Concurrent Conservation and Development: Lessons Learned From a Community-Based Case in Thailand

By

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Abstract

Community-based management holds the potential to simultaneously deal with the multiple objectives of community economic development and the conservation of natural resources. Pred Nai Community Forestry Group based in the coastal mangrove forests of Thailand was recognized by the UNDP in 2004 as an example of a successful case of community-based management. The overall purpose of this research was to study the Pred Nai group in order to learn about the institutional and organizational characteristics, and the cross-scale linkages that facilitate community-based management. This qualitative research was carried out during four months of fieldwork in rural Thailand using interviews and participant observation.

Pred Nai Community Forestry Group has been working toward the sustainable use and restoration of the local mangrove forest. The principal means they have employed includes the restoration of formerly logged and degraded areas and the development of a forest management plan. In addition to stopping the loss of existing biodiversity, their efforts have also resulted in the return of many formerly displaced native fauna, including species of wetland birds and monkeys.

Pred Nai's conservation efforts have also had a direct impact on alleviating poverty and facilitating local economic development. This has come about through the improvement of yields in the local crab harvest, the utilization of non-timber forest products from the mangroves, and the establishment of a village savings fund to assist with social and economic development initiatives. The restoration and conservation of mangrove forests has improved the long-term sustainability of the villagers' economic activities.

Research on Pred Nai's community-based management program revealed the importance of the following factors:

1. Availability of funding to proceed in small, practical steps;
2. A village savings group that provides capital, training, and lends credibility to the community;
3. Step-wise evolution leading to formal management;
4. Step-wise evolution allowing for capacity building over time;
5. Interplay of leadership, community cohesion and NGO support;
6. Leadership as key to grassroots movement;
7. Partnership with a key organization for building capacity and establishing linkages, in this case, RECOFTC;
8. Horizontal learning among communities as the key to replication of experience, and;
9. Local ecological knowledge as the foundation for environmental stewardship.

The community did not immediately assume full responsibility for the management of the mangroves, but instead progressively assumed a greater role over time as the community built capacity and gained experience. Strong leadership within the community also played an important role as it ensured that the community members remained united in support of Pred Nai's conservation and management efforts. It was found that Pred Nai has formed numerous important linkages with external organizations, i.e. government, NGOs, and other communities, at the sub-district, provincial, national and international levels. Networking and other forms of horizontal learning between communities also played an important role in the replication of Pred Nai's successful initiative in other communities. Local ecological knowledge also played a role in Pred Nai's success as the community members' knowledge of the mangrove forest allowed them to create rules which were relevant to local ecological conditions, thereby helping the community to conserve a resource that provides at least part of the livelihood needs for 80% of Pred Nai villagers.

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Table of Contents

List of Tables

List of Figures

List of Plates

List of Acronyms and Abbreviations

CODI:	Community Organization Development Institute
DMCR:	Department of Marine and Coastal Resources
GEF:	Global Environment Facility
LEK:	Local ecological knowledge
PAR:	Participatory Action Research
RECOFTC:	Regional Community Forestry Training Center for Asia and the Pacific
RFD:	Royal Forest Department
SGP-PTF:	Small Grants Programme for Operations to Promote Tropical Forests
SIF:	Social Investment Fund
TEK:	Traditional ecological knowledge
TAO:	Tambon Administration Organization
TRF:	Thailand Research Fund
UNDP:	United Nations Development Programme

Chapter 1: Introduction

Plate 1: A formerly logged area in Pred Nai's mangrove forest. The trees in the foreground were replanted approximately 10 years after this area was logged.

Plate 2: A typical fish pond within Pred Nai. The mangrove forest is visible in the distance.

1.1 Background

The problems of ecological degradation and poor economic development have often been dealt with separately as if they were two unrelated issues. While there has been progress in recent years, in the past conventional thinking from within both the conservation and development perspectives viewed the two goals as antagonistic. Conservationists saw development as a threat to conservation while the development perspective viewed conservation as an obstacle to development (Brown, 2002). As a result of these opposing views, ecological degradation was dealt with by conservation organizations and governments through the creation of protected areas which excluded local resource users. These top-down, government implemented initiatives have enjoyed limited success (Agrawal & Gibson, 1999; Dietz et al., 2003). On the other hand, common approaches towards economic development also involved large-scale, top-down approaches by national governments and international development organizations. In many cases, these have met with failure as they have usually failed to take into account economic, ecological and social realities within communities and/or failed to meet the needs and desires of the people that they purported to assist.

Despite separate goals, conventional approaches to economic development and ecological conservation hold numerous characteristics in common. First, they are top-down. This means that the projects are designed and initiated by higher levels of government or international organizations and then implemented within local communities, usually without consultation and with little consideration of local circumstances. This contributes to the second characteristic, the exclusionary nature of

these projects due to their prescriptive means of design and implementation which fails to recognize the needs and priorities of community members who are supposed to benefit from development.

The limited success of these "top down" initiatives has led to the implementation, in recent decades, of completely new approaches to development and conservation. Chief among these is the strategy known as community-based resource management (Brown, 2003a; Brosius et al., 1998). Rather than taking a top-down, prescriptive or mechanistic approach to addressing the problems in rural areas of the developing world, community-based resource management is participatory in nature and takes a more holistic, integrative approach to the problems facing communities (Berkes, 2004). Community-based management can be considered holistic and integrative because it is generally designed with multiple objectives, dealing with the numerous problems which the community in question may be facing and often adapting and changing over time. This is opposed to top-down approaches which tend to be rigid, difficult to change, and designed with very specific objectives which sometimes conflict with the interests of the community. The holistic, integrative nature of these projects comes about largely because they are participatory, and the goals and objectives are, therefore, defined by the very people who are faced with the consequences of poverty and ecological degradation (Brosius et al., 1998). Community-based management can be seen as a form of management which is flexible, adaptive and responsive to the many needs of the community. In other words, community-based resource management projects have the capacity to simultaneously deal with the multiple objectives of community economic development, and the conservation/sustainable use of natural resources.

The incorporation of ecological conservation and poverty alleviation as multiple objectives in development projects acknowledges the fundamental linkages that exist in social-ecological systems. Community-based management, by recognizing and working with the linkages between social and ecological systems at the operational level, has an excellent opportunity to achieve both objectives.

A new initiative designed to reward community level development programs which are successful in conserving biodiversity and at the same time alleviating poverty and generating sustainable livelihoods was born in 2002, when the United Nations Development Programme (UNDP) held the first round of Equator Initiative Awards. The Equator Initiative recognized the fact that the tropical region of the earth holds the Earth's greatest resources of biodiversity and also many of the world's poorest nations (UNDP, 2004). Thus the two cycles of the biennial award, 2002 and 2004, have each provided numerous examples of community-based management and conservation programs which were successful in both conserving biodiversity and utilizing it to reduce poverty and provide sustainable livelihoods for their community (Koziell & McNeill, 2002).

1.2 Purpose

The overall purpose of this research was to study a successful example of community-based resource management and learn about the institutional and organizational characteristics, and the cross-scale linkages that contributed to the success of the project.

Community-based and collaborative forms of management between government institutions and local communities are becoming a more common form of natural resource management and conservation throughout the world (Berkes et al., 2003). The increased implementation of community-based management programs, however, has not resulted in resounding successes on a widespread, continuous basis, as originally expected. Results from community-based management and conservation programs have thus far been mixed at best, with both successes and failures documented (Smith & Berkes, 1993; Barrett et al, 2001). Thus, an important area of research is the study of the conditions and organizational structure under which community-based resource management works (Berkes, 2004; Brosius et al., 1998; Koziell & McNeill, 2002).

As one of the 27 finalists in the United Nations Development Programme 2004 Equator Initiative awards (UNDP, 2004), Pred Nai Community Forestry Group (hereafter referred to as the Pred Nai group) in Thailand may be considered an example of a successful community-based resource management initiative. Since successful cases are uncommon (Songorwa, 1999; Barret, 2000; Kellert et al., 2000), the Pred Nai Group is of great interest, in order to learn by example the factors that make it possible for communities to fulfill the dual objectives of generating sustainable livelihoods while conserving biodiversity.

1.3 Objectives

In order to learn lessons from this successful community-based management program, the research efforts focused on analysis of three key elements of the institutional and organizational framework of Pred Nai's conservation group. The three

research objectives which were explored in order to fulfill the purpose of this research were:

1. To examine the role of self-organization within the Pred Nai Community Forestry Group.
2. To examine the cross-scale institutional linkages of the Pred Nai Community Forestry Group
3. To examine how local ecological knowledge is utilized within the project.

First, research was conducted into understanding the self-organizational aspects of the Pred Nai group. Self-organization is a measure of the degree to which a complex system (ecological or social) is able to organize and influence its own structure and characteristics (Holling et al., 2002). Leadership within the community was examined as it is often one of the important factors in self-organization (Olsson et al., 2004). Thus self-organization in this sense refers to the ability of the community in question to organize and implement institutions regarding access and utilization of the local common-property resources.

Second, this research examined the cross-scale institutional linkages present in the Pred Nai group. Cross-scale linkages consist of both vertical (across levels of organization) and horizontal (across space) linkages. Vertical linkages are present in community-based management because the community does not exist in an institutional vacuum; local institutions and authorities will interact with those that exist at other levels of authority including district, state and national levels. These linkages that cross institutional levels are important because effective resource management cannot be conducted at only one scale (Ostrom et al., 2002). The involvement of multiple levels of

authority, therefore, allows for utilization of the competencies of specific institutional levels while mitigating their weaknesses through the inter-connectivity (Pomeroy & Berkes, 1997). Horizontal linkages are concerned primarily with the linkages and connections across space, largely between communities.

Third, the role of local ecological knowledge, its use, and integration with conventional scientific knowledge was examined in this project. There is growing recognition in the academic literature that local and traditional ecological knowledge holds the potential to contribute to natural resource management and conservation (Smith & Berkes, 1993; Berkes et al., 2000; Striplen & DeWeerdt, 2002; Berkes & Folke, 2002). This research will document the manner and mechanisms by which local ecological knowledge was utilized in this project and how it was reconciled with conventional scientific knowledge.

The specific research questions concern:

1. The self-organizational aspects of the Pred Nai group.
    a. Why was the program initiated?
    b. How was the program implemented?
    c. How was the project funded and organized?
    d. What changes and adaptations has the program undergone?
2. Cross-scale institutional linkages:
    a. What are the key organizations/authorities involved in at different organizational levels (local, regional, state, national, international)?

b. What kinds of linkages exist between the Pred Nai group and these other organizations? What is the nature of the linkage (financial, advisory, technical, etc)? Who initiated the linkage?
c. What are the key horizontal linkages? What is the nature of the linkage (networking with other communities, other local level organizations)?

3. The use of local ecological knowledge in conservation and management:
    a. How are local ecological knowledge and scientific knowledge reconciled in this project?
    b. What scientific knowledge/information has been made available to the community and how is it communicated?
    c. What local ecological knowledge was passed on to government representatives/researchers and how is it communicated?
    d. Is equal weight given to both forms of knowledge at various levels of the organizational hierarchy?

1.4 Methods

This research was conducted within the qualitative paradigm as a single-case, case study. The research questions were explored principally through collection of primary data sources. In order to collect the necessary primary data, the researcher spent approximately four months in Thailand; half in the village of Pred Nai itself, collecting and verifying the necessary data. A translator from a nearby university was employed in order to enable the researcher to communicate with local people effectively. Interviews were the primary means of data collection and they were conducted with villagers and

local leaders involved in the Pred Nai Forestry Group, government personnel and other key people involved at various organizational levels. Participant observation in the daily life and livelihood activities of villagers was employed by the researcher in order to gain a better understanding of issues from villagers' perspectives. A number of workshops and one-on-one sessions were also conducted with key informants in order to: probe questions further, confirm data, construct a timeline of the project's development, and diagram the involvement of outside agencies.

This project is one node within a larger research effort to examine successful community-based cases from amongst the projects nominated for the Equator Initiative Awards. The individual research is being conducted by students from the Natural Resources Institute, University of Manitoba in cooperation with IDRC and the UNDP Equator Initiative. Research methodology is expanded upon in greater detail in chapter three.

1.5 Study Area: Pred Nai Community Forestry Group

The village of Ban Pred Nai is located in Section 2, Hung Nam Khao sub-district, Muang district, Trat Province, near the Cambodian border in Southeast Thailand (see **Figure 1**). The village was founded over 100 years ago by approximately 10 families and has grown largely from natural, internal growth. As of 2004, the village was home to approximately 560 people from 130 households (Kaewmahanin, 2004). Nearly all of the residents are ethnic Thai and follow the Buddhist religion.

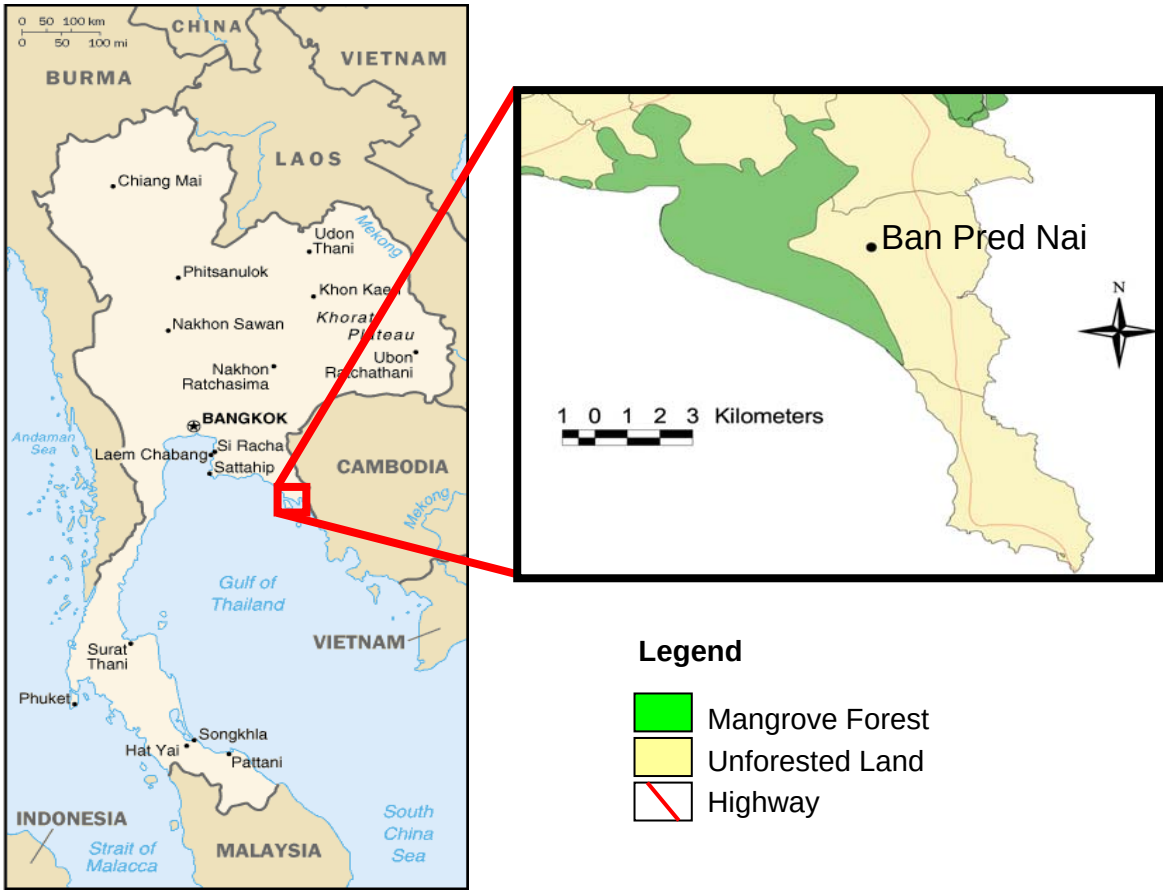


Figure 1: Map showing the location of Ban Pred Nai (Source: http://www.cia.gov/cia/publications/factbook/geos/th.html & GIS data)

The village of Ban Pred Nai is located on a peninsula which extends south from the mainland into the Gulf of Thailand. **Figure 2** clearly illustrates the 1920 hectares of Pred Nai's mangrove forest in green, one of the largest contiguous blocks on Thailand's Eastern Seaboard, visible to the west of the village of Ban Pred Nai. The village, consisting of household yards, agricultural space, and public space, covers approximately 380 hectares, immediately to the east of the mangrove forest (Pred Nai Community Forestry Group, 2003). The mangrove forest near Pred Nai, moving from lowest to highest elevation, follows a general profile of areas dominated by *Avicennia* sp.,

Rhizophora sp., and in the highest elevations by *Bruguiera* sp. Land-use in the region also follows a profile based on elevation and distance from the sea. Moving up from the mangrove forest in the inter-tidal zone one encounters fish farms followed by household yards mixed in amongst fruit gardens. The highest elevations are occupied by a mix of fruit gardens and rubber plantations. The climate is tropical; hot and humid with a monsoon season typically lasting from May to October.

