community pride. However, the various benefits offered by the rehabilitation plots continue to be vulnerable until the community gains official legal rights to access, manage, and benefit from them.

## Community Efforts Support Access Rights

While access to forest areas remains informal, so far there have been no attempts by authorities to block community access to buffer zones in the Park. This may be mainly due to recognition of the valuable contributions made by local communities to the sustainable management of the Park. Since 2001, approximately 3,000 farmers, working in 104 community forestry farmer

groups, have planted 186,666 trees of more than 30 species within and around the Park. These measurable contributions to the Park's ecology are an important negotiating tool for the villagers when addressing access rights with new Park directors.

## 4. Vulnerabilities

Despite the various assets that contribute to adaptive capacity, challenges remain for the communities in responding to natural events and environmental changes, including climate change.

Of Curahnongko's 6,168 inhabitants, only 1,677 are landowning farmers due to limited available land. More than 1,000 landless community members are employed on these smallholdings.

Of the large landless population, most are classified as poor and resort to wage labor to meet basic needs. This landless segment of the local population relies heavily on Park rehabilitation land for crop production via agroforestry, cultivation of medicinal plants, and fodder for livestock. The rehabilitation lands provide poor families with up to 90% of their household cash income. However, the limited land-use options associated with the classification of Park land constrain uses that might otherwise help to reduce poverty.

The Director of Meru Betiri National Park informally grants access to the forest areas through personal discretion; consequently villagers and community forestry farmer groups participate in the forest rehabilitation program without a written legal basis. The Ministry of Forestry is obliged to uphold the director's agreements but, without formal access rights, the communities remain vulnerable to losing forest access should political or structural changes take place. This is a real possibility and over the duration of the rehabilitation activities, the Park's director has changed four times, creating a sense of insecurity among the local communities.

> "I have observed the relationship between the Meru Betiri director, the local community and KAIL. Every time there is a new Park head, KAIL presents the forest rehabilitation and agroforestry program. If the head likes the program, we continue to discuss collaboration opportunities. If not, the discussion usually stops.
>
> *Kaswinto, LATIN Staff and KAIL Advisor*

Vulnerability is also associated with governance issues. The central source of seedlings for rehabilitation plots is the Indonesian community forestry nursery program, administered through a district-level forestry agency. At times, the program has been influenced by political parties' interests to garner votes and, on the basis of political affiliation, some villagers have found it difficult to source the needed seedlings.

Due to limited understanding of climate change dynamics, villagers struggle to independently incorporate climate change adaptation strategies within forest rehabilitation strategies. Currently, Park representatives and LATIN do not have sufficient capacity to facilitate this. Rural development organizations and micro-finance institutions in the area have yet to include climate change risk or adaptation profiles within their development service programs, projects, or support activities.

Work by LATIN and KAIL has created important opportunities for diversifying and strengthening villagers' livelihoods, but there is no guarantee of continued NGO support. LATIN and KAIL have continued to struggle to secure funds to carry out activities around Meru Betiri. Sensitive to issues of sustainability, LATIN and KAIL staff are strategically seeking to build local leadership, as well as overall social and human capital, for the continued resilience of the community.

> "My concern is about developing new KAIL facilitators without the means to pay them. This is why local recruitment is so important. They can be motivated through religious beliefs and in return gain community respect.
>
> *Kaswinto, LATIN Staff and KAIL Advisor*

## 5. Responses to Environmental Changes and Development Needs

The Curahnongko community uses forest-based livelihood assets to respond to environmental impacts and changes. From 2003 to 2007 periods of insufficient rainfall induced heavy crop losses so many villagers sought wage labor or relied on revenue from rehabilitation lands to compensate for shortfalls in income. As agroforestry production grew, fewer people outsourced work as income derived from the rehabilitation lands gradually increased. The integrated agroforestry system progressed beyond an emergency safety net to providing more secure and reliable livelihoods and subsistence for the community.

To compensate for crop yield declines generated by temperature and rainfall fluctuations, farmers began to plant crops in the rehabilitation lands, such as corn, peanut, chili, and tomato where they are protected by the forest canopy.

With the assistance of the MBNP-REDD+ project facilitators, LATIN, and KAIL, villagers are engaged in action research that will define effective forest management strategies in the rehabilitation lands, particularly with regard to forest enrichment and agroforestry. The villagers recognize that this will eventually enhance the forest's capacity as both a natural asset in countering climate change as well as a carbon sink.

## 6. Adaptation, Mitigation, and Community Forestry Linkages

Climate change mitigation and adaptation are strongly linked in Indonesia. High rates of deforestation exacerbate climate change impacts and constrain available adaptation options (University of Gothenberg, 2008). The MBNP-REDD+ pilot project, while still in its early stages, has various activities underway on the ground with lessons already emerging.

Discussions on REDD+ benefits are focusing increasingly on the indirect benefits to local communities rather than raising expectations of direct financial payments. This has led to an interest in non-financial benefits, such as increased tenure security and access rights that may accrue as a result of REDD+ projects and become a key negotiating point for the communities living around the Park. Even without full tenure and virtually no discussion of financial payments, the promise of informally-recognized forest access has been a powerful incentive in generating strong levels of support within the community.

Largely missing from REDD+ discussions until recently, agriculture and food security are unavoidable components of forest conservation in the region. The high levels of poverty and

food insecurity cause agriculture to be a powerful driver of deforestation. In order for REDD+ to be viable in contexts such as Meru Betiri, efforts are needed to incorporate and validate food production in a forestry context. Agroforestry needs to be recognized as an important component of sustainable forest management in the region. The pressures communities are facing to shift from subsistence food production to cash crops will lead to increased vulnerability; however the integration of sustainable food systems, such as agroforestry within REDD+, will provide an alternative to reliance on cash crops.

## Effects of the REDD+ Project on Community Resilience

In its early stages, the REDD+ project made important contributions to building resilience in Curahnongko and the Park. Community engagement in forest rehabilitation has fostered social capital and improved relationships with Park authorities. The project has also provided technical information and contributed to skills development for surrounding communities and other stakeholders, including Park officials, local authorities, and NGOs.

The 2011 MOU granted to community forestry farmer groups has strengthened access to Park rehabilitation land. The agreement, while informal, provides improved security of access for the villagers. The signing process was an important symbolic step forward for the relatively new local JAKETRESI network. The negotiations gave members confidence and experience in articulating their needs; now members consider themselves to be in a better position to advocate for their rights.

> “ It is not a large park that can withstand disruptions and we have more to manage than just carbon.
>
> *Mrs. Khairun Nisa, Head of Meru Betiri National Park, Section Area II*

The MBNP-REDD+ project has focused on local communities since its inception. Livelihood development is an important component of the project and Meru Betiri has provided technical and financial support for a range of small-scale activities, including aquaculture and marketing support for dried jackfruit production.

> “ For the MBNP-REDD+ project, community engagement is very important. Without community involvement, Meru Betiri National Park just does not have adequate resources to protect the trees and biodiversity. And without the community as a partner, it is likely illegal logging will increase. My hope is that at some point in time, REDD+ revenues can benefit both the Park and the villagers equally.
>
> *Kaswinto, LATIN Staff and KAIL Advisor*

JAKETRESI community forestry farmer groups have developed rules and regulations to avoid further forest encroachment and prevent illegal logging and wildlife hunting in Meru Betiri, all supporting ecological services and biodiversity protection. Over the past year, JAKETRESI members have conducted detailed forest and plant inventories, mapping, and resource-use research within the rehabilitation lands. They hope to use this information to better understand community assets and thereby strengthen their role as a strategic partner in the MBNP-REDD+ project. Project partners, the Park, LATIN, KAIL, and JAKETRESI, will initiate a large-scale rehabilitation effort in mid-2012. Overall, the aim is to employ assisted natural regeneration, in addition to agroforestry approaches, to enhance carbon stocks and strengthen adaptive capacities through access to a range of forest products.

NEPAL

# Community Forestry: Well Placed to Address Climate Change Challenges in the Terai, Nepal

Nirmal Kumar BK, Forest Action

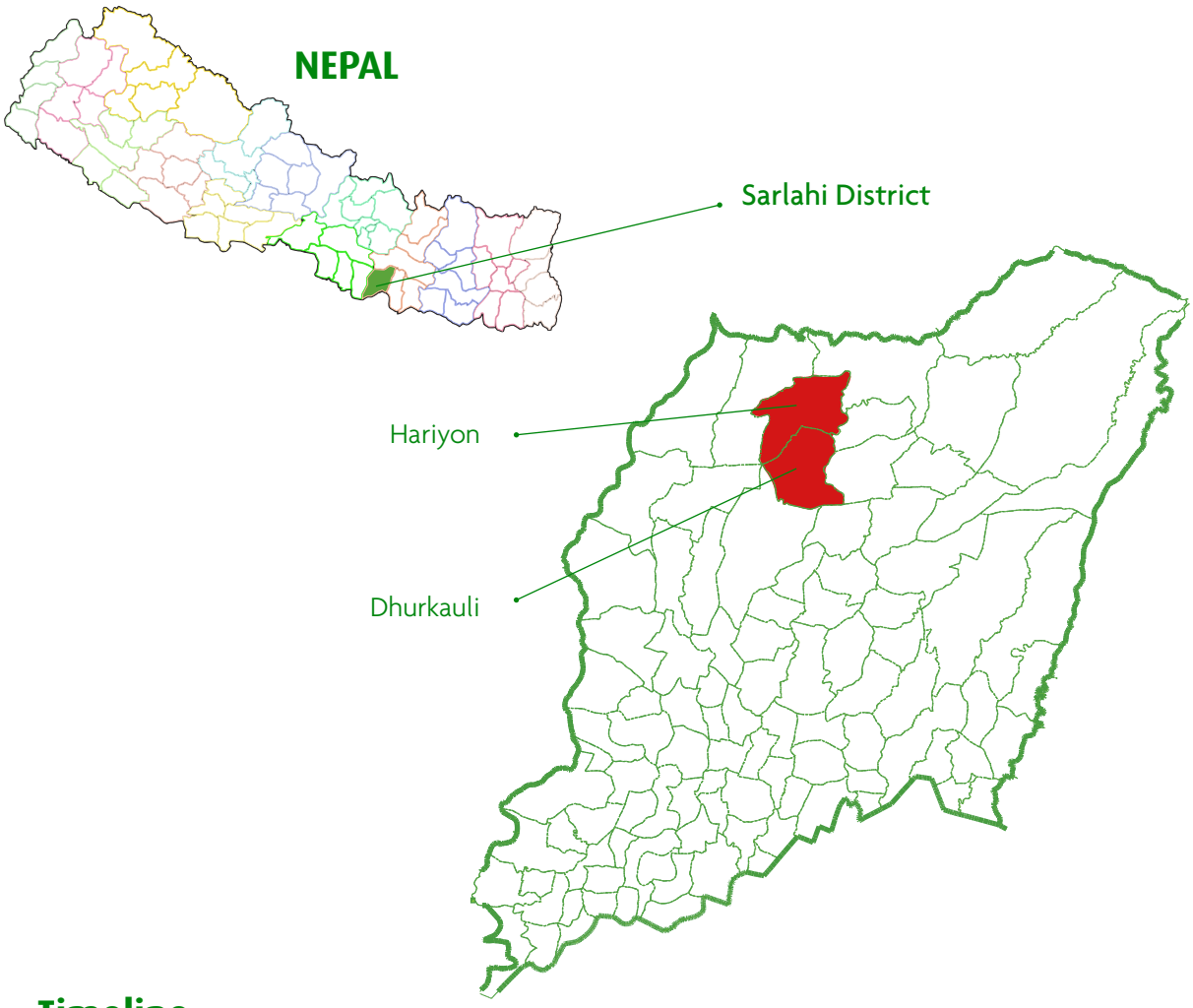
## Key Lessons

Community forestry institutions in Nepal provide a potential basis for resilience to climate change impacts. This case study demonstrates that one of the significant contributions made by community forestry is its potential to provide equitable structures for local-level decision-making and benefit sharing, in ways that are innovative and may be applicable to contexts of climatic and ecological change. While State-led responses to disaster management and climate change adaptation are often lacking, community forestry institutions have already begun to play a valuable role in providing practical responses to adaptation needs.

