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Payment for Ecosystem Services in Thailand and Lao PDR

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Front cover photo: Elephants crossing the road at Khao Ang Rue Nai Wildlife Sanctuary, Thailand.
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PAYMENT FOR ECOSYSTEM SERVICES IN THAILAND AND LAO PDR

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EXECUTIVE SUMMARY

Payment for ecosystem services (PES) is a new approach that has seen growing interest in conservation. The definition of PES in this report is given by Wunder (2005, p. 3) as “a voluntary transaction where a well-defined environmental service or a land use likely to secure that service is being ‘bought’ by a minimum of one service buyer from a minimum of one service provider if and only if the service provider secures service provision (conditionality).”

This report aims to review PES implementation in Thailand and Lao PDR and to draw lessons from the case studies. Although the projects in Thailand and Lao PDR that have been identified and discussed in this report produce ecosystems services, they lack many of the components of full PES projects as provided by the definition of Wunder (2005). Thus, we refer to these cases as “PES-like.” In the case of Thailand, most of the funds for natural resources conservation are primarily corporate social responsibility investments. However, investors do not directly benefit from the ecosystems services they are paying for; donations have tended to be one-time investments with no guarantee of continuity in funding. In addition, PES-like projects related to wildlife has the potential to generate voluntary contribution from private companies or from the general public; flows of contributions from these sources are unlikely for ecosystems services such as watersheds, mangroves, wetlands, etc. This is because it is difficult for the general public to understand the importance of such ecosystem services. The challenge then is how to demonstrate the direct and indirect benefits of ecosystems services in order to create a real public demand.

PES cases in Lao PDR are also at the design stage; however, the mining and hydro-power projects of private sectors in Lao PDR have developed their own incentive or benefit-sharing mechanisms, which depend on the outcome of negotiations for concession agreements. Moreover, the Government of Lao PDR has shown strong interest in the PES mechanism. The main constraint in Lao PDR is not the legal issue itself, but rather the lack of human and financial capacity to implement PES.

1.0 INTRODUCTION

Payment for ecosystem services (PES) is an innovation that uses financial markets to provide incentives for improving environmental management (Smith et al. 2006; Wunder, Enger, and Pagiola 2008). There is growing interest in using the PES approach in conservation, especially in the classical case of watershed protection. It emerged when it was becoming obvious that, as a result of budget constraints in many jurisdictions, the common approach (e.g., command-and-control measures) could not provide enough funds for conservation from government sources. PES can provide a new source of funding, especially if the private sector and service-providing communities can improve their livelihoods from investing their funds in this way (Wunder, Enger, and Pagiola 2008). Although the PES concept has gained increasing attention over the past decade, a review of PES implementation in Thailand and Lao PDR is still missing. This PES review will help us to better understand and recognize the necessary preconditions for an effective PES scheme, and to use these conditions to develop a framework for assessing opportunities and evaluating the feasibility of implementing a PES scheme in the future.

1.1 Research Objective

The objective of this project is to review the PES implementation in Thailand and Lao PDR. Specifically, this study aimed

1. To review PES policy and implementation experiences in Thailand and Lao PDR;
2. To identify success and constraining factors in Thailand and Lao PDR based on literature review, and to document cases of PES implementation;
3. To report on a selection of 3–4 cases for detailed in-depth interviews of relevant stakeholders.

1.2 Research Methods

A review of existing PES documents, site visits, and interviews with relevant stakeholders were undertaken to collect the data and information.

1.3 Rationale for Choosing the Cases

The PES-like cases in this study were chosen based on three factors: (1) the cases matched many of the criteria in the definition of PES¹, but not all of them (Wunder 2007); (2) the cases had already been implemented, and (3) details of the cases were available.

2.0 BACKGROUND OF PES IN THAILAND

Unlike other countries in Southeast Asia, Thailand has no practical experience in implementing the PES concept although there are PES projects being designed. There have been studies of academic nature as well as pilot studies. The latter, such as the Khao Ang Rue Nai PES project selected for study in this report, had been supported by public agencies with the original intention of launching pilot projects; however, these never really progressed beyond the publication of the project report. The PES projects initiated by the United Nations Development Project (UNDP) are likely to result in concrete action but all of these are in the “design stage.” Having said that, at the national policy level, the 11th National Economic and Social Development Plan nevertheless acknowledges the value of PES as one possible natural resources management option. Furthermore, there are “institutional” interests from international organizations such as the World Wildlife Fund (WWF), the International Union for the Conservation of Nature (IUCN), and the ECOBEST on the use of economic instruments to create incentives for natural resources conservation and improvement of environmental quality.

2.1 Legal Framework Related to PES in Thailand

At present, no legal framework pertains directly to PES, although some laws directly apply to the management of specific types of land that are likely to be PES sites (Table 1). Almost all of the existing PES-like projects, as well as PES projects being designed, are located in public lands covered by different pieces of legislation and varying levels of protection, such as the 1961 National Park Act, the 1964 National Forest Reserve Act, the 1992 Wildlife Protection and Preservation Act, the 1954 Land Code, and the 1975 Treasury Act. To enforce these laws, ministerial orders, rules, and regulations have been issued, laying down the details of rights, responsibilities, and restrictions on access to various types of public land and penalties for violation. These laws were designed to protect natural resources; the stipulations in these laws therefore aim to prohibit access and to penalize noncompliance. Thus, if PES projects are to be implemented in areas subject to these restrictions, some amendments or exemptions will have to be made to allow service providers to carry out measures in these areas that entail “legal” entry restrictions. The various pieces of legislation related to these areas with potential as sources of ecosystems services, as well as laws that support the role of local communities in looking after natural resources are summarized in the table below.

¹ The formal definition of PES is identified by Wunder (2005, p. 3) as “(1) a voluntary transaction where (2) a well-defined environmental service (ES) or a land use likely to secure that service (3) is being ‘bought’ by a minimum one service buyer (4) from a minimum one service provider (5) if and only if the service provider secures service provision (conditionality)”.

Table 1. Laws related to the management of natural resources in Thailand

Law	Key Principles
National Park Act, 1961	The National Park Act provides for the establishment of both terrestrial and marine national parks for biodiversity conservation. Entry on a visitor basis is allowed but other forms of uses are prohibited, such as residence, hunting, clearing, gathering of vegetation, mining, and the introduction of livestock within park boundaries.
Wildlife Preservation and Protection Act, 1960 (amended in 1992)	The Act was enacted in 1960 with the principal objective of conserving and protecting wildlife, expanding wildlife breeding, and ensuring that wildlife protection and conservation measures are in accordance with international agreements. The Act also stipulates rules governing hunting and trading of wild animals and lists protected species. The Act was amended in 1992 to provide for the establishment of wildlife sanctuaries as primarily wildlife conservation areas under the jurisdiction of the Department of National Parks, Wildlife and Plant Conservation. As in the National Park Act, no forms of residence or extractive use are allowed within wildlife sanctuaries. Entry is restricted only for education and research purposes and is subject to notification of authorities.
National Forest Reserve Act, 1964 (amended in 1992)	<p>The objective of the Act is to protect the state of the forest and natural resources within the forest by designating areas as National Forest Reserves and permitting utilization only in areas outside of these reserves.</p> <p>The amendment of this Act in 1992 resulted in the classification of National Forest Reserves into three zones, i.e., Conservation Forest, Economic Forest, and Agricultural Use Forest. By definition, Conservation Forests cover protected areas and areas of ecological importance such as Class I watersheds. Access and utilization is permitted for Economic Forests, which are generally used for commercial forestry.</p>
Constitution of the Kingdom of Thailand, 2007	The Constitution defines the rights and entitlements of individuals over natural resources, and can be used as reference to justify roles of individuals or groups of individuals as service providers.

2.2 Policy Framework

While there are no specific laws on PES, the concept is endorsed within the current 11th National Economic and Social Development Plan (NESDP) covering the period 2012–2016. In this Plan, PES is recognized as an instrument for creating incentives for natural resources conservation.

At the policy level, two agencies are involved in implementation. The first is the National Economic and Social Development Board (NESDB), which is a macro-level planning body responsible for formulating the Five-Year Social and Economic Development Plans. The second is the Office of Natural Resources and Environmental Policy and Planning (ONEP) of the Ministry of Natural Resources and Environment (MONRE). ONEP serves as the secretariat of the National Environmental Board (NEB). As the agency responsible for coordination of issues related to natural resources management, it could play a greater role in advocating PES. Furthermore, the mandate of one of its three divisions—the Environmental Quality Management Sector (EQMS)—is to monitor, control, supervise and promote incentives for the prevention and remedy of environmental problems. Being the division responsible for the management of Thailand's Environmental Fund, EQMS could play a potentially critical role in financing mechanisms for PES in Thailand. In addition, ONEP is the agency that formulated the National Policy, Measures, and Plans on the Conservation and Sustainable Utilization of Biological Diversity (1998–2002), which is considered as the principal framework for biodiversity conservation and management in Thailand. PES will be of direct relevance to ONEP, particularly to the Regional Environmental Management Sector, which is responsible for the management of biological resources.

As mentioned earlier, although Thailand does not have ongoing PES projects, some are at the design stage of development. The significance of these projects is that they will be the first PES projects to be implemented in Thailand. Altogether, 16 projects can be said to be at the initial stages. These include four

pilot projects under the Community-Based Forestry and Catchment Management (CBFCM) program, which is funded by the UNDP-Global Environment Fund (UNDP-GEF), and five projects under the Catalysing Sustainability of Thailand's Protected Area System (CATSPA), which also receive financial and technical support from the UNDP-GEF. Three public agencies organized within MONRE will be closely involved in the design and implementation of these projects, namely, the Department of National Parks, Wildlife and Plant Conservation (DNP), Regional Environment Offices (REO), and the Department of Marine and Coastal Resources (DMCR).

Firstly, DNP's role in PES implementation is significant because the agency is responsible for managing environmental and biodiversity hotspots, most of which are located within terrestrial or marine parks. Moreover, the PES concept is consistent with DNP's key strategy to adopt participatory approaches to integrated watershed management, including developing the economic welfare of people in watersheds. Secondly, REOs are the main counterparts of the PES project currently being designed under the CBFCM project. This structure may be due the mandate of each REO, which is to coordinate the provincial governments and other relevant government agencies, including the Royal Department of Forestry and DNP, for the effective management of the environment. Nationwide, there are 16 REOs, four of which are now acting as CBFCM project counterparts in the four PES pilot project sites. Finally, DMCR will play a key role in PES projects that involve conservation of coastal and marine resources, such as the Tarutao site (CATSPA) and Phangan Island site (CBFCM).

3.0 PES STUDIES IN THAILAND

The four PES cases under study include three PES pilot projects launched under the broader CBFCM framework, and the PES study project supported by the Biodiversity Economy-Based Development Organization (BEDO) designed to generate experience and lessons in the case of ecosystem restoration and wildlife conservation.

The three CBFCM initiatives to launch PES concepts in Thailand include one in which the UNDP is a key player; another entitled *Sustainable Financing of Protected Area: Catalyzing Sustainability of Thailand's PA System*, started in January 2011; and a third one entitled *Sustainable Production and Marketing: Sustainable Management of Biodiversity in Thailand's Production Landscape*, which was originally planned to be launched in October 2011.

The CBFCM project supported by the UNDP has been designed to promote the use of economic incentives to local communities to conserve biodiversity and to reduce greenhouse gas (GHG) emissions from land uses. The goal, objective, and outcomes were intended to support the goals of the United Nations Partnership Framework with the Kingdom of Thailand (2007–2011) by promoting capacity building at the local level for environmental management, sustainable resource use, and cleaner energy. This project fulfills part of the UNDP's Country Programme Action Plan (2007–2011) for Thailand under the Energy and Environment Outcomes, which include

1. efficient community-based natural resources and environmental management in selected ecosystems;
2. increased capacity of national agencies to set policy priorities and remove barriers to pursuing sustainable management of biodiversity, renewable energy, and water resources; and
3. promoting community-based knowledge management by supporting the formation of community networks and promoting evidenced-based policy making at all levels.

The launch of this project was said to have been driven by country needs as MONRE identified it as a high-priority national project; it satisfied Thailand's GEF strategy of providing support to the implementation of the 10th NESDP (2007–2011). Further, this project is consistent with the 11th NESDP (2012–2016), which emphasizes the following:

1. the importance of sustainable management of natural resources and environment toward sustainability;
2. restoring and securing natural resource and environment bases;

3. enhancing adaptive capacity to achieve climate-resilient society; and
4. enhancing good governance in natural resource management.

The project is anchored on Target 9 of the Millennium Development Goal 7 (MDG7), which aims to integrate sustainable development into country policies and programs and to reverse the loss of environmental resources. The relationship between natural resource and environmental management and GHG can be synthesized from the National Strategy on Management of Climate Change and the four-year operational plan of MONRE. Under the CBFCM project, three sites were identified to pilot the PES concept. The information presented below is output from the first six months of what is planned to be a four-year project.

3.1 Koh Phangan, Suratthani Province

3.1.1 Baseline situation

Koh Phangan is an island district in Suratthani province, which is situated within the Gulf of Thailand, and covering an area of 168 km². The physical topography of the island consists of forested mountainous terrain in the middle of the island, which is the source of water for the entire island. Most of the area is designated as National Forest Reserve. Another two-thirds of the area around the island is flat lowland with 13% of the total area on this island being privately owned. The economy is primarily based on tourism, followed by fishing and agriculture (primarily coconut growing). Thirteen of the island's villages are based on fishing, and there is one agricultural cooperative. Every village has a savings bank, with funds coming from village fund projects derived from the Community Development Department.

Koh Phangan islands consist of 10 islands (Figure 1), namely, Phangan, Tae Nok, Tae Nai, Tao, Nang Yuan, Mah, Hin Bai, Kong Kliangan, Wao Yai, and Tung Goo. The only two islands where there are human settlements are Phangan and Tao.

The PES pilot project covers only Phangan Island, which is the second largest island in the Gulf of Thailand, after Samui Island. The island is located 70 km from the country's coast. The island's total area is 168 km² and most of the 63 km² of forests has been declared as part of Tharn Sadej-Koh Phangan National Park. Although there are problems of encroachment, most of the natural forests are still in relatively good condition, particularly the watersheds, which are the main water source of various short streams that provide freshwater supply. Because the physical terrain is mainly mountainous, only 13% of the land is occupied.

Koh Phangan has a diversity of ecosystems from forest to estuaries and coral reefs. All of the island's ecosystems are facing mounting pressures from the rapidly growing tourism and related land development activities (Figure 2), including the growing volume of solid waste and uncontrolled discharges of wastewater into the sea. Increasing tourism activities on and under the sea, coupled with the rising density of development and people along the beaches, are directly linked to declining seawater quality that is affecting marine ecosystems.

Phangan Island is divided into three subdistricts and is administered by three municipalities. The total registered population is 17,203, although the actual population would be much higher due to a large number of Burmese workers on both Phangan and Tao. Both islands are also major tourist destinations.

The economy of Phangan is driven solely by tourism. Although there is diversity of attractions of historical and cultural interest, the main attractions are beach and sea-based recreational activities. What the island is best known for is the Full Moon party held monthly on Haad Rin beach, bringing in more than 30,000 tourists every month.

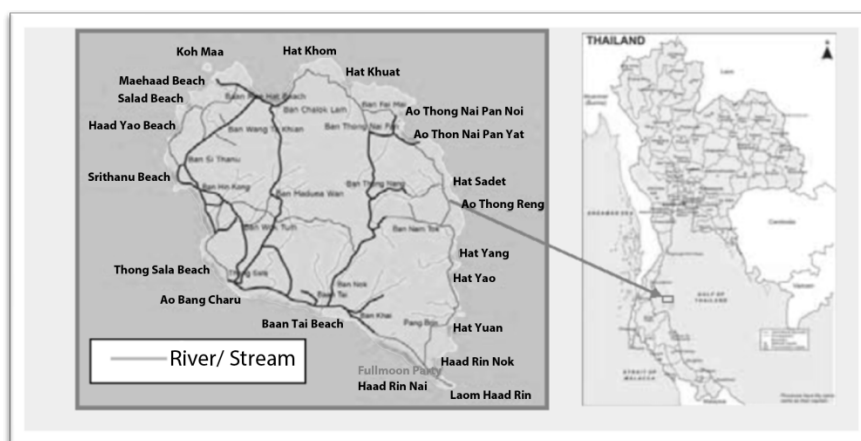


Figure 1. Koh Phangan Island

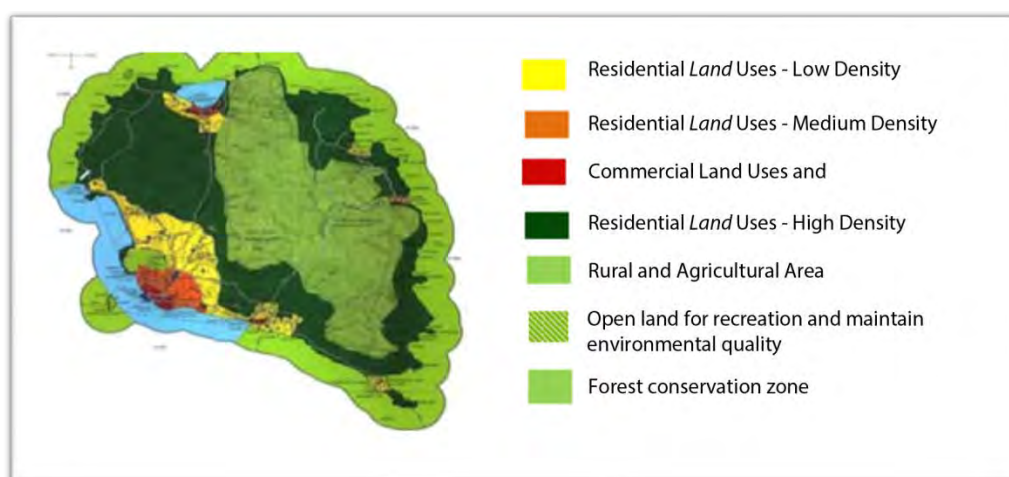


Figure 2. Land use in Phangan Island

3.1.2 The driver of this PES project

The decision to include Koh Phangan as one of the pilot sites is a combination of the physical characteristics of the island and institutional considerations, including the following:

1. The types of ecosystems that can be found, from watershed forests to coastal and marine ecosystems;
2. The decline in ecosystems services, likely resulting from both land-based pollution and sea-based activities, such as fishing and tourism;
3. The potential to introduce economic instruments that can generate funds to finance conservation activities and to ensure sustainable benefits from ecosystems services; and
4. Existence of some baseline data on the “status quo” situation, i.e., detailed survey of the state of coral reefs and inventory of marine biodiversity by Sakanand Platong.

3.1.3 The PES pilot project components

A skeletal structure of the PES Project for Phangan Island was drafted based on the above considerations, and through a series of field visits and consultations with local stakeholders in the island as well as meetings with REO counterparts and UNDP representative. For Phangan, the two environmental services identified were (1) water quality improvement (Table 2) and (2) natural resources and environmental quality management for sustainability (Table 3).