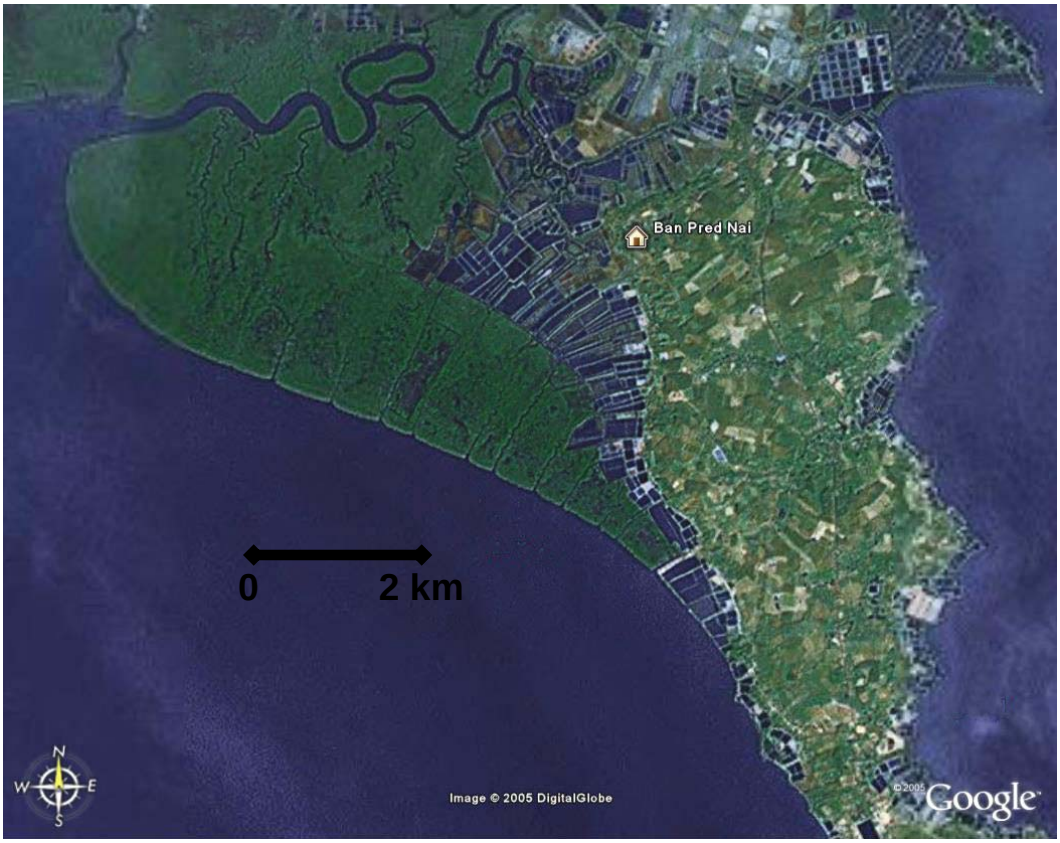


Figure 2: Satellite Image of Ban Pred Nai (Source: Google Earth)

The mangrove forest near the community has been managed by the government through the Royal Forest Department (RFD) as a reserve forest with some small-scale commercial logging carried out. In the mid 1980s the commercial logging in the mangrove forest was intensified and large intensive shrimp aquaculture ponds were

constructed in the newly logged areas by a Thai corporation. The Pred Nai villagers recognized that these large-scale activities would destroy their mangrove forest and, as a result, cripple many local livelihoods which depend on the ecological services of the mangrove forest. The villagers worked together to put a stop to the logging and intensive shrimp aquaculture and protect the mangroves from exploitation by local people. Over time the community became more organized in their conservation efforts and began to reforest and restore their mangroves, and play an active role in management.

Before the start of the large-scale logging and intensive shrimp aquaculture Ban Pred Nai relied on rice agriculture in the lowlands, and fruit and rubber plantations upland as its principal economic activities with livelihoods supplemented by the harvest of resources from the mangrove forest. After the partial destruction of their local mangrove forest and the establishment of large industrial shrimp aquaculture operations most villagers followed in kind and converted their former rice fields to intensive shrimp aquaculture operations once they saw the opportunity for large profits. A small group of villagers forced an end to the logging and corporate shrimp aquaculture through armed resistance and political protest; however, villagers continued to operate their own shrimp farms. In time, the productivity and profitability of the villager's intensive shrimp aquaculture operations began falling due to disease, poor environmental conditions, and the increased inputs required to maintain productivity. The conservation group finally banned intensive shrimp aquaculture within Pred Nai and, over time, the villager's shrimp farms were converted to fish aquaculture operations. Currently, fish aquaculture and fruit and rubber plantations are the principal economic activities in the village.

Another important activity in the village is the harvest of crabs for commercial sale. The two most important crab species are: grapsid crab (*Grapsidae* sp.), a principally terrestrial species that lives in the inter-tidal mangrove forest; and Giant Mud Crab (*Scylla serrata*), a marine crab. The harvest of these commercially important crabs is significant in Pred Nai as there are approximately 20 full-time crab collectors, 25-30 part-time or seasonal collectors, and numerous crab buyers/processors in the village. A small but increasing number of villagers also work wage jobs in nearby towns. Livelihoods are also supplemented by the harvest of resources from the mangroves for household use. Most households claim to own the land they live on, and use for agriculture or aquaculture; however, according to an earlier study by Bos (2002) some of the villagers do not hold legal title to the land but it is instead land which has been in the family for generations with no legal title. In addition, there are approximately five to ten households in the village which are landless and rely solely on the commercial harvest of grapsid mangrove crabs for their household income.

Pred Nai Community Forestry Group has been working towards the sustainable use and restoration of the local mangrove forest. As a result, they have addressed and arrested biodiversity loss. The principal means that they have used include the development of a forest management plan, which includes limits on the timing and techniques appropriate for harvesting crabs, and restoration of formerly logged and degraded areas. The restoration of mangrove forest areas is vitally important as studies have shown that Thailand has lost nearly half of its mangrove forests in the preceding three decades (Barbier, 2000; Huitric et al., 2002). In addition to stopping the loss of existing biodiversity, their efforts have also resulted in the return of many formerly

displaced native fauna. Villagers described the return of many species, including monkeys such as Crab-eating Macaque (Macaca fascicularis), Spider Crabs (Dorippe dorsipes), bats, wild bees, fireflies, and wetland birds. In the words of one of the community's crab collectors, "there are more interesting birds in the mangroves now".

Their conservation efforts have also had a direct impact on alleviating poverty and facilitating local economic development. This has come about through the restoration and improvement of yields in the local grapsid crab harvest, the development of a mud crab bank which returns gravid crabs to the canals to spawn, the utilization of non-timber forest products from the mangroves, and the establishment of a village savings fund to assist with social and economic development initiatives. The restoration and conservation of mangrove forests also improves the long-term sustainability of villagers' economic activities as mangroves are an important fish habitat and provide many valuable ecological services (Rönnbäck, 1999). **Table 1** shows the documented increase in the villagers' harvest of fish and shellfish.

Table 1: Improvements in the harvest of key species

Type	Year 1998	Year 2003
Grapsid crab	8 kg/day/collector (50 Baht = $1.25 USD/kg) (6 collectors)	15 kg/day/collector (40 Baht = $1 USD/kg) (30 collectors)
Clams	10,000 Baht ($250 USD)/ 1 crop / 3 months / 1 family (6 cultivators)	15,000 Baht ($375 USD) / 1 crop / 1 family (20 cultivators)
Mud Crab	5 kg/day/collector (25 Baht = $.063 USD/kg) (5 collectors)	6 kg/day/collector (30 Baht = $0.75 USD/kg) (10 collectors)

Source: Final Report: Building local capacity in forest and natural resources management (Kaewmahanin, 2004).

1.6 Research Significance

This research is significant in several ways. First, it contributes to a better understanding of the social and institutional conditions under which community-based resource management may be successful. Identification of the conditions under which community-based management works has been identified by numerous authors as an area which requires more research (Berkes, 2004; Ostrom et al., 2002). An understanding of the self-organizational characteristics will also include an appreciation for the role and importance of leadership and key people in this project and other factors such as specific community characteristics and organizational patterns.

It is well established in the literature that community-based management does not exist in a vacuum; that the community is connected vertically within an organizational hierarchy, and horizontally with other communities of resource users (Young, 2002; Feeny et al., 1990; Pomeroy, 1995). Therefore, the identification of the cross-scale linkages which are present in this successful program is important as it allows lessons to be learned about the role of NGOs and various levels of government in connection with successful community-based projects, as well as the importance of horizontal linkages, between communities, in supporting community-based projects. It will also bring to light possible policy, administrative, and legal frameworks that governments can adopt in order to facilitate the success of community-based conservation and resource management.

The Pred Nai group was built by local inhabitants incorporating their knowledge into the design and functioning of the program. Thus, by studying this project the researcher will uncover the role of local and traditional ecological knowledge, and

traditional institutions within this community-based resource management setting. This will help to highlight important ways in which traditional ecological knowledge has been utilized successfully in community-based natural resource management. As well, it will offer some insight into the means by which traditional ecological knowledge and conventional scientific knowledge may be reconciled and used in concert to improve future resource management endeavours.

The most significant part of this study is the role that it plays within the network of case studies on successful Equator Initiative projects. When the results from this study are compared and contrasted with the results from the other studies concerning different Equator Initiative projects, general rules and theories may be drafted concerning successful community-based conservation and resource management. Hence lessons from successful projects, such as this, may be valuable in designing and implementing new initiatives as well as creating institutional and policy environments where future projects can succeed.

1.7 Study Limitations

As previously stated, the purpose of this study was to learn about the organizational and institutional framework in place and how it contributed to the success of the project. This research, therefore, proceeded under the assumption that this project was successful, and as such, no attempt was made to evaluate or assess the success of the Pred Nai group.

Organizational and institutional structures in community-based management tend to be flexible and dynamic. This research, however, was conducted over a relatively short

period of time. As a consequence, the results from this research must be recognized as a "snapshot" in time resulting from the context and conditions occurring within the study area during the duration of the research.

Due to the nature of the information sought, this research was designed to utilize a participatory approach to data collection. As the researcher is from a different country and culture from the participants in this research project there may have been some hesitation from community members in accepting the researcher. Since community participation was crucial to this study, any real or perceived cultural barriers may have hindered community participation, and as a result, data collection.

Another barrier in this study was language. Language barriers necessitated the use of a translator which may have limited the depth and breadth of questioning to some degree. The language barrier and resultant need for translation through a third party also contributes to an increased chance of miscommunication of meaning between the participants and the researcher.

1.8 Project Support

Funding was provided by the Social Sciences and Humanities Research Council of Canada through their Canada Graduate Master's Scholarship Program. Dr. Fikret Berkes, Canada Research Chair (CRC) in Community-Based Resource Management, is the coordinator of the Equator Initiative case studies and the supervisor of the research project. The Equator Initiative cases also have partial support from the IDRC and CRC, and research facilities were made available by the CRC.

Chapter 2: Community-Based Management in Context

Plate 3: A portion of the walkway through the mangroves. Pred Nai constructed the walkway with funding from the Social Investment Fund.

Plate 4: A crab buyer sorting the previous night's harvest of grapsid crab.

2.1 Introduction

This chapter will review the relevant literature and provide an outline of some of the key concepts that relate to community-based resource management. The first section of the chapter reviews the literature pertaining specifically to community-based resource management, including defining community, common property resources, and sustainable livelihoods. The second section of this chapter is more abstract, examining the complex interrelationships between social and ecological systems, including resilience, the question of scale, and the use of traditional and local ecological knowledge. The final section in this chapter examines the importance of institutions and organizations in community-based management as well as the role of cross scale linkages between organizations at different levels.

2.2 Community-Based Management

2.2.1 Conservation vs. Development

Within the literature there is a debate currently underway between the proponents of conservation and development as linked objectives and those who see the goals of each as incompatible or antagonistic and advocate one or another separately. The Equator Initiative Award winners and nominees can be seen as amongst the best examples of community-based development programs which have successfully reconciled and achieved the objectives of biodiversity conservation and poverty alleviation.

2.2.2 Community-Based Resource Management

An increasingly common approach to socio-economic development and conservation in many parts of the world is community-based resource management and conservation. Community-based natural resource management, however, is somewhat difficult to define precisely. By its very nature, community-based resource management is dynamic and its form and function will often differ greatly in each community depending on the site and situation of the community in question. Despite the diverse nature of community-based projects, Kellert et al. (2000) identified five characteristics as generally being common to community-based projects. These are:

1. *a commitment to involve community members and local institutions in the management and conservation of natural resources;*
2. *an interest in devolving power and authority from central and/or state government to more local and often indigenous institutions and peoples;*
3. *a desire to link and reconcile the objectives of socioeconomic development and environmental conservation and protection;*
4. *a tendency to defend and legitimize local and/or indigenous resource and property rights;*
5. *a belief in the desirability of including traditional values and ecological knowledge in modern resource management.*

From: Kellert et al. (2000, p. 706)

These five characteristics provide an excellent starting point to understanding community-based management and each one will be discussed in more detail in the following paragraphs.

