

Restoration Cases Flagship Collection

Case #12:

Community-based mangrove restoration, conservation and management in Pred Nai, Thailand



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CROWTHER LAB



Community-managed mangrove forest adjacent to Pred Nai Village in 2018.
Photo credit: Mangrove Action Project

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In brief

Overview

Pred Nai Village is located along the eastern seaboard of Thailand in Trat Province. Intensified logging and shrimp aquaculture in the early 1980s directly threatened livelihoods of Pred Nai villagers due to overharvesting and destruction of mangrove ecosystems, which restricted villagers from harvesting mud crabs, Grapsid crab, shellfish, fish, and other products for their livelihoods and income generation. In 1986, villagers took collective action, organizing patrol groups to stop logging and enforcing regulations on harvesting of crabs to sustain village livelihoods. They succeeded in forcing the national government to ban logging and shrimp aquaculture in the local mangrove forests. Crab harvests increased, benefitting poorer members of the village. Villagers restored mangrove forests and protected others so they could regenerate naturally. In 1998, the Pred Nai Community Forestry Group was formally initiated to implement local mangrove forest management activities. Local actions taken by Pred Nai villagers led to the restoration and protection of 1,920 ha of coastal mangrove forest and enabled larger scale mangrove management and restoration throughout the region.

Exemplary practices

Two major activities engaged diverse actors in the community: development of a management plan with detailed mapping of forest resources and establishment of a Village Savings Group that ensured financial sustainability of local mangrove forest conservation, management and restoration activities. Principles for mangrove forest ecosystem restoration were adopted that reflect the broad socio-environmental goals of the villagers. Actions moved beyond protection of the mangrove forests and their species to more proactive methods of management. Through implementing their goals and developing partnerships with many governmental and non-governmental agencies and organizations, the villagers gained capacity in many ways and became change makers and leaders of conservation and restoration efforts in neighboring areas of Pred Nai and Trat Province.

Key lessons learned

- ▶ *Fundamental livelihood needs of local communities can drive collective action to protect and restore ecosystems.*
- ▶ *Partnerships and institutional linkages are critical to achieve the sustainability of conservation and development activities.*
- ▶ *Locally initiated restoration and natural resource management can reduce poverty and increase social equity, while also contributing to climate mitigation and adaptation.*
- ▶ *Community members' knowledge of the mangrove forest allowed them to create harvesting rules that were relevant to local ecological conditions and improved livelihoods.*
- ▶ *Restoration and resource management provide opportunities for integrating conventional scientific knowledge and local ecological knowledge.*





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Restoration narrative

“Managing the mangrove forest is not a problem, we must manage the people.”

- Buddhist Monk Phra Subin

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Mangrove Forest Conservation Area

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Geographic context

The village of Pred Nai is located in Muang district of Trat Province on the eastern seaboard of Thailand, close to the Cambodian border (Figure 1). The region has a tropical climate typical of Thailand: hot and humid with a monsoon season typically lasting from May to October (Senyk, 2005). Pred Nai Village was founded in the 1850s by less than 10 households. By 2009 the village population was reported to be 560 people from nearly 130 households (On-Prom, 2014). The geographical area of the village is 378.7 ha, of which nearly 42% is residential, while the remaining area is under agriculture and other land-use practices (On-Prom, 2014).

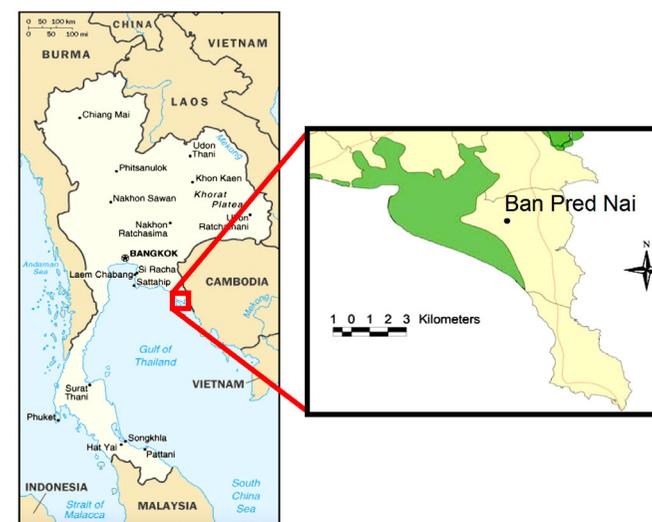


Figure 1. Map of Thailand, Ban Pred Nai and community mangrove forests (in green). Source: Senyk, 2005

The mangrove forests located about 1 km to the west of Pred Nai Village (Figure 1) are one of the last surviving mangrove forests along the eastern seaboard of Thailand and extend over 1,920 ha today (Silori et al., 2009; On-Prom, 2014). This species-rich tropical mangrove forest is dominated by red (*Rhizophora* and *Bruguiera* spp.) and black (*Avicennia* spp.) mangrove trees (Senyk, 2005). Trees and shrubs in mangrove forests are adapted to high salinity and water-logging of tidal environments, with regular flooding by 12 major and 6 minor creeks (Senyk, 2005; Silori et al., 2009). These highly productive forest ecosystems support a diverse variety of wildlife and livelihoods for coastal communities (UNDP, 2012).

Original settlers engaged primarily in rice farming in the lowlands but also harvested crabs, fish and shellfish. Forest products from the mangrove forest were also harvested, including Prong (*Ceriops tagal*), a common mangrove tree that is used for poles in pepper fields (Soontornwong, 2006). Currently, agricultural land use in upland areas is dominated by rubber plantations and orchards of durian, rambutan, jackfruit, mango, and mangosteen.

Today, a major source of livelihoods in the village is fish and shrimp farming and crab



Figure 2. A village woman sorting *Grapsid* crabs. Photo credit: Jason Senyk

harvesting. Small and marginal landholders also earn daily wages in the agricultural sector, while many households collect various marine animals in mangroves for domestic and commercial use, such as Grapsid crab (*Metopograpus spp.*), Mud crab (*Scylla serra*), and shrimp, as well as a variety of fish and shells (On-Prom, 2014). Nearly 74% of total average household income is derived directly or indirectly from mangrove and marine resources (Silori et al., 2009). Most Pre Nai villagers are ethnic Thai and follow the Buddhist religion (Senyk, 2005). The vast majority of households have small property holdings, and only about 7% of the households do not own land (On-Prom, 2014). Landless households rely solely on the commercial harvest of Grapsid crabs (*Metopograpus spp.*; Figure 2) for their household income (Senyk, 2005).