Table 2. PES mechanism for water quality improvement in Koh Phangan

Attribute	Description
Actions that will lead to provision of ES	<ol style="list-style-type: none"> 1. Waste separation (producing organic fertilizer from kitchen waste) 2. Producing organic fertilizer from seaweeds, seagrass
Indicator of improvement in environmental quality	<p>Changes in concentration of nitrogen and phosphorus in six major locations:</p> <ol style="list-style-type: none"> 1. Chaloklam Bay 2. Nai Wok Canal 3. Haad Rin beach 4. The old pier at Thong Sala 5. Bang Jaru Canal 6. Bang Nayok Canal
Service providers	<ol style="list-style-type: none"> 1. Phangan island organic farm group 2. <i>Haad Rin</i> Business Operators Association
Beneficiaries and potential buyers	Tourism-related private businesses
Intermediary	Municipality at the subdistrict Level
Existing data	Data on water quality from the 17 collecting stations
Data requirement for detailed design of PES project	<ol style="list-style-type: none"> 1. Data on water quality from various points in the canals/streams on the island itself 2. Verification of the effectiveness of the use of bio-fermentation to treat wastewater (which may just be a matter of testing concentration of selected parameters before and after treatment) 3. Cost estimation for the activities to be undertaken

Table 3. PES scheme for natural resources and environmental quality management for sustainability in Koh Phangan

Attribute	Description
Actions that will lead to provision of ES	<ol style="list-style-type: none"> 1. Stop trawlers violating the 5-kilometer no-take zone in coastal waters 2. Expanding area of mangrove replanting 3. Coral reef conservation and restoration, including additional investments in artificial reefs; locations will include both snorkeling and scuba diving sites (although exact locations are yet to be determined)
Location	<ol style="list-style-type: none"> 1. Fishery: Chaloklam Bay 2. Mangrove: Wok Tum Bay 3. Coral reefs restoration: to be determined by the DMCR based on physical and technical feasibility
Indicator of improvement in environmental quality	<ol style="list-style-type: none"> 1. Fishery: Statistics on species type and quantity caught 2. Mangrove: <ul style="list-style-type: none"> • Absolute increase in mangrove area • Changes in carbon stock • Changes in species diversity 3. Coral reefs restoration <ul style="list-style-type: none"> • Areas where coral reefs have been restored • Number of artificial reef sites created • Species diversity and density
Service providers	<ol style="list-style-type: none"> 1. Fishery: Small-scale fisherfolk who would be willing to accept the compensation/reward money 2. Mangrove: Local people who would be willing to accept the compensation/reward money <ul style="list-style-type: none"> • Planting and measure changes in carbon stock • Building a database of biodiversity resources

Table 3 continued

Attribute	Description
Service providers	3. Coral reefs restoration: <ul style="list-style-type: none"> • Scuba diver volunteers • Save Koh Tao • Phangan Coral Reefs Conservation Group
Beneficiaries and potential buyers	1. Fishery: Small-scale fisherfolk who would be willing to pay for the “coastal watch services” 2. Mangrove: Not yet clear due to the very small scale of replanting 3. Coral reef restoration: <ul style="list-style-type: none"> • Tourism-related businesses • Businesses offering snorkeling and scuba diving services • Those involved in transportation services such as boat-crossing operators and airlines (e.g., Bangkok Airways, Thai Airways) • Contribution from general public; this is because given the uniqueness of the natural resources of Koh Phangan, the general public may attach high value to its preservation, thus the nonuse value may constitute a large share of the total economic value of the island’s ecosystem • Potential buyers could also include companies who wish to invest in corporate social responsibility (CSR) activities. Many private business operators may understand that the initiatives they have already undertaken to “Go Green” or social CSR activities, such as building schools, etc., are already acts of contribution to the provision of “public good.” Under the Koh Phangan PES pilot project, the intention for businesses would be to channel investments into conservation activities, which would ultimately provide assurance for the sustainability of their businesses.
Intermediary	Mangrove: Municipality to be involved in recruitment of service providers (possibly through auction)
Existing data	Fishery <ul style="list-style-type: none"> • No baseline data exist on the number of incidences where trawlers violate the no-take zone, and no estimates have been made of the volume and value of catch associated with these violations • No baseline data on the volume and value of catch by the small-scale fisherfolk • Mangrove: No existing database either about the mangroves (types, species, etc.) or the biodiversity of resources that can be found. • Coral reefs: There are comprehensive data on the coral reefs of Phangan (types, composition, density, the state of bleaching); there is also information about diversity of marine life that can be found in the reefs
Data requirement for detailed design of PES project	1. Fishery: The database on use value from fisheries will have to be created since none exist on the following: <ul style="list-style-type: none"> • Types of fish, volume, and market price • Number of small-scale fisherfolk, fishing efforts, and related expenses • Number of trawlers that violate the no-take zone • Information on costs of implementing a “coastal watch” (man-days, boats, petrol, necessary equipment)

Table 3 continued

Attribute	Description
Data requirement for detailed design of PES project	<ol style="list-style-type: none"> 2. Mangrove <ul style="list-style-type: none"> • Suitable types and species • Information on various types of cost (i.e., planting, replanting, monitoring, and other operational expenses) • Information and technology dissemination on planting, monitoring growth, and measurement of carbon stock 3. Coral Reefs <ul style="list-style-type: none"> • Verification of suitable locations for replanting or installing artificial reef sites • Updating costs for replanting or installing artificial reef sites • Cost estimation for monitoring changes in the state coral reefs and marine life

3.1.4 Payment scheme, monitoring, and actors

A payment scheme does not exist yet, but there is a need to determine whether payment will be equated with “inputs” or “outputs.” Meanwhile, monitoring is acknowledged to be conditionality built into the contract to meet the “additionality” criteria.

The service providers, the potential buyers, and intermediaries have been identified for the specific ecosystem services. Due to the institutional arrangement with the UNDP, one key player for all of these pilot projects will be the Pollution Control Department (PCD). Other public agencies will be involved in providing technical backstopping where necessary. Although the details of the involvement of service providers or potential buyers have not been discussed, a Koh Phangan CBFCM Group has been established, and regular consultation meetings have been undertaken, although these meetings are not yet considered part of the “formal” process of the project.

3.1.5 Problems encountered

Being in its design stage, the organizational setup of the project remains a major obstacle; this is true for all four PES projects under the CBFCM framework, although problems in coordination are more acute in some than in others. People such as Pagiola² have observed that PES is not a panacea for all environmental ills; some problems related to the coastal and marine environments can be served better by other economic instruments (e.g., user charges, clarification of property rights).

3.2. Tha Chin River Basin

3.2.1 Baseline Situation

The Tha Chin River is a tributary of the Chao Phraya River (Figure 3). The River is 325 km in length and flows through four provinces (Chainat, Suphanburi, Nakorn Prathom, and Samut Sakorn). The two upstream provinces of Chainat and Suphanburi have some of the most fertile agricultural lands in the country, while the lower two provinces have some highly industrialized zones. About 67% of the Tha Chin River Basin is used for agriculture. The primary uses of the river include water supply, aquaculture, transportation, recreation, and as a sink for wastewater discharges.

² Pagiola is an environmental economist well known for his contribution and work on the concepts and application of PES (e.g., Pagiola and Platais 2002).

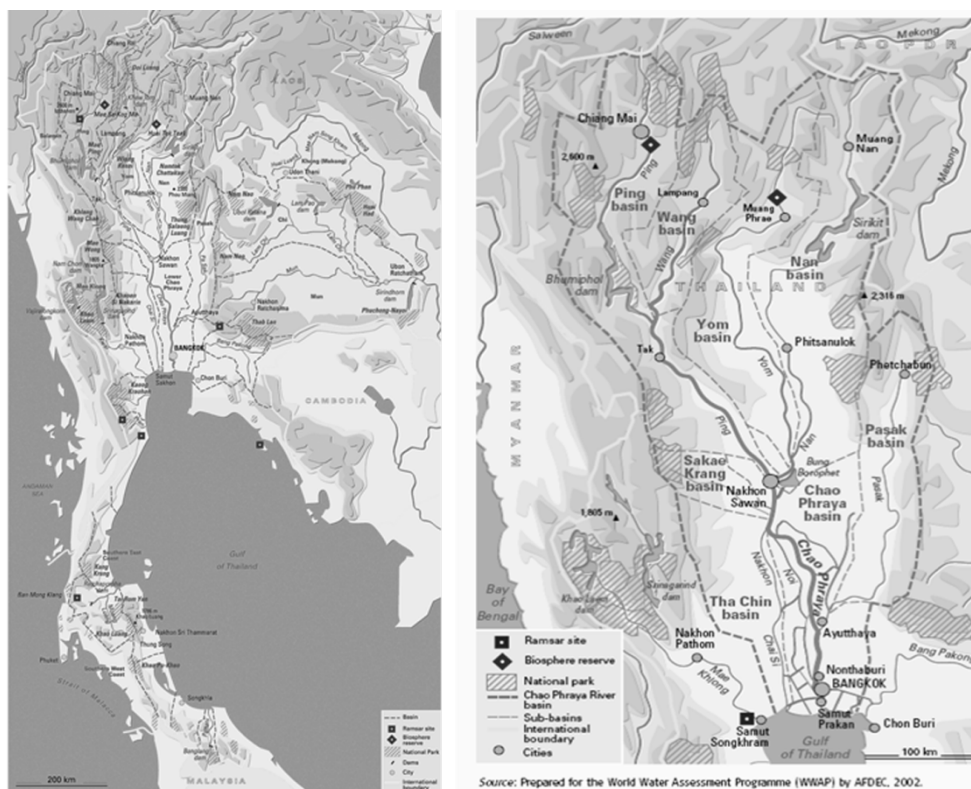


Figure 3. Tha Chin River Basin

3.2.2 The driver of this PES project

The initial pilot site focused on the lower Tha Chin catchment basin, which is a wetland area of national significance. The entire river basin is a major food-production area for the country. Although there are land-use zoning and planning laws to protect agricultural zones and green areas, there is tremendous pressure within the basin to convert the remaining green space—including natural areas of wetland, mangrove forests, open space, agricultural land, etc.—into agriculture (such as water spinach farming), construction of industrial estates, housing estates, condominiums, and tourism facilities (e.g., “floating markets” for the tourist market). River water quality has steadily deteriorated due to uncontrolled wastewater discharge from the industrial, agricultural, and commercial sectors.

Despite the large spatial extent of the catchment area, the nature of the project as a “pilot” means that in order to be clear about the path of the ES being disrupted by water quality deterioration, there is a need for a reduced physical scope for the PES site(s). This small scale also means the ability to limit the number of service providers and buyers to focus understanding about how best to deliver the service. The decision was therefore to limit the spatial scope to just Samut Sakhon province, where the Tha Chin River flows into the sea; the site focuses on the canals flanking Tha Chin, namely, Pittayalongkorn canal on the left and Sunak Hon canal on the right. The reason for this is that the water quality at the river outlet was observed to be worse compared to other parts of the river. Poor water quality not only restricts the use of water by local communities, but is also believed to have direct impacts on coastal fisheries. Another reason for the selection of this portion of Tha Chin is the presence of two or three networks of local people who are already taking some measures to improve the water quality and who could therefore easily become service providers. Members of these groups have not been given any compensation or reward; involvement has been entirely on a voluntary basis.

3.2.3 The PES Pilot Project Components

For Tha Chin, the two environmental services are (1) water quality improvement (Table 4) and (2) mangrove restoration (Table 5). Details of the project design at this stage are summarized in Table 4.

Table 4. PES mechanism for water quality improvement in Tha Chin River Basin

Attribute	Description
Actions that will lead to provision of ES	Improvement of water quality along the banks of the tributaries before the water is drained into the Tha Chin River by: <ul style="list-style-type: none"> Planting vegetation along the river bank to act as buffer from pollution by the fish-processing plants concentrated in this area Dissemination of low-cost technology for treating wastewater, such as biological fermentation
Indicator of improvement in environmental quality	<ol style="list-style-type: none"> Improvement of water quality in Bang Ya Praek and Kok Kham subdistricts Increase in number of fish cleaning and processing plants in Bang Ya Praek and Kok Kham subdistricts
Service providers	<ol style="list-style-type: none"> Local communities of the three subdistricts along the Pittayalongkorn canal, namely, Bang Ya Praek, Kok Kham and Phan Tai Norasingh Local conservation groups and local youth groups
Beneficiaries and potential buyers	The fish cleaning and processing plants in Bang Ya Praek and Kok Kham subdistricts
Intermediary	<ol style="list-style-type: none"> REO Office 5 Samut Sakhon Natural Resources and Environment Office Local governments, namely, Bang Ya Praek Tambon municipality and Kok Kham Tambon Administration Organization PR
Existing data	No existing data on water quality or pollution loads in the area
Data requirement for detailed design of PES project	<ol style="list-style-type: none"> Information about water quality in Pittayalongkorn canal Information about water quality in the tributary canals in Bang Ya Praek and Kok Kham subdistrict The number of fish-cleaning and -processing plants in Bang Ya Praek and Kok Kham subdistricts Cost effectiveness analysis of the different wastewater treatment methods, as well as their respective economies of scale

Table 5. PES mechanism for mangrove restoration

Attribute	Description
Actions that will lead to provision of ES	<ol style="list-style-type: none"> Restoration of mangroves along the coast Restoring the environment along the Sunak Hon canal to maintain and enhance its potential as an eco-tourism site through: <ul style="list-style-type: none"> Improving water quality by using bio-fermentation Improving solid waste management (i.e., reducing waste discharge into the canals) Dredging the canals
Indicator of improvement in environmental quality	<ol style="list-style-type: none"> Increase in mangrove areas Increase in carbon stock in the mangroves Increase in species diversity in the mangroves Improvement in water quality of the Sunak Hon canal
Service providers	<ol style="list-style-type: none"> Local communities in the subdistricts of Bang Kra Chao, Ban Bor, Bang Sai Wat, Ka Long, and Na Kok who live along the Sunak Hon canal Local environmental networks, such as Samut Sakon We Love Tha Chin River, Sunak Hon Conservation Network
Beneficiaries and potential buyers	Those mainly in the five subdistricts who benefit, directly and indirectly, from the improvement of mangrove ecosystem and Sunak Hon river ecosystem
Intermediary	<ol style="list-style-type: none"> Tourism-related businesses REO Office 5 Samut Sakhon Natural Resources and Environment Office Samut Sakhon Coastal and Marine Centre Local governments

Table 5 continued

Attribute	Description
Existing data	There is no existing data except for the perceptions of local stakeholders that the Sunak Hon canal, which is now a known ecotourism site, is subject to high risk because of the changing land use, particularly the increasing number of factories concentrated in this area, which may aggravate existing problems of water pollution.
Data requirement for detailed design of PES project	For the five subdistricts, the following information needs to be collected and systematically compiled: <ul style="list-style-type: none"> • Socioeconomic profile of local communities • Land use • Changes in area under mangrove, scientific data about the plant species that can be grown • Information about water quality in Sunak Hon canal • Cost-effectiveness analysis of the different techniques

3.2.4 Payment Scheme, monitoring, and actors

As with the Phangan pilot site, the payment scheme remains incomplete until stakeholders can agree on a number of key issues, such as (1) activities considered as ecosystem services and (2) confirmation of the service providers and buyers listed above. Monitoring is acknowledged to be a conditionality built into the contract to meet the “additionality” criteria.

In addition to REOs and PCD, which is the official counterpart of the UNDP-GEF project, other public agencies should include the Ministry of Industry, Department of Fisheries under the Ministry of Agriculture and Cooperatives, and DMCR under MONRE. Similar to the situation for Phangan, the Tha Chin pilot site has not reached the stage of discussing the details of involvement either of the service providers or the potential buyers. Nevertheless, like Phangan, a Tha Chin CBFCM Group has been established and “informal” regular consultation meetings have been conducted.

3.2.5 Problems encountered

The fact that Tha Chin River is a very long river passing through many provinces had, during the initial stages of the project, generated interest among stakeholders who want the pilot project to be located in their particular section of the river. Moreover, different parts of the river highlights different aspects of natural resources and environmental quality concerns, which require a combination of both command-and-control (e.g., imposing penalties for non-compliance) and economic (e.g., PES) instruments.

3.3 Lamsebai Watershed

3.3.1 Introduction

Community management of natural resources has existed throughout the history of village settlements in Thailand. Community forest management is the most active and widely practiced management system. Poffenberger, Soriaga, and Walpole (2005) cite four types of community forests:

1. Community protected forests, which have emerged as a response to illegal logging;
2. Monastery forests, which are restricted areas where plants and animals are protected;
3. Wetland forests to maintain breeding grounds for aquatic animals; and
4. Cultural forests, which have economic, historical or religious significance.

However, the community forests in Thailand are now subject to many factors, particularly to increasing demand for land. This problem is also the imminent threat to the community forest in the

Northeast region, where most people who live close to community forest are relatively poor farmers, whose household incomes are mainly generated from cash cropping. The current price of agricultural products, especially rubber and palm oil, are increasing, thereby creating additional pressure on community forests by increasing the demand for land to grow these crops.

Dong Yai community forest, which is located in Lamsebai watershed, is also affected by this pressure. This forest is the most successful case of community forest management in Lamsebai watershed. In the past fifteen years, Wang Or village members have performed collective action by allocating and managing communal land as community forest, referred to as the Dong Yai community forest. However, this community forest has seen a recent increase in pressure due to rising prices of natural rubber and palm oil. Some village members have indicated a desire to take back the land that their forefathers had donated for communal use, so that they can use the lands to plant rubber trees.

In response, the PES pilot project for this community was established to ensure that the collective benefits from timber, non-timber products, and ecosystem services generated from the Dong Yai community forest—which have been maintained due to the protection afforded by the Wang Or community members—are sufficient to offset the private gains from cash crop production.

3.3.2 Description of the study area

Lamsebai River originates in the watershed of the Phu Phan range, which is adjacent to the Yasothorn, Mukdahan, and Sakon Nakorn provinces. The river flows 233 km through the south, and then joins the Moon River at Ubon Ratchathani province. The river basin covers about 3,990 km², with volumes of runoff around 1,666 million m³ annually. Most of the land in the Lamsebai watershed (66%) is used for agricultural purposes, whereas about 11% is forest area. Lamsebai River can also be differentiated into three parts, as presented in Figure 4.

The upper part of the river is part of the Phu Phan national park and is mostly covered by deciduous dipterocarp forest. The middle part of the river is the important area for aquatic animals because seasonally flooded forests, swamps, and marshes can be used as spawning areas, both for local fish and fish that migrate from Moon River during the rainy season. The remaining land area in this part of the river is used for agricultural purposes. The lower part of the river, whose land use is mostly agriculture, has the highest population density relative to the two other parts. Small forest patches exist along the riverbank in this part, and some of them are well-managed by community members. This type of forest is also known as community forest, and generates income mostly from non-timber products as forms of goods. In addition, this forest provides ecosystem services from its regulating function, benefits downstream settlements through watershed conservation, enables carbon sequestration, and possesses aesthetic value.