Community-based management is, by its very nature, participatory. As such, the participation of local people and the incorporation of their views, opinions and goals must be taken into account when managing resources under a community-based program. The arguments in favour of community participation in natural resource management are put

forward as follows: communities recognize that they have a long term need for the resources they use and will manage them for long-term benefit; if communities are involved in conservation and management then the benefits that they receive create incentives for them to use and manage resources more sustainably; and that communities have a closer association with the resources that they use and, therefore, possess a great deal of practical knowledge about the resources and the ecosystems they are associated with (Agrawal & Gibson, 1999).

Legally, nations possess sovereign rights over flora, fauna and natural resources. In many tropical countries, however, the existing legal framework and political institutions are either non-existent or inefficient at monitoring and controlling access to these resources (Posey, 1998). Evidence from societies around the world, both modern and historical, show that communities have created, maintained, and adapted institutions in order to manage common-property resources (Feeney et al., 1990; Ostrom, 1990a). The devolution of some degree of management authority for local resources from government to local communities is often necessary in order to enable community-based natural resource management. In addition, community-based or co-management arrangements hold the potential to address the problems of non-existent or ineffective government management by reducing the role of government bureaucracy.

The potential for community-based management to reconcile socioeconomic development and environmental conservation has been discussed at length previously in this paper. For treatment of this issue see chapter 1, Introduction.

Community-based resource management also holds the potential to defend and legitimize local property rights. By granting communities authority to manage specific

resources or specific geographic areas, the claim to communal ownership of the resource becomes stronger and more legitimate. In turn, by further legitimizing a community's ownership of resources or a specified region, the community is then presented with greater incentives to manage these resources in a sustainable fashion as opposed to exploiting the resources and maximizing their individual profit over the short term.

Community-based conservation and resource management programs are also perfectly situated to take advantage of local ecological knowledge. Since community-based programs are organized and run by local people, traditional values and local ecological knowledge can be incorporated into the conservation or resource management programs at a fundamental level. While the value of traditional and local ecological knowledge is beginning to gain wider recognition, programs which originate from governments or NGOs will tend to rely on scientific knowledge and the opinions of recognized experts. In contrast, when development or conservation programs are implemented by the community, these projects are more likely to incorporate local knowledge as the community members who possess this knowledge are also the people designing the project.

These five characteristics exemplify the reasons community-based management offers advantages towards reconciling the objectives of conservation and development. There are, however, challenges inherent to a community-based approach. Brown (2003a) identified three challenges to people-centred conservation efforts: (1) The first challenge is to incorporate the different understandings, meanings and values that stakeholders have in regards to biodiversity, the environment and nature; (2) the second challenge is to incorporate the plural knowledge, values and interests of the stakeholders into the

decision making process; and (3) the third challenge is to develop new institutions for conservation and development which are more flexible and adaptive than existing institutions.

There is some debate currently underway in academic circles about whether or not community-based conservation/management actually works to meet conservation and development goals (Barrett, 2001; Kellert et al., 2000). Berkes (2004; p. 624) submits to the debate the following:

> *Asking whether community-based conservation works is the wrong question. Sometimes it does, sometimes it does not. Rather, it is more important to learn about the conditions under which it does or does not work.*

Berkes (2004) also points out that there are a number of interdisciplinary research subfields; such as, common property, traditional ecological knowledge (TEK), environmental ethics, political ecology, environmental history and ecological economics; which have made contributions towards understanding the conditions under which community-based conservation/management works. These research subfields have yielded lessons for community-based conservation, including: the importance of cross-scale conservation, adaptive co-management, the question of incentives and multiple stakeholders, use of traditional ecological knowledge, and developing a cross-cultural conservation ethic. Three of these aspects of community-based resource management, cross-scale linkages, adaptive co-management and the use of traditional ecological knowledge, will be explored further within this research project.

2.2.3 Community-based resource management as adaptive management

Adaptive management is an iterative approach to management, based upon learning from both successful and unsuccessful policy approaches (Berkes et al., 2000; Berkes, 2002). Whereas many conventional forms of resource management have focused upon making natural systems more predictable and reliable; adaptive management is flexible, accepts uncertainty, and focuses on learning about the system, as opposed to controlling it (Berkes, 2002). An adaptive approach to management focuses not only on understanding natural systems but also on the social systems which relate to resource management (Olsson et al, 2004). This leads to a more dynamic and responsive institutional and organizational framework.

There is growing recognition that community-based management holds the potential to function as a form of adaptive management (Olsson et al, 2004; Berkes, 2002; Berkes et al, 2000). Within a community-based management setting, management authority is nested within the community and there is less organizational distance, or barriers, between those who are directly connected to the resource and those with decision-making power. Thus, within a community-based management program monitoring, learning, and adaptation can more easily be integrated into the management system.

Feedback learning is a critical component of adaptive management and it is imperative that information about the current ecological and social system must be conveyed to those with management authority. Therefore, ecological and socioeconomic monitoring are both key to learning, adaptation, and refining of management plans and

policies (Kremen et al., 1994). Without social and ecological monitoring the results of policy experiments are not satisfactorily known and opportunities for learning and adaptation are lost.

Adaptive management is an iterative process in which policies can be thought of as experiments. Since these experiments are being conducted within the operative social-ecological system it is imperative that these systems maintain and increase their resilience. Resilient social-ecological systems (see Section 2.2.2 for more details) allow for experimentation and innovation with a lower risk of collapse if policy experiments move the system in an unwanted trajectory.

2.2.4 Community

Community is crucial to any community-based management or conservation program. There is, however, some difficulty in defining community. Communities are dynamic by nature, constantly changing and made up of multiple actors and interest groups (Berkes, 2004). Agrawal & Gibson (1999) have argued that greater effort and attention should instead be focused on understanding three important aspects of communities: the multiple actors with multiple interests that make up communities, the processes through which these actors interrelate, and, especially, the institutional arrangements that structure their interactions.

Too often within conservation and development efforts the assumption is made that an idealized community made of a homogenous group of people divided upon geographic, cultural or ethnic lines exists (Leach et al., 1999). This, however, is often not the case. Even in instances where communities are distinct there are generally important

divisions and distinctions which exist along the lines of age, gender, caste, wealth, and livelihood activities (Leach et al., 1999). As a result of the complexity inherent in communities, many authors have advocated that research into community-based management should focus on the institutions present, as opposed to the nature of the community itself (Agrawal & Gibson, 1999; Ostrom, 1990a).

2.2.5 Common Property Resources & Institutions

There are many examples of common property resources including fisheries, grazing lands and forests. Common property resources share two defining characteristics: subtractability and non-excludability (Feeny et al., 1990). Subtractability is a characteristic of a resource in which the use of the resource by one user makes the resource unavailable or of less utility to another user. It is this characteristic which sets up the interest of the individual versus the interests of the group (Feeny et al., 1990). The other key characteristic is non-excludability; this refers to the difficulty or impossibility of excluding other users from accessing or utilizing the resource in question.

Hardin (1968) argued that common property resources will, without intervention, lead to the "tragedy of the commons" in which each resource user acts in his own self interest to utilize a greater proportion of the common resource. The sum of these actions results in the degradation and eventual destruction of the resource. Hardin's original argument claimed that the only way to avoid the tragedy of the commons was to introduce private or government ownership through which use and access could be controlled. Hardin's observations were quite astute, accounting for the growth of human populations and economic interests, as well as the finite nature of most natural resources.

Hardin's original analysis, however, did not account for the ability of the resource users to recognize the resource degradation caused by their actions and their resultant potential to organize and implement institutions regarding resource access and use (Ostrom, 1990a).

In order for resource users to consider taking part in common property institutions or organizations there are certain conditions which must be met. These include a shared understanding amongst resource users of the following: (1) individual exploitation will seriously harm a resource which is important to all of their survival; (2) the opportunity exists for them to coordinate their resource utilization in order to prevent the degradation to the common-property resource; (3) those participating in the management organization can trust other members to abide by the agreed upon rules, in other words trusting others not to cheat the system; (4) the costs associated with participating in the common-property management institution is less than the benefits which members can expect as a result of their participation (Ostrom, 1990b). These conditions are the requirements which must be met before resource users will consider joining a common property organization; however, they do not necessarily lay out the conditions under which a common-property institution will succeed.

Studies have shown that these self-organized, common property institutions are capable of successfully controlling access to common property resources and thereby avoiding the overexploitation known as the tragedy of the commons (Ostrom, 1990a; Smith & Berkes, 1993; Feeny et al., 1990). Based on extensive research in the field and review of the relevant literature, Elinor Ostrom has proposed a set of eight design principles which are widely accepted within the common property literature. These

principles are recognized as characterizing many successful, long enduring common property institutions around the world. It must be recognized, however, that these principles are not hard and fast rules which are consciously put in place. They are:

1. *Clearly defined boundaries*
   Individuals or households who have rights to withdraw resource units from the Common Property Resources (CPR) must be clearly defined as must the boundaries of the CPR itself.
2. *Proportional equivalence between benefits and costs*
   Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labour, material, and/or money.
3. *Collective-choice arrangements*
   Most individuals affected by the operational rules can participate in modifying the operational rules.
4. *Monitoring*
   Monitors, who actively audit CPR conditions and appropriator behaviour, are accountable to the appropriators or are the appropriators.
5. *Graduated Sanctions*
   Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offence) by other appropriators, by officials accountable to these appropriators, or by both.
6. *Conflict-resolution mechanisms*
   Appropriators and their officials have rapid access to low cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7. *Minimal recognition of rights to organize*
   The rights of appropriators to devise their own institutions are not challenged by external government authorities

For CPRs that are parts of larger systems:

8. *Nested enterprise*
   Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprise.

From: Ostrom (1990a, p. 90)

Common property resources are often difficult to manage in an equitable and effective manner. Effective governance of common-property resources is an important component in effective resource management. It is also important to note that many of

the aforementioned design principles are relevant not only when dealing with common property resources but within any resource management system.

2.2.6 Sustainable Livelihoods & Biodiversity

As poverty alleviation is one of the two objectives of the equator initiative awards it is important to place both poverty and livelihoods within the context of the relevant literature. Poverty is defined as a lack of physical necessities, income, and assets; and is often related to other facets of deprivation including isolation, vulnerability, powerlessness and physical weakness, making it more than just income deficiency (Chambers, 1995). Chambers (1995) also points out that it is important to recognize that the subjects of poverty and those who are studying their situation may have very different conceptions of poverty. As a result, during fieldwork and analysis it is important to consider poverty in terms of the local reality and locally perceived deprivations, not only those perceived from an outsider's reductionist and often narrow vantage point (Chambers, 1997; Chambers, 1995).

Scoones (1998, p. 5) defines a livelihood as follows: "*A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living*." Scoones (1998, p. 5) continues on to define sustainable livelihoods: "*A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base*." Sustainable livelihoods are often an important socioeconomic goal of community-based resource management.

It is important to recognize that a livelihood, especially in developing nations, means much more than just financial income (Chambers, 1995; Scoones, 1998; Singh & Gilman, 1999). Livelihoods in the developing world very often consist of the use of products, services, and land from locally available natural areas (Salafsky & Wollenberg, 2000; Scoones, 1998). This understanding of livelihoods allows for the recognition of the fundamental linkages between the social and ecological systems. The linkages present between livelihoods and the ecological system which supports them require that in order for a livelihood to be sustainable, the natural resource base which forms a key part of the livelihood must be utilized and harvested in a manner which is sustainable.

In order to link sustainable livelihoods with conservation objectives, Salafsky & Wollenberg (2000, p. 1423) developed a conceptual model which includes three categories: *(1) No linkage between livelihoods and conservation: protected areas; (2) indirectly linking livelihoods and conservation: economic substitution; and (3) directly linking livelihoods and conservation: linked incentives for conservation*. The research which this proposal is concerned with fall within the third classification, directly linked livelihoods and conservation, since the local villagers livelihoods depend largely on the products and services which they obtain from the local mangrove forest.

The United Nations Convention on Biological Diversity defines biological diversity as a measure of "the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; including diversity within species, between species and of ecosystems" (UNEP, 1992). Biodiversity is important in its own right, as it is indicative of the integrity, and natural functioning of ecosystems.

From an urbanized, wealthy or western perspective it may be quite difficult to conceive of any direct or consequential linkages between biodiversity and sustainable livelihoods. The fact is that many people, especially the poor in developing nations, depend directly upon the ecosystem and the diversity of life and services that it offers in order to meet their basic needs (Salafsky & Wollenberg, 2000). Biodiversity is fundamental to the maintenance and promotion of human livelihoods, either directly or indirectly. For the rural poor in developing countries the linkage between biodiversity and livelihoods is direct as all, or a significant portion of their livelihoods, are derived from the harvest or utilization of ecosystem products and services. The loss of biodiversity, therefore, has a direct impact upon livelihoods.

Loss of biodiversity also directly lowers the resilience of ecosystems, endangering the stability of the ecosystem as a whole and resulting in the loss of security of livelihood activities. The loss of biodiversity also reduces the number of potential livelihood options available to local people, making them more dependent upon their remaining livelihood activities. By increasing their dependence upon a smaller pool of resources the social system is also less resilient and stable.

People must, necessarily, look after the survival needs of themselves and their families. It is, therefore, important that the livelihoods of local people are given importance in planning resource management programs. Natural resource management programs which explicitly recognize the needs of local people and work towards livelihood based goals can improve both the participation and compliance of local people within a resource management plan. In other words, livelihood issues may act as a primary motivator for local people to participate in community-based management and

thereby help them move towards sustainability and conservation (Marschke & Berkes, in press).

2.3 Social-Ecological Systems & Resilience

2.3.1 Social-Ecological Systems

Human made, social systems are intrinsically linked with ecological systems (Berkes et al., 2003). Within these interconnected systems, ecological systems form the foundation on which social systems and economic development rest (Folke et al., 2002). As a result ecological processes are fundamental in influencing the development of social and economic systems and human societies. Inversely, in more recent years, there has been a growing recognition that social systems and human activities also play an important role in shaping and altering the earth's ecosystems and processes (Leach et al., 1999).

Human influence on the environment is not a new phenomenon, it is generally accepted that humans have had a varying degree of influence on the ecosystems in which they live for as long as humanity has been around. Human influence upon ecosystems has been taking place within the context of a growing recognition that despite humanity's exponential growth in knowledge, our power to understand, predict and control natural and social systems is very poor. Natural and social systems are exceedingly complex and often possess characteristics such as non-linearity, interdependence, synergy among components, self-organization and emergent properties which all contribute to their complexity (Berkes et al, 2003; Homer-Dixon, 2000).

In the past natural resource management was viewed as a form of command and control over natural systems; conducted in order to increase the efficiency, productivity, and predictability of natural systems (Holling & Meffe, 1996; Folke et al., 1998). Ironically, this command and control approach often results in less resilient and more vulnerable ecosystems and more rigid institutions and economic interests all acting in favour of their own short term interests (Holling & Meffe, 1996; Carpenter & Gunderson, 2001). This outdated, mechanistic approach to management has contributed to many of the social and environmental problems facing our world today.