History of mangrove deforestation and coastal degradation

In Thailand, mangrove forests are claimed and managed by the state Royal Forestry Department (RFD), established in 1896. The Land Act of 1954 authorized land ownership rights, encouraging clearing of forests as a means to gain title, promoting monoculture crops, and allowing logging for export. Under state control, much of Thailand's mangrove ecosystems were destroyed. Mangrove area declined from 372,448 ha in 1960 to between 167,500 and 244,000 ha in the late 1990s (Wilkie and Fortuna, 2003; Sudtongang and Webb, 2008). From 2000 to 2012, Thai mangrove losses were 0.69% per year (Hamilton and Casey, 2016). The main drivers of mangrove deforestation were logging for charcoal production and construction of seawalls and ponds for intensive shrimp aquaculture in the logged areas. According to the National Economy and Social Development Plan, Thailand lost 50–60% of its mangrove forests, from 1961 to 1996, mainly due to conversion to shrimp aquaculture. (Soontornwong, 2006).

The mangrove forest near Pred Nai was placed under a logging concession in 1941

(On-Prom, 2014) and has been managed by the RFD as a reserve forest with some small-scale commercial logging carried out over many years (Senyk, 2006). But in the mid-1980s corporations intensified their harvest of trees from the mangroves and began constructing shrimp aquaculture ponds following logging (Senyk, 2005). Uncontrolled logging and intensive shrimp farming caused heavy destruction (Figure 3). As a result, the area of mangroves was reduced from its original extent of 48,000 ha to 1,920 ha by the early 1980s (Silori et al., 2009). According to interview sources, the extractive operations by Thai national corporations were conducted in clear violation of government regulations that required replanting in logged areas (Senyk, 2005). Government agencies were unwilling or unable to stop these illegal activities (Senyk, 2006). Moreover, extractive industries run by outside commercial interests provided little economic benefit for local people and negatively impacted mangrove resources needed for their subsistence and livelihoods (Senyk, 2005).



Figure 3. Shrimp aquaculture in Trat Province, Thailand. Photo credit: RECOFTC

The turning point (1983-1987)

The intensification of logging and shrimp aquaculture in the early 1980s became a direct threat to villagers' livelihoods. In 1985, villagers became concerned that logging concessionaires were overharvesting the mangrove and restricting villagers from harvesting crabs, shellfish, fish, and other products. Other local commercial interests also became engaged in converting degraded mangrove areas into shrimp farms. They built a gate to block seawater, causing further damage to remaining mangrove ecosystems (Kaewmahanin et al., 2007; UNDP, 2012). Availability of marine products, such as crabs, fishes, and shellfish declined substantially (Silori et al., 2009). Protests by villagers to government authorities were largely ignored (Senyk, 2005).

In 1986, faced with losing their livelihoods and the productive mangrove ecosystems that sustain them, a group of villagers took decisive action. They self-organized with the mission of stopping the logging and shrimp aquaculture operations. The small group of people who formed the core of the resistance armed themselves and actually fought against the workers in the mangroves (they claim that no

one was killed), at one point using explosives to destroy one of the seawalls that had been constructed. The group's actions played an important role in forcing the corporations to cease operations in Pred Nai's local mangroves because the company's workers were afraid to return to the mangrove forest (Senyk, 2006). Villagers blockaded roads into Pred Nai to keep out commercial loggers and succeeded in halting commercial logging operations (Senyk, 2006; Kaewmahanin et al., 2008; UNEP 2012). Most of the community was strongly united against the logging of mangroves but favored peaceful forms of protest.

A breakthrough came in 1986–87 in the form of assistance from a sympathetic senior provincial government employee who made contacts with the news media and national government. The villagers received help to write letters that attracted media attention and created public pressure to force the national government to take action and place a ban on logging and shrimp aquaculture in the mangrove ecosystems near Pred Nai (Senyk, 2006).

But even after these triumphs, illegal logging and charcoal production continued by other local people from the area, including former employees of the logging companies (Senyk, 2006). In 1988, the villagers of Pred Nai

began an informal program of patrolling the mangroves to stop illegal activities. The RFD also assisted the organization of patrol groups and punished offenders reported by the villagers, mostly by levying fines. (Senyk, 2006).

Actors and arrangements

Collective actions by villagers led to two major activities that engaged diverse actors in the community: development of a management plan with detailed mapping of forest resources; and establishment of a Village Savings Group in 1993 with help from a local Buddhist monk, Phra Subin, to ensure financial sustainability of local mangrove forest conservation, management, and restoration activities (Senyk, 2006). This monk was invited to the community to help settle conflicts among villagers regarding restricting harvest of products from the mangrove ecosystems. His intervention was key to introducing community-based management of mangrove resources.

The Village Savings Group allowed members to pool their savings and make loans to members from the accumulated savings (Senyk, 2006). The savings group was established in the wake of the economic decline of many shrimp farms (Senyk, 2006). The monk also helped the village to obtain funds from the Social Investment Fund (SIF) of the World Bank (Senyk, 2005). The Village Savings Group improved the organizational capacity of the villagers and developed their capacity to manage and account for

relatively large sums of money (Senyk, 2005). A committee of 14 villagers administered the savings group with the help and oversight of the Buddhist monk (Senyk, 2006).

These activities led to the creation of Pred Nai Community Forestry Group (PNCFG) as a formal entity in 1998 to implement local mangrove forest conservation, management and restoration activities. The PNCFG evolved from a small group of villagers protecting their forest from outside exploitation to a well-connected, grassroots, community-based management organization (Senyk, 2006). The group was divided into 6 sub-groups of 20 households; each sub-group was responsible for taking care of a specific mangrove forest area. The group drew upon strengths of local traditions and elders (Soontornwong, 2006). The PNCFG formalized the rules that had been previously enforced by the informal patrol groups. A special committee of 18 villagers and elders was designated by the leadership of PNCFG to draft the first rules and regulations that would later become the village's first management plan (Senyk, 2006). The RFD also played a crucial role early in the development of a mangrove forest management plan (Senyk, 2006). The PNCFG is now known as the Pred Nai Mangrove Conservation and Development Group and currently oversees a variety of community development projects (UNDP, 2012).