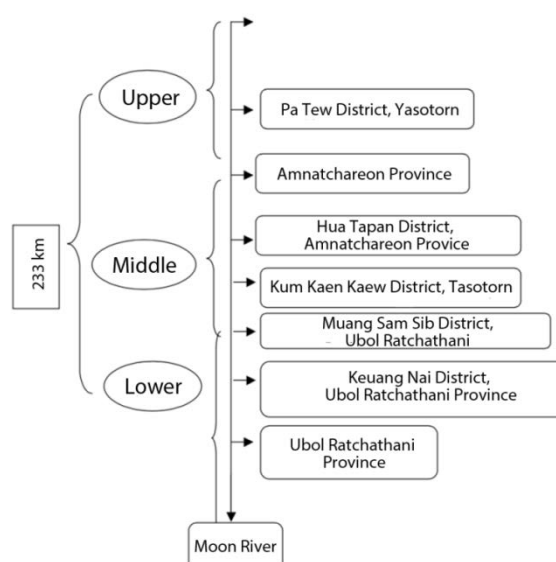


Figure 4. Parts of Lamsebai River

Meanwhile, Dong Yai community forest covers an area of about 3 km² and is located close to and along the Lamsebai riverbank, as shown in Figure 5. The floristic nature of this forest is sparse forest. Several non-timber products serve as food as well as income-generating goods for the villagers. In addition to the non-timber products, this forest may also generate benefits in the form of ecosystem services such as watershed services, green tourism, and biodiversity services. The issue here is to ensure that the collective effort of the village's members to protect the forest is not diminished, and that the 3-square-kilometer forest area and the benefits generated from this forest have remained intact; thus, the PES idea is employed in this area.

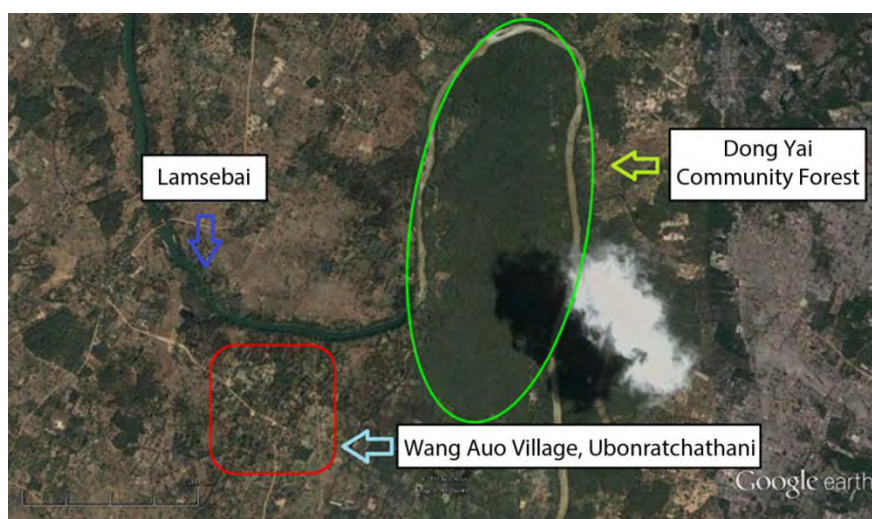


Figure 5. Map of Dong Yai community forest map

3.3.3 Protection and restoration activities

There are three possible activities that may help to protect Dong Yai community forest: (1) sustainable forest conservation and restoration, (2) improving environmental quality around the forest, and (3) developing and transferring knowledge of forest conservation.

1. **Sustainable forest conservation and restoration.** Because the Dong Yai community forest is bordered by Lamsebai River on the north, east, and west, it is almost impossible to increase the forest area. The main purpose is to prevent the reduction of the remaining 3-square-kilometer of forest area—primarily by preventing wildfire—either through creating firebreaks, installing an observation tower, or establishing forest patrolling units.
2. **Improving environmental quality around the forest.** Although increasing the forest area may not be possible, improving the environmental quality of Yai community forest is feasible by increasing forest density and improving the surrounding environment. Lamsebai River can be improved by increasing habitat areas for fish, which may also secure the food source for Wang Or villagers and others who live along Lamsebai River.
3. **Development and transfer of knowledge of community forest and wildlife conservation.** Because Dong Yai community forest is the only one along Lamsebai River that is clearly successful in integrating local people management and forest conservation, knowledge, and experience, this conservation method should be transferred to other communities. In addition, most of the Wang Or villagers who participate in forest conservation belong to the older generation; the younger generation rarely joins the conservation activities due to economic reasons. Therefore, there is a need to involve the younger generation in conservation efforts if the community forest is to continue in its current state. To ensure that the forest and the benefits of the forest still exist for the next generation, the benefits of forest conservation should be quantified; likewise, how these benefits could translate to positive externalities for the villagers should also be determined.

The details of these three activities to protect and restore Dong Yai community forest are presented in Table 6.

Table 6. Details of activities

Attribute	Description
Sustainable forest conservation and restoration	
Activity	<ol style="list-style-type: none"> 1. Maintaining firebreaks three times a year 2. Patrolling the forest by villagers four times a month 3. Building an observation tower
Indicator	<ol style="list-style-type: none"> 1. 3 km² of forest area still remains 2. Number of wildfire and forest area damaged by wildfire each year
Service provider	<ol style="list-style-type: none"> 1. Wang Or villagers 2. Government
Improving environmental quality around the forest	
Activity	<ol style="list-style-type: none"> 1. Planting native trees around the adjacent area between the forest and Lamsebai River 2. Developing and improving fish habitat along the Lamsebai River
Indicator	<ol style="list-style-type: none"> 1. Forest density 2. Number of plant species and wildlife species 3. Number of fish species and number of fish 4. Lamsebai water quality
Service Provider	<ol style="list-style-type: none"> 1. Wang Or villagers 2. Government
Development and transfer knowledge of community forest and wildlife conservation	
Activity	<ol style="list-style-type: none"> 1. Developing knowledge center 2. Collecting biodiversity data of the forest 3. Measure benefits in terms of goods and services from the forest
Indicator	<ol style="list-style-type: none"> 1. Number of Wang Or village participants, especially the younger generation 2. Number of participants from other villages and communities 3. Data of biodiversity and benefits from the forest
Service Provider	<ol style="list-style-type: none"> 1. Wang Or villagers 2. Government

3.3.4 Actors

Since the project is at the initial stage, the potential stakeholders and service buyers to be involved in this project have not been specified. The details of potential stakeholders are as follows:

1. **Service provider.** The service providers for this PES project are the Wang Or villagers who have formed collective action for restoring, protecting, and conserving the Dong Yai community forest since 15 years ago, which consists of 175 households. Most of the households are farmers with an average annual income of about THB 30,000. Most of the households engage in Dong Yai community forest conservation activities, which include creating and improving firebreaks once a year; patrolling the forest once a month; restoring the forest, especially those areas that were previously damaged by wildfire and human activities; and volunteering as tour guides to tourists.
2. **Service buyers.** The potential service buyers cannot be specified at this stage of the project implementation because the direct and indirect benefits generated by Dong Yai community forest—and how these would affect potential buyers—are still currently being studied. However, the potential buyers may be categorized into two groups:
 - *Potential buyers who may get direct (use) benefits from the existence of Dong Yai community forest.* This group of potential buyers include villagers in 18 villages located downstream of the forest, who may enjoy use benefits in the form of non-timber products used as food and income source for households. They may also have benefits from Dong Yai forest in the form of water supply and improving water quality.
 - *Potential buyers who do not live along Lamsebai River but may benefit from using Dong Yai forest for education and recreation.* There are about 20,000 visitors to this community forest each year. Some come for education purposes while others come for green recreation.

3.4 Human-Elephant Conflict Mitigation

3.4.1 Introduction

Elephants (*Elephas maximus*) in Thailand are a cultural heritage species and protected by the National Park Act of 1960 and the Wild Animal Reservation and Protection Act of 1961. Moreover, there are thought to be around 2,500–3,000 elephants left in Thailand (IUCN 2008). The total population of elephants in Thailand has been decreasing, except in some protected areas (e.g., Khao Ang Rue Nai [KARN] Wildlife Sanctuary) where local predators are extinct. Problems emerged when some of the sanctuaries have only limited food and water resources. These factors push elephants from the protected areas to venture into surrounding villages and croplands, resulting in human-elephant conflict (HEC). Due to budget constraints and limited human resources, the current mitigation activities undertaken by government agencies are not sufficient to reduce the problem. The pilot PES study for HEC mitigation in the KARN Wildlife Sanctuary by Nabangchang et al. (2011) was conducted to determine another approach as a parallel environmental market with other conservation measures (e.g., command-and-control or education approaches) to alleviate the problem.

3.4.2 Description of the study area

The KARN sanctuary is a lowland rainforest and is a part of the Rabom Si Yad National Forest Reserve located in Chachoengsao province. KARN covers an area of 1,079 km² across five provinces (Figure 6), namely Chachoengsao (582 km²), Chonburi (61 km²), Rayong (53 km²), Chanthaburi (287 km²), and Sakaew (47 km²) provinces in the East of Thailand. The total population in these five provinces was 3,718,213 in 2011, with Chonburi having the highest (1,338,656 in 2011). The population in the four other provinces were not so different in size in 2011 (Chachoengsao: 679,370; Rayong: 637,736; Chanthaburi: 516,855, and Sakaew: 545,596).

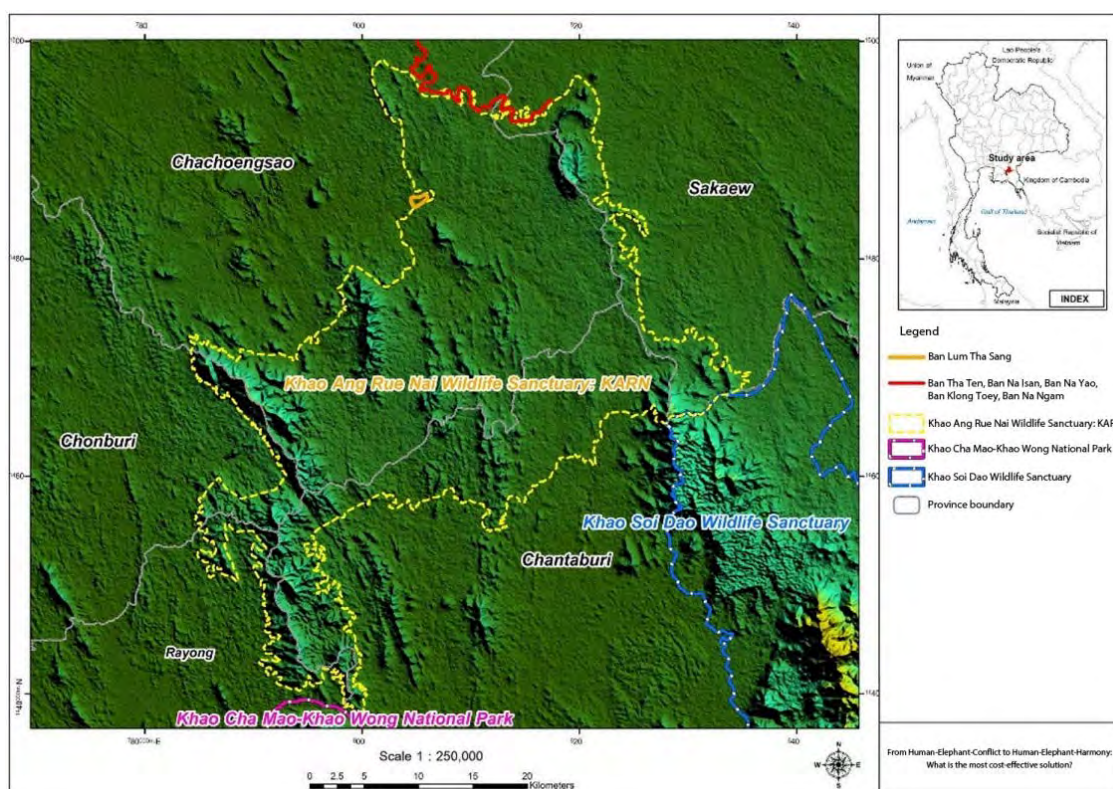


Figure 6. KARN wildlife sanctuary and the study areas

Source: Jarungrattanapong and Sajjanand (2011)

Note: The red and orange lines illustrate the study areas (Ban LumTha Sang, Ban Tha Ten, Ban Na Isan, Ban Na Yao, Ban KlongToey, and Ban Na Ngam).

KARN is one of seven protected areas that have more than 100 elephants; the estimated elephant population in KARN was approximately 217 and the crude density was 0.2 elephant per km² in 2007 (Wanghonsa, Boonkird, and Boonkird 2008a). The KARN sanctuary is the watershed of Bang Pakong River and Prasae River, which are major sources of surface water supply for residential areas, industries, and agricultural production in the downstream area. KARN's upper and middle area is mostly ridged plains, which is moderately steep, and is the source of many brooks and waterways that lead to major rivers, such as the Rabom Si Yad stream that runs to Bang Pakong River at Bangklao district in Chachoensao province, the Lum Phra Peung Yai and Phra Sateung canals that run from Khao Sibhachan mountain to join Prajeenburi River, the Tanod canal that runs to Tamai district in Chantaburi province, and the Prasae canal that runs through Botong district in Chonburi province and into the sea at Rayong province.

The floristic nature of this area is mostly semi-evergreen forest, suited for wildlife habitats, such as wild elephants, gaurs and bantengs, birds, insects, and reptiles. The area consists of Khao Chamao National Park, Khao Kichakood National Park, Khao Soidao Wildlife Sanctuary and KARN Wildlife Sanctuary. The government sectors in charge of both the inner and outer areas are mandated to preserve these fertile forests, to rehabilitate and reforest, to improve people's lives, and build collective consciousness in natural resources preservation. KARN has high biodiversity; there are 132 kinds of mammals, such as black giant squirrel, variable squirrel, crown gibbon, sambar, barking deer, wild elephant, gaur, and banteng, etc. A total of 107 kinds of reptiles are also found in the area, along with 22 kinds of amphibians, 105 kinds of insects, and 23 kinds of freshwater fish. KARN Wildlife Sanctuary is the nearest low and evergreen forest to Bangkok and is also the transition zone between the Central and Northeast region's ecological communities.

3.4.3 Changes in environmental quality

Impacts of HEC in KARN. Over the years, the ecosystems in KARN have been degraded and the natural predators to the elephants, such as freshwater crocodiles and tigers, have become extinct. In the absence of natural predators, the elephant population has been growing 9.83% per annum (Wanghonsa et al. 2006). It has been estimated that only 36.63% of the sanctuary is suitable as elephant habitat (Wonghonsa et al. 2008b). Therefore, because of the shortage of food and water, elephants often come out of the sanctuary, resulting in KARN being one of the areas where the level of HEC is high in Thailand. Jarungrattanapong and Sajjanand (2011) reported that the number of villages affected by crop raiding in KARN was 162 in total across five provinces, affecting 48,058 households. The total compensation for crop loss from crop raiding by elephants was approximately THB 1.5 million in 2009. However, this figure might be underestimated because the number of households who registered for compensation in the study areas was fewer than the actual affected households.

Current HEC mitigation measures. Some investments in habitat improvement activities have been implemented to restore the degraded ecosystems (e.g., increasing mineral licks, food supplies, water resources, and digging ditches), however, the scale of these measures have been insufficient due to the limited availability of financial resources. This is why the PES approach was considered as a promising solution. Presently, local villagers affected by crop raiding have applied traditional crop protection measures, which are designed to chase the elephants away. Examples of deterrents include the use of firecrackers and fire, placement of plastic-bag flags, elevated observation huts, and installment of electric fences (Figure 7). In addition, the government has provided some measures to alleviate the HEC impacts—for example, artificial water ponds, artificial mineral licks, pilot ditches, and road closures at nighttime from 9 pm to 5 am (Figure 8), and compensation for crop damages. However, the current measures are still inadequate compared to the growth rate of wild elephants.



Figure 7. Traditional mitigation measures by households

Source: Jarungrattanapong and Sajjanand (2011)



Figure 8. Mitigation measures by the government agencies

Source: Jarungrattanapong and Sajjanand (2011)

3.4.4 Proposed ecosystem restoration and HEC mitigation measures

The result of the consultations with wildlife experts and staff of the KARN wildlife sanctuary and of the cost-benefit analysis done by Jarungrattanapong and Sajjanand (2011) recommended a number of measures to mitigate HEC. The details of each activity are as follows:

1. **Restoring sources of water supply within KARN.** Presently, many of the natural water resources within KARN have dried up. This is one of the reasons why wild elephants have to come out of KARN. One of the proposals is therefore to increase the water supply available within the sanctuary to reduce the need for elephants to exit the sanctuary in search of water in surrounding farmlands. Cameras would be installed near these water resources to keep track of the number and timing of visiting elephants and other wildlife animals that come to drink.
2. **Creating artificial mineral licks in the sanctuary.** Making artificial mineral licks as a source of food for wildlife is another proposed measure. The mineral licks would be positioned at least 1 km from the borders of the sanctuary and would be 2 km apart. At full scale, there should be 260 artificial mineral licks, with the total boundary of KARN being 460 km.
3. **Managing grasslands.** Elephant's habitat should not be simply dense forests but should have some open grassland area. It is estimated that 70,000 rai (equivalent to 11,200 ha)³ or around 11% of the total area of KARN is covered with mainly bitter bushes and other fast-growing invasive species. Under the PES pilot project, the target is to clear at least 40,000 rai. Since there is no knowledge of how to get rid of bitter bushes permanently, during the short-term, the existing practice of burning and digging will have to be employed. In the medium- and long-term, however, and in anticipation that there will be sustainable support under the PES framework, basic research should be undertaken on ways to control biologically and permanently the spread of bitter bushes and invasive species within KARN.
4. **Planting food for elephants within the sanctuary.** To prevent elephants from exiting the sanctuary, physical barriers may not be enough. Wild elephants raid the local communities not only for water resources, but also for food, which are relatively more plentiful outside the sanctuary. Under the PES pilot project, it is proposed that strips of local varieties of food be planted near the line of artificial mineral licks. With water resources, mineral licks, and food supplies being more readily available, there should be less incentive for elephants to come out of the sanctuary; this would, in principle, be complimentary to putting up physical barriers as the last line of defense.
5. **Contraception of female elephants to control birth rate of elephants.** The maximum carrying capacity of the sanctuary for elephants is approximately 500. The carrying capacity of the sanctuary is estimated to be exceeded in the eighth year. Therefore, contraception of female elephants needs to be introduced during the eighth year of the project, at which point the elephant population would no longer be sustainable. However, contraception is effective for only 10 years; therefore, it needs to be re-introduced at these regular intervals.

³ 1 rai = 0.16 hectare

6. Fencing parts of the sanctuary. Fencing physical barriers to prevent elephants from coming out of the sanctuaries or protected areas is an approach that has been tried in many locations in Thailand. However, without measures to restore the sanctuary's ecosystem, putting up only physical barriers is unlikely to be effective. In KARN, various public agencies and local governments have invested in different forms of physical barriers. Local villagers themselves have put up electric fences to protect their crops. Although none of these measures have ultimately been effective, in the absence of other methods, investing in physical barriers will continued. Under the PES project, the physical fence is only one of the approaches. The perimeter of the sanctuary runs 460 km but fences will only be built along the parts of the sanctuary adjacent to the six villages that would be involved in the PES pilot project. In the long run, if PES activities can be sustained and if more financial resources become available, fences can be erected on the edge of KARN at the risky areas of crop raiding, or about 220 km of the 460-kilometer total boundary of KARN.