However, community forestry is far from being a silver bullet. To support effective and sustainable climate change adaptation a number of barriers must be addressed such as punitive regulations, exclusion, non-representative decision-making and benefit sharing, and insecure access rights. Further, owing to prevalence of high-value hardwood timber in the Terai, sustainable forest management continues to be challenged by illegal logging, corruption, and continuing deforestation.

In this context, for community forestry to meet climate adaptation and mitigation goals some key messages have emerged:

- A sustainable livelihoods approach that supports climate change adaptation must be mainstreamed within development initiatives, including community forestry institutions. User group committees are among the few decentralized local institutions well placed to respond to urgent development needs.
- Forest ecosystems are changing as ecological and climatic conditions change. This requires adapting to changing forest species composition. Forest management must increasingly consider species and management approaches that are appropriate under new conditions; communities should play an important role in their development.
- Mitigation initiatives, such as REDD+, must be part of a bundled approach to conservation and securing livelihoods. The objectives of carbon sequestration must be balanced against needs to ensure subsistence activities and forest-based income; these objectives must not threaten local livelihoods.




## Timeline

**1957** The Nepal Government nationalizes forest areas. The Government gains control of the communal forests in Sarlahi District, rendering traditional uses of forestland and products for subsistence purposes illegal.

**1960s** In response to food insecurity and general hardship in the mid-hills, waves of high-caste uplanders begin to migrate to the areas surrounding Sarlahi District and to the rest of the Terai, increasing deforestation and displacing indigenous peoples.

**1973** A settlement commission recognizes the rights of the migrants and provides them with land titles, while the Terai's indigenous peoples continue to lack recognition

**1990s** Forests in the Churia, the hilly areas of the Terai, are largely barren and the lowland Terai forests are seriously degraded.

**1993** A large flood damages livelihood assets and results in loss of life in Sarlahi District. The Sibeswor community responds by forming a Community Forest User Group (CFUG) to improve their natural ecosystem defenses.

**2000s** The community begins to perceive changes in weather patterns and climate such as prolonged droughts and seasonal variability.

**2007** Community Forestry Guidelines are developed to designate roles, responsibilities, and processes for community forestry stakeholders in Nepal, including provision of inclusive committee structures.

**2008** 2008–2011: the CARE-initiated Churia Livelihood Improvement Program (CHULI), in Sarlahi District, focuses on poor and excluded CFUG members

# 1. Background

The forestry context in the Terai, the southern region of Nepal that borders India, differs greatly from the rest of the country. Though recent regional studies indicate decreasing rates of deforestation in the Terai, during Nepal's last forest inventory in 1994, the Terai was experiencing the country's highest rates of deforestation at 1.65% (Kanel, K. *et al*, 2009). Several explanations have been given for this: the Terai contains significant amounts of high-value timber, in particular Sal (*Shorea robusta*) and road construction has increased accessibility for migrants and to nearby Indian markets. Given the high value of forest products in the Terai, there are powerful incentives for elite capture and corruption. The complex social dynamics in the Terai further challenge efforts for equitable and transparent governance. As a result, the Government has prioritized the more centralized Collaborative Forest Management (CFM) model for the Terai rather than community forestry approaches; this means villagers have less direct involvement in forest management than their counterparts elsewhere in the country. However the three villages targeted in this study – Sibeswor, Bishnupur, and Balganga – employ the community forestry model and have established CFUGs.

In the past, Sarlahi District was known for the collective forest management practiced by its many indigenous communities. However, following the 1957 nationalization of Nepal's forests, all communal forests came under Government control. Overnight, traditional subsistence uses of forestland and products were prohibited.

The lowland forests of the Terai and the Churia first came under threat during multiple waves of migration and, by the 1990s, were highly degraded. This contributed to the area's vulnerability, for example, to flooding and soil erosion. In 1993, a large flood in the district resulted in significant damage and loss of human life. This led to a range of local-level responses, most notably reforestation near rivers and, ultimately, the formation of several community forests including the Sibeswor example.

Community forestry approaches in the area have leaned towards stricter conservation measures than other parts of the country. These include operational management plans that limit collection of forest products, free grazing of livestock, and other subsistence activities. In an effort to support local-level resilience, a number of development service providers, including the District Livestock Support Office, CARE International, and the Federation of Community Forest User Groups, Nepal (FECOFUN), have been working intensively with several CFUGs in the area, including the Bishnupur and Sibeswor groups.

# 2. Climate Change Impacts in Nepal and in Sarlahi District

## Increased Temperature

Since the mid-1970s average air temperature in Nepal has risen by 1° Celsius (Shrestha *et al*., 1999). At the local level in Sarlahi, communities are acutely aware of this change. Local communities have reported atypical heat stresses during summer and severe cold during winter over the past decade. Days and nights are becoming warmer, while cool days and nights are becoming less frequent. Increasing temperatures have reduced the productive capacity of agricultural workers. People used to farm throughout the day, but are now often unable to work between 10.00 and 14.00 hours, which has an impact on income and food security.

### Changing Seasonality and Rainfall Patterns

The most severe impacts are drought and water scarcity. Communities have noted shifts in wet season patterns in the least ten years, with erratic rainfall of shorter duration but greater intensity. This is supported by national trends of irregular monsoon patterns resulting in droughts and floods (Bajracharya *et al*., 2007). The eastern parts of the Terai in particular experienced reduction in rainfall during 2005 and 2006, leading to a 12.5% decline in national crop production (Regmi, 2007). This has induced farmers in Sarlahi to petition for the district to be listed as drought-prone (CARE project staff, personal communication). Over the same period, however, the western Terai experienced heavy rains, flooding, and cloud bursts, reducing annual production by 30% (*ibid*). These changes in weather patterns are affecting the growth, ripening, and storage of rice, as well as the cultivation of other traditional crops.

### Changes in Local Biota

Erratic rainfall has also coincided with changes in soil composition, with apparent declines in soil moisture content. The villagers associate this with the diminishing presence of frogs, earthworms, insects, and other biota needed to create humus and control pests. They note that infestations of pests, such as white grubs and locusts, pose increasing hazards for crops; insect-borne diseases, like malaria, dengue fever, and ringworm, which had previously been eradicated in the area, have re-emerged. The villagers link shifts in seasons and temperature variability to changes in fruit and seed production, as well as the shrinking availability of important medicinal plants. The ranges of a number of endemic tree species, particularly those with high water demands, have retreated to high altitude, hilly areas, or appear to have disappeared from the area altogether.

## 3. Assessing Adaptive Capacity and Resilience

### Adaptive Capacity

The capacity to adapt to climate change is rarely determined by physical impacts alone, but rather by a combination of factors, including socio-economic dynamics. In this context access to and control over livelihood assets are key determinants of adaptive capacity (CARE, 2010). Access to education, financial strength, and social capital are fundamental to long-term adaptive success. This study has analyzed different social groups to assess adaptive capacity and resilience (Table 1).

Table 1: Assets in Curahnongko

| Type | Mid-hill migrant groups (high caste) | Indigenous ethnic groups | 'Madhesh' (Indian-origin) groups | 'Low caste' groups (Dalits, etc.) |
|---|---|---|---|---|
| Natural | ▪ Land<br>▪ Private forest<br>▪ Tube wells<br>▪ Improved variety of cattle | ▪ Community forest<br>▪ Public tube wells<br>▪ Unregistered land | ▪ Registered land<br>▪ Public tube wells | ▪ Some members have access to community forest<br>▪ Degraded land access |

| Type | Mid-hill migrant groups (high caste) | Indigenous ethnic groups | 'Madhesh' (Indian-origin) groups | 'Low caste' groups (Dalits, etc.) |
|---|---|---|---|---|
| **Physical** | ▪ Cement accommodation<br>▪ Good road access<br>▪ Temple | ▪ Thatched housing<br>▪ Partial road access<br>▪ Community meeting structure | ▪ Thatched housing<br>▪ Community meeting structure | ▪ Thatched housing<br>▪ Poor road access<br>▪ Community meeting structure |
| **Financial** | ▪ Government employment<br>▪ Cooperatives<br>▪ Trade/market<br>▪ Savings | ▪ Alcohol production<br>▪ Seasonal migration to Kathmandu and to Gulf countries as unskilled laborers | ▪ Seasonal migration to India as wage laborers<br>▪ Availability of credit | ▪ Wage labor<br>▪ Traditional caste-based occupations<br>▪ Seasonal labor-based migration<br>▪ Availability of credit |
| **Human** | ▪ Relatively high education<br>▪ Entrepreneurial and able to exploit market opportunities | ▪ Agricultural labor<br>▪ Fuelwood collection and marketing | ▪ Fuelwood collection and marketing<br>▪ Labor for local enterprises | ▪ Agricultural labor<br>▪ Fuelwood collection and marketing<br>▪ Labor for local enterprises |
| **Social** | ▪ Broad kinship groups<br>▪ Membership in CFUGs and almost all community organizations | ▪ Ethnic- and cultural-based networks<br>▪ Membership in CFUGs | ▪ Membership in CFUGs | ▪ Membership in CFUGs |
| **Overall Adaptive Capacity** | **High** | **Relatively low** | **Moderate** | **Low** |

Note: These assessments were based on a qualitative review of the range and extent of various livelihood assets available to different community groups.

In addition to natural resource management and livelihood support, the two CARE projects operating in Sarlahi have assisted Bishnupur and Sibeswor CFUGs in developing community adaptation plans of action (CAPAs). These involve the mapping of climate change hazards and hotspots as well as capacity building to facilitate processes for community-based adaptation.

As a result, awareness about climate change and its impacts has grown within these CFUGs, unlike Balganga CFUG which has not received this intervention. However, there is still considerable work to be done in Bishnupur and Sibeswor, particularly with regard to ensuring equity and inclusion. Current adaptation plans do not explicitly consider the most vulnerable groups and their participation in capacity development efforts remains nominal.

The community forests are perceived to be an important buffer to changes observed in the surrounding environment. Productive land closer to forests has greater soil moisture content and water retention capacity, enabling it to better withstand the effects of low rainfall.

Recognizing its value, the three communities have focused forest management efforts on enhancing biodiversity by planting a range of native species.

CFUGs are uniquely positioned within Nepal to manage and respond to the impacts of various ecological changes on different segments of society. Because the committees are mandated to include members from all social groups, they are often able to disseminate information more broadly than other institutions. In addition, CFUGs provide entry points for development service providers and are also important providers of low-interest credit.