In 1999, at the request of the Pred Nai villagers, a partnership began with the Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC), a not-for-profit organization based in Bangkok that specializes in capacity building for community forestry and devolved forest management (UNDP, 2012). RECOFTC provided capacity building, assisted with surveys of the mangroves, offered technical support, and assisted with the development and refinement of a management plan for the conservation group (Senyk, 2005). The regional NGO conducted around 50 workshops to help villagers handle resource conflict and climate change impacts in recent years. Much of this innovative work is supported by the Norwegian Agency for Development Cooperation (Norad), the Swedish International Development Cooperation Agency (Sida), and the Royal Thai Government which, as core donors, have provided financial support for RECOFTC's goals in community forestry in Asia and the Pacific (Kaewmahanin et al., 2008).

Partnering with RECOFTC helped to promote the PNCFG's outreach to communities both within and outside of Thailand and encouraged sustainable utilization of natural resources among the villagers. In 2003, it became clear that Pred Nai Village, alone, could not implement effective management policies

across a wide area of mangrove forests (UNEP, 2012). The PNCFG led the development of the Community Coastal Resource Management Network of Trat Province, including more than 20 village-level community forestry groups along the four provinces at the eastern seaboard of Thailand to manage mangrove resources (On-Prom, 2014).

Costs, funding and other support

Initially, conservation efforts in Pred Nai did not receive any outside funding during the village's resistance to the corporations, nor did the community receive any funding during the period of informal patrolling (Senyk, 2006). In 1999, shortly after the formal creation of PNCFG, the World Bank provided money to the government of Thailand to assist with both business and social development, creating the Social Investment Fund (SIF). Pred Nai received SIF funding to purchase three boats for patrolling the mangroves, to build a cabin in the mangroves as a station for patrol groups, and to build a 2.8 km walkway (Figure 4) through the mangrove forest for education and tourism (Senyk, 2005).

Pred Nai was selected as the site for a large-scale, participatory action research project in 2000 by RECOFTC, funded (US\$80,000) by The Toyota Foundation. Action research is an adaptive learning process that emphasizes the role of local knowledge (Soontornwong, 2006). Technical support from RECOFTC helped villagers to formulate a long-term participatory mangrove restoration and management plan and to establish rules and regulatory practices for marine resource harvesting,

particularly, the Grapsid and Mud crabs, which are key cash earning species for villagers (Soontornwong, 2006; Silori et al., 2009). The Thailand Research Fund (TRF), a national government agency responsible for providing funding for research in Thailand, began working with Pred Nai in 2003. The TRF provided funding to PNCFG to conduct research into coastal erosion occurring in the mangroves as a result of boats fishing within three kilometers of the shoreline. As part of their assistance the TRF also provided some funding for the construction of “fish houses” (Figure 5) out of used rubber tires which are used offshore to reduce erosion and provide alternative fish habitat (Senyk, 2006). Villagers and outsiders said these structures reduce the time needed for fish harvesting (Kaewmahanin et al., 2007).

*Figure 4. Walkway through the mangroves.
Photo credit: Jason Senyk*



Planning, implementation and capacity development

Conservation and restoration efforts of Pred Nai villagers, led by PNCFG and its successor Pred Nai Mangrove Conservation and Development Group (PNMCG), had two main objectives: 1) halting destructive logging and shrimp farming activities that threatened to destroy local mangrove forest and the terrestrial and aquatic wildlife that depends upon mangrove habitat; and 2) implementing management and conservation measures to protect and sustain populations of economically important species for villagers and protect environmental quality of mangrove ecosystems. These approaches were key to the work of PNCFG to achieve sustainable use and restoration of their local mangrove forest (Senyk, 2005). As expressed by Amporn Phetsard, Chairman of Pred Nai Mangrove Conservation and Development Group in 2009, “If we take good care of our mangrove, we also take good care of our food factory.”

Principles for mangrove forest ecosystem restoration were adopted that reflect the broad socio-environmental goals of the Pred Nai villagers (Box 1). Throughout the



Figure 5. Fish houses constructed of rubber tires. Photo credit: RECOFTC

Box 1. Principles for mangrove forest restoration (from Thaworn et al. 2010)

- ▶ Restoration must be carried out in consistence with the natural ecosystem including plant species existing in each area
- ▶ Restoration is a combination of planting new trees and regeneration of naturally existing species
- ▶ Mangrove forest is to be managed in connection with the land and marine ecosystem
- ▶ Restoration emphasizes participation of multiple stakeholders including forest product gatherers and other forest users, people in the community, government agencies and nearby communities
- ▶ Regularly monitor and assess forest conditions
- ▶ Strengthen management capacity of community organizations
- ▶ Promote gender equality and forest users
- ▶ Connect the community's economic and welfare systems with forest restoration and management process through the savings group

process of implementing these goals and developing partnerships with many agencies and organizations, the villagers gained capacity in many ways and became key leaders of conservation and restoration efforts in neighboring areas of Pred Nai and Trat Province. Villagers moved beyond protection of the mangrove forests and their species to more proactive methods of management. A key feature of the implementation efforts over time was the integration of conventional scientific knowledge and local ecological knowledge. Village elders and crab collectors offered the highest quality and quantity of ecological knowledge within Pred Nai Village (Senyk, 2006).

In 1987 Pred Nai villagers conducted the first mangrove restoration activity by planting trees in areas where the mangrove forest had been removed or damaged by the logging and aquaculture companies. The community received support in the form of saplings and training from the RFD (Senyk, 2006). Villagers used a restoration method they have used in the past based on local knowledge, involving planting seeds by hand to mimic how mangroves naturally propagate. (Senyk, 2005). In other mangrove areas, strict village protection was sufficient to allow trees to regenerate naturally (Figure 6).

Harvesting regulations for the Grapsid crab (Figure 2) were developed in 1997. These involved closing the harvest during the breeding period in October. These small crabs are collected mainly for sale. For the other economically important species of Mud crab (*Scylla serrata*), villagers set out to increase production by starting a “crab bank.” People who caught egg-bearing crabs were asked to put them in one of the cages established by the management group in the canals. (Kaewmahanin et al., 2008). In the first year, 29 egg-bearing crabs produced millions of young crabs, which were raised in a nursery pen until they were strong enough to survive in the mangrove area (Soontornwong, 2006).