The locations of the proposed activities are shown in Figure 9. Meanwhile, the costs of launching the PES pilot project can be divided into two main categories, namely, (1) investment costs for the various proposed activities, and (2) costs for monitoring and maintenance after implementation (Table 7).

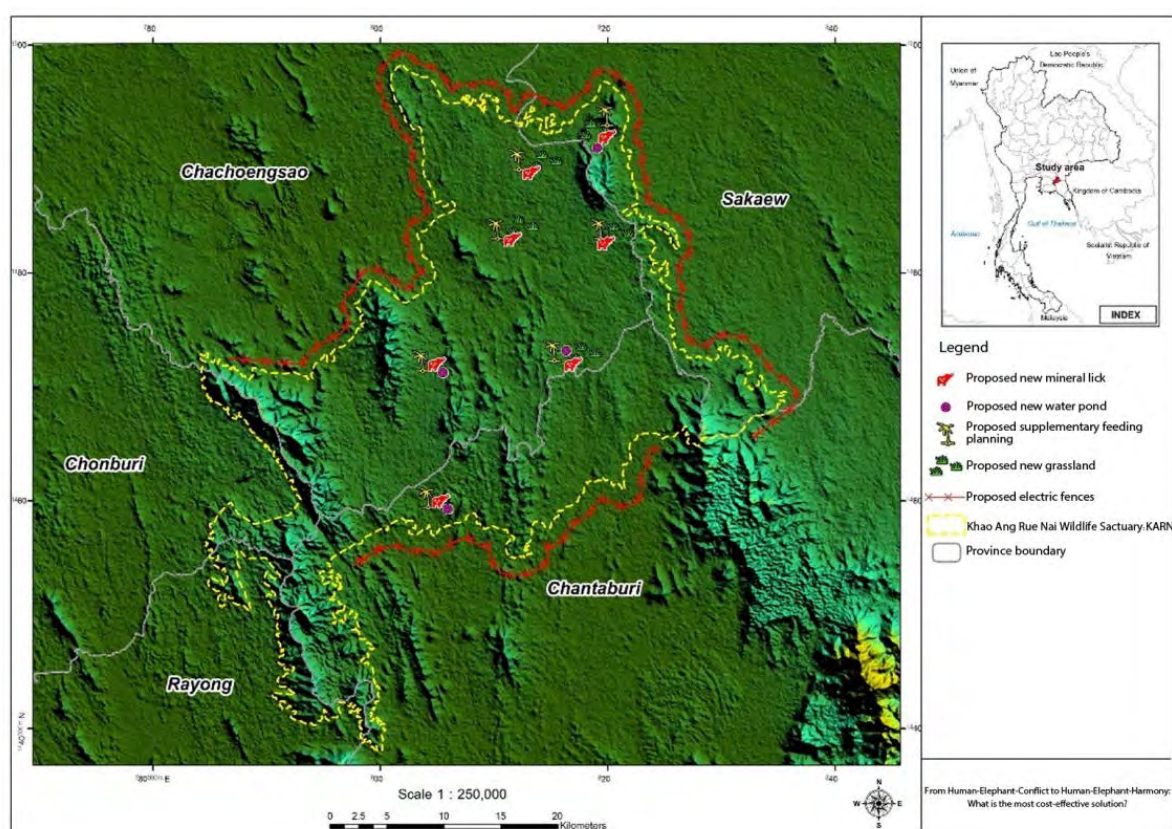


Figure 9. Locations of proposed activities under PES project

Source: Jarungrattanapong and Sajjanand (2012)

Table 7. Costs associated with ecosystem restoration and HEC mitigation measures

Activities (Unit)	Cost per Unit	Additional Activities Needed
Investment costs		
Pond (each)	THB 50,000 (USD 1,667)	5 ponds
Mineral lick (each)	THB 2,500 (USD 83)	260 mineral licks
Conversion of invasive alien plants to grassland (rai)	THB 1,060 (or USD 22,083/km ²)	30,000 rai or 48 km ²
Planting supplementary food for elephants (rai)	THB 2,500 (or USD 52,083/km ²)	500 rai or 0.8 km ²
Contraception or birth control (individual elephant)	THB 50,000 (USD 1,667)	50 female elephants for 10 years, every 10 years
Electric fencing (km)	THB 150,000 (USD 5,000)	220 km
Monitoring activities and maintenance costs after implementation		
Handheld GPS receiver (piece)	THB 20,000 (USD 667)	5 pieces
Monitoring cameras at ponds and mineral licks (unit)	THB 12,500 (USD 417)	10 cameras
Notebook computer (per unit)	THB 30,000 (USD 1,000)	2 units
Staff for monitoring activities (THB/staff/month)	THB 10,000 (USD 333)	2 members of staff
Maintenance cost for electric fencing (THB/year)	THB 15,000 (USD 500)	220 km

Source: Jarungrattanapong and Sajjanand (2012)

Note: USD 1 = THB 30

3.4.5 Actors

Service providers. The service providers for the PES pilot project will be villagers from Na Yao, Na Isan, Lum Tha Sang, Tha Ten, Na Ngam, and Klong Toey. The total number of households in these villages was 2,247 in 2011. Almost all of the households are affected by crop raiding. The total cost of HEC borne by households in 2011 included: (1) the cost of damage (THB 34,825 or USD 1,161 per household per year); (2) mitigation costs (THB 7,632 or USD 197 per household per year); and (3) opportunity costs for guarding crops at night (THB 7,632 or USD 254 per household per year). Therefore, the total cost of HEC to households is approximately THB 48,374 or USD 1,612, which accounts for approximately 26% of annual household incomes (Jarungrattanapong and Sajjanand 2011).

The results of the household survey show evidence to confirm that these villagers would be interested in becoming service providers. More than 90% of the 200 villagers interviewed said that they would be willing to volunteer their labor even if there was no payment. However, this result was not beyond the expectations because these villagers were already spending money to protect their crops and properties; therefore, any measures that would reduce crop raiding incidences would reduce their current expenses.

Establishing a Village KARN Ecosystem Restoration Fund has been proposed as a channel of payment to service providers. The Fund would act as a collective entity to receive payment as opposed to direct payments to individuals or groups of individuals. The optimal rate of payment could be analyzed based on the costs of damages and current prevention costs. Furthermore, identifying the payment rate should be a result of consultative processes, which will ensure transparency and help minimize or prevent any possible conflict among villagers.

Service buyers. The potential service buyers are shown in Table 8. Apart from the service providers who also directly benefit from the HEC mitigation measures that would be undertaken, the beneficiaries of the ecosystem service are those who rely on water supply from the Bangpakong River and Prasae River. The single major user is the EAST WATER company, a private business that has shown considerable interest in being a contributor during the meeting organized to discuss the objectives of the PES pilot project in KARN. However, a single buyer might not be sufficient to fund the initial investment and the corresponding maintenance costs. Voluntary habitat credit system as in New South Wales (BioBanking Scheme) could be created for habitat improvement activities in KARN. All activities described in the earlier section are

converted into “credits”. For example, putting up a 1-kilometer barrier or managing 1 rai of grassland may be counted as 1 credit, whereas digging surface ponds to provide drinking water source in KARN is counted as 10 credits. Buyers who may wish to buy 50 credits can select either to have 50 km of barriers or 5 ponds. The general public should be allowed to be involved as buyers by purchasing “conservation credits”. To provide the incentive, they should be able to use their contribution as tax-deductible expenditures. The same principle also applies where buyers can specify how they wish their credit to be spent (e.g., to plant elephant food crops, create water ponds, etc.).

Table 8. Potential service buyers and their expected benefits

Potential Service Buyers	Benefits They Will Obtain
The water user (EAST WATER Co.)	Direct benefits from ecosystem restoration that leads to an increase in water quality and improved reputation for biodiversity conservation
Private companies who want to buy the biodiversity offsets (e.g., BioBanking or Market-based habitat credit trading system such as those in USA or Australia)	Direct benefits from biodiversity offsets
The general public	Use and non-use values of biodiversity resources (e.g., option value, existence and bequest values)

Source: Nabangchang et al. (2011)

Intermediaries. The BEDO⁴ was proposed as the main intermediary for the PES scheme. The two main roles of intermediaries are identified as follows;

1. The BEDO can act as an intermediary to negotiate and make an agreement. Two contracts are executed—the first is between service providers and BEDO, whereas the second one is between BEDO and the service buyers. In the first contract, BEDO would act as the “buyer,” whereas in the second contract, BEDO would act as a representative of the service providers. The good that is being provided or traded are “credits” from restoring the ecosystem of KARN as described in the earlier section. The two-contract arrangement reduces transaction costs and simplifies the practice.
2. Second, BEDO acts as the clearing house, providing clearing and settlement services for financial and commodity transactions.

3.4.6 Monitoring and evaluation

Monitoring and evaluation will measure the outcome in terms of improved ecosystem services and reduction of the HEC impacts. For each of the activities proposed in the pilot PES project, the expected outputs and indicators of how they can be measured are shown in Table 9. To provide evidence of the improvement of the ecosystem—namely, the reduction in the incidence of crop raiding and reduced HEC costs—villagers would be involved in data collection. With cameras installed at the locations of the water resources, mineral licks, and food patches, and the use of GPS systems. The villagers as service providers would participate in collecting data on the number, timing, and type of wildlife that benefit from the water, food, and mineral licks provided. Villagers would undergo training so that they would be able to undertake these routine but very important tasks.

⁴ The Biodiversity Economy-Based Development Organization (BEDO) is a public organization founded through Royal Decree on (B.E. 2550) on July 17, 2007. The government allocated funds for BEDO to start its operations.

Table 9. Measures, output, indicators, conditions, monitoring, and evaluation

Measures	Expected Output	Indicators	Conditions	Monitoring and Evaluation (M&E)
Increasing grassland by taking out invasive species either manually or by using biological control	Increase population of wildlife in grassland areas after invasive species have been taken out	Number of dropping of various wild animals per square kilometer Number of HEC impacts without the PES project <ul style="list-style-type: none"> A baseline of HEC incidents: 180 incidents per year A baseline of HEC damage costs: THB 34,825 or USD 1,161 per household per year A baseline of HEC protection costs: THB 5,917 or USD 197 per household per year 	<ul style="list-style-type: none"> Need baseline data on types of wild animals and the population Cameras need to be installed to capture photographs 	M&E is required from the beginning and throughout the duration
Increasing food crops within the sanctuary	More abundant food supplies available within the sanctuary	<ul style="list-style-type: none"> As in 1 Additionalities: Reduction in incidences/impacts of elephants coming out of the sanctuary As above, cameras must be installed cameras to collect records of the wild animals that come to feed on the food supplies 	<ul style="list-style-type: none"> As in 1 Additionalities: Reduction in incidences/impacts of elephants coming out of the sanctuary As above, cameras must be installed cameras to collect records of the wild animals that come to feed on the food supplies 	As in 1
Making additional mineral licks within the sanctuary	Additional mineral licks will ensure more balanced diet for wildlife population within the sanctuary	<ul style="list-style-type: none"> As in 1 Additionalities: Reduction in incidences/impacts of elephants coming out of the sanctuary As above, cameras must be installed cameras to collect records of the wild animals that come to feed on the food supplies 	<ul style="list-style-type: none"> As in 1 Additionalities: Reduction in incidences/impacts of elephants coming out of the sanctuary As above, cameras must be installed cameras to collect records of the wild animals that come to feed on the food supplies 	As soon as the PES pilot project commences
Increasing water supplies within the sanctuary	More abundant water supplies available within the sanctuary	<ul style="list-style-type: none"> Additionalities: Reduction in incidences/impacts of elephants coming out of the sanctuary since elephants no longer have to leave the sanctuary in search for water 	<ul style="list-style-type: none"> Additionalities: Reduction in incidences/impacts of elephants coming out of the sanctuary since elephants no longer have to leave the sanctuary in search for water 	One year after the additional water resources have been dug and completed to ensure that elephants and other wildlife frequent the water resources; earlier than that may not be possible because the remaining scent of humans might scare off the wildlife

Source: Nabangchang et al. (2011)

4.0 PES-LIKE CASES IN THAILAND

This section reviews the experience of existing PES-like cases in Thailand. A PES-like program refers to programs that match most of the criteria included in the PES definition, but not all of them (Wunder 2007). The criterion that does not exist in most examples of PES-like cases in Thailand is the one on conditionality. In this study, the PES-like cases were selected based on the available information from documents and webpages; the cases considered include five cases of wildlife conservation and three cases of forest conservation (or carbon sequestration). The PES-like programs for wildlife conservation include the (1) Mai Khao Marine Turtle Conservation in Phuket province, (2) the Adopting Elephant project, (3) the Gaur conservation of the Khao Pang Ma conservation network, (4) the Hornbill Adoption Program in the Budo-Sungai Padi National Park, and (5) elephant conservation by Elephant Conservation Network in Kanchanaburi province. The PES-like schemes for forest conservation include the carbon sequestration project in Inpang community network in the northeastern provinces (Carbon2Markets Program 2009); the Khlongrua Tree Bank (KTREEB) in Chumporn province; the pilot PES initiatives by the BEDO (public organization); and reforestation projects by private companies and state enterprise sectors, including Toyota Motor Thailand Co., Ltd, The Coca-Cola Company (Thailand), The Petroleum Authority of Thailand (PTT) Public Company Ltd, and the Electricity Generating Authority of Thailand (EGAT). The details of each case are discussed in the succeeding subsections.

4.1 Mai Khao Marine Turtle Conservation in Phuket Province

Although sea turtles in Thailand have been protected by the Wild Animals Conservation and Protection Act 2535 B.E., the number of sea turtle nests in Thailand has dropped from approximately 2,500 in 1953 to 300 in 1990 (PMBC, undated). The main threats facing sea turtles are the use of illegal fishing devices, turtle egg smuggling, and coastal development, which threaten the sea turtles' nesting habitats.

Sea turtles, especially the giant leatherback, lay their eggs on Mai Khao beach during the breeding season (i.e., November to February). However, their numbers have become severely depleted over the last 20 years. The Phuket Marine Biological Center (PMBC) reports that approximately 30 sea turtles are stranded on the beach each year. Although approximately 58% of stranded turtles are alive, they are also injured, usually by being caught in fishing nets.

4.1.1 Actors

Intermediary. The JW Marriott Phuket Resort and Spa is located in the Mai Khao beach, which is adjacent to the Sirinath Marine National Park and protected sea turtle nesting area. In 2002, the hotel donated THB 2 million (USD 45,000) during its opening ceremony to launch "the Mai Khao Marine Turtle (MKMT) Foundation". The Foundation aims to raise funds and awareness for endangered giant leatherback turtles that nest in the area. The MKMT Foundation's efforts have included a beach and reef cleanup, a fundraising mini-marathon, and an educational project for Mai Khao students. The Foundation acts as an intermediary by raising the funds for use in conservation initiatives. The Foundation can raise approximately THB 100,000–150,000 (USD 3,333–5,000) annually. The fundraising activities held by the hotel annually are as follows:

1. **Donation from hotel guests.** The JW Marriott Phuket Resort and Spa also set-up a donation program for hotel guests. Another source of fund comes from some part of the accommodation costs. When hotel guests check in at the hotel, they are asked to voluntarily donate for turtle conservation by signing a donation form. The THB 40/room per night⁵ (USD 1.36) is deducted from the accommodation costs of all Thai and foreign hotel guests. The hotel guests can also donate at the front desk or buy the sea turtle souvenir in the hotel.

⁵ This price was set to be equivalent to USD 1

⁶ USD 1 is approximately equivalent to THB 30

2. **The Mai Khao Mini Marathon.** The Mai Khao Mini Marathon event is held to raise money from the general public; those who want to participate in the event pay the entry fee (THB 250 or USD 8.3 per person), which goes to conservation efforts. Another source of funds comes from the donation of the sponsors. The fund is used to support the Marine Animal Stranding Rescue Project of PMBC.
3. **Turtle Release.** The Mai Khao Marine Turtle Foundation holds the annual “The Turtle Release Event” to raise the fund for the hatchery program of Royal Thai Navy and the Foundation in order to support activities for saving injured turtles. The turtle release is a traditional Thai cultural event to reflect a desire for a good long life, especially on birthday or special events. About 50 baby green turtles nurtured by the Royal Thai Navy are released every year. For those who want to release a baby turtle, they need to donate THB 2,500 per turtle (USD 83 per turtle). The Turtle Release event is held at the Mai Khao beach. The event is being organized by Mai Khao Subdistrict Administration, Suan Ma Prao Community, and the Foundation.

Service providers. The PMBC and the Royal Thai Navy (Third Naval Area Command), as well as local Mai Khao villagers, act as service providers for this sea turtle conservation scheme. The Royal Thai Navy at Thaplamu village in Phangnga province launched the Sea Conservation Center for the hatchery program of sea turtles in 1995. The activities are operated in two sites: Similan Island for a hatchery program and Thaplamu village for a nurture program. Revenue sources of the program are (1) annual budget of the Royal Thai Navy (THB 12,000/month or USD 400/month); (2) donation from tourists and general people (THB 4,000/month or USD 133/month); and (3) financial support from MKMT Foundation.

PMBC is a marine research and rehabilitation center for injured marine animals. The Marine Animal Stranding Rescue Project of the PMBC was launched in 2005 (Manawattana 2006). The project’s average cost per stranding was THB 7,000 (USD 233) in 2006. This amount accounted for the medicines, surgery, food supplies, transportation, overtime payment, office equipment, and maintenance costs of equipment facilities. PMBC also provides for the Injured Turtle Rehabilitation program. Sea turtles are threatened by many human activities, including commercial fishing, while many more die from ingestion of or entrapment in plastic debris littering the ocean.

The local Mai Khao villagers have tried to protect these endangered species since 1987.⁷ They brought the eggs to their hatchery to protect the baby turtles from threats in nature and from human exploitation. The villagers, led by the headman (Mr. Manot Saythong) have tried to raise money for sea turtle conservation, and have their own conservation fund. The turtle release is held with financial support from the MKMT Foundation every year. The baby turtles from the nurture program of the PMBC are then released during the Songkarn festival (Thai Traditional New Year) in April. Local villagers also patrol the beach at night during the breeding season, protecting the turtles while nesting, and keeping records of the number of eggs laid. Villagers are paid THB 50 (USD 1.6) for each egg they save. The reason that local villagers have tried to conserve sea turtles is because they believe that the existence of sea turtles indicate an abundance of natural resources. Therefore, as long as sea turtles exist, other marine species would survive. Hence, fishery can be a source of their income or livelihood.

Service buyer. There are several sources of revenues for the scheme. Service buyers under this scheme are all stakeholders who donate to the MKMT Foundation for sea turtle conservation (tourists, general public, and the private sector, especially the JW Marriott Phuket Resort and Spa). However, these service buyers do not pay for the direct benefits; for example, tourists and general people may pay for existence of sea turtles (existence value) or pay for the future generation to make use of these biodiversity services (bequest values). The private sector also may pay to earn CSR publicity.