Traditional caste- and gender-based dynamics are changing due to the influences of globalization and domestic political trends, with the 'untouchability' of certain castes diminishing in recent years. FECOFUN has successfully instituted groundbreaking gender representation requirements, mandating 50% of key CFUG committee positions to be held by women. While not always perfect in application, this has contributed to the establishment of norms in the context of community forestry and beyond. Among the three CFUGs involved in this study, women chaired two of the three executive committees. However, the degree to which this demonstrates genuine gender representation is unclear. The Terai remains generally quite conservative on issues of gender relations (as well as caste) and, in at least one of the CFUGs studied, the chairperson was the only woman in attendance and the committee had established a special all-male advisory sub-committee to 'advise' her on decisions.

## 4. Vulnerabilities

Poor and socially marginalized groups in Nepal are more vulnerable to climate change impacts (NCVST, 2009). For most forest-based communities in the Terai, the biggest barrier to adaptation is access to and control over livelihood assets. People who have tenure security over land and forests tend to have more adaptive capacity than those who do not (IPCC, 2007). Landholders have the capacity to absorb risks associated with experimental agricultural practices and crops. They tend to be wealthier individuals whose diverse assets and greater range of options put them in a better position to respond to climate change impacts.

Historically, low-caste or 'untouchable' groups were prevented from living in more populated areas, so they were forced to settle in marginal and hazard-prone locations. Bishnupur and Sibeswor villagers generally comprise lower-caste and indigenous groups who live near rivers, making them more vulnerable to flooding. A similar trend is seen with respect to employment and livelihoods. Poor agricultural laborers and women are particularly vulnerable to drought, floods, and extremes of heat and cold.

Typical to CFUGs in the Terai, the three villages have restrictions on free grazing in forest areas, green timber extraction as well as collection of fuelwood and non-timber forest products (NTFPs), including traditional medicinal plants. The restricted access makes it difficult for poorer households to meet subsistence needs or generate income from sale of fuelwood, production of furniture, and other traditional industries.

The forest-use restrictions place a disproportionate burden on the most vulnerable members of society. For example, restrictions on the harvest of medicinal NTFPs have forced community members to seek conventional medical attention from hospitals with associated high costs. Women bear a particularly onerous burden. As both household energy needs as well as livestock feeding are their responsibility, they have suffered from the restrictions on fuelwood and fodder collection. Stall-rearing of cattle has led to an approximate decline of 50% in livestock numbers. The corresponding decline in dairy products is believed to have contributed to a rise in osteoporosis and other bone complaints among women. Dairying is also one of the

few sources of revenue controlled directly by women and the decline in livestock has led to diminished earning potential and status for women in the community.

Decision-making is not always equitable in the CFUGs. Officially, it is participatory and consensus-based but, in practice, it is dominated by community elite, generally men from higher castes. There are also complaints of incorrect electoral lists at the district level, which determine residency and voting rights. There are claims that certain groups, such as landless individuals, religious minorities, and indigenous peoples, are sometimes excluded.

The presence of valuable timber species in the Terai such as Sal (*Shorea robusta*), Karma (*Adina cardifolia*), and Khayar (*Acacia catchu*) make illegal harvesting, as well as corruption, tempting and pervasive.

## 5. Responses to Environmental Changes and Development Needs

Despite the range of livelihood assets in Sarlahi communities, in particular the role of CFUGs in responding to local-level needs, they still have serious challenges to address and are endeavoring to respond to.

Only 25% of water needs in the Sibeswor area are met during extended dry periods. During summer, water sources tend to be located close to more affluent and higher-caste groups, while lower-caste and indigenous groups often live in uphill areas with less direct water source access. Some responses have involved covert night-time water 'borrowing' by the uphill villages from the wells and streams of downhill neighbors. This has led to strained relations and, at times, conflicts. Other strategies have involved experimenting with rainwater harvesting and re-locating remaining crops closer to dependable water sources, none of which are providing successful.

Diminishing agricultural productivity due to chronic water shortages has resulted in attempts to cultivate more drought-resistant cash crops, such as sugarcane. While this provides cash income, it creates dependence on market prices and reduces both food security and diversity. The option also seems to benefit wealthier landowners who can afford the investments and benefit from economies of scale.

As livestock numbers have dwindled, district agricultural extension officers and veterinary professionals are promoting the adoption of improved livestock varieties (*Jarsi* cows and *Murra* buffalos) that produce up to five times more milk than the indigenous stock. However, these varieties are much more demanding in dietary requirements, needing greater amounts of water and high-quality fodder; they are consequently increasing community workloads, especially for women.

## 6. Climate Change Adaptation, Mitigation, and Community Forestry Linkages

Arguments are growing for climate change adaptation and mitigation efforts to be combined for greater overall benefit (Bernier and Schoene, 2009); community forestry, especially in countries such as Nepal, may provide a valuable modality for such an integrated approach. Despite Sarlahi being notorious as a district where illegal logging has continued despite community forestry (Nepal Times, 2011), local residents of the two CARE-supported CFUGs vouch that

forest cover and carbon stocks have increased since the establishment of community forests. This is corroborated by local forestry officials.

Nepal serves as a model for how community forestry could provide the foundation for linking mitigation and adaptation efforts. Where community forestry institutions are strong there is the potential to maintain and perhaps even enhance forest cover. The CFUGs studied also provide insights into how adaptation needs can be incorporated, with development service provider support, though how to do so without compromising livelihoods needs further consideration.

Community forestry in Nepal provides important structure that can be built upon in the context of REDD+. In the CFUG structure, local resource persons facilitate forestry activities and relevant training. These same individuals could be engaged in providing community-level support on REDD+ readiness and implementation. CFUGs all have the advantage of established forestry monitoring sub-committees that oversee auditing and are responsible for ensuring transparency.

## Community Forestry - Supporting Adaptation

Community forestry has long provided a buffer against environmental and climate change impacts in Nepal. Reforestation is a strategy for rehabilitating watersheds and ensuring water supply. While community forestry regulations are intended to be pro-poor and contribute to improve livelihoods through sustainable resource management, in practice they are often employed to the benefit of community elite. Despite these challenges, the pro-poor approach embraced by community forestry has nonetheless led to the improved status of marginalized groups by mandating gender, caste, and poverty-based quotas and normalizing the participation of these groups in decision-making.

Bishnupur and Sibeswor CFUGs, with support from CARE, have demonstrated the potential role of community forestry in climate change adaptation. Over the past ten years, the two CFUGs have sought to develop resilience to natural disasters and changing environmental patterns through reforestation, river bank management, and strategic land-use management strategies. They have operated with a much broader mandate than strictly focusing on forest management – sharing information to support agricultural productivity, supporting alternative livelihood development, providing credit, and taking the lead in disaster risk mitigation.

In addition to serving as the strongest entry point for development service providers in a range of sectors, CFUGs represent one of the most stable institutions in rural areas. During times of political instability, they have often offered the only local form of democratic governance. In rural Nepal, they appear to be the institutions most capable of facilitating climate change adaptation at local levels.

## Trade-offs

At times, however, there are trade-offs between forest conservation and the package of livelihood assets that the community needs for its well-being and resilience. The strict regulations imposed by community forestry management plans, particularly in the Terai, impinge on livelihoods and may disproportionately affect vulnerable groups.

These tensions include:

**Politicization:** The forestry sector in Nepal is highly politicized and political pressures affect CFUGs. Partisanship influences both community-level decision-making and the distribution of benefits. This may be a factor should REDD+ related processes become associated with the interests of local elite.

**High-value timber forests:** The high value of some timber species in the area means that the opportunity costs associated with maintaining forests in the Terai are higher than those in other parts of the country. The high values encourage external interests as well as those of community elite. Thus, while opportunity costs for engaging in REDD+ might appear to be low where timber harvesting is already prohibited, the reality is that REDD+ will need to compete with 'unofficial' profits being generated by the timber.

**Landlessness:** Landlessness is a major threat to Nepal's forests and will be exacerbated by climate change impacts as increasing amounts of land become non-farmable. Forests are seen by landless groups to stand in the way of livelihoods and food security. These groups have been mobilized into networks throughout much of Nepal, with the primary objective of converting forest to productive agricultural land. The viability of REDD+ will be compromised until food security and landless issues are addressed for the communities concerned.

**Problems of land tenure:** Tenure and carbon rights are problematic in the context of community forestry in Nepal. While community forestry allows access to and use of forest products under controlled arrangements for a period of five years, the actual land and associated carbon rights are owned by the Government. Communities may be reluctant to make investments and concessions related to REDD+ projects if their rights to benefits are not assured.

THAILAND

# Tenure, Food Security, and Community Forestry Under Changing Conditions in Ban Huay Win, Doi Phu Kha National Park, Thailand

Kasina Limsamarnphun

## Key Lessons

Poverty and food insecurity, combined with a recent shift towards cash crops, make Ban Huay Win village particularly vulnerable to the impacts of climate change. Despite unclear rights, low levels of education, and poor development service provision, Ban Huay Win has various assets that can support adaptation efforts as well as potential carbon sequestration initiatives. The community places high value on the surrounding forests and local community forestry structures. However, the long-term adaptive capacity of the Tai Lue indigenous people in Ban Huay Win is constrained by their lack of formal rights to live in their traditional lands within Doi Phu Kha National Park.

Some issues that need to be addressed to ensure the sustainability of the Park's forest and community resilience in the face of changing climatic conditions are:

- Clarity of tenure and status in Ban Huay Win and similar villages. Without clear entitlements to development service provision, decision-making processes, and participation in determining land use, there is a real risk of adaptive capacity being undermined and ultimately impacting negatively on forest ecosystems.
- Support is required to develop environmentally and socially sustainable strategies. This includes technical guidance and financial support for initiatives, such as rice field terracing, which can help reduce pressure on forests.
- Ban Huay Win has a long tradition and strong interest in sustainable forest management. However, remote location, limited livelihood options, and poverty make it difficult for the community to resist alternative land uses, such as maize cultivation. Financial incentives, for example, from REDD+, could provide critical support for the communities to manage forests sustainably.


Case study location:

In red, Nan Province, Thailand, the location of the Ban Huay Win community.

## Timeline

**1983** Tai Lue indigenous people settle alongside the Huay Win Tributary, and in Ban Huay Win village.
The former fallow lands of a neighboring village, Ban Nam Mao, are transferred to Ban Huay Win for regeneration and management as forest.

**1999** The Thai Government establishes Doi Phu Kha National Park, rendering the Tai Lue settlement in Ban Huay Win technically illegal.

**2004-2008** The Joint Management of Protected Areas (JoMPA) project works to strengthen local forms of community forestry in protected areas.

**2008-2011** Launched by the Raks Thai Foundation with support from Mitsui & Co, the Developing Sustainable Eco-friendly Communities project promotes land-use improvements, such as terracing of rice fields.

## 1. Background

Ban Huay Win village is located inside Doi Phu Kha National Park in Nan Province, one of the northernmost provinces of Thailand. The province has been home to the Tai Lue indigenous people for more than 100 years following waves of migration from Xishuanbanna in Southern China. During years of conflict and communist insurgency in northern Thailand, the Tai Lue in Doi Phu Kha were displaced and eventually settled alongside Huay Win Tributary in 1983. Once settled, the Tai Lue initiated reforestation efforts on degraded lands in an effort to enhance their livelihoods. The village's 26 households engage in traditional rotational rice production, located two to four kilometres outside the village. Villagers have longstanding indigenous practices of community forestry and recognize livelihood dependence on surrounding natural resources.