The community constitution, developed in the year 2002, later halted crab harvesting during the reproduction period in October, using the motto “Yoot jab rouy, khoy jab laan” (Stop hundred catching, wait for million catching)” (Soontornwong, 2006). Community members were not allowed to use pesticides or harvest small crabs. Outsiders who wanted to catch crabs in Pred Nai had to request permission from the committee and were required to follow strict regulations (Soontornwong, 2006).

Since its formal inception in 1988, PNCFG (Figure 7) showed a great interest in technical and academic support and training, and



Figure 6. Young mangrove trees regenerating along a canal. Photo credit: Jason Senyk



Figure 7. Committee meeting of the Pred Nai Community Forest Group in 2005. Photo credit: Jason Senyk

they often preferred capacity development over direct financial funding. This eagerness to gain knowledge and capacity is further borne out by the many linkages that Pred Nai has formed with important knowledge partners such as the TRF (Thailand Research Fund), RECOFTC, and universities across the country (Senyk, 2006). Villagers sought help in developing a management plan from RFD and RECOFTC. Using a participatory approach, the PNCFG developed a restoration and management plan with support from RECOFTC (On-Prom, 2014). Preparing the management plan involved mapping the remaining forest resources, based on traditional knowledge of the local communities, and undertaking a careful needs-based assessment of the restoration process. The plan broadly focused on identifying priority areas for restoration and protection of mangroves, regulating resource harvesting, and implementing measures to strengthen institutional and networking frameworks (Silori et al., 2009).

The village began to implement the mangrove forest management plan and associated agreements and regulations in 2000. Agreements included adoption of rubber structures made out of used tires (Figure 5), increasing the sustainability of fishing tools and methods, and building sediment ponds for sustainable shrimp farming (Thaworn et al., 2010).

Management activities incorporated innovative partnerships and a wide range of participants. After the mangrove concessions ended, local users were not allowed to harvest any products, which caused resentment and conflicts. After discussions with community members, villagers slowly began experimenting with less restrictive management, and the committee became more inclusive. Some villagers who were interested in cultivating the Mud crab formed a group to increase production.

In addition to exchanging ideas among themselves, villagers interacted with fishery researchers who specialize in crab aquarium breeding. Partnerships were established with people from other villages who wished to use the resources. Villagers set up a People's Mangrove Forest Network that met in different villages on a rotating basis. Through this network, villagers gained experience working collaboratively with outside actors, such as fishery experts, foresters and other institutions (Kaewmahanin et al., 2007).

Pred Nai villagers took action to prevent destructive fishing practices and experimented with thinning the dense natural stands of *Ceriops*. The villagers exchanged ideas with fishery researchers to help with the monitoring methods and the collection of relevant data.

(Kaewmahanin et al., 2007). In 2002, studies were conducted on changes of black crab populations, and the erosion of the seafront was monitored as a research study conducted together with TRF (Thaworn et al., 2010).

To achieve their broad management goals, over time the PNCFG established key partnerships with organizations and agencies that operate from sub-district to international scales (Figure 11). These include working with the Tambon Administration Organization, a sub-district level government organization created to assist with decentralization and to serve as an intermediary between local villages and national level government agencies (Senyk, 2005). The Tambon Hung Nam Khao and Ao Yai Network, was established in 2004 with funding by the United Nations Development Project. In addition to the networking between communities, the Hung Nam Khao and Ao Yai Network's primary goal is reforestation within the two sub-districts. Since Pred Nai's section of the sub-district is largely forested, the village serves the network in an advisory capacity and helps with capacity building. UNEP provided funding for the network (Senyk, 2005).

In 2010, PNMCG used their Community Conservation Fund to purchase barren land located between an existing shrimp



Figure 8. Mangrove reforestation site in Pred Nai in 2011 (top) and 2018 (bottom).
Photo credits: Kanchana Wiset (top) and Mangrove Action Program (bottom)

Box 2: Timeline (adapted from Kaewmahanin et al. 2007)

1985: Villagers become concerned about impacts of mangrove logging concessions and shrimp aquaculture

1986: Villagers form group to stop logging and shrimp farming

1987: Logging is halted

1995: Village Savings Group formed

1995: Pred Nai Community Forestry Group informally established

1997: Grapsid crab harvesting regulations implemented

1998: Pred Nai Community Forestry Group formally established

1999: Funds from SIF received and partnership with RECOFTC to support development of mangrove forest management plan

2000: Initiation of RECOFTC Participatory Action Research Project

2003: Development of the Community Coastal Resource Management Network

2002: Pred Nai community constitution developed

2004: Tambon Hung Nam Khao & Ao Yai Network established; expansion of Mangrove Management network to four coastal provinces; Pred Nai Village awarded UNDP Equator Initiative Prize

2005: Pred Nai Community Mangrove Forest Management fund established

2010: Community Conservation Fund used to restore former shrimp farms on community-managed land

2011: Network of six Community-based Learning Centers established by Mangroves for the Future project funded by Norad

2017: Pred Nai Village welcomes delegation including the Ambassador of Sweden to Thailand, Ambassador of Switzerland to Thailand, representatives from the Royal Norwegian Embassy, Bangkok and the Swedish International Development Cooperation Agency

farm and a restored mangrove area. Youth volunteers collected and planted 6,000 propagules of three mangrove varieties (*Rhizophora mucronata*, *Rhizophora apiculata*, and *Ceriops tagal*) on 7.2 ha of community-managed land (Figure 8; RECOFTC, 2012).

In 2011, RECOFTC and Norad launched the first phase of the Coastal Resource Management through Community-based Learning Centers project (CbLC) (Figure 9), which will earmark US\$150,000 to train communities in six sub-districts. The project is part of the larger US\$5,650,000 Mangroves for the Future regional tsunami initiative. The CbLC plans to restore over 5,000 ha of mangrove forest, which will serve as a greenbelt, carbon sink, and income source for communities from seafood (RECOFTC, 2011a). This project represents a wide-scale expansion of the Pred Nai model to neighboring communities, with a focus on addressing the local impacts of climate change (UNDP, 2012).