The same frame of mind and attitude that led to command and control natural resource management also held the view that human ingenuity, scientific and technical prowess could overcome any problem. There is, however, increasing recognition that many of the problems facing our world, both social and environmental, are proving increasingly resistant to any effort at solution (Berkes et al, 2003; Ludwig, 2001; Homer-Dixon, 2000).

Increasingly, new approaches to natural resource management are being conducted with the goal of increasing or maintaining resilience and sustainability within social-ecological systems. These new approaches, including adaptive management, community-based, and co-management arrangements stand apart from conventional approaches in part because they are generally more responsive and involve a tighter integration between social and ecological systems.

2.3.2 Resilience

Resilience is an important concept which relates to both ecological and social systems. Ecological resilience is defined by the Resilience Alliance (2004) as the capacity of a system to buffer and absorb disturbances, shocks, and stresses without collapsing into a different state. Further to this they list three defining characteristics of resilience in social-ecological systems (Resilience Alliance, 2004,):

1. *The amount of change the system can undergo and still retain the same controls on function and structure.*
2. *The degree to which the system is capable of self-organization.*
3. *The ability to build and increase the capacity for learning and adaptation.*

Reduction of resilience within a system increases its vulnerability. A system which is more vulnerable may still function and appear to be normal, however, when subject to disturbances or shocks these systems are more likely to shift into another, possibly less-desirable, state (Folke et al., 2002). Resilient social-ecological systems that have the capacity to buffer disturbance or change can be viewed as being synonymous with ecological, economic and social sustainability (Berkes et al, 2003).

Resilience of social and ecological systems is difficult to assess directly (Walker et al., 2002). Existing sustainability indicators tend to focus on the current state of a social-ecological system, while resilience measurement focuses on variables which maintain the capacity of social-ecological systems to provide ecosystem services (Folke et al., 2002). Walker et al. (2002) identified two sets of information necessary in order to assess the resilience within a social-ecological system: (1) the set of slow variables that interact to determine the dynamic behaviour of the system and that govern the supply of

ecosystem services; and (2) the processes that impact and affect these important slow variables.

Management has the capacity to alter the characteristics of a social-ecological system and, as a consequence, can alter the resilience of social-ecological systems (Folke et al., 2002). Resilience management has two aims: "(1) to prevent the system from moving to undesired system configurations in the face of external stresses and disturbances; and (2) to nurture and preserve the elements that enable the system to renew and reorganize itself following a massive change" (Walker et al., 2002). If the goal of management is to increase resilience and, as a result, sustainability, then it must be flexible, open to learning, conserve diversity and variability, attend to slowly changing variables within the ecological and social system, and not try to optimize components of the system but instead maintain the redundancy of ecosystem functions (Folke et al., 2002; Berkes et al, 2003).

Ecosystems are complex, dynamic and often cyclic in nature. The adaptive cycle (Holling, 2001; Gunderson & Holling, 2002) is a three dimensional model useful to help understand and visualize the dynamic nature of ecosystems. The adaptive cycle displays the course of an ecosystem through four stages: (1) exploitation phase (r), showing increased potential and connectedness but a decrease in resilience; (2) conservation phase (K), where connectedness and potential are at their highest but resilience is at its lowest because the system has become brittle; (3) the release phase (Ω) in which the system collapses only to reorganize in (4) the reorganization (α) phase at which point the cycle repeats (Holling, 2001). This relatively simple model assists in the visualization and understanding of extremely complex and sophisticated ecological systems and processes.

These adaptive cycles are not independent; instead they are interwoven in a complex manner known as Panarchy. Holling (2001, p. 396) defines Panarchy as "a representation of a hierarchy as a nested set of adaptive cycles." The concept of panarchy is important as it illustrates clearly how smaller faster cycles may intervene in larger, slower ones through the "revolt" mechanism as a result of collapse in the smaller system; and how slower larger cycles may intervene in smaller, faster cycles through the "remember" mechanism (Holling, 2001). In this manner, the smaller, faster cycles may act as agents of change and innovation within an ecosystem and the larger, slower cycles act as a buffer which protects the ecosystem across multiple scales from destabilization (Holling, 2001). Panarchy, therefore, is both creative and conservative, and allows the systems in question to reach sustainability (Holling et al., 2002).

2.3.3 Scale

Scale is a critical consideration in natural resource management because it defines the scope of an issue and also affects people's understanding and perception of natural and social systems (Hull et al, 2002). Scale is important in three dimensions: spatial, temporal, and organizational. Spatial scale is concerned with the geographic extent of an activity or a specific area in question. Temporal scale deals with management activities or natural occurrences over a specified period of time. Organizational scale is concerned with the scope of management responsibilities and activities within an organizational hierarchy.

One of the difficulties in natural resource management occurs when the organizational scale employed to deal with a problem or manage a resource does not

match the spatial or temporal scale of the problem (Cash & Moser, 2000). This problem of misfit between scales, called scale discordance, can lead to difficulty in understanding and addressing a problem or issue at hand.

To further complicate the matter, in most circumstances resource and environmental problems rarely occur at one distinct spatial or temporal scale. Many problems are multi-scale, occurring at multiple distinct scales, or cross-scale, operating simultaneously over numerous scales. Both cross-scale and multi-scale issues complicate attempts at management by necessitating a tighter integration and co-operation between institutions at the relevant scales. For more detail on the role of scale see section 3.2 Cross-Scale Linkages.

2.3.4 Traditional & Local Ecological Knowledge

There is growing recognition amongst both the scientific communities and resource management professionals of the potential value that Traditional Ecological Knowledge (TEK) and local ecological knowledge hold. Traditional Ecological Knowledge is defined by Berkes (1999, p. 8) as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment." Local ecological knowledge can be considered much the same as traditional ecological knowledge but it is relatively more recent in nature and, as a result, there is often less opportunity for transmission through generations. Whether local ecological knowledge is traditional or more newly evolved is relatively unimportant, the key issue is whether or not it contributes to an understanding

of the nature and dynamics of local ecosystems, including human use of the ecosystem's products and services (Berkes et al., 2000). For ease of reading the remainder of this paper will refer to both traditional and more recent forms of ecological knowledge as local ecological knowledge.

Local ecological knowledge is more than just abstract observations and knowledge about ecosystems collected by local people. Local ecological knowledge often becomes the foundation for human relations to the environment and, as a result, serves as the basis for local-level decision making in many important areas including: natural resources management, health, education, food preparation, as well as community and social organization (Posey, 2000). Many traditional management systems also contribute to the conservation of biodiversity through practices such as the use of more varieties, species and landscape patches than modern management systems; however, biodiversity conservation comes about as a consequence of this management and is not usually an objective intended by local people (Berkes et al., 2000). Community-based resource management programs, because they are participatory and involve local people, are perfectly situated to incorporate local ecological knowledge into resource management programs since it is the local people involved in the project that possess this knowledge.

The use of local ecological knowledge in resource management increases its profile and also lends to its validity in the eyes of scientists. There are substantial differences between local ecological knowledge, which is experiential and integrative, and conventional scientific knowledge, which is mechanistic and more objective, and in many cases the relationship between the two forms of knowledge is imperfect (Berkes,

2004). There is hope, however, that the two systems of knowledge may be reconciled and more closely integrated for the betterment of the scientific community as well as local communities. Some see the potential for local ecological knowledge to act as a source of hypotheses which can then be tested using scientific methods (Striplen & DeWeerdt, 2002). There is also the potential; however, for a more closely integrated and more equivalent system of reconciliation between the two forms of knowledge. The closer integration of LEK and scientific knowledge also brings up the question of intellectual property rights and ownership of the knowledge (Posey, 2000). The knowledge of communities must be protected against exploitation by outside interests, especially in circumstances where corporations are able to profit from the knowledge of local people in regards to products or ecological functions that are commercially desirable.

Some researchers have brought to light the potential that LEK may function as a form of adaptive management (Berkes et al., 2000; Striplen & DeWeerdt, 2002) (See section 1.2.1, Community-Based Management as Adaptive Management). LEK can be considered as a form of adaptive management because it is experiential and iterative and accepts uncertainty and unpredictability. Like adaptive management, LEK is based upon experiences managing and utilizing the products and services of natural ecosystems which have been handed down between generations, both successful and unsuccessful. In a sense, LEK can be thought of as "a library of information on how to cope with dynamic change in complex systems" (Berkes et al., 2000, p. 1259).

Berkes et al. (2000, p. 1260) point out that despite some major differences that exist "adaptive management may be viewed as the scientific analogue of local ecological knowledge because of its integration of uncertainty into management strategies and its

emphasis on practices that confer resilience." One way in which LEK relates to resilience management (See section 2.2, Resilience) occurs when local resource users who are experienced and well versed with LEK will allow, or even create, disturbances to enter into lower levels of the panarchy of adaptive renewal cycles (Berkes & Folke, 2002). By allowing disturbance at lower levels the probability of a large scale catastrophic collapse are decreased, thereby enhancing the social-ecological resilience of the system (Berkes & Folke, 2002).

2.4 Institutions, Organizations, & Cross-Scale Management

2.4.1 Institutions & Organizations

Within the vernacular, institutions are known as well established agencies, such as banks or universities. Within community-based management terminology, however, institutions refer to the "the rules in use" within a given social arena. This is the meaning which the term institution will refer to within this section of the paper. It is thus important to distinguish institutions, as rules in use, from organizations, which are socially constructed groups of actors. In other words, if institutions are thought of as the rules in a game, then organizations are the players within this game (North, 1990).

Another distinction needs to be drawn between formal and informal institutions. Formal institutions are the more concrete rules, such as the rule of law. In communities formal institutions typically require administration and enforcement from a third party organization (Leach et al., 1999). Informal institutions, on the other hand, are generally

accepted principles, norms, or rules which are generally enforced by mutual agreement, monitoring, and informal power and authority relationships (Leach et al., 1999).

There is no, one, universal institutional arrangement which will work in every instance. Ideal institutional arrangements are site specific and depend upon the characteristics of the resource and the resource users (Ostrom et al., 2002). In some circumstances existing institutions may be inappropriate and their hierarchies and power structures may be inequitable and ineffective, which prevents them from attaining resource management objectives (Brown, 2003b). When community-based management programs are ineffective because their institutions are inadequate, new institutions may need to be designed and developed, including new organizations and different property rights (Brown, 2003a; Brown, 2003b). In some circumstances, however, an adaptive approach to improving existing institutions may be utilized. Adaptive management is an ideal framework to improve upon and develop new institutions, since adaptive management is built upon innovation, experimentation and learning.

2.4.2 Cross-Scale Institutional Linkages

The concept of cross-scale institutional linkages refers to the connections present between institutions both horizontally and vertically (Berkes, 2004). In this context institutions are referred to as agencies. Horizontal linkages refer to connections between institutions across space, for example, the networking and cooperation of fishing villages along a section of coastline. Vertical linkages refer to the connections which occur between institutions across levels of organization, for example multiple connections may exist between different organizations at the village, state, national and international level.

Cross-scale institutional linkages are important because there is, in most cases, a misfit between institutions and the ecosystems which they attempt to manage (Brown, 2003b). Government run top-down, command and control approaches to manage natural resources in developing nations have failed (Agrawal & Gibson, 1999; Dietz et al., 2003). Conversely, complete devolution of power and authority to communities has also proven inadequate for management (Barrett et al, 2001). When management becomes too decentralized connections between areas may be lost (Berkes, 2002), and local resource institutions may not have the capacity to deal with all facets of resource management effectively; such as formal rules and legislation, or research. The fact that community-based natural resource management initiatives have met with mixed results bears this out (Berkes, 2004; Barrett et al., 2001; Smith & Berkes, 1993). The failure of both top-down and strict community level management, indicates that effective management of natural resources cannot be accomplished by management operating only at one scale (Berkes, 2002; Folke et al., 1998).

The reason for this apparently confounding situation is that environmental and resource management issues are not large-scale or small-scale, but rather act across multiple scales, in terms of both space and time (Folke et al., 1998; Berkes, 2002). As a result, management of these resources needs to be undertaken, simultaneously, at different levels (Folke et al., 1998; Berkes, 2002) (See section 2.3, Scale). When management is undertaken at multiple scales it allows for the utilization of the strengths of various levels, while minimizing the weaknesses present at other levels (Pomeroy & Berkes, 1997). For example, the local level is more in touch with the resource base in

question, allowing for closer monitoring of feedbacks; while the state or federal levels have the technical capacity and funding needed for advanced scientific research.

There is potential that the tighter connections resulting from cross-scale linkages may result in a gradual shift of power away from the original institutions. Within the context of community-based management, the community itself acts on the operative level in which most management activities are conducted; and as the foundation for management authority. Simply put, the community both administers, implements, and enforces its own conservation agenda. Although community-based resource management holds great promise to achieve both conservation and socioeconomic development, it is also true that "community-based resource management systems cannot be revitalized in isolation… it will require the development of legal, administrative and institutional arrangements for defining legal status, rights and authorities" (Pomeroy, 1995, p. 149).

Chapter 3: Methods

Plate 5: The author helping villagers to harvest shellfish from the seafloor.

Plate 6: The author displaying a grapsid crab from the previous night's harvest.

3.1 Introduction

This chapter will describe the methods utilized in conducting this research, including a discussion of the theories and methodological assumptions guiding the research. This chapter starts off with a general examination of qualitative research and the design of this project in general. The chapter then moves on to cover Rapid and Participatory Rural Appraisal, research methodologies from which this project borrowed heavily. The next section deals with the role of the researcher and discusses the efforts made to eliminate bias in the conduct of this research. The chapter then finished off by examining some of the specific data collection methods, and activities undertaken in the field.

3.2 Nature of the Research

The three objectives which were designed to fulfill the overall purpose of this research are:

1. to examine the role of self-organization within the Pred Nai Community Forestry Group;
2. to examine the cross-scale institutional linkages of the Pred Nai Community Forestry Group; and
3. to examine how local ecological knowledge is utilized within the project.

The research objectives of this project necessitated a strong familiarity with the Pred Nai group, including its origins and setting. There was also a need for a strong

familiarity with the people involved in the project. These research requirements indicated that a qualitative approach to research was most suitable. The research was, therefore, conducted within the qualitative paradigm as a single case, case study. Qualitative research provides an in-depth understanding of the experiences, perspectives and histories of people within the context of their own setting or circumstances (Spencer et al, 2003) which allows for the full exploration of the research questions posed.

Creswell (1994) lists numerous assumptions that are involved in qualitative research, including:

1. *Qualitative research is concerned primarily with process, rather than products or outcomes.*
2. *Qualitative research is concerned with meaning, in other words, how people make sense of their lives, experiences, and the structures of their world.*
3. *The researcher is the primary instrument for data collection and analysis.*
4. *Qualitative research necessitates fieldwork, allowing the researcher to observe behaviour and conditions in their natural setting.*
5. *Qualitative research is descriptive because meaning and understanding are gained through words, pictures and other mediums.*
6. *Qualitative research is inductive, meaning that the researcher builds abstractions, concepts, hypotheses, and theories from details observed.*

There are numerous possible approaches to qualitative research including ethnography, grounded theory and case studies (Creswell, 1994). Case studies are empirical enquiries that allow for investigation of contemporary phenomena within their real-life context in which multiple sources of data are used, and in which the boundaries between the phenomenon being studied and the context are not clearly defined (Yin, 1989). Case studies are particularly valuable as research designs because they allow researchers to understand complex social phenomena. In other words the case study "allows an investigation to retain the holistic and meaningful characteristics of real-life events" (Yin, 1989, p. 14).