In 1999, a Government decree established Doi Phu Kha National Park as part of a controversial push in the 1990s to establish protected areas and strict conservation measures to compensate for widespread deforestation. There had been little local consultation and the new land designation resulted in the Tai Lue having no legal grounds for access to their village and surrounding agricultural land. As a result, Ban Huay Win village lacks tenure security and basic development services.

### Raks Thai JoMPA Project

In 2004, the JoMPA project, led by the Raks Thai Foundation (CARE Thailand), initiated a process to strengthen local forms of community forestry. JoMPA was jointly implemented by the Raks Thai Foundation, Doi Phu Kha National Park, and the Mekong Environment Resource Institute with support from the Danish International Development Agency.

The four-year project aimed to improve dialogue between villages and Park authorities over access to forest resources. JoMPA worked to establish a special zone for community forestry, and created village maps and land-use agreements through participatory mapping. This was constrained by the legislative environment as community forestry is not recognized as a management option under the Thai National Park Act of 1961.

After the JoMPA project ended, a follow-up project sought to develop models of joint climate change adaptation and mitigation for subsistence communities in northern Thailand. Project staff introduced improved land management systems including terracing for rice cultivation.

## 2. Climate Changes and Perceived Impacts in Thailand and in Ban Huay Win

Temperatures have increased in Thailand by 0.10 to 0.18°C per decade over five decades of observation (Jesdapipat, 2008). Rainfall in Thailand has been decreasing over the past three to five decades compared to the first half of the last century (ADB, 2009).

Thailand is predicted to see an increase in extreme events including prolonged floods and drought, landslides, and strong storm surges (Jesdapipat, 2008). These extreme events have become more frequent and more damaging over the past few decades with storms becoming less frequent but more intense (Jesdapipat, 2008). Changes in rainfall patterns and the frequency and intensity of rainfall have affected the quantity and quality of water resources in a number of watersheds *(ibid)*.

### Perceived Local-level Impacts

While climate models and national data indicate changes in climate, at local levels there remains little empirical documentation and so changes described here are largely based on reports from villagers. Ban Huay Win villagers have reported a number of perceived impacts of climate change. These include changes in seasonality, with seasons starting much earlier than in previous years. The community reports that in the past, the rainy season started in May and extended into October, with peak rainfalls in August and September. However, in recent years, the rainy season has begun as early as March and ended either much earlier or much later than previously. The normally intense rainy period in August is cited as having virtually disappeared. Rainfall patterns are reported to be highly irregular and the dry season to have grown longer and hotter. This is supported by predicted weather patterns and climate trends in the north of

Thailand (Jesdapipat, 2008). Attesting to the community's perceptions of changes in weather, the average annual rainfall in Nan Province was 1,365 mm between 2000 and 2009, whereas the annual rainfall in 2010 was 2,933 mm (RECOFTC, 2011). Rates were similarly high in 2011.

The community perceives the main threats related to climate change to be increased food insecurity and natural disasters, such as flash floods and landslides. Changing seasonality and weather patterns have had adverse impacts on food security with observed declines in crop quality and quantity. Rain-fed rice cultivation, the food staple of the community, is cited as having been affected by seasonal weather fluctuations for the past five years, with the community reporting annual losses in rice yields of 40 to 100%. The impacts on recently introduced cash crops, such as maize, have been similar, resulting in financial losses for villagers investing in maize production.

Table 1: Reported Rice Yield in a Normal Year and Indicative Previous Year (2011) at Ban Huay Win

| | |
|---|---|
| **Cultivated land per year** | 1.5-1.8 hectares per family |
| **Rice yield in normal year (prior to 5 years ago)** | 2,194 kg per hectare |
| **Rice yield in 2011** | 884 kg per hectare |
| **Rice yield reduction** | **59.71%** |

It is claimed that forest-based food sources such as sugar palm, rattan, and mushrooms have also declined. Villagers believe this to be related to increased rainfall that affects forest fire frequency needed to trigger spore production and the propagation of certain tree species. The populations of some animals are also reported to be changing. The local *mun* fish, an important river-based source of protein, needs sufficient stream water during the spawning season, but this is now coinciding with the prolonged dry season which impacts on stream water levels. Villagers report that the fish is becoming more difficult to find.

At least one positive change is perceived to be accompanying the changes in weather patterns. Rainfall appears to be increasing with Ban Huay Win reporting enough freshwater for household use in April 2011 for the first time in living memory. However, while total increased rainfall has been recorded for the past five years, long-term climate change forecasting suggests this will be temporary (Jesdapipat, 2008).

## 3. Assessing Adaptive Capacity and Resilience

Table 2: Asset Comparison in Ban Huay Win

| Types | Strengths | Vulnerabilities | Effects on Adaptive Capacity |
|---|---|---|---|
| **Natural Assets** | ▪ 557.87 hectares of forest<br>▪ 521.35 hectares of agricultural land<br>▪ Freshwater availability (18 streams)<br>▪ Diversity of indigenous crops | ▪ Poor quality upland soils, low fertility<br>▪ No clear or secure tenure or access rights to forests or agricultural lands | ▪ Lack of tenure security undermines adaptive capacity and incentives for long-term investment in land<br>▪ Access to non-timber forest products (NTFPs) provides a safety net |

| Types | Strengths | Vulnerabilities | Effects on Adaptive Capacity |
|---|---|---|---|
| **Physical Assets** | ▪ Water diversion systems for household and irrigation purposes<br>▪ Most houses have a motorcycle, radio, and television | ▪ No central and reliable electricity supply; small-scale solar panels provide limited power<br>▪ No central water source<br>▪ Poor road system<br>▪ No telephone connections or mobile phone reception | ▪ Lack of basic infrastructure curtails capacity to respond to extreme events or environmental changes |
| **Financial Assets** | ▪ Agricultural crops, cattle, and pigs are raised as a source of income and for savings<br>▪ The village maintains cash reserves in a forest conservation fund and rice bank | ▪ At village and household levels, cash reserves are very limited | ▪ Community lacks financial buffers needed to improve resilience to shocks such as drought or pest attack |
| **Social Assets** | ▪ Trusted community forest committee<br>▪ Strong community cohesion and cooperation | ▪ Community forest committee all male, women's role limited to housewives' groups for handicraft production | ▪ Strong social capital compensates for other barriers to adaptive capacity<br>▪ Gender remains an inequity issue |
| **Human Assets** | ▪ Multi-skilled leaders<br>▪ Primary education is now available and compulsory<br>▪ Traditional knowledge, especially that related to land management practices | ▪ Educational levels, particularly for adults, are low<br>▪ Women excluded from opportunities for development of leadership and other skills | ▪ Strong attributes such as perseverance and work ethic<br>▪ Low education and literacy restrict ability to exert entitlement claims |

Source: Key informant interviews (2011).

While other assets may require strengthening, the Ban Huay Win community has a strong asset in its robust social capital, defined as the value of social relations in achieving collective or economic results. The Tai Lue's strong kinship structures and internal relations provide a support network that allows for experimentation and innovation by individuals, often rooted in traditional knowledge. Lessons learned are easily shared and adopted within the community.

The community forest management committee has been strengthened by decades of struggle in exerting the community's rights over the forest areas, and it receives unified community support. Several committee members are involved in a loose climate change network established in Doi Phu Kha by the Raks Thai Foundation. Through this informal network, they have opportunities for further learning. These same members are often at the forefront of experiments with new livelihood technologies, such as new cropping patterns and crop varieties. Increasingly, these leaders are mobilizing their strong community support in advocating for increased rights with Park officials and local authorities.

The Tai Lue have a holistic view of the environment and ecosystem services. The forests are central to the Tai Lue's culture and include important sites for paying homage to natural spirits

and ancestors as well as providing broader ecosystem services, such as protection from wildfire, floods, landslides, and conservation of biodiversity. Because of spiritual associations with the land and their dependence on key ecosystem services, the Tai Lue have always emphasized sustainability in their land-use strategies.

Community forestry management plans limit extraction of forest resources, depending on forest category type, with allowances made for NTFP collection, such as bamboo shoots and herbs, in virtually all forest types. Collection of timber from the conservation and utility forests is allowed only for local construction purposes and must be approved by the committee.

## 4. Vulnerabilities

Participatory rural appraisal exercises with the community underscored food security as one of the most significant issues facing Ban Huay Win village. The community relies largely on subsistence activities, practicing rotational rice cultivation and depending heavily on forest products to supplement their livelihoods. Many families cannot produce enough food for the year and this is cited by the community as being exacerbated by changes in weather and ecological conditions believed to be associated with climate change.

In particular, barriers to knowledge acquisition, technology, basic infrastructure and services, and financial resources limit the adaptive capacity of the Ban Huay Win community.

Ban Huay Win's ambiguous rights over the land and unrecognized legal status are core issues for the community, with a range of consequences that affect their ability to benefit from forest products as well as their access to external support and so forth. The National Park Act of 1961 fails to support land tenure for groups such as the Tai Lue (RECOFTC, 2010) and the establishment of Doi Phu Kha National Park in 1999 led to conflict and distrust between the community and Park officials.

As indigenous people, the Tai Lue are entitled to certain rights under international conventions, such as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). These include the right not to be subjected to any action that has the aim or effect of dispossessing them of their lands, territories, or resources (Part II, Article 7). Thailand is a signatory to UNDRIP, but in practice application has been a challenge, mainly due to historical associations of indigenous hilltribes with the illicit drug trade. Some 300,000 indigenous people in the country remain without citizenship and accompanying rights accruing to citizens of a country (Aguettante, 1996).

Ban Huay Win's geographic and political isolation is a major barrier to building resilience. The community has limited access to development services such as health care, basic infrastructure, and education due to its ambiguous status within the Park. The community's isolation, poverty, and low education exacerbate this problem and limit opportunities for engagement in decision-making processes.

The villagers access the forests almost daily to gather food and fuelwood for subsistence activities. The villagers sell maize and occasionally rice and forest products for cash; however, this income remains relatively negligible. Other sources of income include handicrafts, such as bamboo rice containers and grass brooms made from NTFPs. However, retail is limited by poor market linkages and access. With low agricultural productivity and low income, the villagers of Ban Huay Win are left with few options other than seasonal outmigration as laborers and a shift to more profitable cash crops.

The thin layer of topsoil covering the limestone prevalent throughout the Park is vulnerable to erosion and landslides caused by increasingly heavy rainfall. Particularly where agriculture is taking place on sloping land, the community has observed that the loss of topsoil has been rapid and has reduced soil fertility.

The village is also highly exposed, located on a hill next to a tributary with little shelter from extreme weather events. Drought in the dry season, increased rainfall, storms, and unusually high or low temperatures are cited as having major impacts on all aspects of villagers' lives, including food security, agricultural practices, village infrastructure, mobility (due to road closures), and financial security.

The geography and ecological conditions of Doi Phu Kha are vulnerable to the changing climatic conditions and weather predicted for northern Thailand (Jesdapipat, 2008).

Certain groups, such as the elderly, the disabled, and those with young dependents, are particularly vulnerable as they lack the resources to produce sufficient rice. Also, women in the community have a marginalized role with men dominating leadership and decision-making positions.