Education, communication and outreach

Education and outreach have been emphasized by Pred Nai villagers for over 30 years. Early on, the community built a learning center in the village school to provide an opportunity for students, and other villagers, to learn about their local environment from perspectives of both conventional science and local ecological knowledge (Senyk, 2006). Word about the successful mangrove conservation and restoration practices initiated by Pred Nai villagers began to spread, first to surrounding communities and then far beyond. With the assistance of RECOFTC and the RFD, the village conservation group began hosting leaders from villages all over Thailand. Visitors learned about the organization and methods used by the PNCFG (Senyk, 2005).

Sharing knowledge and experience related to community-based forest management was important in the development of the Trat Provincial Forestry Network and the Community Coastal Resource Management Network of Trat Province, a network operating at the provincial level and focusing on communities on the coast of the Gulf of



Figure 9. A young member of Pred Nai shows visitors botanical collections in the Community Learning Center in 2018. Photo credit: Mangrove Action Project

Thailand. This network was created to share knowledge and experience among communities in the areas of conservation and resource management and to provide a strong critical mass for gaining political influence. The leader of the Pred Nai group was elected as leader of the network after its inception, highlighting the leading role Pred Nai played among neighboring communities (Senyk, 2006). In 2009, reflecting the importance of outreach, Amporn Phetsard, Chairman, Pred Nai Mangrove Conservation and Development Group stated, “We’re proud of Pred Nai’s success. But we would like to see the natural resources that are left in the country taken care of seriously.”

Sharing their knowledge with other communities and government agencies was also important for preserving the community’s local environmental knowledge. Pred Nai’s prohibition on collecting Grapsid crabs during the spawning season has been applied in many other communities, in part due to Pred Nai’s willingness to share their success stories and their knowledge of Grapsid crab breeding cycles (Senyk, 2006). In 2000, RECOFTC organized and funded a study tour for the leadership of Pred Nai to travel to community-forestry sites in other areas of Thailand. This trip helped the members from Pred Nai to learn about problems and

successes in other communities and also facilitated the building and strengthening of relationships, not only between communities, but also amongst the members of Pred Nai (Senyk, 2006). In 2003, the Asia-Pacific Economic Community (APEC) sponsored a group of school children from various countries to attend an environmental camp and carry out fieldwork at Pred Nai. Students learned about mangrove and coastal resources, generating a strong sense of pride in the community (Kaewmahanin et al., 2008). The experiences from Pred Nai are being shared and expanded into surrounding villages through a network of six Community Learning Centers (Figure 9) as part of a US\$150,000 Mangroves for the Future (MFF) project implemented by RECOFTC and partners (RECOFTC, 2011b).

Outcomes and impacts

Locally, the actions taken by Pred Nai villagers led to the restoration and protection of 1,920 ha of coastal mangrove forest (UNDP, 2012). These local actions directly stimulated efforts at the regional, provincial, and national levels that supported mangrove restoration and community-based sustainable management activities. Moreover, these efforts are significant for climate change mitigation, as mangrove forests store up to four times more carbon than most other tropical forests (Donato et al., 2011). In 2010, the Good Governance for Society and Environment Institute found that mangrove forest restoration by the community helped absorb 1,205 tons of carbon dioxide per year. (Thaworn et al., 2010). The community-managed mangrove forest in Pred Nai Village absorbs 1.85 metric tons of carbon dioxide per person per year, more than double the non-communal forest absorption rate of 0.91 ton per person per year (Towprayoon, 2016).

This substantial regeneration of mangrove forest has enabled the return of wildlife species to the coastal area. Many water birds like the Painted Stork (*Mycteria leucocephala*), Purple Swamphen (*Porphyrion poliocephalus*), Purple Heron (*Ardea purpurea*), Grey Heron (*A.*

cinerea), Indian Whistling Duck (*Dendrocygna javanica*), and Brahminy Kite (*Haliastur indus*) are returning. Crab eating Macaque (*Macaca fascicularis*) and Razor Clams (*Solen strictus*), known locally as Hoi Lod, were absent from the area for twenty years, have also reappeared thanks to improved ecological conditions in the mangrove forests (Kaewmahanin et al, 2008; UNDP, 2012; Figure 10). Fruit bats (*Macroglossus minimus*) that feed on nectar of the mangrove tree *Sonneratia* spp, red squirrels, the mudskipper (*Boleophthalmus boddart*), fireflies (*Pteropteryx tener*), and many water birds are sighted more frequently now in the mangrove forests. Stocks of crab, shellfish, and fish all increased (Silori et al., 2009). Bees are returning to the mangrove area as the variety of trees has increased. Villagers collected more than 1,000 liters of honey, earning more than 100,000 Baht (US\$2,433) in the first six months of 2005 (Soontornwong, 2006).

Restoration and management efforts in Pred Nai village directly reduced poverty and facilitated local economic development through increases in the crab harvest, utilization of non-timber mangrove forest products, and the establishment of a Village Savings Fund (Senyk, 2006). Poorer community members were immediate beneficiaries of the sustainable management of mangrove resources, as crab collecting