⁷ Based on an interview with Mr. Manot Saithong, head man of the Mai Khao village, on November 17, 2013

4.1.2 Monitoring and evaluation

There is no baseline data on turtle population; therefore, the additionalities of the scheme cannot be clearly defined. Although the nurture program under the Royal Thai Navy (Third Naval Area Command) records the survival rate of turtles after hatching (Table 10), there are no records of their survival rates upon release to the sea. In addition, there is no systematic recording of how many baby turtles can survive until they are released to the sea. In general, newborn turtles are nurtured in the Center for six months before releasing them to the sea. According to an interview of the Center staff, the survival rate of baby turtles before releasing them to the sea is approximately 90%. Donations from the MKMT Foundation for the nurture program do not rely on the survival rate of turtles but depend on how much the Foundation can raise for the fund in each year. Therefore, it can be said that there is no systematic monitoring and evaluation process in the payment scheme.

Table 10. The survival rate of turtles after hatching in the Sea Turtle Conservation Center in Phangnga province

Year	No. of Eggs Laid	No. of Newborn Turtles
2011	11,617	7,270
2012	6,564	4,242

Source: The Sea Turtle Conservation Center

4.2 Adopting Elephant Program

The Asian Elephant Foundation of Thailand has operated the Adopting Elephant program since the Foundation was established in 1991. The Adopting Elephant program is one of several activities of the Foundation, whose objective is to raise funds for taking care of sick elephants in Thailand under the Elephant Health Care Program. The program has provided some activities for elephant health care, which include vaccine provision every six months, supplementary food (e.g., vitamins, minerals), blood test, and wound treatment.

4.2.1 Actors

Intermediary and Service provider. The Asian Elephant Foundation of Thailand acts as an intermediary and service provider of the scheme. In this scheme, the staff of the Foundation acts as service providers who take care of elephants. In 2013, 100 elephants were adopted under this program; therefore, the Foundation raises approximately THB 500,000 (or USD 16,667) annually under this program. For example, the elephant conservation club of the Kasetsart University Laboratory School donated THB 45,000 (or USD 1,500) to adopt nine elephants in 2010.

Service buyer. Either Thai people or foreigners can be elephant adoptive parents who act as service buyers in the program. The cost for adopting an elephant is THB 5,000/elephant per year (or USD 167/elephant per year), which was calculated from costs of vaccine provision, supplementary foods, blood test, and wound treatment. The adoptive parent will receive the adopting elephant certificate, biography, and health care report of the adopted elephant.

4.2.2 Monitoring and evaluation

The Foundation reported that 60–70 elephants were rescued in 1994. In addition, 100 elephants have been adopted under the Adopting Elephant program. Therefore, the number of adopted elephants is the proxy for additionalities of the scheme, compared to the baseline of the scheme that presupposes no elephant being adopted.

4.3 Gaur Conservation of the Khao Pang Ma Conservation Network

Gaurs in Thailand are protected by the Wild Animal Reservation and Protection Act of 1992. Around 1,000–2,000 gaurs were estimated to be left in Thailand in 1999.⁸ The Khao Pang Ma is part of the Phu Luang Wildlife Sanctuary in Nakhon Ratchasima province. The Reforestation Campaign in Commemoration of the Royal Golden Jubilee Project was launched in 1999 through collaboration between the Wildlife Fund Thailand (WFT) under the Royal Patronage of H.M. the Queen and the Ministry of Agriculture and Cooperatives. The gaur conservation of the Khao Pang Ma conservation (KPMC) network was initiated by the local people and nongovernmental organizations (NGOs) under the Reforestation Campaign in Khao Pang Ma area. The KPMC network has also been working with the WFT since 1994. Over the past 11 years of conservation work by the KPMC network and WFT, the number of gaur population in the Khao Pang Ma area has been increasing from 4–5 gaurs in 1995 to 96 gaurs in 2006 (Figure 10). During the site visit, the park staff informed the research team that the population of gaurs had increased to almost 200 in 2013.

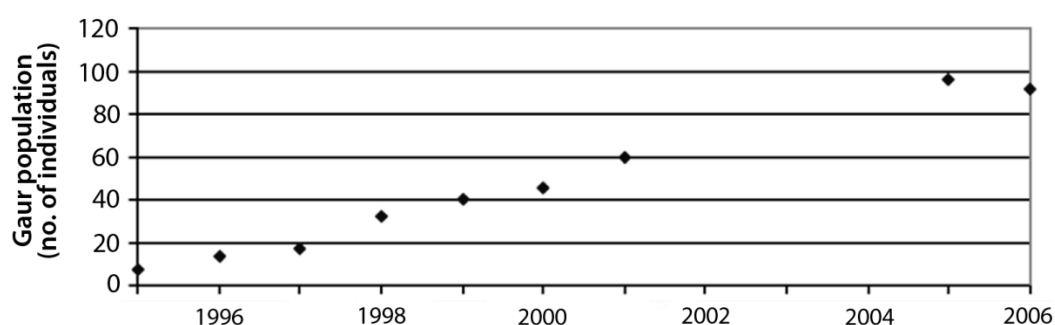


Figure 10. Number of the gaur population in Khao Pang Ma area during 1995– 2006

Source: Khao Pang Ma Conservation Network (n.d.)

4.3.1 Actors

Intermediary and service provider. Since the Reforestation Campaign in Commemoration of the Royal Golden Jubilee Project was finished in 2007, the network needed to find another financial source to support the program. Ecotourism was chosen to be a new source of fund to support the program. The Master plan for ecotourism was developed to prepare for tourism activities in the future. The Khao Pang Ma Conservation Fund was also established in 2007 to raise money to support conservation activities, which was operated by the KPMC network as its intermediary and service provider. The activities for gaur conservation are comprised of reforestation, building check dam, forest fire prevention measures, restoring sources of water supply/mineral licks and managing grassland as sources of food for wildlife.

In addition to the KPMC network, there are other small groups of people who act as service providers. This group contains a group of employees from the Bangkok Continental Hotel, TATA Motor (Thailand) limited company, Nakhon Ratchasima Rajabhat University, and conservation rangers. This group of service providers focuses on mitigating conflict between gaurs and humans because areas surrounding the Khao Pang Ma conservation are agricultural lands, which are mostly planted to corn and cassava. During the dry season, food and water shortage inside the conservation area causes gaurs to move outside to find food and water (Figure 11). The long-term plan to mitigate this conflict is to increase food and water supply inside the conservation. However, increasing food and water supply inside the park takes some time before having any effects on mitigating human and gaur conflict. The officers of the conservation try to develop and build electrical fences to prevent, or at least minimize the number of, gaurs moving out from the conservation. However, due to the budgetary constraints of DNP, these groups of people help by donating money, material for building the fence, and labor. Starting in 2012, the fund donated from these private companies has reached around THB 100,000 per year. This money has been used mainly for building the fence. Another source of fund comes from revenue from selling gaur pictures, all taken by conservation rangers, to tourists. This activity generates about THB 15,000 of revenue each year, and is mostly used for maintaining and fixing the electrical fence.

⁸ <http://dinsorsee.files.wordpress.com> (29 October, 2013).



Figure 11. Gaur moving back to the conservation area after searching for food outside the park

Service buyer. Currently, the source of fund comes from donations from the general public (either Thai people or foreigners) and from the CSR budget of private companies. The Krating Daeng (or Red Bull) company has been the main donor to the conservation network since 2008, which has provided THB 1 million to the network each year. This money is mainly used in three ways:

1. For youth camp for forest and gaur conservation, which focuses on students living around the Khao Pang Ma conservation;
2. For building check dams, establishing forest fire prevention measures, and managing grassland as sources of food for wildlife;
3. For supporting small-scale data collection, which is combined with the data from university research projects, such as counting the gaur population and recording gaur behavior.

As indicated by this information, the general public and private companies are the service buyers for the scheme. Another source of fund comes from research grants of universities—for example, the research grants from Mahidol University to study gaur and Asian black bear's genes and biodiversity of ecosystems in 2011, and the study of managing grassland as sources of food for wildlife in 2013.

4.3.2 Monitoring and evaluation

The baseline indicator of the scheme is the number of gaur in the population within Khao Pang Ma area, which was composed of only five individuals in 1995. The increase in number of the gaur population is the proxy for additionalities being measured in the PES scheme. The KPMC network reported that the gaur population has been increasing from five gaur in 1995 to 96 gaur in 2006, and to almost 200 in 2013. In addition, the direct counting method by the network staff is used to monitor the gaur population. Not only are the data on gaur population recorded, but the structure of the gaur population is also collected. This information helps wildlife researchers to understand any changes in gaur numbers.

4.4 Hornbill Adoption Program in the Budo-Sungai Padi National Park

The Hornbill Research Foundation was established in 1993 by the Faculty of Science, Mahidol University (The Hornbill Research Foundation 2013b). In the beginning, the Hornbill project focused only on research on the biological and ecological aspects of hornbills. However, since 1994 it has expanded to include the adoption program in the Budo-Sungai Padi National Park, Southern Thailand.

4.4.1 Actors

Intermediary. The Hornbill adoption program has been set up and operated by the Faculty of Science, Mahidol University, who acts as an intermediary of the scheme to conserve the endangered hornbill species. The objectives of the program are

1. To subsidize local villagers in their determination and efforts to conserve hornbills.
2. To study the biological and ecological aspects of hornbills
3. To encourage villagers to collect biological and ecological data of hornbills for research purposes, and to monitor and secure long-term hornbill populations in the area

Service provider. Prior to the start of the Hornbill adoption program, local villagers, who earned only THB 1,500–3,000 (USD 50–100) per month, tried to earn additional income by selling hornbill chicks stolen from their nests. After introducing the adoption project, the local villagers then cooperated with the Hornbill Research Foundation in pursuing the foundation's goals. The villagers, who act as service providers, get paid if they help to look after the hornbills and collect the research data. The payment rate is THB 160 (USD 5) per day. In 2013, 20 villagers participated in the project by taking care of 167 hornbill nests. The six species of hornbills included in the adoption program are the Great Hornbill (*Buceros biornis*), Wreathed Hornbill (*Aceros undulates*), Rhinoceros Hornbill (*Buceros rhinoceros*), Helmeted Hornbill (*Buceros vigil*), White-crowned Hornbill (*Berenicornis comatus*), and Bushy-crested a (*Anorrhinus galeritus*). The last four species are identified as endangered species.

Service buyer. The general public can act as service buyers by adopting hornbills at the rate of USD 30–123 per hornbill family per year (Table 11). The one who adopts the hornbill would be provided information of the hornbill; for example, the condition of adopted hornbills, location of the nest, and the species and characteristics of the tree in which the nest is located, accompanied by photographs of the actual tree. The hornbill report would be sent at the end of the year after all the information has been processed. Hornbill adopters would also be allowed to visit the hornbills that they adopt, at their own costs and with the research team. In this scheme, a service buyer pays for the use and non-use value since they may pay for the existence of hornbill (existence value) or pay for a visit of a hornbill in the future (option value).

Table 11. Rates of adoption program for each hornbill species

Species	Rate of Adopting Program (THB/family/year)
White-crowned Hornbill	3,700 (USD 123)
Helmeted Hornbill	3,700 (USD 123)
Rhinoceros Hornbill	3,200 (USD 107)
Bushy-crested Hornbill	3,200 (USD 107)
Great Hornbill	2,700 (USD 90)
Wreathed Hornbill	2,700 (USD 90)

Source: Interview with Hornbill Research Foundation staff (1 November, 2013)

Note: USD 1 = THB 30

4.4.2 Monitoring and evaluation

The baseline indicator of the scheme is the number of hornbill population in the project area. The number of adopted hornbills is the proxy for additionalities of the scheme, compared to the baseline of the scheme in which no hornbill is adopted. In 2013, the Foundation reported that 167 nests of hornbills have been adopted.

4.5 Elephant Conservation Network in Kanchanaburi Province

Thailand has about 3,500 wild elephants that live in 10 conservation complexes and some isolated national parks. HEC had not been an issue until 20 years ago. Due to the increase in human demand for land, especially for agricultural purposes, the number of serious HEC in some protected areas of Thailand has been increasing, especially where human and elephants live alongside each other.

Salakpra area, which consists of the Salakpra Wildlife Sanctuary, Chalerm Rattanolsoin National Park, and the Srisawat forest reserve, covers about 1,200 km² (Figure 12). This area forms the southeast arm of the Western Forest Conservation Complex (WEFCOM), with two vulnerable north and south corridors that prevent genetic and social isolation of the elephants who live in this area from others who live in other areas in WEFCOM. Salakpra now supports about 200 wild elephants, but the environment in this area is under pressure from the increasing number of people living nearby and using the same forest resources that support the wild elephants, resulting in HEC around this area.



Figure 12. Conservation area

Source: Elephant Conservation Network Thailand (2012)

4.5.1 Actors

Intermediary. The Elephant Conservation Network (ECN), established in 1999, is the non-profit organization that has developed and established programs and activities to mitigate HEC around the Salakpra area and other conservation areas in the southern WEFCOM. This organization has also developed programs that may turn HEC into human-elephant co-existence (HECx). Starting with a grant support from the British Government's Darwin Initiative, the organization has developed the programs that can be separated into two dimensions: conservation and protection program and HECx program.

The conservation and protection program focuses on internal protected areas; it consists of three main projects: the smart patrol project, conservation connectivity project, and ecosystem research project. These projects aim to protect wild elephants, increase food supply, and link the protected areas to prevent genetic and social isolation of wild elephants. Meanwhile, the HECx program has three main projects: HEC monitoring/training project, HEC mitigation project, and HECx awareness and facilitation project.

The organization acts as intermediary by developing the project as described and finding grant and non-financial support as well as donation from many conservation organizations and the general public. The main organizations to date that support the ECN are as follows:

- British Government's Darwin Initiative
- Zoological Society of London
- Elephant Family
- U.S. Fish and Wildlife Service
- Cecil King Memorial Foundation
- BBC Wildlife Fund
- Bring the Elephant Home
- Taiwan Forestry Bureau
- Whitley Fund for Nature
- Golden Triangle Asian Elephant Foundation

Service providers. The ECN, DNP, and local villagers around the protected areas are joined together as service providers. ECN leads the development of projects that could fulfill the objectives of elephant conservation and mitigate HEC. Thailand's DNP provide mostly non-financial support to the projects developed by the organization. The support includes, for example, the deployment of rangers to patrol the protected area under the smart patrol system project, which aims to apply monitoring information system technology to integrate data collected on patrol that can be used to inform and improve protected area management. In addition, the rangers and local villagers also join together to survey the reserve forest north of Salakpra that connects to the core of WEFCOM and to map signs of elephant, other wildlife, and human activities. This set of data is used to provide supporting information to recommend upgrading this area to a secure corridor that would allow elephants and other wildlife to move freely between Salakpra and Huai Kha Khaeng.

Service buyer. There are two main sources of income for the program. The first, and largest, buyer is the group of non-profit organizations listed above that provided both financial and non-financial support to the program. The financial support comes in the form of long-term grants, one-year grants, and donations. In case of non-financial support, it comes in the form of institutional support, strategic development, practical guidance, and equipment. The second buyer is via private donation, which is not a very large amount each year.

4.5.2 Monitoring and evaluation

ECN employs two main monitoring systems. The first system is to monitor crop-raiding. Started in 2006, the organization has started working with farmers in communities affected by HEC. The organization trained farmers to record, map, and measure all incidents of crop-raiding on prepared data sheets. Figure 13 shows the incidents of crop-raiding recorded between 2006 and 2011. Another monitoring system is being done inside the protected area. The organization developed 22 seasonal ponds into large and permanent ponds, which could provide water sources to wild elephants. However, due to the insufficiency of budget to install camera-traps to all ponds, only five ponds currently have camera-traps that can check whether these ponds are being used by wild elephants.

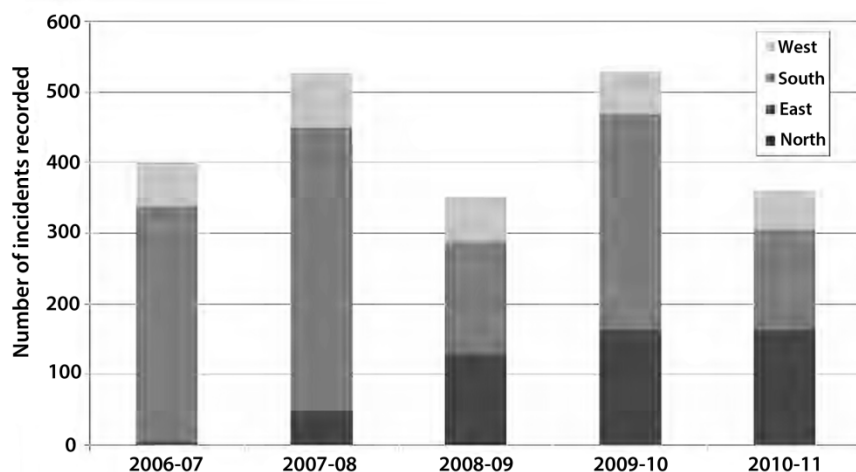


Figure 13. Incidents of crop-raiding between 2006 and 2011

Source: Elephant Conservation Network (2012)

4.6 Carbon Sequestration Project in Inpang Community Network

The carbon sequestration project in Inpang Community Network was a project under the Carbon2Markets Small-Holder Agroforestry Project in Thailand. Carbon2Markets is a project of the Michigan State University that focuses on combining value chains from carbon credits in the carbon financial markets and agro-forestry products for smallholders in developing countries (Carbons2Market 2009). The project was developed through collaboration with Inpang Community Network, scientists at the Department of Forestry, Michigan State University (USA), Mahasarakham University (Thailand), and staff of National Research Council of Thailand. Inpang Community Network is a self-organized farmer cooperative established in 1987 with members composed of more than 4,000 farmers from Northeast Thailand. The network promotes the tenets of the “sufficiency economy” by encouraging the network members to transform their farm landscapes from mono-crop farming to multi-species agroforestry system. The farmlands combined annual agricultural/perennial crops and teak trees. In addition, the Inpang Community Network also provides training and services in sustainable farm management to farm communities throughout Thailand.

4.6.1 Actors

Intermediary. The researchers from Mahasarakham University and National Research Council of Thailand as well as the staff of the Carbon2Market and Michigan State University acted as intermediaries for the scheme. Inpang Community Network works with the researchers in Mahasarakham University and National Research Council of Thailand to coordinate this project with Inpang farmer members in three provinces (Kalasin, Nakhon Phanom, and Sakon Nakhon) as well as with farmers in three other provinces in Thailand (Nakhon Sawan, Nongbua Lumphu, and Uttaradit). The staff members of these three organizations work on farms in order to develop the project, to indicate site boundaries and permanent sample plots, and to undertake tree measurements. Carbon2Market and Michigan State University provided technical backstopping and support for the project through the deployment of an on-line project management application to ensure transparency of the carbon accounting and to provide geospatial tools for efficiently managing and monitoring sequestered carbon in these agroforestry systems.