## 5. Responses to Environmental Changes and Development Needs

Previously, Ban Huay Win engaged in subsistence production of rice for household consumption. In 2011, however, for the first time community members grew a higher proportion of maize, prioritizing income generation over subsistence needs. Agriculture extension officers as well as company representatives have actively promoted maize production and promised market price guarantees. The shift to contract farming of maize, however, involves high investment costs and high risks including lack of available food for daily subsistence. Efforts to compensate for declines in maize and rice production have involved high use of chemical inputs and shortened rotations of rice plots to as little as two years. Although maize production may not be the preferred option for the community, the villagers feel there is insufficient information and lack of options to make alternative livelihood choices.

A key response to crop losses has been the outmigration of labor to cities. For between three and 12 months of the year Ban Huay Win is populated largely by the very young and the very old.

Entering the forest" (*khao pa*) is the second most important subsistence livelihood activity for Ban Huay Win villagers, after rice production. Dependence on NTFPs is much higher in times of stress, such as during food shortage or natural disasters. In 2008, the worst year for rice yields in recent memory, villagers sold NTFPs in markets whenever possible to generate cash income to purchase rice and other necessities.

Climatic and environmental challenges have indirectly led to strengthening of community forestry institutions and enhanced appreciation of the ecosystem services that forests provide. At present, 51% of the total area under village management is forestland, 39% of this has been reforested by the community over the past 30 years.

From 2004 to 2008, the JoMPA project attempted to open discussions on underlying issues of tenure and land access rights. The project worked with Ban Huay Win and 19 other villages in the Doi Phu Kha National Park to jointly demarcate land uses with Park authorities and neighboring villages. This has been an empowering experience, directly involving community members in

formal processes and validating customary claims to forestlands. The loose network of 20 village community forestry management groups now oversees 23,873 hectares of forestland and has led efforts for return of fallow lands in order to expand overall forest areas. The project has also contributed to strengthening dispute resolution mechanisms within and among villages.

Heavy rains have allowed weeds and fungal diseases to multiply and in conjunction with eroded soil, have contributed to declining rice and other crop yields. In the past, villagers waited for the rainy season to subside before rice planting; now given the unpredictability of weather patterns, they prepare for cultivation at the earliest opportunity. Preparation generally involves burning the plot, a practice believed to increase soil fertility. However this is increasingly being replaced by the use of chemical fertilizers in response to State restrictions on fire use as well as the widespread availability of chemical inputs. Commercial fertilizers are expensive and risk increasing the debt load of the community.

Plot rotation cycles have also changed in response to declining yields, land-use restrictions by the Park, and an increasing population. Fallow periods for plots have declined from six-year periods to typically four years with some being as short as two years. The financial expenses and workloads required to maintain the same or even lower levels of agricultural productivity have risen significantly.

Ban Huay Win has demonstrated innovation and interest in exploring new sustainable land management practices while embracing indigenous knowledge and crop varieties. Farmers have adapted and modified traditional cultivation practices and species on a trial-and-error basis independent of any official external assistance.

A component of the Raks Thai project, though still in its early stages in Ban Huay Win, is focused on the promotion of sustainable and more efficient forms of land use, such as the intensification of rice cultivation through terracing. As part of project support, up-front investments associated with terracing were subsidized by 50%. In return, farmers designated areas of fallow land for natural regeneration of the forest. Terracing is a new method for the Tai Lue, and while the labor and initial investments for terracing are high, terracing in Doi Phu Kha has resulted in increased yields per hectare of land and improved retention of both topsoil and water (Raks Thai, 2008). The introduction of terracing is hoped to mitigate forestland encroachment by reducing the amount of land required for cultivation. While income generation is clearly important, the villagers expressed their preference for setting aside fallow land for the regeneration of natural forest. Embarking on large-scale terracing is part of the long-term plans of the community, although they feel as yet unready to make the investments required.

## 6. Adaptation, Mitigation, and Community Forestry Linkages

In Ban Huay Win many adaptive strategies are mutually reinforcing climate change mitigation objectives, particularly in the context of community forestry; for example efforts to relieve pressure on forestland through improved agricultural systems and in particular, terracing. Other activities such as the shortening of crop rotations may reduce pressure on forestland, but are ultimately likely to result in negative impacts on livelihoods through declining yields and the need for high chemical input use.

The community has sought to maintain the momentum of forest conservation activities despite the termination of the Raks Thai project; however, unless pressing livelihood and food security needs are accounted for there is a real risk of land-use practices becoming increasingly unsustainable.

## REDD+ Potential

REDD+ is on Thailand's national agenda for improved forest management and could offer opportunities for both climate change adaptation and mitigation benefits. While REDD+ discussions in Thailand remain contentious with little trickle down to the level of national parks such as Doi Phu Kha, potential income from REDD+ could offer critical compensation to ensure continued community support for forest conservation. REDD+ could also serve as an important lever in clarifying and securing community rights to the forest and surrounding areas.

The Raks Thai projects strengthened existing community forestry management practices and standardized forest use rules and regulations (Raks Thai, 2008). They also catalyzed the important step of joint land mapping, which has established the basis and processes for community-Park collaboration. However, before considering REDD+ engagement, critical issues such as land tenure, community status within the Park, and the strengthening of participatory processes must be addressed. Without the endorsement of indigenous peoples' rights and their role in participatory processes, it will be difficult to ensure that communities such as Ban Huay Win will benefit equitably rather than ceding further rights to the Park or State authorities.

Although Thailand has recognized community forestry as a strategy for forest management since the 1970s, it lacks an official framework for local participation and recognition in forest management, especially in the context of national parks and upland indigenous peoples. Given the lack of policy clarity around community-managed forests, the development of REDD+ in Thailand is likely to be constrained until these issues are addressed.

Finally, it will be important to consider time and labor requirements associated with REDD+ relative to expected benefits. REDD+ initiatives may increase local workloads, for example, to develop alternatives to existing forest exploitation strategies. It will be critical in precarious contexts such as Ban Huay Win that carbon sequestration objectives do not undermine livelihood assets and overall adaptive capacity.

VIETNAM

# Adapting to Natural Disasters and Contributing to Climate Change Mitigation: Mangrove Community Forestry in Vietnam

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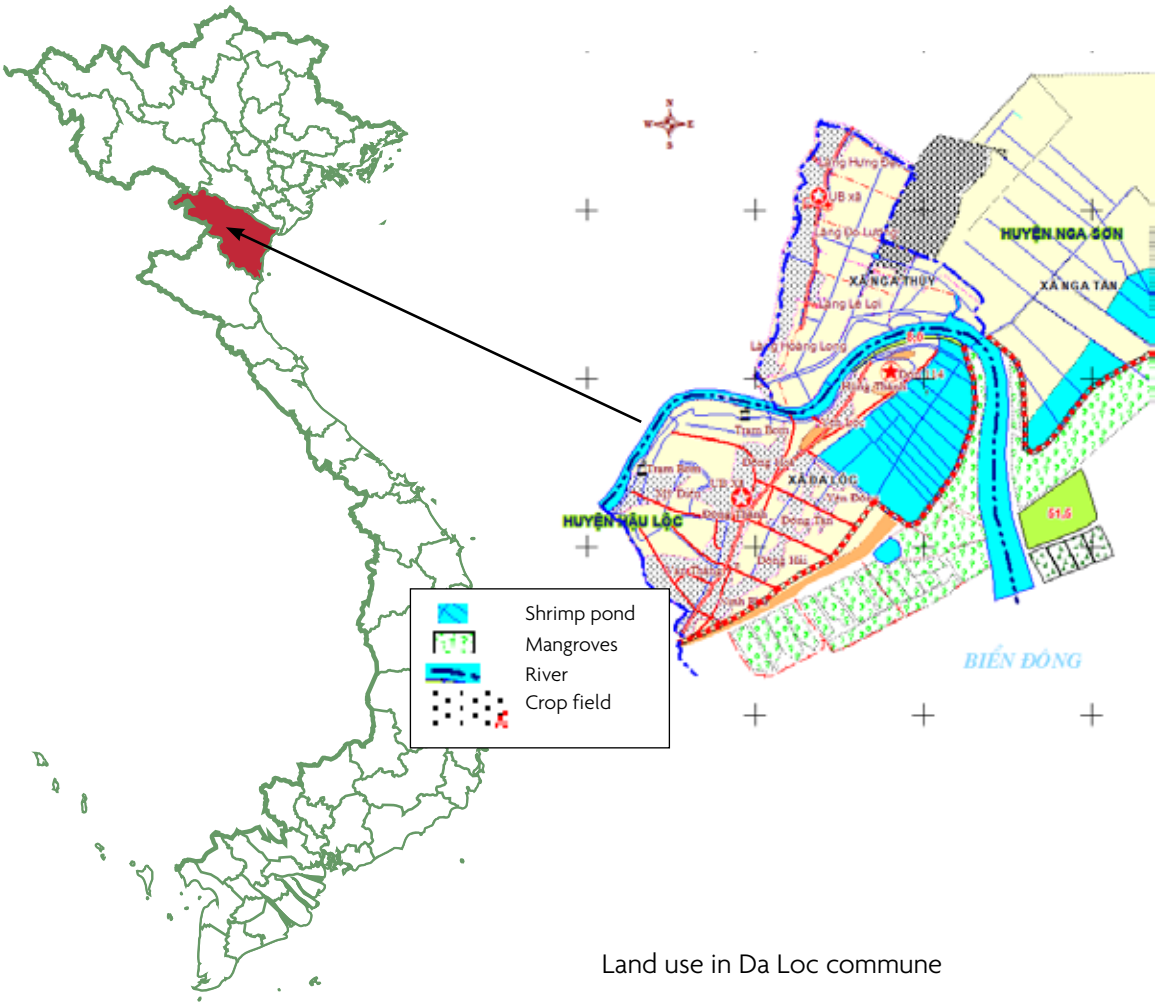
## Key Lessons

Da Loc commune is vulnerable to increasing extreme weather events. The damage caused by Typhoon Damrey in 2005 was a pivotal moment for the commune, leading to mangrove reforestation initiatives for disaster risk management. Involving local communities as direct partners led to this project's success compared to earlier less participatory initiatives. In the interim years required for the mangroves to reach maturity, unanticipated secondary benefits have resulted. In addition to the income benefits from enhanced aquaculture, mangroves also serve as powerful carbon sinks. Thus, while originally designed as an adaptation measure, the project is an example of strong synergies with significant mitigation benefits. It has shed light on a number of important issues:

- Official recognition of community management rights over the mangroves has been critical in ensuring the sustainability and commitment of local communities. However, currently these rights are short term (five years). The sustainable management of the mangroves is contingent on establishing longer-term community rights.
- Trade-offs have emerged that may threaten the project. The income potential of aquaculture practices that are destructive to the mangroves is proving a strong temptation. Careful analysis on costs and benefits of both adaptation and mitigation actions is needed.
- Unless equitable benefit-sharing mechanisms are ensured and participatory decision-making processes are incorporated for the well-being of vulnerable community members, there is a risk that the success of the project will be compromised.
- Pre-existing, locally adapted knowledge can be highly beneficial to projects. Understanding and incorporation of local knowledge may lead to innovations that enhance effectiveness and improve uptake by local communities.