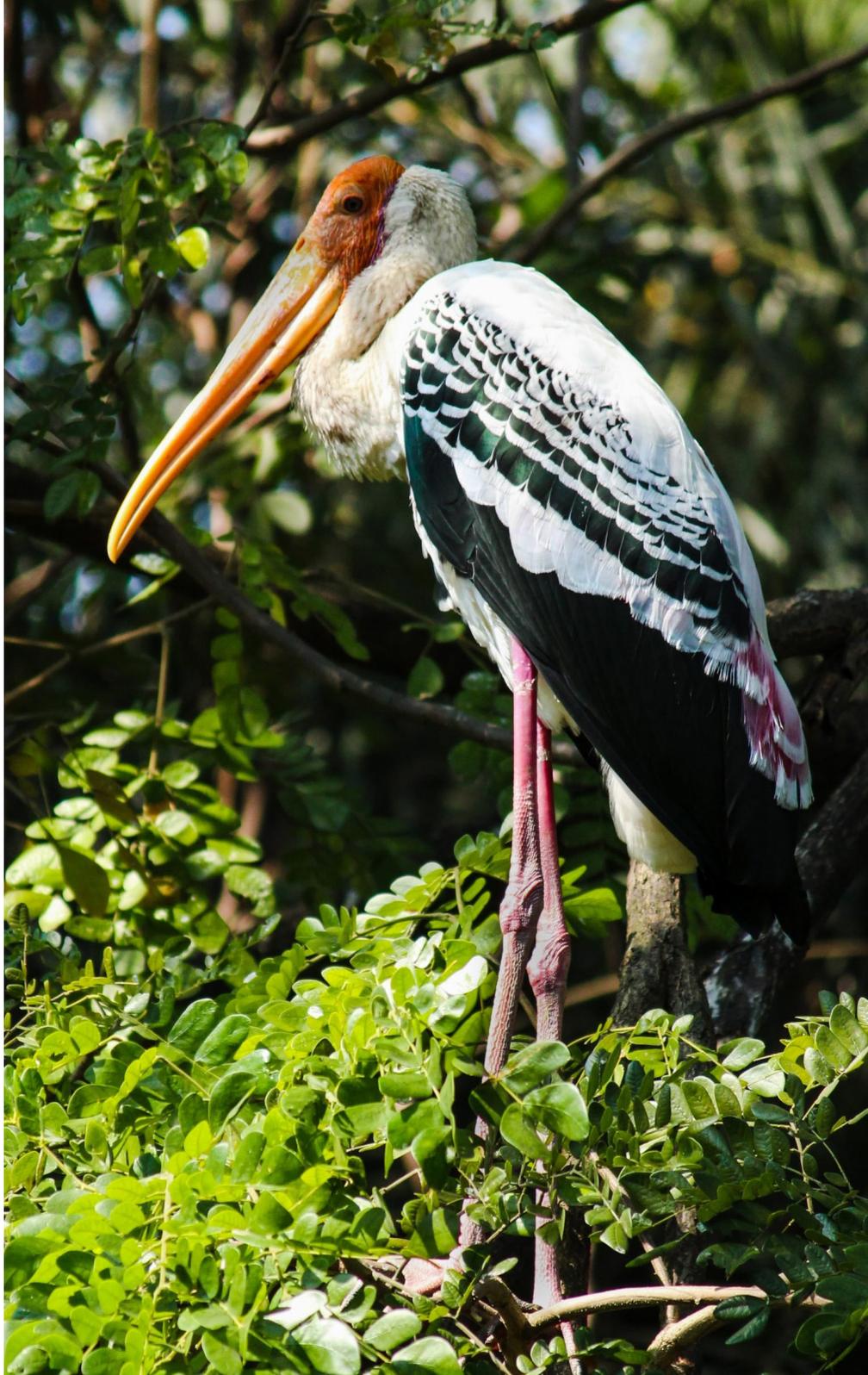


Figure 10. (Left) The Painted stork (*Mycteria leucocephala*) and (Above) Crab eating macaque (*Macaca fascicularis*) are some of the native wildlife that have returned to the Pred Nai mangrove ecosystem. Photo credits: Tahsim (stork) and Peter Prokosch (macaque; <https://www.grida.no/resources/3494>).

is an important economic activity for low-income households in the village (UNDP, 2012).

Harvests of Grapsid crabs (Figure 2) almost doubled from approximately 8 kg per day per harvester in 1998 to 15 kg per day in 2004 after regulations were introduced to prohibit harvesting during the crabs' breeding period (Soontornwong, 2006; Kaewmahanin et al., 2007). Anecdotal evidence supplied by villagers suggests that the income level of villagers involved in crab collecting almost doubled during this period as a result of improved catches of Grapsid crabs. Poorer villagers engaged in crab collection could earn 600–700 baht (US\$15–18) per day. Collectors were able to harvest crabs more quickly as a result of greater availability, particularly in the low season, freeing up time for other economic activities (Kaewmahanin et al., 2007; UNDP, 2012). Increased quantity of harvest also provided employment opportunities to villagers; the number of harvesters increased from 6–7 persons per day around 1998 to nearly 70 in 2009 (Silori et al., 2009). The PNCFG also initiated activities for opening social spaces for the poor and for women to participate in the process of increasing their social and economic equity through participation in the Mangrove Herbal Production Group and the Village Savings Group (Soontornwong, 2006). Through collective action and awareness

raising, the Pred Nai villagers improved human, natural, and financial capital. Fundraising for forest management activities through the Village Savings Fund generated a collective understanding of the importance of sustainable mangrove forest management (Thaworn et al., 2010). Women actively participated in the Forest Management Committee as well as in the Village Savings group, including taking leadership positions (Kaewmahanin et al., 2007).

By 2004, the Village Savings Group, formed in 1995, had more than 600 members and a total of nearly 6 million THB (about US\$72,000) in the fund. Other community organizations were established, such as a women's group, a youth group, and a network of people from various villages who use the mangrove area. The management initiative also encouraged other villages to set up community forests (Kaewmahanin et al., 2008). Moreover, these activities motivated villagers to monitor their mangrove forests themselves (Soontornwong, 2006). Strengthening of community-based management institutions led to a growing sense of ownership as the harvesters became resource managers. Through this collective learning process, Pred Nai villagers broadened livelihood sources to include managing herbal products, collecting honey and harvesting other local foods

(Soontornwong, 2006). Community action also increased confidence to engage in ecotourism activities (Kaewmahanin et al., 2007).

Community leaders became empowered to develop partnerships with outside agencies that helped to generate more resources and support from government agencies and from non-governmental organizations. Overall, 17 groups or organizations outside of Pred Nai Village became engaged in different ways in the process of mangrove forest management (Thaworn et al. 2010; Figure 11). The most lasting impacts emerged from the formation of three community forestry networks at the district, provincial, and regional scales: the Community Coastal Resource Management Network (within Trat province), the 4-province network (four coastal provinces of Trat, Rayong, Chantaburi, and Chonburi), and the Tambon Hung Nam Khao and Ao Yai network (two sub-districts of Hung Nam Khao). All of these networks facilitate communication, dialogue, and knowledge sharing across communities and national and provincial branches of government (Senyk, 2005).