3.2.1 Rapid & Participatory Rural Appraisal

The research conducted in this project, while not strictly Rapid or Participatory Rural Appraisal, borrowed heavily from the methodological assumptions and data collection methods of both techniques. There are many definitions which exist for Rapid Rural Appraisal (RRA) as it is conceived of and used differently under many diverse circumstances. For the purposes of this research it is best to conceive of RRA as a set of guiding principles which assist the researcher to work with rural communities in a structured, yet flexible manner; and as a collection of tools which facilitate the researcher communicating and interacting with the community (Townsley, 1996). Townsley (1996, p. 21) continues to lay out some of the essential guidelines of Rapid Rural Appraisal:

1. *Structured but flexible*
   RRA is structured and requires clear objectives and careful planning but is also flexible enough to respond to local conditions and changing circumstances.
2. *Integrated and interdisciplinary*
   RRA is typically conducted by a research team with diverse backgrounds and training so that it crosses institutional and disciplinary boundaries.
3. *Awareness of bias*
   RRA attempts to avoid the influence of bias by being aware of the biases that researchers may possess and remains cognizant of differing points of view and opinion.
4. *Accelerating the planning process*
   RRA attempts to shorten the amount of time that it takes to learn about a community and in the case of development projects, implements development interventions.
5. *Interaction with and learning from local people*
   RRA projects typically involve intense interaction between researchers, local people and authorities. Researchers must be willing to interact with, listen to and learn from local people.
6. *Combination of different tools*
   RRA involves data collected through different tools and through a variety of different sources which assist with cross-checking of information to ensure accuracy and comprehensiveness.

7. *Iterative*
   RRA involves constant revision, learning, and adaptation within the field setting. This allows the focus of the research to shift according to the findings of the RRA.

The specific methods which are employed within Rapid Rural Appraisals are diverse and include: secondary data review; community workshops; formal or informal interviews; ranking and classification techniques; diagrams and graphics; mapping techniques; and structured observations, such as transect walks (Townsley, 1996). RRA draws upon a wide range of techniques but the process remains largely extractive because the research agenda is, ultimately, set by the external researchers (Rennie & Singh, 1996).

Participatory Rural Appraisal (PRA) is a related methodology which developed as an extension of RRA. PRA can be best understood as a style of research in which the researcher adopts the role of a humble outsider who is there to learn from the community (Rennie & Singh, 1996). PRA, like RRA is also defined in many different ways but there is a general consensus that PRA involves not only the participation of local people but also a degree of control and ownership over the research and findings. Within this line of thought, PRA seeks to empower local people challenging them to take control of their own social and economic development. The methods employed within PRA are largely identical to those employed within RRA.

3.3 Role of the Researcher

Within qualitative research the researcher acts as the principle instrument of data collection. It is, therefore, imperative that the biases, values and judgement of the

researcher are stated explicitly in the research report (Creswell, 1994). Prior to undertaking this study I had only briefly travelled to developing nations in the Caribbean as a tourist and I had no previous hands-on experience with any community-based resource management projects. Since this was the first community-based project that I had been involved with I made an effort to approach the community with an open mind and to observe and learn without judgment, attempting to be impartial and fair.

Within human relationships issues of dominance and subordination or power and weakness often exist (Chambers, 1997). In order to overcome any hierarchical barriers which may have existed or have been perceived between the researcher and the community I tried to adopt an approach of humility as I was there to learn from the community members. In order to avoid potential bias in the selection of interviewees the researcher attempted to interview as wide a variety of people as possible, both within and outside the community. The nature of this research did require more interviews with people in leadership positions, as they were generally more knowledgeable about the structure of the organization and the nature of external linkages. These individuals were in the majority male, but not exclusively, as the village head and a number of other leaders were female. In addition, those in leadership positions were not necessarily from a higher socioeconomic class within the village. The researcher made an attempt to interview, and also spent time with individuals from both genders, from lower socioeconomic classes, with differing levels of involvement in the project, and from different occupations.

3.4 Language & Selection of Participants

During the four months spent in Thailand the researcher was not able to learn enough Thai to conduct interviews with the villagers of Pred Nai. Mr. Attakorn Kamchutr, a Geography instructor from Rhambai Bharni University in Chantaburi, was employed as the translator for the duration of this project. All data collection, including semi-structured interviews and participatory observation, were conducted with his assistance. The translator's academic knowledge and training was extremely useful during the research process as he understood and was already familiar with the concepts and terms being discussed in the project.

The researcher remained in control during the interview sessions, talking to interviewees with the translator acting as an intermediary. The researcher noted that the interviewees seemed to prefer talking directly to the translator, but he was generally quick to translate their responses so that the researcher could follow up on the questions. Overall, language was an obstacle to data collection, although with diligence and patience it proved possible to collect useful data from a variety of sources as discussed below.

The researcher first visited the community on 11 March, 2005 along with a small team of people from the UNDP that had been working with Pred Nai other local communities. The researcher was introduced to the community leaders. The village head and chairman of the conservation group both consented to allow the research, agreed to participate and to inform the members of the community of the research project. Data collection did not begin in earnest until late March and the intervening time was split between the village, meeting villagers and other local people, and Bangkok, meeting government and NGO representatives that have been involved with Pred Nai.

The original selection of interviewees was based upon recommendations from contacts that the researcher had made with personnel from RECOFTC and the UNDP that have been working with Pred Nai. The leaders of the village and the conservation group were also pre-identified for participation in data collection. The early stages of data collection were spent by the researcher trying to understand, in the broadest sense: the current status, history, and the development of the conservation group in Pred Nai. Once the researcher had a familiarity with the community and the semi-structured interviews had begun in earnest, interviewees were asked to recommend others who were knowledgeable about the Pred Nai group, past or present, or could contribute any other related information. Government employees and NGO workers were identified for data collection based on their involvement with the project. The researcher attempted to interview as broad and representative a group of people as possible, across gender, age, and apparent socioeconomic class.

3.5 Data Collection

A standardized list of questions to address during the investigation of Equator Initiative case studies was created by a team of researchers from the University of Manitoba, led by Dr. Fikret Berkes and Dr. Cristiana Seixas. The checklist of questions covers topics including: community organization, cross-scale linkages, biodiversity conservation and environmental improvements, poverty alleviation, and a detailed analysis of community-based conservation. The material covered using the checklist provided information beyond the objectives of this thesis but was necessary in order to facilitate comparison across all Equator Initiative cases. All of the data obtained were

important as it contributed to a standardized set of information available for all of the equator initiative cases which are being studied. The data obtained from addressing the Equator Initiative checklist are laid out in full in the Technical Report submitted to IDRC (Senyk, 2005). The data gathered in this manner will allow for comparison between the Equator Initiative case studies. For more information see Appendix C: Equator Initiative Checklist of Questions.

Table 2: Breakdown of Interviews conducted

Group	# of Interviewees
Pred Nai villagers	23
Members of nearby villages	3
NGO representatives	6
Government representatives	9
Academic representatives	4
Monk	1

Semi-structured interviews were one of the primary means of data collection utilized in this research project. A total of 47 interviews were conducted over the course of the research project and the breakdown of who the interviewees were is shown in **Table 2**. The researcher and translator introduced the project to the potential interviewee, and the person was then asked if he or she wanted to participate in the project. If the person agreed, and most did, the interviewee was then asked to read and sign the informed consent form, which had previously been translated into Thai, (see Appendix F: Informed Consent Form). Whereas structured interviews strictly follow a predetermined list of questions; semi-structured interviews are more open-ended, informal and conversational using a pre-made list of questions as a rough guide or

checklist to keep the interview flowing and on topic (Pretty & Vodouhê, 1997; Chambers, 1988). This allowed semi-structured interviews to elicit information that may not have been considered by the researcher prior to the interview.

Interviews lasted for an average of about 45 minutes, ranging from twenty minutes to two hours. Interviews were generally conducted wherever the interviewee preferred, most commonly at their home or office, but on occasion at restaurants, at the village school, or village community centre, or other public space. When interviews were conducted in public spaces the researcher made every attempt to stay apart from other people in order to preserve confidentiality, although in most cases the interviewees indicated that they were not concerned about confidentiality. A list of pre-planned questions which were used to guide the interviews can be found in Appendix B: Question Schedule for Semi-Structured Interviews.

The researcher spent as much time as possible interacting with, and participating with, local villagers in their daily routines. Participant observation allows the researcher to derive insight from a community's values, dynamics, internal relationships, structures, and conflicts as opposed to their stated opinion of what exists (Rennie & Singh, 1996). The researcher found this to be true as in Thai culture it is generally considered improper to discuss negative things, but the researcher's participation in the community allowed him to uncover the existence of a number of conflicts between leaders in the village which people did not like talking about. Participation in village life contributed to a better understanding of how the Pred Nai group is organized and actually operates, as opposed to how it is supposed to operate, as well as contributing insight into the level of interaction that community members have with the project. According to Pretty &

Vodouhê (1997), the process of participation and immersion in the community's lifestyle by the researcher also helps to build rapport, contributes to a change in the researcher's attitude (and biases) and also constitutes an explicit commitment by an outsider to village life, thereby increasing acceptance. The language barrier did make participant observation more difficult than the researcher had originally anticipated, however, he was able to participate in numerous activities including village and network meetings, a children's summer camp, resource harvesting activities, and sports and recreational activities in the community. An additional advantage for the researcher was the fact that he was able to eat all foods put before him, including extremely spicy foods; this helped the researcher to fit in better at people's homes, community events and in the community in general because he was able to eat with the local people. The researcher maintained a journal documenting day-to-day experiences as well as the thoughts and feelings that occurred during fieldwork. During analysis the data from the journal was used sparingly but proved to be a useful supplement.

In the project proposal two focus group discussions were planned, one before commencing research in order to introduce the community to the researcher, and another at the end of the research to verify the findings of the research. Since the objectives of the first planned focus group discussion had been met by attending pre-planned meetings with UNDP personnel, a focus group to meet the community was cancelled as it would have been redundant. Also, the focus group discussion that was planned for the end of the project, in order to verify data, was cancelled in favour of a larger more inclusive meeting open to the whole community. The researcher presented a summary of the findings back to the community on June 18, 2005, at a regularly scheduled meeting of the village

savings group, thus ensuring a larger attendance. After the presentation, the floor was opened for comments and feedback from the community although only the leaders of the community put a few comments, questions and suggestions forward. After the meeting a meal was provided for all in attendance, paid for by the researcher as a small token of gratitude.

Participatory resource mapping involves villagers in the construction of maps which highlight natural or social conditions in and around the community (Pretty & Vodouhê, 1997). Participatory resource mapping was planned but not undertaken because it was quickly discovered by the researcher that the community had already participated in a thorough mapping of their local mangrove forest (the maps were actually hanging in the bedroom that the researcher stayed in while living in the village).

Institutional and network diagramming was undertaken near the close of the research period with the two key leaders from Pred Nai. These two individuals were selected for participation in the network diagramming process as they were the individuals who were most knowledgeable about the history and development of the conservation group and the involvement of outside agencies. Institutional Venn diagrams created with the input of community members provided invaluable insight into the cross-scale organizational linkages present in the Pred Nai group. Institutional Venn diagramming was helpful in identifying important institutions and important connections and relationships between institutions. The diagramming/discussion sessions were conducted with the two individuals separately to ensure that input came from each person's opinion, and was not influenced by anyone else in attendance.

Timeline construction was undertaken informally near the beginning of the research project, often taking place during, or just after, semi-structured interviews. Discussions about the timeline of the conservation effort in Pred Nai were conducted with the two key community leaders as well as with a few other individuals who were knowledgeable about Pred Nai's history and the development of the conservation effort over time. The construction of timelines outlining major events in the history and development of the Pred Nai group contributed significantly to understanding both self-organization as well as the origin, development and change over time of cross-scale linkages which were found to be present. Pretty & Vodouhê (1997) suggest that timeline construction and historical analyses with community members may also act as an important icebreaker when beginning fieldwork. In this project timeline construction was begun with key informants at the beginning of the fieldwork, but the timeline was updated throughout the fieldwork stage as new information was uncovered. Sometimes an event or key linkage would come out during an interview and the timeline would be updated accordingly. New facts were always verified with the key informants before they were taken as truth and added to the timeline constructed for the project.

When the researcher first visited the community of Ban Pred Nai and sought permission from the village leadership to conduct this research the village head requested that he hold classes to teach the local children English. Thai children learn some English within the public school system but in this rural area they do not have an opportunity to speak with or learn from a native English speaker. The researcher ran classes of half-hour to one hour duration on most of the days that he was in the community and class attendance varied from 2 to 30 students, increasing over time. The English classes were

originally planned in order to "give something back to the community" and to increase the researcher's acceptance within the community. In addition, the researcher found that the classes proved to be useful to the research process. Often the parents of children would come by to watch the classes or pick their children up; thus providing an excellent opportunity for the researcher to meet new people from within the community and giving the opportunity for numerous interviews to be arranged with parents. In addition, the classes were scheduled for the daytime when most of the adult community members were busy working, minimizing the loss of potential data collection time.

3.6 Data Verification

Data verification is important to the research process as it ensures that the researcher's findings are truly representative of the actual situation on the ground. Within this project verification is especially important as there is an increased likelihood of miscommunication of meaning due to the translation required between English and Thai. Throughout the data collection process the researcher met with key informants, often informally, in order to discuss some of the findings and confirm the validity of his understanding of the situation. A formal meeting was also held by the researcher upon the close of the field work in order to present an outline of the findings to the community. The researcher made a point of asking for feedback from the community. There was very little feedback offered from the community, only the leaders asked a few questions of the researcher. This could indicate general agreement with the researcher's findings, or simply a culturally appropriate polite response. In any case, it is clear that there were no strong disagreements with the findings presented to the community.

3.7 Data Analysis

Within this qualitative research project, data was collected using a variety of different techniques and from a variety of different sources. This resulted in large quantities of data to be analyzed in order to produce useful results. Data analysis in qualitative research consists of taking a large quantity of information and breaking it down into themes or categories and then utilizing the resultant themes to form a coherent picture and address the research objectives of the study (Creswell, 1994). Field notes were transcribed into Microsoft word while in Thailand in order to facilitate easier analysis. Data analysis was conducted with the aid of the qualitative research software package, Nvivo, upon the researcher's return to Canada from July to August, 2005. The NVivo software was used to sort data into three broad categories corresponding to the three objectives: self-organization, cross-scale linkages, and local ecological knowledge. From this point the data within these three categories was then coded into more specific areas within each of the objectives, and additional categories were coded into NVivo for prominent topic areas, such as RECOFTC, the village savings group, etc.