Land use in Da Loc commune

## Timeline

| | |
|---|---|
| 1982 | The Government begins to construct a sea dike in Da Loc commune. |
| 1989 | The Japanese Red Cross and partners launch a mangrove afforestation project on 350 hectares of land. |
| Pre-2005 | Only 15 to 20% of the mangroves from the Red Cross project survive). |
| 2005 | Typhoon Damrey strikes, causing widespread destruction to the commune and damaging the sea dike. The few areas shielded by mangroves suffer less damage than elsewhere. |
| 2006 | The Government, CARE International, and Da Loc citizens establish the Community Based Mangrove Management Board (CBMMB). |
| 2007-2008 | CARE leads community mangrove planting with *Kandelia candel* and *Sonneratia*, earlier tested as suitable species in the Red Cross initiative. |
| 2007 | CARE and the CBMMB successfully establish a mangrove nursery of 15,000 Sonneratia seedlings, spanning approximately 50 hectares. |
| 2008 | CARE and CBMMB plant 32,000 mangroves seedlings over approximately 70 hectares. |
| 2009 | The Government signs a five-year agreement for Community-Based Forest Management in the commune. |
| 2010 | This model is replicated in Nga Thuy commune; an additional 37 hectares of mangroves are planted resulting in a combined total of approximately 300 hectares. |

# 1. Background

Da Loc is a coastal commune located in Thanh Hoa Province, north-central Vietnam and covers an area of 11,116.3 km2. The East Sea and the Len River border almost two-thirds of the commune and support much of the agriculture and aquaculture relied upon by the commune's ten villages for subsistence and income generation.

Although water resources offer many livelihood benefits, the commune's geography also presents a number of threats that are intensifying with climate change (Buffle *et al*., 2011; ADB, 2009; IPCC, 2007). Da Loc and surrounding areas experience an average of five to six typhoons annually, in addition to continuous sea encroachment and flooding (Trinh, 2009). In 1982 the Government constructed a five-kilometer sea dike around the commune to mitigate typhoon damage. However, despite significant investment, the dike has continuously suffered damage from extreme coastal weather events.

Mangrove afforestation is a promising option to protect both the community and the sea dike. Starting in 1989, the Japanese Red Cross, Save the Children, and the Government collaborated in planting approximately 350 hectares of mangrove seedlings in offshore areas bordering Da Loc. After testing several different mangrove species, they selected *Kandelia candel* and *Sonneratia*. However, survival rates proved disappointing – in some instances only 15 to 20% survived within a year of planting.

In 2005, Typhoon Damrey inflicted serious damage to Da Loc commune. The sea dike largely failed to protect the commune with the exception of where mangroves remained as buffers. In these sheltered areas agricultural lands experienced less seawater incursion, whereas elsewhere it swept several kilometres inland, causing destruction to settlements, livestock, and human life (Buffle *et al*., 2011; Kempinski, 2009). The long-term impacts on agriculture and freshwater supplies are still being felt.

The demonstration of the mangroves' buffering capability inspired CARE International to take an active role in the regeneration and further expansion of mangrove forests within Da Loc. CARE facilitated a Community Based Mangrove Reforestation (CBMR) approach, which empowered local communities as stewards and beneficiaries of the mangroves.

A range of stakeholders were engaged in the CBMR project. More than 700 people from three villages took part in nursery establishment, planting and maintenance of mangroves, and protection groups. State agencies such as the Border Army and the commune police collaborated on protection aspects and district and provincial authorities played important roles in land-use planning and the establishment of community rights over the mangroves.

# 2. Climate Change and Perceived Impacts in Vietnam and in Da Loc

## Climate Change at the National Level

The fourth assessment of the Intergovernmental Panel on Climate Change in 2007 noted that most climate change assessments in Vietnam at that juncture had been qualitative and there was a pressing need for more empirical data collection. Despite this, it pointed to clear climate change impacts already occurring, with weather conditions becoming more extreme and unpredictable (IPCC, 2007). In its Second National Communication to the United Nations Framework Convention on Climate Change, the Government of Vietnam reported increasing

average temperature rises over the past several decades, more cold fronts, and growing intensity of typhoons affecting coastal areas (GoV, 2010). Annual average temperatures had increased by 0.1°C per decade from 1900 to 2000 with summers becoming hotter (Hoang and Tran, 2006).

## Community Perceptions of Climate Change

Most stakeholders surveyed (including those at household, commune, and district levels) have at least a basic understanding of the term 'climate change', generally gained through local media and project intervention sources. Commune-level officials tend to have a better understanding, and many have had opportunities to attend specific training on climate change adaptation and mitigation. All members of the community claim to have been negatively impacted by what they perceive to be climate change, pointing to declining agricultural productivity due to erratic seasons and rainfall, saltwater incursion, and the effects of natural disasters.

Similar to seasonal shifts experienced in other parts of the country (Oxfam, 2008), Da Loc villagers report that since the late 1990s, the dry season has lengthened considerably, beginning a month earlier and extending a month later (Oxfam, 2008). Cold spells have also changed in both duration and intensity, with villagers reporting unprecedented lows of 7°C. *Tieu Man*, a regular natural flooding event that normally takes place at the end of April, signals the start of crop planting, but this predictable event has not taken place for several years (Oxfam, 2008).

> "The weather has been changing too much. It's not regular as it was before. People now experience very hot days, then a freezing cold winter.
>
> *Mr. Dao Van Nhe, Dong Tanh village, Da Loc commune*

> "We used to have three or four definite seasons: spring, summer, autumn and winter... Now we have two: hot and cold. In previous years, rainfall came between spring and winter. Now it rains in autumn and winter. With these changes, we cannot forecast our agriculture production activities... It just rains whenever and however.
>
> *Mrs. Nguyen Thi Dien, Dong Tanh village, Da Loc commune*

Fresh water is simultaneously becoming scarce. Groundwater tables are lowering, partly due to human activities such as land-use management and agricultural practices, and the incursion of salinized water has advanced as far as ten kilometres inland, affecting the flow dynamics of the Len River.

## Changes in Natural Assets and Implications for Livelihoods

The Da Loc villagers estimate that since Typhoon Damrey struck household income from agriculture and animal husbandry has dropped on average by 20%. This is closer to 50% for villages near to the coastline. This is attributed, at least in part, to the lasting impacts of typhoon storm surges as well as rising sea levels.[1]

During participatory rural appraisal (PRA), the villagers estimated that average rice yields have dropped from 6,944–7,500 kg/hectare to 4,166–5,556 kg/hectare since Typhoon Damrey,

1 According to MONRE (2008), average sea level rise along the shoreline of Vietnam from 1993 to 2008 was about 3 mm/year.

presenting significant challenges for household food security. Land available for rice cultivation has also been falling over time mainly due to salinization and conversions to aquaculture. In 2009 and 2010, more than 50% of the households were forced to purchase rice for consumption, an increase of 15% from preceding years.

Da Loc is now facing a critical freshwater shortage. Due to extended dry seasons, as well as increasing salinization from sea level rise, the Len River has become inundated by saltwater throughout the year. This is forcing communities to explore other water access options including purchasing water for household needs, filtering water, developing rainwater harvesting tanks, and requesting water donations from other communities.

Irregular weather patterns are linked by villagers and district authorities to a number of new and intensifying human, crop, and animal diseases. Villagers report an increased onset of diseases such as rice seedling blight (Pyricularia oryzae, also known as rice blast fungus or rice rotten neck), rice leaf foddering (Cnaphalocrocis medinalin), and what appears to be foot and mouth disease among cattle and pigs and avian influenza in poultry. These diseases have emerged in a very short period and have presented serious management challenges for the community.

Marginalized households and women, in particular, face growing health risks due to lack of clean water as salinization of wells and river accelerates.

> “Women, who are more active and socialize in the Da Loc communities, have been more affected by climate change and environmental pollution than men because we are responsible for more work like taking care of the family, the fields, and animals, as well as social activities.
>
> *Mrs. Tran Thi Xuyen, Yen Dong village, Da Loc commune*

While there is no direct evidence of a causal relationship of these diseases with climate change, anticipated climate change impacts include increased incidence of human, livestock, and crop disease (ADB, 2011).

Animal husbandry has been adversely impacted as drought, saltwater intrusion, and cold spells have reduced available grazing areas. Reductions in fodder availability have curtailed animal-raising activities, particularly affecting poorer households. Coupled with emerging (and possibly climate change-related) animal diseases, the PRA exercises indicated that the cattle population has declined by 45% since 2005, and more than 50% of the households have stopped raising pigs. Although there are moves to purchase commercially-produced feed and medicines for animals, the capital required has effectively eliminated this option for poorer households.

Saltwater intrusion on *coi* grass habitats and subsequent conversion into aquaculture is leading to loss of income from traditional local handicrafts such as sedge mats and other similar products.

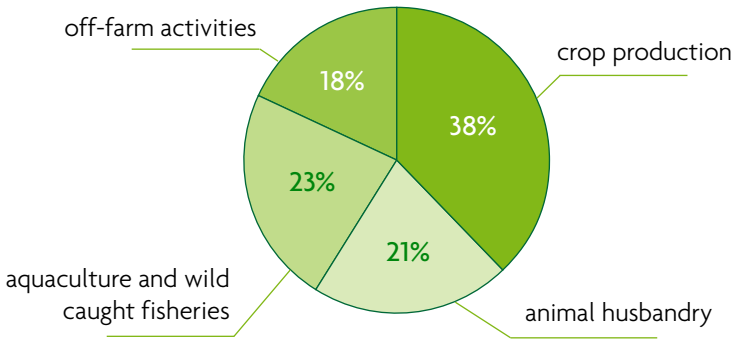
The growing brackish water habitats around the commune have also led to new opportunities through aquaculture and capture fisheries. The reforestation of the mangroves has led to expansion of sandy mudflats to 1,300 hectares. These coastal wetlands provide an ideal habitat for valuable brackish aquatic species such as mollusks, oysters, hard and soft crabs, coy fish, and shrimp.

The PRA exercises revealed the growing economic importance of aquaculture and in particular mollusks for the community. Prior to the CBMR project, daily harvests of mollusks averaged two

kilograms per day per person (selling at US$1.20/kg). Today, as a result of improved habitat and strict harvest regulations, the yield is five to ten times greater. In addition to aquatic species, the areas around the mangroves support livelihood activities such as duck rearing and bee keeping.

However, there are questions emerging about equity in the distribution of the new community resources. In 2010, approximately 46% of the mudflat area was allocated to individual households for aquaculture production at set rent prices. Those able to pay the high rental fees have been the primary beneficiaries. Conflicts are already emerging within the community over mudflat access rights and the opportunity costs of strict mangrove conservation.

The community livelihood earnings for Da Loc (2010) are as follows:




# 3. Assessing Adaptive Capacity and Resilience

## Adaptive Capacity

As Da Loc faces unpredictable seasons and increasing intensity and frequency of extreme weather events, the community is drawing increasingly on its various livelihood assets to respond (Buffle *et al*., 2011). Da Loc has demonstrated considerable resilience, understood as the ability to adapt or recover from potential hazards (UN/ISDR, 2004), via livelihood diversification.

The livelihood assets that support both adaptive capacity and resilience in Da Loc are summarized in Table 1.