Service provider. The 94 smallholder farmers of Inpang Community Network were selected in the project as service providers because they had already begun incorporating teak trees in their farms in early 1992. The teak farmlands were small, averaging 2.9 ha. Most of the forest products generated by these teak farmlands were eventually used on-farm or in local markets. These teak farmlands were not certified since they were not scaled largely enough for commercial forest operations. The project initiated a carbon market to verify sustainable management of the teak farmlands to assure permanent carbon storage for the duration of the project or beyond. These farmers benefit from two sources of revenues—one from the sale of carbon and another from the sale of teak. The project lands were in annual agricultural production or unproductive and degraded lands. No agricultural or forestry activities were replaced as a result of the project; therefore, leakage is limited.

Service buyer. The Chicago Climate Exchange (CCX) acted as a service buyer in the scheme. CCX paid USD 37,000 in total to the 40 Inpang members in three provinces for two years (2010–2011). The project covered 85 plots of land or 625 rai (1 km²), which sequester an estimated 75,000 tCO₂ over two years. The price of carbon credit was USD 4.25 per tCO₂ equivalent.

4.6.2 Monitoring and evaluation

The baseline inventories were conducted in 2009. Additionalities of the scheme were measured by increased carbon sequestration of registered trees. Monitoring reports were submitted annually based on annual updates of the field level inventories and available satellite data. Farmers collect and report the field level inventory updates with guidance from the National Research Council of Thailand and Mahasarakham University. Carbon2Market and Michigan State University coordinate the acquisition of high-resolution satellite imagery and its use in the on-line management application. Field verification will occur every four years with the third party verification of the reported forest inventories in 2014, 2018, and 2022, and will include site visits by the third party. The annual updates of the field data will be used to verify and adjust the estimated rate of sequestration compared to the initial baseline inventory. The default scenario is assumed that farmers would keep the teak trees for a period of 30 years after project commencement in 2010. In case that some teak farmlands are harvested, the contractual agreement is that farmers will re-plant the teak trees or other trees and the amount of carbon for the remaining period of time (2024–the date of harvest) will drop to zero, until restored to the “sold level” of carbon. The *Bangkok Biz News* (27 February, 2011) reported that in 2010, the forty Inpang members who participated in the project received USD 37,000 in total for two years (2010–2011) at the rate of USD 4.25 per tCO₂ equivalent.

4.7 Khlongruea Tree Bank in Chumporn Province

The Khlongruea Tree Bank (KTREEB) was established in 2006 by civil society. It aims to encourage local villagers to grow and nurture the trees in their farmland by certifying the trees as assets in banking terms, in which the trees add value to the land while they are alive. Currently, 56 households are members of KTREEB in Chumporn province. In the past, the major economic activity in Khlongruea village was the mono-cropping system of agriculture such as coffee, oil palm, and para-rubber plantation. Unregulated promotion of these quick cash crops resulted in ecosystem degradation. Consequently, some farmers went into debt, had to mortgage their lands, and eventually lost their land. Some farmers realized that the mono-cropping system might not be an appropriate approach to sustain either their income or ecosystem. With support and encouragement by the staff of the Phato Watershed Conservation and Management Unit, farmers have started the integrated farming practices and tourism provision as supplementary sources of income. In the beginning, the tree plantation was supported by some budget of the Phato Watershed Conservation and Management Unit and some farmers invested in it themselves. The motivating drive to grow trees in farmlands was to recover the degraded farmlands and to prevent further deterioration of fertile lands. However, the budget for tree plantation is still far beneath the sufficient level.

4.7.1 Actors

Intermediary. KTREEB, who acts as an intermediary, submitted the proposal to the UNDP-GEF to support the Tree Bank activities; it received a project grant from GEF in 2012. The main activities to carry out in the project are:

1. Launching technical capacity building of targeted population through meeting;
2. Demonstration of conservation activities through resources inventory, promoting planting native species/integrated agriculture, and monitoring;
3. Dissemination of project results
4. Launching participatory evaluation.

Service provider. The local farmers act as the service providers who prepare the seeds for sowing and transplanting, plant and nurture trees, and measure their size to ascribe a value to them. The example of an evaluation form is presented in Figure 14. The details of the form are comprised of the size and value of each registered tree, which are recorded by the farmers themselves. The farmers are annually paid for their services at 5% of their registered tree values.

Figure 14. Evaluation form for the tree value

Service buyer. The GEF and a member of the private sector (e.g., Nestlé (Thai) Ltd.) as well as the Khlongrua community are the service buyers of the scheme to support the Tree Bank activities. Table 12 shows the total budget of the scheme, which costs approximately THB 1,120,320 (USD 37,344) and a contract period of two years (2012–2014). The 56 of 81 households in Khlongrua village has been involved in the project.

Table 12. Service buyers of the Khlongrua Tree Bank scheme for two years

Service Buyers	Amount (THB)
GEF	810,220 (USD 27,007)
Khlongrua community	181,100 (USD 6,037)
Private sectors (e.g. Nestlé (Thai) Ltd)	129,000 (USD 4,300)
Total	1,120,320 (USD 37,344)

Source: Treebank Thai (2011)
Note: USD 1 = THB 30

4.7.2 Monitoring and evaluation

The baseline condition of the ecosystem is measured by the value of the trees calculated from investment and nurture costs. The baseline inventory of tree values was conducted in 2006. Additionalities of the scheme are measured by an increase in value of the registered trees. The calculation method for estimation of tree values can be categorized into two approaches (Treebank 2011):

1. When the tree is younger than 11 years old (between 1 and 10 years old), the value of the one-year-old tree starts from THB 100,⁹ and then increases by THB 100 annually. Therefore, the value of a 10-year-old tree would be THB 1,000.
2. When the tree is older than 10 years old, the value of the tree is calculated by the actual market price of the timber according to size and type of the tree.

4.8 The Pilot PES Initiatives by the Biodiversity-Based Economy Development Office

BEDO is a public organization established in 2007, which aims to promote the management of biodiversity resource utilization for economic purposes and to encourage sustainable conservation of biodiversity as well as local wisdom from the community to the national level (BEDO 2014). Currently, BEDO has initiated two pilot PES schemes: (1) mangrove conservation project at Klong Prasong subdistrict in Krabi province and 2) watershed conservation project at Mae Tang district in Chiang Mai province. However, the mechanism for monitoring and evaluation for both schemes is not yet clear.

4.8.1 Mangrove conservation project at Klong Prasong subdistrict in Krabi province

Mangrove conservation is the ecosystem service of the scheme. Local villagers who are members of the Mangrove Conservation Group in Klong Prason subdistrict act as service providers to conserve the mangrove forest. There are several service buyers in this scheme, which are (1) the Islanda Village Resort, (2) the Khao Kanabnum Community-based tourism group, (3) the Local Business Group in the community, (4) the Thalay Business Group, and (5) the Rue Hua Thong tourism group in Klong Prasong subdistrict.

The memoranda of understanding (MOU) between BEDO and the service buyers were signed on 30 August, 2012, with BEDO acting as the intermediary of the scheme. The values of the ecosystem services were estimated in 2013. The total ecosystem service value in 2013 was estimated at THB 196,209/rai/year (USD 40,839¹⁰/hectare/year), and is comprised of

1. fishery products (THB 137,694/rai/year or USD 28,686/hectare/year);
2. benefits from coastal erosion protection (THB 22,794/rai/year or USD 4,749/hectare/year);
3. charcoal (THB 17,874/rai/year or USD 3,724/hectare/year);
4. carbon sequestration (THB 13,200/rai/year or USD 2,750/hectare/year); and
5. tourism (THB 4,467/rai/year or USD 931/hectare/year).

The payment of the scheme was set to be THB 500 per buyer per month (USD 16.7 per buyer per month) to contribute to the Mangrove Conservation Fund. BEDO also prepared a donation box for tourists who would like to contribute to the Fund. The management plans for the PES scheme have already been prepared, which are for ecosystem restoration and conservation, environmental management for tourism, and business plan for tourism.

⁹ The payment is estimated from the investment and maintenance costs of tree planting.

¹⁰ USD 1= THB 30

4.8.2 Tung Jo watershed conservation at Mae Tang district in Chiang Mai province

The scheme provides for watershed conservation at Mae Tang district in Chiang Mai province. The local villagers at Hua Lao village, Pa Pae subdistrict, Mae Tang district are the service providers. The service buyer is the Provincial Waterwork Regional Office 9 located in Chiang Mai province. The total ecosystem service value in 2013 was estimated at THB 171,585/rai/year (USD 35,747/ha/year), which is comprised of

1. timber (THB 119,280/rai/year or USD 24,850/ha/year);
2. benefits from heat reduction (THB 38,967/rai/year or USD 8,118/ha/year);
3. carbon sequestration (THB 6,353/rai/year or USD 1,324/ha/year);
4. benefits from soil erosion protection (THB 1,800/rai/year or USD 375/ha/year);
5. water improvement (THB 4,987/rai/year or USD 1,039/ha/year); and
6. soil nutrient loss protection (THB 198/rai/year or USD 41/ha/year).

The Provincial Waterwork Regional Office 9, as a service buyer, paid a total of THB 170,000 in 2013 (for 12 months) to the local villagers (as service providers) to build, maintain, and check dams; make forest fire lines; and work on fire patrol in the watershed. A total of 75 villagers participated in the scheme and got paid approximately THB 1,350 per person (USD 45 per person) or THB 112.5 per person per month (USD 3.75 per person per month). This pilot PES scheme was conducted in cooperation with several government agencies, namely, the Watershed Management Unit of Tung Jo, the Mae Lao–Mae Sae Wildlife Sanctuary, and the Protected Area Regional Office 16. These government agencies acted as intermediaries to provide some information, such as how to build the check dam. They also worked cooperatively to ask for approval from DNP in order to perform the PES activities in the park. Further, the Provincial Waterwork Regional Office 9 has started the new scheme (i.e., “One Miter, One Tree”) since 2014 (PWA 2013). In this scheme, the Provincial Waterwork Regional Office 9 has provided seedlings to the villagers who applied for the new pipeline connection to plant the seedling in the PES site (Hau Lao village, Pa Pae subdistrict, Mae Tang district, Chiang Mai province). In this scheme, BEDO and DNP acted as intermediaries between the Provincial Waterwork Regional Office 9 (the service buyer) and villagers (the service providers).

4.9 Social Projects under CSR of the Private Companies and State Enterprises

Private companies or state enterprises in Thailand may choose to contribute to environmental improvement via their CSR budget; these social projects (e.g., reforestation and wildlife conservation projects) are designed to generate goodwill or improve the reputation of these firms. The firms can act in behalf of either service providers or service buyers because their employees are also the ones who provide the services by planting trees in the project sites. These service providers—either the local villagers, company employees, or government servants—voluntarily contribute their efforts; therefore, they are not paid for their services. The source of funding depends on the CSR budget of the firms for each year, and thus the permanence of the scheme is not secured. Examples of social projects by firms are shown in Table 13.

Table 13. Reforestation projects by private companies and state enterprises

Company	Project	Year	Area	Project details
Toyota Motor Thailand Co., Ltd.	The One Million Trees Project	2008– present	<i>Forest plantation:</i> Toyota factory at Pho village, Chachoengsao province	The total number of trees that has been planted under this project since 2008 is 971,000; this is expected to sequester an estimated 10,600 tCO ₂ equivalent. Villagers from the Pho village contributed their labor to prepare seedlings, with financial support from the company. The staff of the company and Pho villagers planted trees together in the reforestation project. The company continues to provide financial support to the villagers for maintenance of the reforestation project.
	The Stop Global Warming Project	2004–present	To date, the project has worked with 190 schools and 152 municipalities in 77 provinces across the country.	Toyota Motor Thailand, in collaboration with TEI, initiated the award to promote low carbon living and self-sufficient communities. Established in 2005, the Stop Global Warming Project has contributed over THB 153 million as a financial support for environmental projects in 152 communities and 190 schools across the country during the past 7 years.
The Coca-Cola Co. (Thailand)	The Rak Nam project (The sustainable water resource management program)	1997–present	<i>Forest plantation:</i> Huai Ton Tong Stream, Lumpang province <i>Mangrove plantation:</i> Songkhla Lake Basin (Songkhla province); Samut Sakhon Mangrove Forest Research Center (Samut Sakhon province)	The Coca-Cola Foundation Thailand introduced the Rak Nam project through collaboration with the Coca-Cola group (The Thai Namthip Company Ltd., The Haad Thip Public Company Ltd.) for sustainable water resource management. The activity of the program is to undertake reforestation in degraded forests/mangroves. The Foundation provides financial support through the Office of Provincial Governor to RFD for seedling preparation. Staff of the company and local villagers planted trees together in the reforestation project. The Foundation continues to provide financial support to the villagers for maintenance of the reforestation sites.
	The One Million Rai for Reforestation project under the Reforestation Campaign in Commemoration of the Royal Golden Jubilee Project by PTT Public Company Ltd.	1994 –2002	<i>Forest plantation:</i> Provinces of Prachuap Khiri Khan, Nakhon Sawan, Phayao, Phitsanulok, Nakhon Ratchasima, Ubon Ratchathani, Phetchabun, Rayong, Lampang, Kanchanaburi <i>Mangrove plantation:</i> Provinces of Nakhon Si Thammarat and Phang Nga	The One Million Rai for Reforestation project under the Reforestation Campaign in Commemoration of the Royal Golden Jubilee Project by PTT Public Company Ltd. was launched in 1994. It aims to revive deteriorated forests in protected areas, which encompass watersheds in the country. All project sites are in protected areas, which are under the DNP or the RFD. PTT provided financial support through DNP and RFD for seedling preparation. The staff of the company and the local villagers planted trees together in the reforestation sites. Currently, the project has been completed. The reforestation projects were maintained by PTT in the first-year period of the project, and then RFD and DNP have taken care of the projects since the second-year period of the project with financial support from PTT. By the end of the project, forest and mangrove plantations have covered 938,042 rais (1,500 million m ²) and 89,108 rais (142.6 million m ²) respectively.

Table 13 continued

Company	Project	Year	Area	Project details
EGAT	Reforestation at Watershed area in Honor of His Majesty the King Project	1994 – present	<p><i>Forest plantation:</i> The Ping River, Nan River, and Meklong River</p> <p><i>Mangrove plantation:</i> The coasts of the Gulf of Thailand and the Andaman Sea</p>	<p>Since 1994, EGAT has supported the reforestation program initiated and implemented by the Thai government in commemoration of the Royal Golden Jubilee Celebrations of His Majesty's Ascension to the Throne. EGAT's reforestation project covered a total area of 384,418 rai in 49 provinces across the country. The project implementation during the period 1994–2009 included replanting and maintenance activities covering 377,638 rai of watershed forest areas and river basin areas of the Ping, Nan, and Meklong rivers, 7,430 rai of mangrove forests along the coasts of the Gulf of Thailand and the Andaman Sea, and 350 rai of swamp forests.</p>
	Irrawadee Dolphin Conservation	2011	Bang Pakong River, Chachoengsao province	<p>This conservation project was a collaboration between EGAT and the Department of Fishing and Coastal Resources of MONRE. Its main objective is to support the study and conservation of the Irrawaddy dolphins in Bang Pakong River. Public relations campaigns were organized to raise public awareness among youth and local communities on the importance of conservation efforts for these valuable and nearly extinct animals. EGAT contributed to this project by providing financial support of THB 6 million (USD 200,000).</p>
	The 840 check dams in honor of His Majesty the King Project	2011	The watershed areas around Bhumibol dam	<p>The project was a collaborative scheme between EGAT and the communities in the watershed areas around Bhumibol dam. These check dams were built in compliance with the King's royal initiative for the conservation of watershed areas and water resources, which further contributed to the effective water management and restoration of fertility to the watershed areas. The project was completed as planned in 2011; it successfully raised the public awareness and community involvement in conserving the country's forest and watershed resources.</p>

Note: (1) rai is a unit of area which equals to 1,600 m² (2) DNP = Department of National Parks, Wildlife and Plant Conservation; EGAT = Electricity Generating Authority of Thailand; MONRE = Ministry of Natural Resources and Environment of Thailand; PTT = The Petroleum Authority of Thailand; RFD = Royal Forest Department; TEI = Thailand Environment Institute

Table 14. Design of the PES-like case studies in Thailand

Study Sites	Environmental Services	Service Providers	Service Buyers	Intermediaries
PES-like cases for wildlife conservation				
Mai Khao Marine Turtle Conservation, Phuket province	Turtle conservation	Royal Thai Navy, PMBC, and Mai Khao local people	Tourists, general public and private sectors, especially JW Marriott Phuket Resort and Spa	The Mai Khao Marine Turtle Foundation administrated by the JW Marriott Phuket Resort and Spa
Adopting Elephant project	Elephant conservation	Staff of the Asian Elephant Foundation of Thailand	General people (donations)	Asian Elephant Foundation of Thailand
Gaur conservation of the Khao Pang Ma conservation network	Gaur conservation	Local villagers	General people (donations)	Khao Pang Ma Conservation Network
Hornbill conservation, Budo-Sungai Padi National Park, Southern Thailand	Hornbill conservation	Local villagers	General people (donations) and some part of the hornbill research grant	Hornbill Research Foundation
ECN	Reforestation and elephant conservation	ECN, Thailand's National Park, Wildlife, and Plant Conservation Department, and local villagers	Non-profit organizations, General people (donations)	ECN
PES-like cases for forest and watershed conservation				
Inpang community network in three provinces	Carbon sequestration	Small-holder farmers	Chicago Climate Exchange	Inpang Network members, Maharakham University, the National Research Council of Thailand, Carbon2Markets, and Michigan State University
KTREEB, Chumporn province	Forest conservation	Farmers (coffee, orchard, para-rubber and oil-palm)	GEF, private sector, and Khlongrua community	KTREEB
Mangrove conservation project at Klong Prasong subdistrict, Krabi province	Mangrove conservation	Local villagers who are members of the Mangrove Conservation Group	The Islanda Village Resort, the Khao Kanabnum Community-based tourism group, the local business group in the community, the Thalay Business Group, the Rue Hua Thong tourism group in Klong Prasong subdistrict.	BEDO

Table 14. Design of the PES-like case studies in Thailand

Study Sites	Environmental Services	Service Providers	Service Buyers	Intermediaries
PES-like cases for forest and watershed conservation				
Tung Jo Watershed Conservation at Mae Tang district, Chiang Mai province	Watershed conservation	Local villagers at Hua Lao village, Pa Pae subdistrict in Mae Tang district	The Provincial Waterwork Regional Office 9	BEDO, the Watershed Management Unit of Tung Jo, the Mae Lao – Mae Sae Wildlife Sanctuary, and the Protected Area Regional office 16
Reforestation projects and wildlife conservation under CSR, Thailand	Reforestation and wildlife conservation	Company employee, local villagers, government servants	Private companies and State enterprises	Private companies and State enterprises

Note: BEDO = Biodiversity-Based Economy Development Office; CSR = corporate social responsibility; ECN = Elephant Conservation Network; GEF = Global Environment Facility; KTRFEB = Khlongruea Tree Bank; PMBC = Phuket Marine Biological Center;

Table 15. Factors affecting effectiveness of the PES-like cases in Thailand

Study Sites	Baselines	Additionalities	Monitoring and Leakage	Compensation/Reward
PES-like cases for wildlife conservation				
MKMT Conservation, Phuket, Thailand	No baseline of turtle population	No clear indicators of additionalities	No systematic recording for monitoring and evaluation	Depending on how much MKMT can raise the fund
Adopting Elephant project, Thailand	No baseline of elephant population; a baseline of the scheme assumes that no elephant was adopted	Increased number of adopted elephants	No monitoring measures	Depending on how much people donate, but the rate of adopting an elephant is THB 5,000 or USD 167 per elephant per year
Gaur conservation of the Khao Pang Ma conservation network	Baseline of gaur population in 1995	Increased number of gaur population. The number of gaur population in Khao Pang Ma has been increasing from 5 gaurs in 1995 to 96 gaurs in 2006	Monitoring by direct counting or gaur census. No clear indicator for the leakage	Depending on how much people or private companies donate to the Foundation.
Hornbill conservation, Budo-Sungai Padi National Park, Southern Thailand	No baseline of hornbill population	No clear indicators of additionalities, but it is claimed that the Foundation has taken care of 167 nests in 2013	No monitoring measures	The payment rate is THB 160 (USD 5) per day for the villagers who help to look after the hornbills and collect the research data.