3.8 Results & Dissemination

Two definite outputs have resulted from this research project. The first is a technical report detailing the findings of the research submitted to the funding agencies, as well as key partners in Thailand. This technical report was submitted to IDRC and the UNDP in December of 2005. The second definite output from this research is this

Masters Thesis produced by the researcher and submitted in fulfillment of the requirement for the Masters Degree from the Natural Resources Institute.

The findings from this research project will also contribute to the larger study of Equator Initiative cases which is currently underway at the University of Manitoba. The outputs from this larger scale research project include both journal articles and a book detailing the lessons learned from the successful community-based management cases of the Equator Initiative. One additional output that may be produced as a result of this research is a paper written for an academic journal, depending on the schedule of the researcher and the project advisor.

3.9 Ethics Approval

In accordance with University of Manitoba Policy #1406 (U of M Policy and Procedures S. 1400, Policy 1406) all research under the auspices of the University of Manitoba that involves human subjects must be approved by the Research Ethics Board. This research was granted human ethics approval by the Joint-Faculty Ethics Board on 14 March 2005 after some minor revisions and clarifications from the original ethics submission. Although the researcher was already in Thailand the actual fieldwork did not begin until early April, after the formal ethics approval was received.

Chapter 4: Self-Organization

Plate 7: Community members participating in the monthly meeting of the village savings group.

Plate 8: Artificial “fish houses”. The conservation group constructed these “fish houses” out of old tires to provide new fish habitat in the canals of the mangroves.

4.1 Introduction

As discussed in Chapter 1, self-organization is a measure of the degree to which a complex system (ecological or social) is able to organize and influence its own structure and characteristics (Holling et al., 2002). Thus self-organization in this sense refers to the ability of the community in question to organize and implement institutions regarding access and utilization of the local common-property resources.

This chapter will examine, in detail, the organization, implementation, and development of Pred Nai's conservation group. The chapter begins with a chronological overview of the origin and development of Pred Nai's conservation effort over time. This chapter then proceeds to examine some of the individual factors that influence the origins and structure of the conservation group, including: leadership, capacity building, funding, conflict management, and decision making.

4.2 Origins and Evolution of the Project

Pred Nai Community Forestry Group has undergone many changes through its development from a small group of villagers protecting their forest from exploitation by outsiders; to an informal patrol group; to a well-connected, grassroots community-based management organization. This section will outline the major events and changes which served to shape the conservation group. In order to more easily conceptualize and understand the development and evolution of the community organization this section is broken down into four distinct periods of time which capture the overall level of organization and sophistication of Pred Nai's conservation and management efforts.

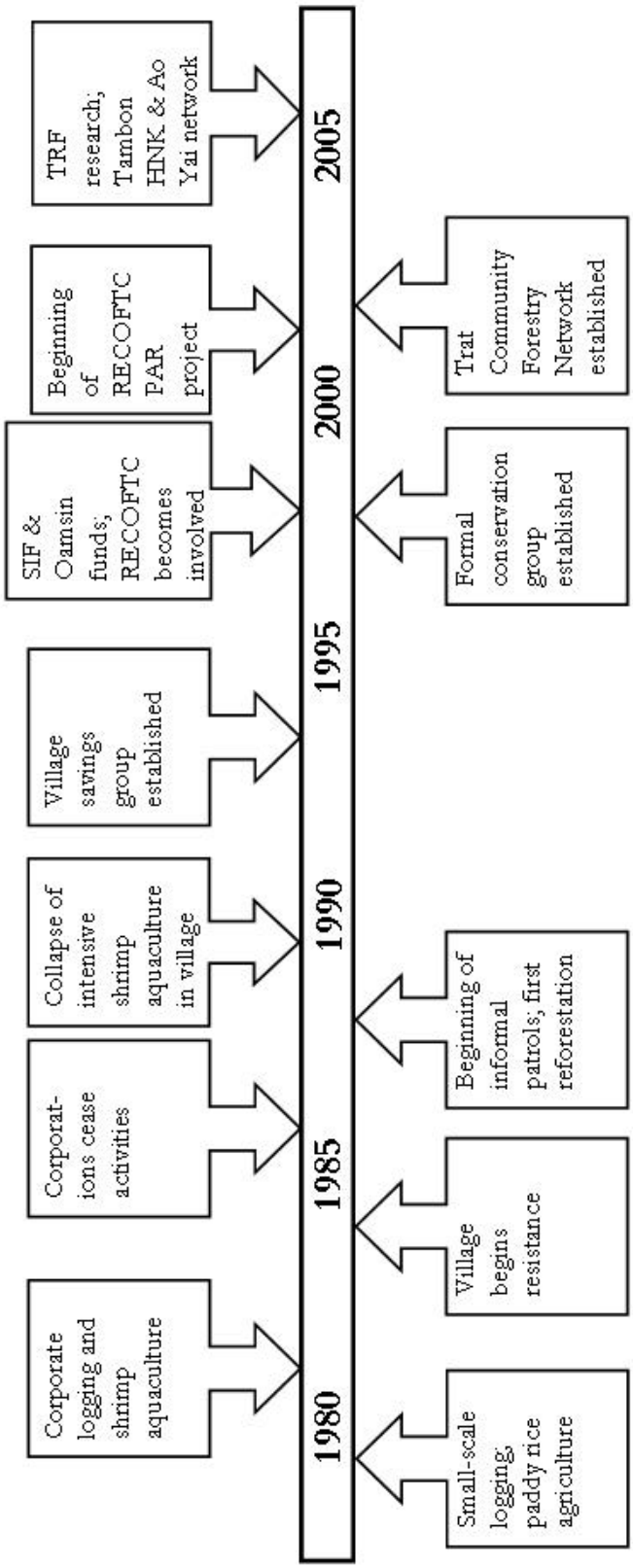
Figure 3 is a timeline which displays some of the major milestone events the Pred Nai group's development. The remainder of this section will provide an in-depth discussion of the development of Pred Nai through four periods.

Phase 1: Conflict and Initial Community Resistance (1982-1987)

According to the chairman of the conservation group and numerous other villagers, the key trigger event for the villagers' initial protection of their local resources was their resistance to logging activities carried out within their local mangrove forest by a Thai corporation. Logging for charcoal production had occurred regularly in this area for many years; however, in 1983 the logging was intensified and another corporation began constructing seawalls and ponds for intensive shrimp aquaculture in those newly logged areas. These extractive and destructive operations were run by Thai national corporations that operated in violation of government regulations requiring replanting of logged areas; however, government officials and law enforcement agencies were unwilling or unable to stop them.

The villagers of Pred Nai began their initial resistance to the corporate destruction of their local mangrove forest after they recognized that the logging operations coupled with intensive shrimp aquaculture ponds in the wake of the cutting would eventually consume all of the remaining mangroves, thus eliminating an important primary and supplemental source of income for the villagers. According to the elders and leadership of Pred Nai, all of the villagers, except for a few employed by the logging companies, were opposed to the destruction of Pred Nai's mangroves. Initial community organization

Figure 3: Timeline



began in 1986 and centered on a small group of five to 10 villagers who banded together, without outside support, in order to fight off the logging and shrimp aquaculture businesses operating within Pred Nai's mangrove forest. The small group of people which 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. Their 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.

The remainder of the community of Pred Nai also disapproved of the logging of their mangroves; however, they did not take up arms and offered resistance mostly in the form of complaints to government authorities and protests in the provincial capital. The villagers of Pred Nai received support at these protests from villagers in other nearby communities. One of the local Buddhist temples also offered their support to Pred Nai and assisted them in pressuring the provincial government to take action. According to villagers, however, the government largely ignored the villagers' complaints.

Two corporations were active in Pred Nai's mangroves. The first was a Thai logging company which had been holding rights on Pred Nai's mangrove forest for decades, but it was only active through local small-scale contracts. According to villagers, this company had been moving in other parts of Thailand, logging forests and leaving the land bare despite laws requiring replanting. When this company intensified their logging in Pred Nai's mangroves, this "cut-and-run" pattern looked to repeat. According to villagers, there was a second company which was responsible for creating the shrimp farms in the mangrove area. It was established by rich and powerful men from

the provincial capital who recognized this newly logged coastal land as an opportunity to turn a quick profit from intensive shrimp aquaculture. The following information could not be verified, but some community members also alleged that senior members of the provincial government were involved in the ownership of this latter corporation, and that was why the government did nothing to stop the logging or shrimp aquaculture as improperly practiced by these corporations.

A breakthrough occurred for the community in 1986-87 when a senior provincial government employee, who was sympathetic to Pred Nai's cause, assisted the village leadership in contacting the news media and national government. According to the man who was the village head at the time, this senior bureaucrat assisted Pred Nai by helping them to write letters to the Prime Minister's office, the National Parliament, and telling the village's story to the national news media. The media attention and resultant public pressure forced the national government to take action and place a ban on logging and shrimp aquaculture in the mangroves near Pred Nai. Soon after the intervention of the national government the provincial governor also lost his position. Some villagers claimed his termination was related to his alleged support for the exploitation of Pred Nai's mangroves but others claim he resigned over unrelated issues.

Phase 2: Informal Patrolling (1988-1997)

After the large-scale logging and shrimp aquaculture was stopped, Pred Nai's mangroves remained in danger. Logging and charcoal production continued to be conducted illegally by other local people from the area, including former employees of the logging companies. In response to the continued threat to their mangroves the

villagers of Pred Nai began a program of informal patrolling of the mangroves in order to stop these illegal activities and protect the natural resources of the local area. The majority of the villagers who were involved in the patrolling were crab collectors, since they spent the greatest amount of time in the mangroves. The villagers of Pred Nai sought the help of the RFD in organizing their patrolling activities. As the group had no power to enforce laws, they would report offences to the RFD who would then proceed to punish offenders who violated national forestry law – most penalties came in the form of fines. The RFD also assisted the villagers of Pred Nai in organizing the patrol groups, scheduling patrols (two per week), and delineating the areas to be patrolled, as well as meting out punishment to the violators according to existing forestry laws.

During this period, in late 1987 or early 1988, Pred Nai also began grassroots reforestation efforts in their local mangrove forests. The first reforestation efforts were initiated by the community itself and focused largely on the 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 in their first attempts.

After the expulsion of the logging and aquaculture companies most of the farmers in Pred Nai, over the course of a few years, took out loans from banks and converted their paddy rice fields into shrimp aquaculture ponds. At first this brought large incomes to the community's shrimp farmers. In a few years the villagers' shrimp farms required increased chemical inputs and suffered increased occurrences of disease so that shrimp production decreased, resulting in decreased profitability. The proliferation of these small, intensive shrimp farms also brought many negative environmental impacts such as

the release of waters polluted with chemical fertilizers, antibiotics, and pesticides into the canals of the mangroves. These pollutants have a deleterious impact on the water quality in the mangroves (Dierberg & Kiattisimkul, 1999) and in turn diminish the productivity of the flora and fauna of the mangroves. In addition, the intensive shrimp ponds also brought about changes in soil salinity and acidity, further lowering productivity and making a return to rice aquaculture impossible without rehabilitation. The increased pollution from these small-scale, intensive shrimp aquaculture operations also decreased the productivity of the flora and fauna in the mangroves. This pattern of declining production, coupled with increasing chemical use and pollution, and declining profitability is common in intensive shrimp aquaculture operations throughout Southeast Asia (Primavera, 1997) and typically results in diminished livelihoods for the aquaculture practitioners. The high capital and input costs associated with intensive shrimp aquaculture required the villagers to take out more loans in order to fund their intensive aquaculture operations, and when the profit from their farms began to fall, villagers found themselves in financially difficult positions.

It was during this period that a village savings group was initiated in the community of Pred Nai. In 1993 a monk from one of the local Buddhist monasteries came to Pred Nai with a proposal to set up a village savings group. The group was established in the wake of the failure of many villager's intensive shrimp farms with the dual purpose of providing a safe mechanism for villagers to save their money and earn some interest while at the same time, keeping the savings within the village by loaning money out to other villagers in order to improve social welfare (especially for those hurt by the failure of the shrimp farms). Socioeconomic development was accomplished

through low-interest rate loans to villagers who were in need of money for things such as education or health care. In this way the village savings group functions similar to other micro-credit programs improving the social and economic welfare of the village without resorting to expensive bank loans or handouts from government or NGOs. The monk also utilized the savings group as a platform to further educate villagers about conservation.

Phase 3: Formal Management (1998-2002)

In 1998 the village of Pred Nai established a formal conservation group with the assistance of the RFD. This group distinguishes itself from the earlier, informal groups, because the group adopted an organizational structure, objectives, and rules and committed them to paper in the form of a draft management plan. The formal group was also more inclusive, seeking the input and participation of all community members, not just those who were active in conservation. Officially known as Pred Nai Community Forestry Group (the Pred Nai group) the organization set about to formalize the rules that had been enforced previously by the informal patrol groups. A special committee of 18 villagers and elders was designated by the leadership of the new conservation group to set the structure of the conservation group and draft the first rules and regulations that would later become the village's first management plan. The initial structure of the Pred Nai group reflected the importance of the patrols in the mangroves, consisting of four patrol groups, a service group (responsible for preparing food and lodging for guests to the village), which was led by a committee appointed by the chairman, who, in the early days of the conservation group, was also the village head.

It was in 1998 that Pred Nai also obtained their first funds from an outside source. The Social Investment Fund (SIF) was established by the World Bank in the wake of the Asian economic crisis and administered in Thailand by Oamsin Bank in order to provide funds for social and economic development projects. Pred Nai learned about the SIF funding through their contact with the local monk who helped them to establish their village savings group. With help from the monk they applied for SIF funding and were awarded 1.8 million baht (approx. $45,000 USD) which was used to purchase boats specifically for patrolling the mangroves, build a cabin in the mangroves which could be used by the patrol groups during their long patrols, and to build a 2.8 km walkway through the mangrove forest for education and tourism purposes.

The NGO RECOFTC (Regional Community Forestry Training Centre for Asia and the Pacific) became involved with Pred Nai in 1999 soon after the community received SIF funding. The director of RECOFTC had been involved with the SIF funding program and when he discovered Pred Nai and their efforts at community-based forestry management he was eager to learn more and initiate a relationship with the community. In 1999 the director of RECOFTC visited Pred Nai and initiated an institutional relationship. Soon after, RECOFTC began helping Pred Nai in their management efforts; assisting them in conducting a forest inventory, a social inventory/assessment, and in developing a formal management plan. In 2000 RECOFTC organized and funded a study tour allowing some of 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 served to build and strengthen relationships, not only between communities, but also amongst the members of Pred Nai.

In late 2000 this relationship culminated in a Participatory Action Research (PAR) project between RECOFTC and Pred Nai. This PAR project had three objectives: 1) evaluation and monitoring of resource use; 2) development of the management plan; and 3) establishment of networking between stakeholders and communities. This PAR project was funded by the Toyota Foundation, providing 3,000,000 baht (approximately $75,000 USD) which funded two RECOFTC members to work full time with the community. In addition to direct assistance, numerous capacity building exercises were undertaken. Capacity building was provided both formally; in the form of courses and training paid for, or provided by, RECOFTC, and informally; principally through villagers' participation in RECOFTC's existing research and activities in the community.