**Table 1: Valued Community Assets in Da Loc commune**

| Type | Assets | Effects on Adaptive Capacity |
|---|---|---|
| **Natural Assets** | ▪ Terrestrial land available: 1,350 hectares, including 450 hectares of agricultural land<br>▪ Mangrove forests: 500 hectares<br>▪ Shoreline mud flats: 1,300 hectares<br>▪ Len River and tributaries | ▪ Land to support subsistence agriculture (primarily rice)<br>▪ Benefits from mangroves including disaster risk reduction and income potential from aquaculture and carbon sequestration |

| Type | Assets | Effects on Adaptive Capacity |
|---|---|---|
| **Physical Assets** | ▪ Sea dikes: 5 kilometres<br>▪ Road infrastructure<br>▪ Accessible public transportation<br>▪ Accessible preschool, primary, and secondary schools<br>▪ Health care station | ▪ Protection from natural disasters and extreme weather events<br>▪ Access to services, markets, etc.<br>▪ Economic mobility through education<br>▪ Support for medical complaints |
| **Financial Assets** | ▪ Official credit systems through national banks<br>▪ Unofficial credit system: private and farmers' group saving initiatives | ▪ Investment opportunities in diversified income-generating activities |
| **Social Assets** | ▪ Associations for women, farmers, and youth, along with a Green Team which raises awareness about environmental issues<br>▪ Hard working, collective work ethic | ▪ Channels for information dissemination and awareness raising<br>▪ Opportunity to respond to changes with collaborative activities and actions |

Source: Key informant interviews, 2011.[2]

## 4. Climate Change Vulnerabilities

With a long coastline and densely populated river deltas, Vietnam has a long history of dealing with natural disasters. With 3,200 kilometers of coastline, Vietnam is considered to be among the five most vulnerable countries in the world to climate change (ADB, 2009). Da Loc commune is particularly vulnerable given its combination of exposure and sensitivity to natural hazards including high population concentrations in low elevation areas. As many of the properties are only two to three meters above sea level, without dikes these assets would be lost.

In 2010, the incidence of poverty[3] in Thanh Hoa Province (which encompasses Da Loc commune) was 19.8%, and relative poverty was 23.5%.[4] Agriculture-based livelihoods, land scarcity, and vulnerability to natural hazards are identified by commune officials as major barriers to poverty alleviation.

While community members are described as diligent and enthusiastic about collective work, Da Loc is facing a severe drain of human capital. In 2010 and 2011, an estimated 1,700 young people out of a total commune population of 7,694 (approximately 22% of the population) migrated in search of paid work (Thanh Hoa Statistics Office, 2010).

2 Fifty-two villagers participated in two focus group discussions. In-depth interviews with individual households, commune and district leaders, and CARE staff were conducted; a workshop was also held in Da Loc commune to supplement and validate data.

3 Ministry of Labour, Invalids and Social Affair (2011) categorizes extremely poor households in rural areas as having average income/person/month of under US$$20; relatively poor households have an average income of US$20-26/person/month.

4 Thanh Hoa Provincial General Statistical Office (2010).

## 5. Responses to Environmental Changes and Development Needs

Da Loc commune is responding to climate change, environmental, and broader socio-economic changes with coping, adaptive, and in some cases, inappropriate adaptive strategies. Some of the most common adaptive responses include:

- Maintaining mangroves for their protective function
- Changing areas of land use, crops, and cropping patterns to respond to seasonal weather changes (Pereznieto *et al*., 2011)
- Increasing use of crop species that are resistant to drought and saltwater
- Employing agricultural techniques, such as use of fertilizer and pesticides, to respond to declining crop productivity and diminished land resources; this has increased needs for intensification
- Investment in irrigation systems in response to growing water scarcity (Pereznieto *et al*., 2011)
- Transition from rice farming for subsistence to cash-based aquaculture
- Reduction in livestock rearing due to high costs and diminished natural resources
- Digging of water ponds around fields for freshwater capture
- Migration to cities for employment (Thanh *et al*., 2010).

Many of these strategies represent planned adaptation, but not all are based on long-term forecasting and full information. Coping measures such as the increased use of chemical pesticides and fertilizers are reducing financial resources, food security, and potentially leading to health impacts. Others, such as a shift in livelihoods from subsistence rice farming to cash-based aquaculture have appeared to increase available resources, at least in the short term.

Da Loc has also developed its social capital in response to the changes it is experiencing. The community's Flood Committees have been instrumental in supporting disaster management and the youth-based Green Team actively raises awareness about climate change and environmental management.

## 6. Adaptation, Mitigation, and Community Forestry Linkages

In climate change initiatives, adaptation and mitigation approaches do not always complement each other, and can be conflicting (Julia *et al*., 2009). Efforts to mitigate climate change may hinder the adaptive capacity of local communities or vice versa. However, the Da Loc mangrove-planting project illustrates the potential for adaptation activities and mitigation goals to be mutually reinforcing through community forestry initiatives.

CARE's initial goals in the mangrove reforestation project focused on disaster risk management and responding to environmental and climate changes. However, mangroves are among the most effective carbon sequestration ecosystems, capturing as much as four times more carbon than tropical rainforests (Donato *et al*., 2011; Khan *et al*., 2009). The project has therefore made simultaneous and significant contributions to both climate change adaptation and mitigation.

While the synergies between adaptation and mitigation in Da Loc are multiple and strong, they are not without trade-offs. Unanticipated opportunity costs have emerged through the temptation to collect high-value mollusks, which is potentially destructive to the mangroves. Given the current climate of receptivity to REDD+, especially in Vietnam, Da Loc residents

are increasingly aware of the potential for carbon financing. If the CBMR project develops into a mitigation project that brings in carbon finance, the added revenue may counterbalance community interest in favor of the mangroves.

The CBMR project has made significant contributions to adaptive capacity through diversifying livelihood sources. However, for the entire community to benefit, mechanisms are needed to ensure equitable benefit sharing. These must include transparent, participatory processes for determining access to and sharing of benefits and ensuring that marginalized groups are not further disadvantaged.

The CBMR approach used a range of media sources and promoted social events for building awareness about climate change and environmental management. These activities created community buy-in and have been important in the success of the initiative. In addition to the value of the mangroves promoted by the project, the community also recognizes the social benefits that have resulted, including better education, awareness, and strengthening of social capital.

Additionally, disaster risk reduction and adaptation strategies have benefited from incorporating local experiences and indigenous knowledge. For example, community members avoided using expensive and harmful chemical pesticides to remove barnacles from mangroves. Instead, they already knew when the barnacles had the thinnest shells, and they planned the best times to remove them manually.

Because mangroves in Vietnam are classified as protection forest, they cannot directly be allocated to households or communities for management. However, the CARE-led project facilitated negotiation of community-based management agreements among local communities, people's committees, and local forestry department offices, which established the rights, roles, and responsibilities of the local community in managing the mangroves. The community has seen this as a key accomplishment and recognition of its contributions and rights to benefit from the mangroves. It has provided a powerful incentive for sustained management of, and investment in, the mangroves.

# References


**Action Against Hunger** (2003) 'Food Security Assessment Mondulkiri Province', Action Against Hunger, Phnom Penh, Cambodia.

**Aguettante, J.** 1996. Impact of population registration on hilltribe development in Thailand. *Asia-Pacific Population Journal,* 11(4): 47–72.

**RRC.AP.** 2011. *Climate change adaptation - factors of choice, effectiveness, and supporting systems*. Regional Resource Centre for Asia and the Pacific, Bangkok, Thailand. Regional Climate Change Adaptation Knowledge Platform for Asia. Available at: www. asiapacificadapt.net.

**RRC.AP.** 2011. *An approach to climate change adaptation research: Events, strategies and drivers.* Regional Resource Centre for Asia and the Pacific, Bangkok, Thailand. Regional climate change adaptation Knowledge platform for Asia. Available at: www. asiapacificadapt.net, accessed on 22 September 2011

**Angelsen, A.** 2011. 'The economic contributions of forests to rural livelihoods: a global analysis. Oral presentation at the PEN Science Workshop: Exploring the Forest-Poverty Link: New Research Findings. University of East Anglia, Norwich, UK, 13–14 June 2011.

**Arendt, A.A. *et al.*** 2002. Rapid wastage of Alaska glaciers and their contribution to rising sea level. *Science,* 297: 382–386.

**Asian Development Bank (ADB).** 2009. *The economics of climate change in Southeast Asia: a regional review.* Available at: http://www.adb.org/Documents/Books/Economics-Climate-Change-SEA/PDF/Economics-Climate-Change.pdf

**Asian Development Bank.** 2011. *Accounting for health impacts of climate change.* Available at: http://beta.adb.org/sites/default/files/heath-impacts-climate-change.pdf, accessed 23 January 2012.

**Bajracharya, S.R. *et al.*** 2007. *Impact of climate on Himalayan glaciers and glacial lakes.* ICIMOD/ UNEP. pp.7–19.

**Bernier, P. & Schoene, D.** 2009. Adapting forests and their management to climate change: an overview. *Unasylva,* 60(1-2): 5–11.

**Boer, R. & Faqih, A.** 2004. Current and future rainfall variability in Indonesia. *In An integrated assessment of climate change impacts, adaptation and vulnerability in watershed areas and communities in Southeast Asia.* Report from AIACC Project No AS21. Washington, DC, International START Secretariat.

**Buffle, P., Nguyen, Y. & Fauerby Thomsen, M.** 2011. *Community based mangrove reforestation & management in Da Loc, Vietnam.* Ecosystems, Livelihoods & Adaptation Network (ELAN).

**Cambodian Rural Development Team (CRDT).** 2009. *Annual progress, monitoring and evaluation report in 2009 for Wildlife Conservation Society (WCS).* Cambodia, CRDT.

**Cambodian Rural Development Team.** 2011. *Vulnerability reduction assessment (VRA), four villages: AndongKralong, Gratie, O'Ranna and SreLavie, KeoSeima District, Mondulkiri Province.* A report for UNDP-GEF. Cambodia, CRDT.

**CARE International.** 2009. *Climate vulnerability and capacity analysis handbook. 1st edition.* Available at: http://www.careclimatechange.org.

**CARE International.** 2010. *Community-based adaptation toolkit. digital toolkit – version 1.0 – July 2010.* Available at: www.careclimatechange.org/files/toolkit/CARE_CBA_Toolkit.pdf

**Casson, A.C. *et al.*** 2007. *A multistakeholder action plan to curb illegal logging and improve law enforcement in Indonesia*. Jakarta, WWF, Indonesia/World Bank/DFID Multistakeholder Forestry Program.

**Chao, S.** 2012. *Forest Peoples: Numbers Across the World.* Forest Peoples Program.

**Chen, C.T.A.** 2009. Acidification and potential dissolution of CaCO3 in the sediments of the

South China and Sulu Seas; In "*Critical States: Environmental Challenges to Development in Monsoon Southeast Asia*", edited by Louis Lebel, Anond Snidvongs, Chen-Tung Arthur Chen and Rajesh Daniel; Strategic Information and Research Development Centre: Selangor, Malaysia, ISBN: 978-983-3782-62-8, p. 358-364.

**Council for Social Development (CSD).** 2001. *Achieving Poverty Targets,* Cambodia-Poverty Net, Phnom Penh, http://www.un.org.kh/undp/poverty/net/

**Donato, D.C. *et al.*** 2011. *Nature Geoscience* advance online publication doi:10.1038/ngeo1123 (2011).

**Earthtrends/World Resources Institute.** 2003. *Coastal and marine ecosystems – Indonesia.* Available at: http://earthtrends.wri.org/pdf_library/country_profiles/coa_cou_360.pdf

**Eastham, J., F. Mpelasoka, M. Mainuddin, C. Ticehurst, P. Dyce, G. Hodgson, R. Ali & M. Kirby.** 2008. Mekong River Basin Water Resources Assessment: Impacts of Climate Change. CSIRO: Canberra.