Table 15 continued

Study sites	Baselines	Additionalities	Monitoring and Leakage	Compensation/Reward
PES-like cases for wildlife conservation				
ECN in Kanchanaburi province	200 wild elephants and 1,200 km ² of forest area	No clear indicators of additionalities	Some systematic recording for monitoring and evaluation	Depending on grants and donation from domestic and foreign non-profit organizations
PES-like cases for forest and watershed conservation				
Inpang Community Network	Baseline inventory of carbon sequestration in 2009	Increased carbon sequestration	Field verification occurs every 4 years with the 3 rd party verification of the reported forest inventories including site visits by the 3 rd party verifier as per the new protocol	Carbon credit price is USD 4.25 per tCO ₂ equivalent. The 40 Inpang members who participated in the project received USD 37,000 in total for 2 years (2010–2011)
KTREEB, Chumporn, Thailand	Baseline of tree values in 2006	Increased value of trees	Field verification occurs every year by KTREEB staff.	The farmers are annually paid for their services at 5% of their registered tree values.
Mangrove conservation project at Klong Prasong subdistrict, Krabi province	No information	No information	No information	The payment of the scheme was set to be THB 500/buyer/month (USD 16.7/buyer/month) to contribute into the Mangrove Conservation Fund.
Tung Jo Watershed Conservation at Mae Tang district, Chiang Mai province	No information	No information	No information	A total of 75 villagers who participated in the scheme got paid approximately THB 1,350/person (USD 45/person) or THB 112.5/person/month (USD 3.75/person/month) for 12 months
Reforestation projects wildlife conservation, Thailand	No baseline of forest cover data/wildlife population in the project site	Number of reforestation area in the project site No indicator for additionalities in case of wildlife conservation project	No monitoring measures	Voluntary contribution of company employees, local villagers, and government servants No payment for their services.

Note: ECN = Elephant Conservation Network; KTREEB = Khlongrua Tree Bank; MKMT = Mai Khao Marine Turtle

5.0 BACKGROUND OF PES IN LAO PDR

Lao PDR also has no practical experience with implementing PES. Currently, no PES legal framework in Lao PDR is in place; however, the Government of Lao PDR has shown strong interest in the PES mechanism at the policy level, understands the rationale for PES, and does not need to be convinced of the usefulness of this approach (Midgley et al. 2012). PES cases in Lao PDR are at the “design stage,” in which the concepts have been accepted in principle, although there is considerable uncertainty about the best operational procedure for implementation. Potential ecosystem services for PES schemes in Lao PDR fall under three ES categories: (1) climate change regulation (including carbon sequestration), (2) watershed services (including maintenance of soil quality and mitigation of sediment production), and (3) biodiversity conservation, especially in natural forests (Midgley et al. 2012). Currently, potential sources of funding on PES-like cases in Lao PDR focus on foreign companies in the hydropower and mining sectors.

The institutional framework relating to the management and monitoring of natural resources and the environment in Lao PDR is quite complex. At least 18 agencies were identified to have some form of involvement in the management of natural resources and the environment (Midgley et al. 2012). The details of the mandate of each agency are described in Table 16. It is therefore difficult for national agencies and international organizations to assign responsibilities for establishing, managing, monitoring and utilizing plantations and natural forests and all aspects of PES.

However, Muziol, Tan, and Oberndorf (2011) have tried to analyze the primary Laws in the Lao PDR that are relevant to the establishment of a Reducing Emissions from Deforestation and Forest Degradation with conservation (REDD+) entry, which can be defined as one category of PES (Table 17). At least seven laws were identified that are related to the establishment of a REDD+ benefit-sharing mechanism. For example, the State Asset Law (2002) defines the different types of state assets, including forestlands and the trees on the lands. Article 13 in the State Asset Law (2002) says that the state assets can be granted to individuals and organizations through a lease or concession. It also provides room for designing a creative approach, such as the creation of carbon forestry concessions, where local people could be granted access, use, and management rights over an area in order to gain defined incentive benefits in exchange for sustainably managing the area granted over an extended period of time. In addition, the State Budget Law (2006) provides the legal framework for the management of all state revenues. Regarding Article 3 of this law, special state funds can be created with authorization from the government for specific purposes as outlined through regulation. Therefore, a specific REDD+ benefit-sharing fund could be established, either by modifying and creating specific finance windows in an existing fund, or as a new fund.

According to the question of “who owns the carbon?”, Article 4 in the Forest Law (2008) can address this question, which considers the planted trees in designated areas as the property of those who planted them. This provision answers the question of who owns the carbon sequestered by forests, and how benefits resulting from carbon credit sales should be distributed, which depends on how broadly this provision may be interpreted by the government. In addition, Article 85 in the Forest Law promotes participation of the local people in the sustainable management of forest resources. The law also allows the government to grant forestlands to households, individuals, and organizations as a lease or concession, which could create opportunities for the development of a REDD+ scheme if properly utilized. Articles 37 and 38 in this law also provide the legal basis of the Forest and Forest Resource Development Fund. Particularly, Articles 37 and 38 allow the use of this fund only for activities relating to the conservation, rehabilitation, and management of forests and forestlands. However, it does not allow the use of a mechanism to provide non-forest management-related poverty alleviation or other benefits to local communities or individuals that might be involved in the sustainable management of forest resource. Additionally, the contractual arrangement of the REDD+ scheme can be set up under the Contract Law (1990); Article 2 of which specifies the possible parties to a contract, including the state, individuals, legal entities, and collective organizations, which could be broadly defined as including a community group or organization.

Table 16. Institutions related to the management and monitoring of natural resources and the environment in Lao PDR

Institution	Mandate
Ministry of Agriculture and Forestry (MAF)	MAF is the key government agency responsible for the management of natural resources associated with forests and agricultural land, including forestry and forest conservation, and protected areas.
Department of Forestry (DoF)	DoF provides services related to forest management, protection and development to ensure the effective and sustainable use of forest resources for the whole country. The main mandates of DoF are to: a) implement policies on forest activities; b) formulate and develop laws on forestry, aquatic life and wildlife; c) research and recommend policies, methods and measures on tree planting, forest regeneration/management/protection and forest uses; d) monitor, supervise, and evaluate the implementation of master plans/programs/projects; and e) inspect, monitor, and evaluate the output from the implementation of laws.
Department of Forest Inspection (DoFI)	DoFI is the primary government agency for responding to problems and complaints related to illegal logging, land encroachment, smuggling of timber and wildlife, and forest-related corruption.
National Agriculture and Forestry Research Institute (NAFRI)	NAFRI is mandated to carry out technical research activities on agriculture, forestry, meteorology, and hydrology. The research centers under NAFRI are the Forestry Research Centre (FRC) and the National Agriculture and Forestry Research Centre (NAFReC).
Prime Minister's Office (PMO)	PMO serves as staff support for the Prime Minister in coordinating/studying various issues related to collective administration and state management of the country.
Water Resources and Environment Administration (WREA)	WREA is responsible for a) conducting, approving, and monitoring environmental impact assessments (EIAs) and issuing environmental certificates; b) the Lao commitment to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and c) maintaining a coordination network at the provincial level and with key ministries, such as the MAF and Ministry of Industry and Commerce; the network, plays a key role in the EIA approval process.
National Land Management Authority (NLMA)	NLMA is mandated to a) draft laws and regulations on land management and, in cooperation with other relevant agencies, to investigate, register, and develop land use management plans and strategies; b) cooperate with other agencies to issue land use certificates, and is obligated to monitor, control, and evaluate land use within the country.
Science and Technology Authority	The Science and Technology Authority is responsible for the certification and protection of intellectual property related to cultural rights and traditional knowledge.
National Environment Committee	National Environment Committee is mandated to coordinate and advise the government on environmental management, strategies, regulations and plans.
Ministry of Industry and Commerce (MoIC)	MoIC is responsible for facilitating trade of commodities (for example, forestry industry including timber sales), licensing of wood-processing industries, and working with wood processors to foster domestic and export markets.
Economic Research Institute for Trade (ERIT)	ERIT is the key department with a mission to provide research and policy advice and act as an advisory body for the ministry on issues relating to trade policy and enterprise law.
Ministry of Planning and Investment (MPI)	MPI is the key agency for the promotion of investment and responsible for coordinating the investment approval process.
National Economic Research Institute (NERI)	NERI is mandated to (1) assist MPI to monitor macroeconomic indicators, formulate long-term national, regional, provincial and sectoral policies; (2) conduct researches including development policies and economic management mechanisms; (3) provide economic data and information; (4) train government officials in economic management; and (5) cooperate with local and foreign economic research institutes.

Table 16 continued

Institution	Mandate
Provincial Administrative Authorities	Provincial Administrative Authorities play a key role in consideration and approval of large investment and development agreements and maintain working relationships with adjacent provinces in neighboring countries within the national framework of diplomatic relations.
District Administrative Authorities	District Administrative Authorities are responsible for the day-to-day implementation of the district socioeconomic development programs.
Universities	
National University of Lao (NUoL)	NUoL has some faculties and centers that provide teaching and research related to natural resources and the environment, including the Faculty of Forestry and its Centre for Natural Resources Management and Climate Change; the Faculty of Economic and Business Management (Natural Resource Economics); the Centre of Environment and Development Studies.
Souphanouvong University	Souphanouvong University provides teaching on forest management under the Department of Forest Resource Management.
Mekong River Commission (MRC) (Regional Institution)	MRC aims towards joint management of the shared water resources and development of the economic potential of the river. The commission promotes the coordinated development and management of water and related resources, in order to maximize economic and social welfare in a balanced way without compromising the sustainability of vital ecosystems.

Source: Midgley et al. 2012

Table 17. Primary legislation relevant to establishing a REDD+ benefit sharing mechanism in Lao PDR

Legislation	Details
Constitution (2003)	The Constitution provides for foreign direct investment and promotes the use of modern management technologies (Article 15), lays out the basis for both state and private property ownership (Article 16), guarantees the protection of land property rights (Article 17), and creates a duty in all citizens and organizations in the country to protect the environment and natural resources of the country (Article 19).
State Assets Law (2002)	The State Assets Law defines the different types and outlines the management responsibilities for assets of the State, for example, forestlands and the trees occurring naturally in them. State assets are owned by the national community and centrally controlled, although access, use, and management of these assets may be granted to organizations and individuals (Article 3). State assets with natural features such as forestlands are classified in the law as "Public Assets" (Article 4), and although these assets must be used for the good of the public and are still owned and held in trust by the state, they can be granted to individuals and organizations through a lease or concession (Article 13).

Table 16 continued

Legislation	Details
State Budget Law (2006)	The State Budget Law provides the legal framework for the management and expenditure of all state revenues, which are controlled by the National Treasury. All state revenues are to remain in the overall state budget system, although special state funds may be established with proper authorization (Article 6). Special state funds can be created with the authorization of the government for specific purposes as outlined through regulation (Article 3). The Environment Protection Fund (EPF), Poverty Reduction Fund (PRF) and Forest and Forest Resources Development Fund (FFRDF) would be considered under this fund.
Forest Law (2008)	The Forest Law provides the overall framework for the classification of forestlands and forest resource management in the Lao PDR. Although natural forest and forestlands are considered as property of the state, trees that are planted in designated areas are considered the property of those that planted them (Article 4). The Forest Law also promotes the participation of local people in the sustainable management of forest resources in the country, and local people should be able to benefit from such involvement (Article 6). The law mandates that regulations should be implemented to create incentives that encourage households and individuals to be involved in the regeneration of forests and forestlands (Article 34). The law also allows the Government to grant forestlands to households, individuals, and organizations as a lease or concession (Article 85). Furthermore, the law provides the legal basis for the Forest and Forest Resource Development Fund that can be used for activities relating to the conservation, rehabilitation, and management of forests and forestlands (Article 37 & 38).
Environmental Protection Law (1999)	The Environmental Protection Law provides important provisions for the protection and restoration of the natural environment in the country. The law also provides the basis for the establishment of the Environmental Protection Fund in Lao PDR (Article 30–32). In addition, the current draft revision of Article 12 refers to payment for ecological services and suggests that methods and processes for payment for ecosystem services would be established separately.
Land Law (2003)	The Land Law lays out the overall regime of the classification, use, management and protection of land resources in the Lao PDR. It defines that all land in the country is technically owned by the state, although various rights can be granted, including the right of access, use, transfer, inheritance, and alienation (Article 3). The Land Law also defines forestlands as similar to the Forest land, such that individuals and families may only be granted long-term use rights to degraded forestlands, while other areas of forestlands, such as production forest areas or forestland areas for tourism, may be granted through a lease or concession from the government (Article 21).
Contract Law (1990)	The Contract Law provides the parameters for contractual arrangements in the country, which is important since REDD+ (and PES) arrangements could not occur without contractual agreements being recognized in the Lao PDR. Under the contractual agreement between parties, payment for a particular specialized service is being made (Article 1). The Law lists the possible parties to a contract, including the State, individuals, legal entities and collective organization (Article 2). Contracts under the Law may be between multiple parties, such as an international organization, the state and a community group or organization (Article 4).

Source: Muziol et al. (2011)

6.0 PES STUDIES IN LAO PDR

This study identified some feasibility studies that aim to develop and implement PES for watershed and forest conservation in Lao PDR. This part of the report reviews some of these feasibility studies, which focus on watershed and forest protection.

6.1 The PES Study for Watershed Management in Northern Lao

The study side of this feasibility study project is the Houay Xon watershed located in the Luang Prabang province in Northern Lao (Figure 15). This watershed covers 22 km², which includes seven villages along the Houay Xon stream that runs for about 15 km and contains three tributaries (George et al. 2009).

The environment of the watershed is under pressure, which is mostly caused by human activities. Forest clearing and burning for farming activities (mostly maize) cause not only topsoil loss but also soil erosion. These erosions reduce the downstream water quality of the Houay Xon stream by increasing sediment and turbidity. In addition to degrading the water quality, clearing the upstream forest also reduces stream flow.



Figure 15. Houay Xon watershed

Source: George et al. (2009)

6.1.1 Potential seller and buyers

The Management of Soil Erosion Consortium (MSEC) program suggested alternative farming techniques that could be applied in sensitive areas like the upstream area of Houay Xon watershed. This technique is used to conserve or introduce grass along the river bank, which can prevent soil erosion and reduce sediment delivery into the stream, thereby improving downstream water quality. More importantly, the cost of implementing the method is not high. A survey of villagers who live upstream of Houay Xon watershed revealed that they had been aware of soil erosion problems and were willing to participate in soil conservation practices in exchange for some compensation.

The downstream villagers are the potential buyers of the ecosystem service (i.e., water quality). The buyers can be divided into two groups. The first group is the downstream villagers whose income is mainly generated from cropping vegetables, which are then sold to consumers and restaurants in Luang Prabang. The second group is the fish farmers, who also demands for an improvement in the water quality of the stream. However, fish farmers also cause water pollution in downstream areas because of the lack of infrastructure for collecting wastewater from their fish ponds.

The survey of villagers in downstream areas suggested that potential buyers were willing to pay, on average, about USD 0.3 per month per household to compensate upstream villagers for implementing the new land management practice that could prevent, or at least mitigate, soil erosion, which would subsequently improve downstream water quality.

6.1.2 Institutional capacity

The study also pointed out that a highly placed organization that may be in a position to manage a PES market in this area is the UNESCO Heritage House, which is a national Lao authority, and could act as an administrative mediator for the PES scheme. This is because the main activities of this organization are to protect, conserve, and enhance the natural, cultural, and architectural heritage within the protected area, encompassing the old historic city and adjacent areas, and the Houay Xon watershed. In addition, the Heritage House has actively promoted gardening with organic fertilizers in many villages, including some in the Houay Xon watershed. In addition to the Heritage House, other organizations—such as the Northern Agriculture and Forestry Research Centre and the National Centre for Environmental Health and Water Supply, both of which are national Lao authorities—could also provide valuable assistance for implementing a PES in the Houay Xon watershed by supporting the new cropping technique that could protect soil and by improving sanitation in the area.

6.2 A PES Study for Enhancing Livelihoods in Lao PDR through Environmental Services and Planted-Timber Products

The second PES study in Lao PDR was conducted by Midgley et al. (2012). Lao PDR is well-endowed with natural and planted forest, having about 40% of the country covered by forest. This number is aimed to be increased to 70% by 2030, according to Lao PDR government. Planted forest is one of the ways with high potential to reach that target. In addition, the planted forest sector not only supports an increase in area of forest cover but also enhances economic growth and poverty alleviation, especially in remote rural areas. The expansion of planted forests may reach 500,000 ha and would create an annual supply of timber wood of about 4 million cubic meters (m³) (Midgley et al. 2012). However, this industry in Lao is weak, and the value added to wood-processing products is still low. In addition, the potential markets for wood and wood products are in developed countries, which have become increasingly sensitive to timber sourced illegally or unsustainably. This feasibility study of applying PES through planted timber products aims to examine the opportunities for research and development in relation to employing PES through planted timber products by improving efficiency and sustainability in the industry, which can increase returns to smallholders and wood processors.

6.2.1 Improving returns to smallholders and wood processors through planted timber value chain: Research issues

Although Lao PDR has the highest forest cover in Southeast Asia, its forests are currently under pressure. In 1940, about 70% of land in Lao PDR was covered by forest, but this number decreased to 40% in 2010. In contrast, the area of degraded forests and permanent agricultural land has continuously increased. The main causes of the decrease in forest areas are the increasing demand for agricultural land and logging.

There are also tree plantations owned by various members of the private sector. These owners include domestic and foreign owners through direct investment by forest industrial companies as well as farmers. The demand for wood will increase due to population growth and economic development, which will add pressure to the natural forests and forestlands. Timber from tree plantations would be the source of wood that could fulfill this rising demand and accordingly reduce pressure on natural forests. In addition, sustainable management of planted forests would also increase forest areas and obtain environmental service from them.