As part of the PAR project, RECOFTC and Pred Nai were successful in creating the Community Coastal Resource Management Network (I will refer to this network as the Trat Network), a network operating at the provincial level and focusing on communities which are on the coast of the Gulf of Thailand. Prior to the establishment of this network in 2001 communication between communities in the province was informal and infrequent. This network was created for the purpose of sharing knowledge and experience between communities in the areas of conservation and resource management and also to amalgamate their voices and provide a strong critical mass allowing for greater political influence. The leader of the Pred Nai group was elected as leader of the network after its inception, which showed the important and leading role Pred Nai played amongst the other communities. In order to support the network in its initial stages RECOFTC provided some funding from the PAR project in order to provide venues as well as food for network meetings, and also to assist leaders from the different

communities with travel expenses (by providing travel allowances or subsidizing fuel costs).

During the year 2000 Pred Nai also began cooperating with local army and police forces to conduct patrolling in their local mangrove forest. This cooperation was manifest in two forms. First, through direct cooperation, some Coast Guard or army members would volunteer or be tasked to assist the villagers in their patrolling. This allowed the officials to apprehend or fine individuals who were found to be violating the government's or conservation group's laws. Secondly, these law enforcement agencies also provided some free training to volunteers from Pred Nai. This training was mostly in skills relevant to patrolling, such as: navigation, legal issues, and fieldcraft; as well as specific tactics and techniques for patrolling.

Phase 4: Further Development and Networking (2002-Present)

The past four years have seen a tremendous increase in the volume of activities that the Pred Nai group has become involved with in their conservation efforts.

The Thailand Research Fund (TRF) is a national government agency that is responsible for providing funding for research in Thailand conducted by teachers, researchers and students. The TRF began working with Pred Nai in 2003 after the institution began working in two new strategic research areas, one concerned with communities and their environment, and another concerned with coastal resources and the problems associated with coastal management. Pred Nai conveniently fit into both categories. The director had met the head of the Pred Nai group a couple of years earlier at a provincial network meeting and, after this shift in research priorities he approached

the community about becoming involved with the TRF. The TRF provided funding to Pred Nai's conservation group in order to conduct research into coastal erosion occurring in the mangroves as a result of boats fishing within three kilometres of the shoreline. As part of the their assistance the TRF also provided some funding to the Pred Nai group in order to build "fish houses" out of old rubber tires which are used offshore in order to reduce erosion and provide alternative fish habitat.

Another new partner for Pred Nai during this period was the Social Capital Development Institute, a non-profit NGO based near Pred Nai in the provincial capital city of Trat. The Social Capital Development Institute focuses on promoting social and economic development in rural communities. For more information on Pred Nai's involvement with this group see Section 5.8: Unusual Cross-Scale Interaction.

During this period Pred Nai also became involved in two new networks, both of which operated at different organizational levels. The first is a four-province, regional network which operates in the four south-eastern coastal provinces of Trat, Chantaburi, Chonburi and Rayong. This network was started in 2004 and grew as an amalgamation of the four existing community forestry networks in each of the provinces. Pred Nai has played an important role in this network, evidenced by the fact that the head of the Pred Nai group is also the head of the four-province network.

The second new network, also started in 2004, is known as the Tambon Hung Nam Khao and Ao Yai network, and includes both of the sub-districts from which it derives its name. This network, which has a strong focus on reforestation of mangroves and coastal forests, was created from scratch when a man from Ban Ao Yai (a village in Tambon Ao Yai, near Pred Nai) applied for funding from the UNDP to encourage

reforestation and networking amongst local communities. Funding, as well as assistance in initiating and organizing the network, was provided by the UNDP. Since Pred Nai's section is the only one within the two Tambons that has significant forest cover remaining, Pred Nai is officially included in the network but does not receive any of the funding, which is aimed at reforestation. Instead, Pred Nai plays an important role in the network by providing leadership and sharing their accumulated knowledge and experience in community-based forest management. Pred Nai has also participated in some of the capacity building exercises organized by this network.

4.2.1 Analysis of the Evolution and Development of Pred Nai's Conservation Efforts

An examination of the evolution and development of the conservation and management efforts in Pred Nai reveal that the community did not enter into management of their local resources immediately. Instead, the community's foray into formal management came as an organic growth, or progression, from their informal efforts. In other words, the community adopted increasingly formal and comprehensive conservation and management activities as their collective capacity and experience increased over time.

The decision by the villagers to create a formal management group was influenced largely by three separate factors. First, there was a wide-spread appreciation within the village for the importance of conservation after the threat of losing their mangroves at the hands of outside business interests. The second factor was the creation and successful operation of an informal patrol group by the villagers in order to protect

the local mangroves against the indiscriminate harvesting practices of individuals who were logging trees to produce charcoal.

The third contributing factor was the influence of the village savings group. The village savings group helped to improve the organizational capacity of the villagers' and also increased their skills in managing and accounting of relatively large sums of money. It is also important to note that the savings group helped to increase unity within the village since it was the first group in the community that was all-inclusive. The savings group also helped to develop village leadership by increasing their experience organizing a group and managing money for a project. These aspects of the village savings group are particularly significant when viewed in the larger organizational context of Pred Nai's conservation and management efforts. As the first formal, community-initiated organization the village savings group also stood as an important milestone in the community, bringing the community as a whole together and equipping leadership with skills important to administering an organization. The success of the savings group also appeared to the researcher to have increased the community's confidence in their own capabilities.

In the case of the creation of the formal conservation group there does not appear to be one, single trigger event. Instead, the Pred Nai group came about largely due to the culmination of a number of earlier activities, including: an awareness of the importance of conservation, informal patrolling of the mangroves, the creation of the village savings group, and the development of strong leaders within the community.

4.3 Catalytic Element

A key catalytic element which contributed to the success of Pred Nai was the involvement of the Thai-based international NGO, Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC). RECOFTC was not involved with Pred Nai from the very beginning. However, RECOFTC's involvement with Pred Nai has been so central to the development and expansion of the community's conservation activity that the word "catalyst" is appropriate.

RECOFTC's involvement with Pred Nai began in 1999, only a year after the formal establishment of the conservation group. RECOFTC's early involvement came in the form of: capacity building, assisting with surveys of the mangroves, technical support, and assisting with the development and refinement of a management plan for the conservation group.

Pred Nai's grassroots origin and on-going strong community support are one of its important strengths and a key factor in the community's success. The involvement of outside NGOs and government agencies, RECOFTC in particular, has also been an important contributing factor to the community's success. RECOFTC's contributions to Pred Nai's conservation and management program are multi-faceted and diverse. They include new initiatives, such as the forest survey and the establishment of the Trat Provincial Forestry Network, as well as helping to expand and develop initiatives that Pred Nai had begun on their own, such as the village management plan and the "eco-tourism" program. RECOFTC has also played an important role in facilitating intra and inter-village meetings, as well as mediating and assisting in resolution of internal conflicts within the village. Through their involvement RECOFTC has helped to provide

training and capacity building for members of the village and also helped to provide key contacts for village leadership within government, academia, and NGOs; which have further assisted the village in achieving their conservation and management goals. It is likely that Pred Nai would have been successful in conserving their local mangrove forest on their own, but RECOFTC has acted as an important catalyst in helping Pred Nai Conservation Group to achieve its goals and to continue to develop and expand its conservation and management efforts.

4.4 Leadership

Leadership was a critical element contributing to the success of the Pred Nai group. Over the course of the Pred Nai group's growth and development there have been numerous individuals who have played important roles in helping the community to achieve success. Strong leadership within the village has ensured that progress has been made towards stated conservation objectives and unity has been maintained throughout the village. There are three individuals in particular who have shown strong leadership within the community and have helped to inspire, guide and shape the character and direction of Pred Nai's conservation movement.

Male leader: This individual became a leader within the community during the beginning of the initial resistance to the destruction of the mangroves. After the expulsion of the corporations he became the leader of the informal patrol group and, in time, was elected as the village headman. As village head he was instrumental in expanding conservation efforts and in creating the formal conservation group, adopting the mantle of leadership after its creation. About three years ago he was forced to resign all of his

leadership positions due to illness, but he has since resumed his position as head of the Pred Nai group. Currently, within the village, in order to avoid conflict or potential overlap with the current village head, his focus is more external. This male leader is also very active in networking, and in addition to serving as the chairman of Pred Nai's conservation group, he also serves as head of the Trat Provincial Conservation Network and the Four Province Conservation Network.

Female leader: She is the current village head, and is actively involved in many aspects of both village administration and local conservation. In her capacity as village head she is involved in many community forestry networks and often liaises with government departments. Currently within the village, in order to avoid conflict or potential overlap with the current leader of the Pred Nai group, she has shifted her focus to be more internal, managing village affairs, but she still maintains many of the existing external linkages which she helped to establish. Although there was originally some conflict, in the form of a power struggle between the two leaders, it appears that they have resolved their differences and are able to work together towards common objectives.

Local Buddhist monk: This man was actively engaged in educating the villagers about the importance of conservation and was instrumental in changing local people's attitudes towards the environment. After the community had successfully stopped the logging in their mangrove forest an informal conservation group was started and originally prohibited the collection of any products from the mangroves. This created conflict within the community as many of the poorest villagers depended on the mangroves for their livelihoods. This monk was invited to the community to help settle the dispute, he told the villagers, in an often quoted line: "Managing the mangrove forest

is not a problem, we must manage the people". His intervention was important in settling the dispute, allowing access for the local people but also heralded the beginning of management by the community, rather than just strict protection. After the creation of the formal conservation group the monk also helped the village to obtain funds from SIF (Social Investment Fund of the World Bank) which was used to buy boats for patrolling, to build a cabin in the mangroves, and to build a walkway through the mangroves. He also played an important role in introducing Pred Nai to the concept of a village savings group and helping them to implement their own group. Currently, he remains involved with Pred Nai although in a smaller and much less significant role than in the past.

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 it's own to take action. 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. It is well recognized within the literature that Thai society and Southeast Asian societies in general are patriarchal in nature, with people adhering to the guidance of, and often showing deference to, individuals recognized as leaders (Boyle, 1993). Therefore, there was also a cultural need for strong leadership within this project in order to make it work and to fit people's perceptions of a good organization. Strong, honest, leadership within the village was, therefore, a key element in initiating the conservation movement, developing it in a manner which benefited the entire community, and maintaining local control of the conservation group's agenda.

4.5 Key Organizations

There were numerous organizations that were critical in helping Pred Nai to initiate and further develop their conservation and management efforts. For a more complete discussion of Pred Nai's linkages with outside groups and organizations see Chapter 5: Cross-Scale Linkages.

The Thailand Royal Forest Department (RFD) was an important organization in the early days of the Pred Nai group. Until 2002 the RFD was the government department with the legal responsibility for the management of the mangrove forests in Thailand. Local officials from the RFD cooperated with Pred Nai, encouraging them to create a formal conservation organization and assisting them with the development of their initial management plan. In 2002 the Department of Marine and Coastal Resources (DMCR) was created and the mandate for mangrove forest management was transferred from the RFD to the newly formed DMCR. Since this time RFD has played no official role in the mangroves of Pred Nai, but individuals from the local RFD office still maintain contact with the community and still recognize Pred Nai as an important source of learning for community-based forestry. The RFD and DMCR have also both helped to organize study trips to Pred Nai so that people from other communities can come to Pred Nai and learn from their successful example of community forestry.

RECOFTC was a key organization, not in the initiation of the Pred Nai group but in the early development of the formal conservation group. RECOFTC first became involved with the Pred Nai group in 1999 and one of its first actions was to organize study tours for Pred Nai's leadership to other community forests in Thailand in order for them to learn first-hand from their peers and develop relationships with other

communities. Soon after RECOFTC developed a three-year Participatory Action Research (PAR) program with Pred Nai, in which they assisted the community: to conduct surveys and inventories in the mangrove forest; to begin capacity building programs; to establish community forestry networks; and to enter into collaborative research projects between the community and RECOFTC. Even after the termination of the PAR project RECOFTC has remained an important partner with Pred Nai and both the community and the organization continue to benefit from their strong relationship.

4.6 Funding

The initial 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. All activities were grassroots in nature, organized and carried out by local people. Any expenses, such as fuel for boats during patrols, were absorbed and shared by those in the village participating in the activities.

The first outside funding provided to the community came in 1999 shortly after the creation of the formal conservation group from an unlikely international source. In 1998, in the wake of the Asian financial crisis, the World Bank provided money to the government of Thailand to assist with both economic and social development. The money designated for social development was used to create the Social Investment Fund (SIF) to assist social development in Thailand. The local monk who assisted Pred Nai in establishing the village savings group brought this funding to the attention of Pred Nai and assisted them in applying for the money. The 1.8 million baht (approximately $45,000 USD) in SIF funding received by Pred Nai was used to buy three boats for

patrolling the mangroves (so that individuals did not have to use and risk their own personal boats), to build a cabin in the mangroves as a station for patrol groups, and to build a 2.8 km walkway through the mangrove forest that could be used for education and tourism purposes.

Shortly after Pred Nai received this money from SIF, RECOFTC became involved with Pred Nai (the former director of RECOFTC discovered Pred Nai through the SIF funding program) and began assisting with a forest inventory as well as social inventories and assessments. In the year 2000, Pred Nai was selected as the site for a large scale, three year, three million baht (approximately $80,000 USD), participatory action research (PAR) project by RECOFTC. The three objectives for this project were: 1) evaluate and monitor resource use; 2) develop a forest management plan; and 3) establish networking between stakeholders involved. Although the funding from this project did not go directly to the conservation group RECOFTC used some of this money to employ two field workers in the community who assisted in numerous ways. As a participatory research project the community members were actively involved and the results, as well as the processes (i.e. capacity building, establishing networks) served to benefit Pred Nai's conservation efforts greatly.

4.7 Capacity Building

Within the PAR project begun by RECOFTC with the Pred Nai group, capacity building, in both a formal and informal sense, was an important part of the project. Informal capacity building took place through the participation of villagers in the RECOFTC projects. This included actual research on topics such as assessing crab

populations in areas in which the tree density was thinned versus areas left undisturbed, and conducting social and forest inventories. By participating in these activities villagers learned skills in using GPS receivers and mapping, expanded their ecological knowledge, and they also acquired skills relating to the conduct and documentation of research. Formal capacity building consisted of RECOFTC covering the costs of bringing community members to formal training workshops run by RECOFTC, and bringing some community members to conferences and other events relating to community forestry attended by RECOFTC employees. RECOFTC also brought village leaders on study trips to other community forests in Thailand in order to learn from them (this also contributed to networking).

Other forms of capacity building that have been important in Pred Nai include training provided by various government departments in order to fulfill needs within the village. For example, when villagers began informal patrolling of the mangroves, training was provided by the fisheries department in conjunction with local army units. Training in reforestation efforts, as well mangrove ecology and forest management, have also been provided by both the RFD (in the past) and currently the DMCR.