Pred Nai village's efforts in outreach and improving local socio-environmental status were recognized by outside organizations over the years. The PNCFG received the Green Globe Award in 2001 (On-Prom,

2014). In 2002, Pred Nai Community Forest was awarded a prize by the Royal Forest Department (Kaewmahanin et al., 2008). Pred Nai received an Equator Initiative Award from UNDP in 2004 in recognition of the village's sustainable development solution (Senyk, 2005; UNDP, 2012).

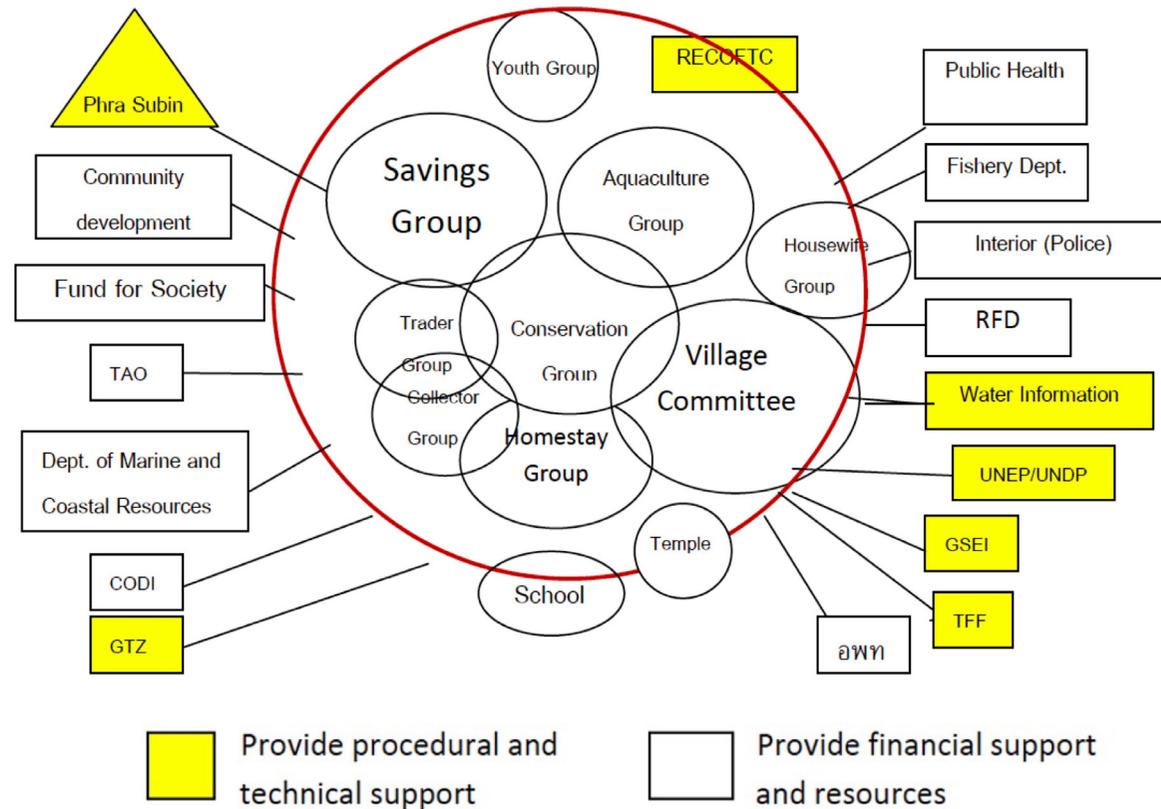


Figure 11. Relations between external actors, groups, and organizations that played a role in conservation and restoration of Pred Nai Village's mangrove forest. Source: Thaworn et al. 2010

In 2017, Ambassadors of Sweden and Switzerland in Thailand visited Pred Nai to learn about their mangrove restoration efforts (Persson, 2017). Pred Nai's successful example of community-based mangrove forest management received substantial attention at the national and international levels, lending substantive support to calls for the devolution of forest management to the community level in Thailand and other Asian nations (UNDP, 2012). The Community Forest Bill was eventually passed in November 2007 by Thailand's National Legislative Assembly. While there is still no recognition for community forests within protected areas, the bill built on many of the most successful aspects of the Pred Nai initiative (UNDP, 2012).

Key challenges

Early on in the mangrove forest management process, the socially and economically heterogeneous village of Pred Nai experienced serious internal conflicts regarding the emphasis of management activities on conservation vs. sustainable use. Discussion and negotiations led to compromises, and a democratic change in the leadership committee shifted emphasis from conservation towards increased and sustainable use and equity among village members. (Kaewmahanin et al., 2007). Even with these considerations, poorer members of the community chose to engage more in passive rather than active ways and were not involved in large-scale decision making (Soontornwong, 2006). Additional challenges involved continued threats to coastal ecosystems from outside agents, including illegal encroachment for settlement and expansion of shrimp aquaculture. Large fishing trawlers come inshore illegally and damage the seafloor with their nets, destroying fish habitat. Villagers worked together with the responsible government departments to patrol coastlines and reported violation of the rules but with limited success in halting these illegal activities (Senyk, 2006). A small community located in the sub-district north of the village used fish traps with a

small mesh size in the river which forms the boundary with Pred Nai's section. These actions violated rules of the conservation group forbidding the catching of small fish, upsetting Pred Nai villagers (Senyk, 2006). Initially, the customary uses of mangrove resources by Pred Nai village were not recognized by governmental authorities. In the late 1990s, the RFD granted usufruct rights to the Pred Nai community, which can manage and use the resources. All forests of Thailand remain under state ownership; restrictive and intrusive national legislation can potentially usurp the rights and efforts of the local villagers in the name of the national interest (Kaewmahanin et al., 2008). Gains in local empowerment and community-based management could easily be lost. Finally, a challenge facing Pred Nai as well as many other community-led initiatives is how to sustain engagement with future generations. Youth are critical assets to the reforestation project and overall community functioning (Figure 12). As one PNCMG member stated, "The future of these forests depends on our children." Out-migration of youth to urban areas and lack of involvement in village activities threaten continuity of leadership and community cohesion in the long term in Pred Nai and other villages within Trat Province (RECOFTC, 2012).