**Evans, T.D., P. Hourt, P. Phet, and M. Hang**. 2003. *A Study of Resin-Tapping and Livelihoods in Southern Mondulkiri, Cambodia, with Implications for Conservation and Forest Management.* Wildlife Conservation Society: Phnom Penh

**Evans, T. *et al.*** 2011. Pilot REDD activities in Cambodia are expected to improve access to forest resource use rights and land tenure for local communities. WCS REDD Fact Sheet.

**Food and Agriculture Organization**. 2012. *Forests and climate change adaptation in Asia.* Policy Brief: http://www.fao.org/fileadmin/templates/rap/files/NRE/Forests_and_climate_change_adaptation_in_Asia.pdf.

**Forest Authority, Cambodia.** 2007. *Forest cover changes in Cambodia, 2002-2006.* Paper prepared for the Cambodia Development Cooperation Forum. Phnom Penh, Forestry Administration.

**Government of Vietnam.** 2010. Vietnam's Second National Communication to the United Nations Framework Convention on Climate Change. Hanoi, Vietnam.

**Gruza, G. & Rankova, E.** 2004. Detection of changes in climate state, climate variability and climate extremity. *In* Y. Izrael, G. Gruza, S. Semenov & I. Nazarov, eds. *Proc. World Climate Change Conference, Moscow,* pp. 90–93. Institute of Global Climate and Ecology, Moscow.

**Hoang, D. & Tran, V.** 2006. Developing various climate change scenarios of 21 century for regions of Viet Nam. *Scientific and Technical Hydro-Meteorological Journal,* No. 541, January 2006.

**Intergovernmental Panel on Climate Change (IPCC).** 2001. *Third assessment report – climate change 2001 synthesis report.* Available at: http://www.grida.no/publications/other/ipcc_tar, accessed 10 June 2011.

**Intergovernmental Panel on Climate Change.** 2007. *Fourth assessment report – climate change 2001 synthesis report.* Available at: http://www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html, accessed 10 June 2011.

**Intergovernmental Panel on Climate Change.** 2007. *IPCC fourth assessment report: climate change 2007.*

**Intergovernmental Panel on Climate Change.** 2007. *Climate change 2007: the physical science basis.* Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B., Averyt, M. Tignor & H.L. Miller, eds.). Cambridge University Press, Cambridge, UK and New York, NY, USA.

**Jesdapipat, S.** 2008. *Thailand country report—a regional review on the economics of climate change in Southeast Asia.* Report submitted for RETA 6427: A Regional Review of the Economics of Climate Change in Southeast Asia. Manila, Asian Development Bank.

**Julia, L. *et al.*** 2009. Combining climate change adaptation and mitigation measures at the local level. *Habitat International,* 33(3) July 2009: 287–292, ISSN 0197-3975.

**Kanel, K. R., Bikram, S.S., Poudel, K. & Regmi, N.P.** 2009. *Quick Assessment of Land Use, Forest Policy and Governance.* Report submitted to REDD – Forestry and Climate Change Cell Ministry of Forest and Soil Conservation, Kathmandu, Nepal.

**Kempinski, J. & Cuc, N.K.** 2009. *Review of CARE's community based mangrove reforestation and management project, Thanh Hoa Province, Vietnam.* Unpublished evaluation report.

**Khan, M.N.I., Suwa, R. & Hagihara, A.** 2009. Biomass and aboveground net primary production in a subtropical mangrove stand of *Kandelia obovata* (S., L.) Yong at Manko Wetland, Okinawa, Japan, *Wetland Ecol. Manage,* 17, 2009: 585–599.

**Locatelli, B., Kanninen, M., Brockhaus, M., Colfer, C.J.P., Murdiyarso D. & Santoso. H.** 2008. *Facing an Uncertain Future: How Forests and People can Adapt to Climate Change.* Forest Perspectives, 5. CIFOR, Bogor, Indonesia.

**Mann Mouy.** 2009. *Impact assessment of bamboo harvesting in the Seima Biodiversity Conservation Area, Mondulkiri, Cambodia.* VIII World Bamboo Congress Proceedings, Vol.2: 67-84.

**Manton, M.J., Della-Marta, P.M., Haylock, M.R., Hennessy, K.J., Nicholls, N., Chambers, L.E., Collins, D.A., Daw, G. & Co-authors.** 2001. Trends in extreme daily rainfall and temperature in Southeast Asia and the South Pacific; 1961–1998. *Int. J. Climatol.,* 21, 269–284.

**McAndrew, J. & Il, O.** 2008. *Access to natural resources: case studies of Cambodian hill tribes. land and cultural survival: the communal land rights of indigenous peoples in Asia.* Asian Development Bank.

**Mc Kenney, B., Y. Chea, P. Tola, and T. Evans.** 2004. *Focusing on Cambodia's High Value Forests: Livelihoods and Management.* Cambodia Development Resource Institute and Wildlife Conservation Society, Phnom Penh

**McSweeney, C., New, M. & Lizcano, G.** 2008. *UNDP climate change country profiles: Cambodia.* UNDP.

**Ministry of Environment, Cambodia.** 2010. GHG inventory and mitigation study (draft report prepared for SNC). Phnom Penh, MoE.

**Ministry of Forestry, Indonesia.** 2012. Meru Betiri National Park official website: http://www.dephut.go.id/INFORMASI/TN%20INDO-ENGLISH/merubetiri_NP.htm, retrieved 2012-04-11

**Ministry of Natural Resource and Environment, Vietnam.** 2008. *National target program on climate change mitigation and adaptation.* MONRE.

**Ministry of Planning, Cambodia.** 2010. *Achieving Cambodia's Millennium Development Goals (update 2010).* Phnom Penh, MoP.

**National Strategic Development Plan (NSDP).** 2010. *Poverty reduction, employment, equity and efficiency to reach Cambodia's Millennium Development Goals.* The Royal Government of Cambodia.

**Naylor, R.L., Battisti, D.S., Vimont, D.J., Falcon, W.P. & Burke, M.S.** 2007. Assessing risks of climate variability and climate change for Indonesian rice agriculture. *Proceedings of the National Academy of Sciences of the United States of America,* 104(19): 7752–7757.

**Nepal Climate Vulnerability Study Team (NCVST).** 2009. *Vulnerability through the eyes of vulnerable: Climate change induced uncertainties and Nepal's development predicaments.* Nepal Climate Vulnerability Study Team (NCVST), ISET-Nepal.

**Nepal Times.** 2011. Neither forests nor trees. Issue #535 (7 to 13 January 2011). Available at: http://nepalitimes.com/issue/2011/01/07/Nation/17821

**Oxfam.** 2008. Viet Nam*: climate change, adaptation and poor people.* A report for Oxfam.

**Pearson, P., Harris, N. & Brown, S.** 2008. *Assessing the potential for generating carbon offsets in the Seima Biodiversity Conservation Area, Cambodia.* Report to WCS, WINROCK International.

**Pereznieto, P. *et al.*** 2011. *The social impact of economic crisis upon youth: youth-led participatory research and real time monitoring of the current economic crisis.* London, UK, ODI. 102 pp.

**Raks Thai Foundation.** 2008. *Annual report.* Available at: http://www.raksthai.org/files/media/Annual_Eng_2008_for_web.pdf

**Regional Community Forestry Training Center (RECOFTC) Thailand.** 2011. Carbon stock in trees and capacity in reforested land: Ban Pang Yang, Nan. Draft research paper.

**Regional Community Forestry Training Center (RECOFTC) Thailand.** 2010. *The role of social forestry in climate change mitigation and adaptation in the ASEAN Region.* Bangkok, RECOFTC.

**Regional Community Forestry Training Center (RECOFTC) Thailand.** 2008. *People and Forests in a Time of Rapid Change: Strengthening Capacities for Community Forestry to Respond.* RECOFTC Strategic Plan 2008–2013. Bangkok, RECOFTC.

**Regmi, H.R.** 2007. Effect of unusual weather on cereal crops production and household food security. *The Journal of Agriculture and Environment,* pp. 20–29.

**Rignot, E. *et al.*** 2003. Contribution of the Patagonia icefields of South America to sea level rise. *Science,* 302, 434–437.

**Robledo, C., Kanninen, M. & Pedroni, L., eds.** 2005. *Tropical forests and adaptation to climate change. In search of synergies.* CIFOR, 2005.

**Royal Government of Cambodia (RGC).** 2006. National Adaptation Programme of Action to Climate Change (NAPA). Phnom Penh, Royal Government of Cambodia, Ministry of Environment.

**Shrestha, A. B., Rana, B., Aryal, R. & Pokhrel, A. P. 2001.** "Hazard Assessment and Remediation Work at Tsho Rolpa Glacier Lake, Rolwaling Himal, Nepal." *Journal of Japanese Society of Civil Engineers*, 86, 2001: 72-75.

**Stern, N.** 2007. *Stern Review on the economics of climate change.* Cambridge, Cambridge University Press. 692 pp.

**Thanh Hoa Statistics Office.** 2011. *Statistical year book 2010.* Vietnam, Thanhhoa Province, Thanhhoa Publisher.

**Thanh, N., Tan L. & Loan V.** 2011. Climate Change and Youth. Live & Learn for the Environment and Community Vietnam. http://www.dfid.gov.uk/r4d/PDF/Outputs/Mis_SPC/60828_Vietnam-climate-change-poster-presentation.pdf

**Thuon, T.** 2010. *Using indigenous knowledge for predicting floods, droughts and insect infestations: A case study from North-East Cambodia.* A report to the Asia Pacific Regional Human Development Network.

**Turner, B.L. *et al.*** 2003. A framework for vulnerability analysis in sustainability science. *PNAS,* 8 July 2003, 100(14). Available at: http://www.pnas.org/content/100/14/8074

**United Nations Development Programme (UNDP).** 2011. *Building resilience: the future for rural livelihoods in the face of climate change.* Cambodia Human Development Report 2011.

**United Nations Inter-Agency Secretariat of the International Strategy for Disaster Reduction (UNIDSR).** 2004. *Living with risk – a global review of disaster reduction initiatives.*

**UN-REDD**. 2011. *REDD+ Benefit Sharing: A Comparative Assessment of Three National Policy Approaches.* UN-REDD Programme.

**University of Gothenberg.** 2008. *Indonesia environmental and climate change policy brief.* Available at: http://www.sida.se/Global/Countries%20and%20regions/Asia%20incl.%20Middle%20East/Indonesia/Environmental%20policy%20brief%20Indonesia.pdf

**Wildlife Conservation Society (WCS),** 2012. See: http://www.wcscambodia.org/conservation-challenges/climate-change/seima-village-gains-rights.html

**Woodworth, P.L. *et al.*** 2004. Long term sea level changes and their impacts. *In* A. Robinson & K. Brink, eds. *The sea,* pp. 717–752. Cambridge, Massachusetts, Harvard Univ. Press.

**Yusuf, A.A. & Francisco, H.** 2009. *Climate change vulnerability mapping for Southeast Asia.* Economy and Environment Program for Southeast Asia (EEPSEA), Singapore.

**Zhai, P.M.** 2004. Climate change and meteorological disasters. *Science and Technology Reviews,* 7: 11–14.

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