However, the wood product industry in Lao PDR is currently finding it difficult to extend wood processing up the value chain into value-added production. Logs and sawn timber are currently the main products of the industry, sold in the domestic market or exported to other countries. In addition, the industry also has a problem in complying with the international certificate of sustainability standards (e.g., Forest Stewardship Council and Chain of Custody) that have been set up by developed countries, which are the potential markets of the industry, due to inadequate tracking systems and processes. The government also tries to promote downstream processing, which focuses on finished or semi-finished products, such as furniture, but the promotion is just in the early stage. These compliance problems lead to low return of investment in the industry, which include not only the wood processor but also the tree

grower, especially a smallholder. The study suggests research topics whose findings may improve returns to small plantation holders and wood processors.

The first topic is for growing planted trees. For the small plantation owners, most growers of planted trees aim for early and reliable returns. To match this demand, the studies that could identify a good combination of fast tree growth with profitable crop plantations are demanded. In addition, techniques that help to improve the plantations and wood quality are also important.

The next topic that may also be important is harvesting and transport. Currently, the harvesting and transport system of planted trees from farms and smallholders are inefficient. The average current costs in Luang Prabang province for harvesting small teak, transporting them to roadsides, and loading them onto the trucks are about LAK 150,000/m³ (USD 18.75).¹¹ Most of this cost comes from labor, which may be reduced by introducing appropriate equipment, such as modified diesel cultivators and small cranes to load logs onto the trucks. The cost of transportation for logs and sawn lumber is relatively high when compared to other countries in Southeast Asia, but may be decreased when the Chinese railway and improvement of road infrastructure are completed.

The next issue is about how small growers could provide reliability of supply to processors, which remains a challenge for logistics and coordination. The demand for wood is varied, but the deadline to get the wood supply from smallholders to processors is strict. To develop the industry and to attract commercial interest, small growers should develop a reputation for responsiveness to demand and reliability in supply, which is an important step in value-chain efficiency.

Another issue is to create grower groups, which may offer an alternative and potentially attractive means to delivery; increased efficiency in product delivery may provide additional benefits to the growers by either bypassing or complementing the services of the middleman. However, to make grower groups function efficiently, appropriate training and skill development for group members are essential.

The next issue is closely related to the creation of the grower group. The certification of planted trees could provide market advantages and offer an opportunity to develop a brand name. However, to get certified, a long certification as well as auditing process needs to be undergone, which entail a lot of transaction costs. However, it may be more cost-effective if the processes are developed through the grower groups.

6.2.2 Study sites

The study sites have not yet been clearly specified. However, policy makers suggest a pilot trial study into two characteristic areas, either a catchment area or an administrative area such as a province. If a catchment is selected, it may be under the Nam Ngum River Basin or under the Nam Theun 2 watershed. The Nam Theun/Nam Kading Basin is also a possible study site because it contains large dams and extensive natural forest in catchments. In addition to the study site areas, the study also suggested research issues within PES, which can be separated into two categories, policy issues and operational issues, some of which have been provided by Midgley et al. (2012) as follows:

1. Selecting a limited range of the most significant environmental services that improve ecosystem stability and sustainability;
2. Providing guidance for policy makers in setting the amounts of funds for PES required for new developments;
3. Developing options for policy frameworks to guide PES schemes that will lower transaction costs in their establishment;
4. Ensuring that each selected environmental service can be simply, quickly, objectively, and cooperatively measured using practical and robust field methods; and
5. Continuing research to improve the methods for assigning and agreeing upon acceptable monetary values for each unit of ecosystem services.

¹¹ USD 1 = LAK 8,000 (as of January 11, 2016).

7.0 PES-LIKE CASES IN LAO PDR

Since the foreign investors have commitments and responsibilities to their shareholders to have concern for environmental care and the maintenance of ecosystem services, some of them have provided contributions to conservation activities, for example, the Biodiversity Offset Program at Sepon district and conservation programs in Nam Theun 2 watershed.

7.1 Biodiversity Offset Program at Sepon District

Minerals and Metals Group (MMG) Ltd., the mining investor at Sepon district of Savannakhet Province in Lao PDR, has established the Biodiversity Offset Program (MMG Ltd. 2009). The objective of the program is to conserve the key ecosystems and species to offset the impacts of mining activities. The two conservation projects under the Biodiversity Offset Program are the Namkok River Headwaters Biodiversity project and the Siamese Crocodile Wetland Conservation project.

7.1.1 Namkok River Headwaters Biodiversity project

The project conducted the baseline survey of the Namkok Headwaters Area in cooperation with provincial and district authorities, the Wildlife Conservation Society (WCS), and the National University of Lao from July to September 2009. The MMG Company acts as the service buyer, while WCS staff, government authorities, as well as the staff of the National University of Lao act as service providers. The survey covered the high biodiversity areas, and included indigenous knowledge surveys, camera traps for large species, sound recording for birds, and pitfall traps for reptiles. The project aims to provide an inventory of the terrestrial flora and vertebrate fauna in the upper catchments of the Namkok River, identify species and habitats of particular conservation or social significance, and determine the areas with low biodiversity value. The project is an offset for the Phou Thengkham Development.

7.1.2 Siamese Crocodile Wetland Conservation project

The Siamese crocodile is the third-rarest crocodile in Lao PDR (Figure 16). In this case, MMG acted as the service buyer, while WCS staff members were the service providers. The project was conducted in cooperation with WCS from 2008 to 2011, and aimed to collect genetic samples of crocodiles, restore wetland habitat, and develop community livelihood programs to support the wetland conservation in Champhone district. The project succeeded in fostering cooperation among local communities in protecting the crocodile's habitat and any eggs that are found (IUCN 2011). The project provided an offset for biodiversity (land and aquatic habitat) impacts associated with the development of a new tailings storage facility on the site. The project also worked with communities to create a crocodile conservation zone, train villagers and officials on how to monitor crocodile populations using GPS units and forms, and patrol the conservation area and nests regularly. The project also worked on improving local livelihoods by improving irrigation systems for rice farmers and developing a community-based ecotourism program (WCS 2014).



Figure 16. Siamese crocodile

Source: MMG (2009)

7.2 Conservation Programs in Nam Theun 2 Watershed

The Nam Theun 2 Watershed has been recognized for its unique natural diversity. The Office of the Prime Minister established the Nam Theun 2 Watershed Management and Protection Authority (WMPA) to manage conservation efforts in the area since 2005. The Nam Theun 2 Power Company (NTPC), as a service buyer, has contributed to WMPA by providing a total of USD 31.5 million through the course of 31 years (USD 1 million annually) (WB 2013a) for environmental protection and for local livelihood protection. WMPA, (with support by the World Bank) as an intermediary, conducted several activities (WB 2013b) for the capacity building of its staff and for the local villagers in Nam Theun Watershed in order to protect biodiversity. These activities have included forest patrol, building awareness on the impacts of hunting, providing livelihood improvement to reduce pressure on forest encroachment, and identifying protection zones.

Another conservation activity supported by NTPC is an elephant protection program in Nakai-Nam Theun National Protected Area. The Nakai Elephant Program was established 2004 by NTPC as a service buyer, with the support of WCS as a service provider. NTPC has started funding this program, and will do so until 2031.¹² Several conservation activities were implemented, including HEC mitigation, around the National Protected Area, such as monitoring and maintenance of the artificial mineral licks (Figure 17). The mineral licks were designed to replace natural salt sources that are now covered by the Nakai Reservoir, which provides the water for the Nam Theun 2 Power Station.



Figure 17. Elephants at an artificial mineral lick in the Nam Theun 2 area

Source: Nam Theun 2 Power Company Press Release (25 March, 2010)

¹² *Nam Theun 2 Power Company Press Release (25 March, 2010)*

Table 18. Design of the PES-like cases in Lao PDR

Study Sites	Environmental Services	Service Providers	Service Buyers	Intermediaries
Biodiversity Offset Program at Sepon district, Savannakhet province	Ecosystem restoration (Biodiversity Offset for the Phou Thengkham Development)	WCS staff, government authorities, and staff of the National University of Lao	MMG Company (the mining investor at Sepon district)	WCS and National University of Lao
Siamese Crocodile Wetland Conservation project (2008–2011)	An inventory of genetic samples of crocodiles and wetland habitat restoration (biodiversity offset for land and aquatic habitats) for the development of a new tailings storage facility at Sepon district	WCS staff and local villagers	MMG Company (the mining investor at Sepon district)	WCS
The Nam Theun 2 Watershed Conservation project	Watershed conservation including forest patrol, building awareness on the impacts of hunting, providing livelihood improvement to reduce pressure on forest encroachment, identifying protection zones	Nam Theun 2 Watershed Management and Protection Authority	NTPC	The World Bank
Elephant protection program in Nakai-Nam Theun National Protected Area	Elephant conservation and HEC mitigation	WCS staff	NTPC	WCS

Note: HEC = human-elephant conflict; MMG = Minerals and Metals Group; NTPC = Nam Theun 2 Power Company; WCS = Wildlife Conservation Society

Table 19. Factors affecting effectiveness of the PES-like cases in Lao PDR

Study Sites	Baselines	Additionalities	Monitoring and Leakage	Compensation/ Reward
Biodiversity Offset Program at Sepon district, Savannakhet province	The baseline survey (indigenous knowledge surveys, camera traps for large species, sound recording for birds and pitfall traps for reptiles) in the Namkok Headwaters Area during July to September 2009	No information	No information	No information
Siamese Crocodile Wetland Conservation project (2008–2011)	No information	Number of crocodile eggs saved by local villagers	No information	No information
Nam Theun 2 Watershed Conservation project	No information	No information	No information	NTPC has contributed to WMPA with funding (USD 1 million annually) USD 31.5 million in total over 31 years since 2005
Elephant protection program in Nakai-Nam Theun National Protected Area	A baseline of the scheme assumes that no artificial mineral lick was established	Increased number of artificial mineral licks	No information	No information

Note: NTPC = Nam Theun 2 Power Company; WMPA = Nam Theun 2 Watershed Management and Protection Authority

8.0 LESSONS LEARNED FROM PES IMPLEMENTATION IN THAILAND AND LAO PDR

8.1 Lessons Learned from PES in Thailand

The definition of PES that was used to identify and classify PES projects in Thailand was given by Wunder (2005) as “a voluntary transaction where a well-defined environmental service or a land use likely to secure that service is being ‘bought’ by a minimum of one service buyer from a minimum of one service provider if and only if the service provider secures service provision (conditionality).” Although all of the projects in Thailand that have been identified discussed in this study produce ecosystems services, they lack many of the components of a full PES project. Therefore, this study referred to these projects as “PES-like.” Of the eight cases identified, five were related to wildlife conservation and three were cases of forest conservation, mainly for the purpose of carbon sequestration. The PES-like programs for wildlife conservation include the Mai Khao Marine Turtle Conservation in Phuket province, the Adopting Elephant project, the Gaur Conservation of the Khao Pang Ma Conservation Network, the Hornbill Adoption Program in the Budo-Sungai Padi National Park, and the elephant conservation by Elephant Conservation Network in Kanchanaburi province.

8.1.1 PES-like activities related to wildlife conservation

These cases have not been designed as PES projects; thus, they were not set up at the onset to be able to easily measure “additionality,” which requires having established the baseline condition of the natural resources under management. Payment is on a voluntary basis and not conditional upon undertaking specific activities. Among the five PES criteria, the projects that come closest to the concept of PES are the marine turtle, the gaur, and the hornbill conservation projects. The assessment of PES-like activities related to wildlife conservation in the following discussion is based on the components of these projects in relation to some of the key principles of PES projects:

Ecosystems services provided and the issue of additionality. For marine turtles, the ecosystem service is protection of the nests from natural and human threats and keeping quantifiable records of eggs hatched. In the gaur conservation, local villagers are engaged in a number of things, i.e., reforestation, building check dams, forest fire prevention measures, restoring sources of water supply/mineral licks, and managing grassland as sources of food for wildlife. For hornbill conservation, the role of the local villagers is more in terms of research support since they are engaged in collecting biological and ecological data of hornbills and monitoring populations in the area. What is common in these projects is that part of the ecosystems services is to reduce the impacts on the natural resources; local villagers were formerly involved in extraction activities, such that turning them into service providers reduces the immediate threats.

The two elephant-related projects used the scheme of wildlife adoption to mobilize financial support. The funds mobilized are used to improve habitat conditions or other measures to eliminate threats to the elephants, in efforts to reduce their risk of extinction. In these projects, for publicity reasons, the increase in the number of adoptions has been cited as an indicator of performance. While the justification may be that the increased interest to adopt implies progress, this may not necessarily be the case. The measures undertaken to create incentives for “adoption” may well result in improvement of ecosystems services, but insufficient information is available to evaluate how the funds are used to improve habitat or other measures to reduce the risk of extinction of the species being adopted.

Service providers. In the case of the gaur and hornbill conservation projects, direct payments are made to local villagers involved as service providers. Villagers in the marine turtle conservation project are paid on the basis of output; that is, for every turtle egg saved, they are paid USD 1.6, which provides the incentives needed. However, villagers (service providers) in other projects are more like waged workers; payment is not conditional upon the output but based on inputs, i.e., the number of hours worked per day. So whether they can actually be called service providers is questionable. The Hornbill Adoption Program is somewhere in between. Local villagers are paid USD 5 per day to look after the nests but it is not clear how many nests each villager is looking after or what incentives are provided to ensure performance.

Intermediaries. Based on the information available, there are two types of intermediaries:

1. *Intermediaries with vested interests.* The intermediaries in all cases have vested interests in mobilizing funds for conservation. For instance, the increased publicity or improved image of the private sector involved as intermediary is a desirable exchange for the increased funds to reduce the threats on endangered species. The role of the JW Marriot Phuket Resort and Spa for marine turtle conservation is both as an intermediary and buyer since the business also directly benefits from the environmental services. The Khao Pang Ma conservation network, on the other hand, fits the definition of intermediary somewhat better because it acts as a link between buyers and sellers.
2. *Intermediaries who are also service providers.* Distinction must be made for agencies engaged in conservation work as part of their mandate and who utilize normal budgetary allocation to do so. The Royal Thai Navy and the Phuket Marine Biological Center, for example, have their own budgetary resources for marine turtle conservation in Mai Khao beach, Phuket province. What these agencies do therefore cannot strictly be defined as providing ecosystems service, as such, because no element of “transaction” is being made. Moreover, with conservation measures being undertaken as part of their mandate, there is, in effect, no additionality. Nevertheless, these agencies can still be considered as intermediaries if some of the budgetary resources allocated are used to engage local people in conservation efforts, which they would not otherwise have done. The same applies to the two elephant conservation projects; the institutions involved were staff of the Asian Elephant Foundation of Thailand, ECN, and DNP.

8.1.2 PES-like schemes for forest conservation

The PES-like schemes for forest conservation discussed in detail in this report include the carbon sequestration project in Inpang Community Network in the northeast provinces (Carbon2Markets Program 2009), the KTRREEB in Chumphon province, and the reforestation projects by private companies and state enterprise sectors including Toyota Motor Thailand Co., Ltd; The Coca-Cola Company (Thailand); PTT Public Company Ltd.; and EGAT.

Because the project was initiated to generate carbon credit, the Inpang community project has almost all the components of a PES project, except the last condition, namely conditionality. That is, there are services providers and sellers, and there are baselines from which to measure the “additionality.” What is interesting about this project is that the Inpang network has been around since 1987 and has oftentimes been cited as a case of success. Over the years, many study tour visits have been organized so that other local communities, government agencies, and universities can come and learn from their experiences. Yet, despite the fact that many other local communities can be provided the incentives to engage in similar activities, the replication of Inpang elsewhere has thus far been limited. For the remaining projects, similar to the PES-like projects related to wildlife, most of the projects grouped in this category are CSR-funded.

8.1.3 Observations

In addition to the above, a few observations can be made about the experience, or lack thereof, in adopting and implementing the concept of PES in Thailand.

First, most of the funding sources for natural resources conservation are primarily CSR investments that result in producing ecosystems services. There is potential, however, to develop the existing PES-like projects into full PES projects. Among the merits of doing so would be the promotion of sustainability in these conservation efforts. Although no objections are being made towards CSR investments, donations have tended to be one-time investments with no guarantee of continuity in funding because investors do not directly benefit from the ecosystem services that they are paying for.

Second, although PES-like projects related to wildlife has the potential to generate voluntary contribution from private companies or from the general public, flows of contributions from these sources are unlikely for ecosystems services such as watersheds, mangroves, wetlands, coral reefs, etc. The benefits from these latter ecosystems services, which provide “life support” functions, are more difficult to understand and appreciate. The main challenge that remains is how to demonstrate the direct and indirect

benefits of ecosystems services in order to create a real demand for them, but to date, few attempts have been made to do this in Thailand.

Third, to develop the existing PES-like projects into full PES projects, the following elements need to be developed:

1. Revisiting the actions to provide ecosystem services, particularly in terms of the costs to provide the services and the transaction costs;
2. Establishing the baseline to be able to measure “additionality”; and
3. Identifying the beneficiaries of the ecosystem services, the means by which they benefit, and the methods for measuring the benefits.

Finally, although Thailand does not have ongoing PES projects, some PES projects are at the initial design stages, and are significant in their stature as the first PES projects to be implemented. At this stage, however, the progress of these projects has been hampered by the institutional and organizational aspects of project management. Except for some preliminary conclusions over the physical boundaries of the sites and the ecosystems services, much scientific work remains to be undertaken for these projects, as well as the need to define the social and economic aspects of project design. Particularly on the economic analysis, capacity building will be critical.

8.2 Lessons Learned of PES in Lao PDR

Although there is currently no formal PES implementation in Lao PDR, the Government of Lao PDR has shown strong interest in the PES mechanism (Midgley et al. 2012). However, it needs guidance on how the PES scheme can be established within the context of Lao PDR. Some lessons learned from the PES implementation in Lao PDR can be drawn, as follows:

1. PES cases in Lao PDR are at the “design stage.” Conceptually, these cases are accepted, but entail considerable uncertainty with regard to the most appropriate operational procedures. Most PES-related issues are related to the adoption of ad-hoc project-based policy, due to the lack of specific PES regulations (Midgley et al. 2012).
2. Potential ecosystem services in Lao PDR fall under three sets of legislation—Forestry Law, Water Resources Law and Environmental Protection Law. However, no specific, supporting legislation exists as yet, although Article 12 of the draft revision of the Environmental Protection Law specifically mentions PES (Midgley et al. 2012). Most mining and hydro-power projects have developed their own incentive or benefit-sharing mechanisms, which depend on the outcome of negotiations for concession agreements. However, the study of Muziol et al. (2011) shows that the existing laws are sufficient to perform PES under REDD+ scheme.
3. The main constraint in Lao PDR is not the legal issue itself but rather the lack of human and financial capacity to implement PES (Stenhouse and Bojo 2011). For example, the National Land Management Authority and the Water Resource and Water Administration play important roles for PES implementation; however, they have limited staff and resources, particularly at the provincial level, to be effective.
4. There is no mechanism to distribute benefits equitably to concerned stakeholders; thus, a new law is needed that requires delivery of additional benefits to rural villagers. Furthermore, a lack of clarity in the roles to be played by the government agencies regarding ecosystem services is another constraint in Lao PDR (Midgley et al. 2012).

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