Figure 12. Village elders meeting with children. Photo credit: Jason Senyk

Enabling factors and innovations

When villagers were asked why they thought that Pred Nai had been so successful in their conservation and management efforts, the three most common responses were: unity of the community, leadership within the community, and support from outside organizations (Senyk, 2006). These responses reflect the key importance of social and human capital in Pred Nai's restoration and management efforts. Pred Nai's success in community-based conservation can be attributed to the grassroots democratic nature of the PNCFG. All residents of Pred Nai are considered to be members of the conservation group and all adults are allowed a vote at the monthly meetings (Senyk, 2006). Village and PCNFG leaders are well respected within the community for their knowledge and experience. Their role remains largely to guide the conservation group and act as its representatives in dealings with government, NGOs, or other outside agencies (Senyk, 2006). "Pred Nai developed a strong village network, a strong sense of identity, and a willingness to put in the effort required to successfully manage the mangroves. This is considered a good base for grassroots action" (Soontornwong, 2006, p. 198). "The

grassroots nature of this project required strong leadership within the community since initially there was no outside support available and the community was on its own to take action. Village leadership played an important role in order to inspire and unify the people of the community to action; and to act both as a focal point for decision making power and a voice for the community to outside agencies" (Senyk, 2006, p. 78). Village cohesion was strengthened by creating opportunities for poor and marginalized groups to become involved in initial management activities, such as formulating crab harvesting regulations. This engagement empowered the participation of these groups as key stakeholders in management and conservation efforts (On-Prom, 2014). The village effectively leveraged social capital to increase natural assets, raise financial capital, and take actions beyond their local village. They diversified livelihoods through effective management of diverse natural resources provided by restoring and conserving mangrove ecosystems. They developed key horizontal and vertical institutional linkages through many partnerships that extended their financial resources and extended their impact in the Trat region and beyond (Soontornwong, 2006). Engagement with RECOFTC and other NGOs, government agencies, and communities

was critical for building capacity as well as receiving legal, institutional, and technical support (Senyk, 2006). Proactive community leaders knew how to compromise with and negotiate among different actors in the community (Soontornwong, 2006). Through building capacity and self-instruction, villages developed their own abilities to solve problems, and learned new ways to manage resources, govern their village and improve their own lives (Kaewmahanin et al. 2008). The Village Savings Fund provided capital, training, and credibility to community enterprises, allowing the village to take small, practical steps while they developed greater capacity and strengthened village networks. This fund enabled the community to proceed unhindered by the limitations of their own personal finances. When the community later received external funds, they were already involved in conservation and management activities and had already begun establishing an organizational structure and had developed valuable skills that helped them to succeed in future formal funding arrangements. Funding agencies were therefore able to capitalize on existing capacities within the community and to increase the chances of success (Senyk, 2006). Local ecological knowledge of village members was an important tool for planning and implementing conservation

and management efforts. The village elders and crab harvesters, in particular, stood out for their contributions. Sharing of knowledge was a key principle held by villagers, essential for transmitting values and practical knowledge to younger generations through the village school and annual summer camps (Senyk, 2006). Local ecological knowledge was more useful for management of mangrove resources in Pred Nai than for implementing mangrove restoration, where government agencies provided needed practical knowledge (Berkes et al., 2007).

Parting shot

“It’s our legacy to be treasured by future generations. We have to protect it. It’s as if we are taking care of our elders. We must help each other to conserve it.”

—Manot Peung Rang, Pred Nai Village Headman (2009)





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Key lessons learned

- ▶ *Fundamental livelihood needs of local communities can drive collective action to protect and restore ecosystems.* Collective action can initiate protection and restoration of ecosystems and resources where and when government agencies cannot. It may be able to alleviate problems caused by government agencies and policies, such as with the charcoal logging concessions and shrimp farm promotion (Kaewmahanin et al., 2008). Self-initiated capacity building in communities, although often limited in depth and breadth, promotes conservation and management efforts (Senyk, 2006).
- ▶ *Partnerships and institutional linkages on all horizontal and vertical levels are critical to achieve the sustainability of conservation and development activities.* In Pred Nai Village, the PNCFG incorporated innovative partnerships and a wide range of participants that enabled scaling up of community actions and promoted their sustainability (Kaewmahanin et al., 2008; On-Prom, 2014)
- ▶ *Locally initiated restoration and natural resource management can reduce poverty and increase social equity within communities.* Community-initiated conservation improved livelihoods and increased incomes of poor members of the community (Kaewmahanin et al., 2008).

Unless the conservation and development efforts provide benefits for individuals and communities, the goal of sustainability is difficult to achieve (On-Prom, 2014).

- ▶ *Local ecological knowledge is the foundation for environmental stewardship.* Community members' knowledge of the mangrove forest allowed them to create harvesting rules that were relevant to local ecological conditions, thereby helping the community conserve a resource that supports livelihood needs for 80% of Pred Nai villagers (Senyk, 2006)
- ▶ *Restoration and resource management require proactive approaches that move beyond protection and conservation and provide opportunities for integrating conventional scientific knowledge and local ecological knowledge.* Sharing knowledge with other communities and government agencies also preserves the community's local ecological knowledge (Senyk, 2006).
- ▶ *Mangrove reforestation provides an attractive option for both climate mitigation and adaptation.* Restoring and regenerating coastal forests leads to multiple benefits, including carbon storage, protection against extreme flooding events, and improved livelihoods for villagers. (UNDP, 2012).



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**Learn
more**

Further information and resources

Video: Voices of the Forest

<https://www.youtube.com/watch?v=SORScA9vmrk>

Video: Battlefield Earth, visit to Pred Nai Village

<https://www.youtube.com/watch?v=lanjSsVOLF4>

Video: Mangrove Forest at Ban Pred Nai

<https://www.youtube.com/watch?v=kxX7z9PKq-g>

Video: Forests, local knowledge and livelihoods (Pred-Nai section begins at 7:54). This film, produced in 2000, was a joint production of the International Fund for Agricultural Development (IFAD) and the Regional Community Forestry Training Centre (RECOFTC), in cooperation with the Office of Extension and Training, Kasetsart University, Bangkok.

<https://www.youtube.com/watch?v=hTfxPONy8G8>

Videos Mangrove Action Project

<https://mangroveactionproject.org/portfolio-video/>

Slideshare: Mangrove management in Thailand

<https://www.slideshare.net/ratkaweeboonmake/mangroves-management-in-thailandpresentation-for-jica-workshop-nov-4-10-2012final>

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