In addition, one local network, which consists of two sub-districts, Hung Nam Khao (which Pred Nai is part of) and Ao Yai has received funding from the UNDP GEF/SGP-PTF small grants fund, principally to promote reforestation. Pred Nai's participation in this project is largely advisory, as there is little need for reforestation in Pred Nai's section of the subdistrict. One of the goals of this project, however, is capacity building and the researcher was able to attend a weekend long training course held for villagers and children from communities involved in this network. During this training

session attendees were taught map reading skills and then participated in construction of a 3D topographic model of their local communities. Another of the stated goals of this project is to draw from the experience and success of Pred Nai in managing community forests and, to this end, the leadership of Pred Nai have been involved in working with the leadership of other communities involved in the network. During one of the network meetings, and one of the capacity building sessions that the researcher attended it was observed that leaders from the communities were able to meet in small groups, often including representatives from NGOS, and discuss problems that the communities were facing both individually and collectively. These small-group discussions, while centered on problem-solving, also provide an important opportunity for leaders to learn from each other as well as from the NGO personnel who participate.

4.8 Conflict Management & Resolution

Within Thai culture open conflict is generally avoided, and conflict in general is dealt with differently as compared to western cultures. In Thai culture open conflict leads to a loss of face amongst participants (Boyle, 1993). This is not to say that conflict does not exist between different stakeholders within the village, however, disagreements and conflict between fellow villagers are generally kept low key and often out of open view. For example, there has been a long-standing, low-intensity conflict/disagreement between two of the key leaders in Pred Nai; however, this animosity has not prevented them from working in the best interests of the village, often cooperating in order to pursue common goals. There does not appear to be any formal conflict-management mechanisms in place,

but because Thai culture frowns upon open conflict it has been kept rather low-key and, over time, the two leaders have built a mutual respect and understanding for each other.

In the past, after the village successfully stopped the logging of the mangroves, there was an acute conflict within the village between those who favoured strict protection of the mangroves versus those that derived their livelihoods from products available in the mangrove forest. This issue was particularly divisive within the community and a local Buddhist monk intervened in order to help the village reach a solution. When conflicts arise within the conservation group they generally occur over the approach used to solve problems. Conflicts within the conservation group are generally overcome by talking the issue out at meetings. The villagers attempt to reach a consensus and if this is not possible the majority opinion is followed. This is often in line with the views of village leadership as there is generally a strong affinity for, and propensity to follow those regarded as leaders.

Conflict between villagers and outside stakeholders is more common and often more acute. Currently, there are two existing conflicts between the Pred Nai group and two different outside stakeholders. The first conflict is with large fishing trawlers which come inshore illegally and damage the seafloor with their nets, destroying fish habitat. The leadership of Pred Nai has attempted to negotiate with these fishermen on behalf of the conservation group, encouraging them to obey the existing laws which prohibit these fishing boats operating within three kilometers of the shore. Unfortunately, these attempts to negotiate a solution have been in vain and the villagers have worked in conjunction with the responsible government departments, the Coast Guard and fisheries department, in order to patrol coastlines and report any violation of the rules, but with limited success.

The second ongoing conflict exists between the conservation group and a small community located in the sub-district north of the village, bordering the mangrove forest. People from this community have been using fish traps with a small mesh size in the river which forms the boundary with Pred Nai's section. The rules of the conservation group forbid the catching of small fish (<18-22 individuals/kg) (Pred Nai, 2003) and Pred Nai villagers were very upset by their neighbour's indiscriminate harvest. Pred Nai's patrols began destroying any "illegal" fish traps that were found. The provincial government has intervened in an attempt to prevent further escalation of the conflict. The government agrees that these fish traps are destructive and has begun a program to provide the fishermen using these nets with capital to either build new traps with more reasonable mesh sizes or to begin new livelihood endeavours. The conflict, however, is ongoing as the Pred Nai group tend to feel that it is taking too long to see a decrease in the use of these fine mesh fish traps.

4.9 Decision Making

An important element of Pred Nai's success in community-based conservation lies in the grassroots democratic nature of their conservation group. As such, all major decisions made by or within the conservation group are done with the participation of villagers at regularly held meetings. The meetings are supposed to be held monthly, although numerous interviewees complained that conservation group meetings have been held less frequently within the past year. The researcher was unfortunately unable to attend any of the conservation group's meetings, however most community members that the researcher asked said that they regularly attended the meetings and felt that they were

important. There were, however, a small number of community members who felt disconnected from the conservation group and had stopped attending meetings. Most of the people who had ceased participating with the conservation group felt that their disconnection was due to Pred Nai's increasing involvement with outside groups. They felt that there was simply "too much going on" and they were unable to stay up to date with current activities or that most of these activities were external and, therefore, irrelevant to their lives.

The leaders of the village and conservation group are, for the most part, well respected within the community and due to their knowledge and experience and the patriarchal nature of Thai society their advice is often followed when choosing a course of action for the conservation group. The leadership of the village and conservation group is important, not only in the village, but also in meeting with representatives from government, NGOs and other communities; however, decision-making power has remained largely in the hands of the villagers through the monthly meetings of the conservation group. Leadership retains control over the day-to-day operations of the conservation group, but since there is no formal infrastructure in place, their role remains largely to guide the conservation group and act as its representatives in dealings with government, NGOs or other outside agencies.

4.10 Resource Management Objectives

As Pred Nai's informal organization was largely spontaneous; in reaction to a perceived threat, and concerned only with conserving and protecting their mangrove forest there initially was no management objectives in place. Once the formal

conservation group was established a special committee was created to form a structure, rules, and resource management objectives for the community. The rules, objectives and structure that this committee advocated were then brought forward to the community at large and the people of Pred Nai voted on whether or not to endorse each of the proposals.

This system that Pred Nai utilized to form the conservation group seemed to the researcher to be both efficient and socially responsible. It was efficient because a small group of people were better able to formulate a foundation for the conservation group. It would have been time-consuming and unwieldy to have the entire village involved in formulating the rules and objectives for the conservation group. Yet as a grassroots project it is critical that the community has input into the design and functioning of the conservation group and also retains control over the conservation group. This system also allowed the community at large to provide input and ensure that their conservation group reflected the values and priorities of the majority of the villagers. Although there appears to be a growing sense of alienation from the conservation group, all of the villagers that the researcher talked to agreed that the condition of the mangroves had improved as a result of the Pred Nai group's conservation and management. In the words of one of the village's crab collectors "it is now very easy to catch fish and crabs in the mangroves".

4.11 Structure of Pred Nai Community Forestry Group

The structure of the Pred Nai group is reflective of the development of the conservation group over time, and especially of the informal patrol groups that preceded the formal

conservation group. 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. The more active component of the conservation group is comprised of five patrol groups (although this may be reduced to four because of declining participation), one service group, and a management committee responsible for running the conservation group (see **Figure 4**). The patrol groups are made up principally of crab-collectors who are responsible for patrolling the community's mangrove forest and the coastlines, working with authorities to maintain the rules of the conservation group and, with the assistance of the proper authorities, national laws pertaining to mangrove management, fisheries, and forestry. Members of the patrol group also provide tours for visitors who have come to see the mangrove forests and learn about Pred Nai's conservation efforts. The service group consists primarily of village women and is responsible for meals and sometimes lodging for visitors who come to the community for networking, or academic purposes as part of the "eco-tourism" program. The management committee serves to administer the conservation group and consists of the following members: a chairman, two vice chairman, a secretary, an accountant, two members from the service committee and the head of each of the patrol groups. There is also an advisory group that helps provide input into the conservation group. The membership of this advisory group fluctuates but has at various times included the village head, the manager of Pred Nai school (a senior teacher analogous to a principal), the village representative to the TAO, a monk from the local temple, members of RECOFTC, and officers from the RFD and DMCR.

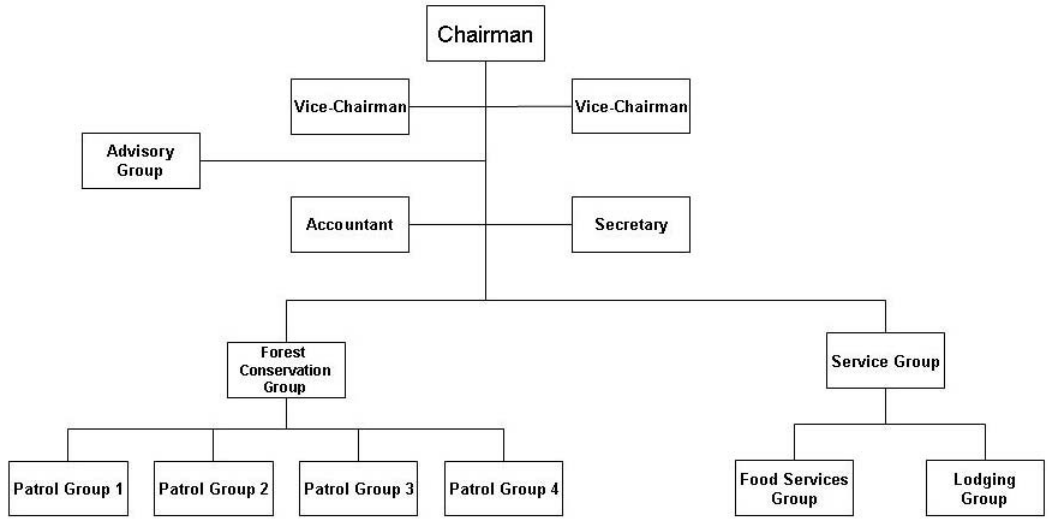


Figure 4: Diagram showing the overall structure of Pred Nai Community Forestry Group

At the outset of the Pred Nai group the village head adopted the role of chairman of the conservation group, but as the duties and responsibilities of this position increased the conservation group was altered to elect a chairman and two vice-chairmen every two years. The other positions on the management committee are appointed by the chairman. All of the villagers are considered to be members of the conservation group and all are eligible to vote in the conservation group's monthly meetings and the biennial election of the chairman and vice-chairmen. The position of village head, which is essentially analogous to the combination of a reeve of a rural municipality or a small town mayor in Canada, is actually an elected political office – the lowest level of elected office in the Thai system. The village head has typically remained involved in conservation efforts and although this has sometimes resulted in friction between the village head and the chairman of the conservation group, the increasing time commitments necessitated by

Pred Nai's numerous cross-scale linkages provide an opportunity for both positions to be involved and to lower the chances of burning-out of any one individual.

According to the head of Pred Nai group, the group currently receives no regular funding from any outside agencies. None of the leaders of the group are paid and the group primarily uses infrastructure in the village, such as the community centre for meetings. Fuel and maintenance expenses are met out of the money that the Pred Nai group takes in from ecotourism. When projects such as reforestation or the construction of fish houses are undertaken by the Pred Nai group, funding is generally obtained from an outside agency who will partner with the group on a specific project. For example, the TRF is currently funding Pred Nai's research project relating to fish houses, and the provincial fisheries department often supplies the conservation group with fish fry to stock in the canals annually. According to the head of the TAO some money is given occasionally to the Pred Nai group to cover fuel costs for patrols and talks are underway with the Pred Nai group and other local conservation groups to provide them with regular funding from the government. Currently, nothing has been put in place as of yet because most communities are hesitant to give the TAO greater input into the activities of the conservation group as part of the agreement.

The rules of the conservation group are laid out in detail in Pred Nai's management plan (Pred Nai Community Forestry Group, 2003). The management plan prohibits cutting trees in the mangrove forest, except in special circumstances with permission from the conservation group; prohibitions on catching species of crab during their spawning seasons; prohibitions on catching smaller immature crab, fish, and shrimp (measured by # of individuals/kg); prohibitions against hunting; restrictions on collecting

crabs in reforested areas; restrictions on outsiders using the mangroves without prior approval from the conservation group; and restrictions against using poisons for fishing or crab collecting. The management plan also outlines punishments for violations of the rules, with differentiation made for villagers and members of other communities who have been given permission to use the mangrove forest. Punishment for villagers escalates from a warning and conservation education on their first offence, to public work around the village (e.g. helping with repairs of public buildings), loss of rights within the community (e.g. suspension of activities with the savings group), and finally to fines and confiscation of the resources in dispute. For violators from outside the community the first offence is punished by a warning and confiscation of the resources in dispute, then escalating to fines. Subsequent violations may result in a ban from using Pred Nai's mangroves. The management plan also stipulates that if individuals are caught in violation of any national forestry or fishery laws the police or proper authorities will be contacted in order to deal with them in the legal system. The researcher was informed by villagers and the leadership of the conservation group that in the early years of the conservation group many violators were caught and patrols were often joined by police officers or officials from the forestry or fisheries department. All of those interviewed agreed, however, that in recent years there have been much fewer instances of violations, by both villagers and outsiders.

4.12 Village Savings Group

The establishment of the village savings group within the village has been another important accomplishment in terms of poverty reduction. Established with the help of a

local Buddhist monk in 1993, the village savings group was set up as an Accumulating Savings and Credit Association (ASCRA) allowing members to pool their savings and make loans to members from the accumulated savings (Bouman, 1995). A committee of 14 villagers administers the savings group with the help and oversight of the Buddhist monk who helped to establish the fund. Villagers often expressed deep respect for monks, and this monk's involvement with the savings group helps to: ensure that the savings group stays legitimate, improve public perception within the community, and act as a check to keep the leadership honest.

The savings group is structured so that villagers commit annually to purchase a pre-arranged number of "stocks" each month at a set price. Villagers are limited to purchasing a maximum of 50 stocks/month/member of the household. Thus the savings group acts as a forced-savings mechanism encouraging villagers to save money. Interest payments are paid out directly to the stockowners every 6 months, allowing them to make a small but secure amount of money from their savings. Once villagers reach 40,000 baht in stocks (approximately $1,000 USD) they are then permitted to withdraw up to half of the money from their savings.

The second function of the savings group is to provide low-interest loans to community members for social or economic development projects. A committee of 14 villagers administers the savings group and makes decisions approving or denying loan applications received from villagers. Priorities for approving loans are education and healthcare, and some money is always kept available in case a member needs money for an emergency or sudden illness. Loans may also be provided to community members for other purposes such agricultural improvement projects, or money to build a new home.

Once approved for a loan the villagers are required to have 2 co-signers and in some cases are required to put up collateral (such as a home or motorbike). According to one of the administrators of the savings group the interest rate charged on loans is only 12% per year. This number seems to be quite low; unfortunately the researcher could not find any further information about the interest rate charged.

The village savings group has produced many benefits in Pred Nai. It has functioned to improve social welfare and economic development, subtly assisting with income redistribution in the village (the wealthy tend to buy more stocks per month and the poorest villagers are able to receive low interest loans for development) and to encourage savings within the village. The village savings group was also critically important to help build unity within the community. When established in 1993 it was one of the first formal organizations in the community, and whereas the original conservation efforts were informal and limited to a small number of people, the savings group was more structured and open to all community members. In addition to providing a structured group, the monthly meetings of the savings group became important community events, bringing the community together and providing a venue for the monk to teach the community as a whole about the importance of conservation. The savings group also helped to build money management skills within the community as participants were forced to commit to purchase stocks every month and, therefore, would have to budget their finances to ensure that they had the money to meet their commitment to the savings group.

Chapter 5: Cross-Scale Linkages

Plate 9: A meeting between village leaders and members of RECOFTC.

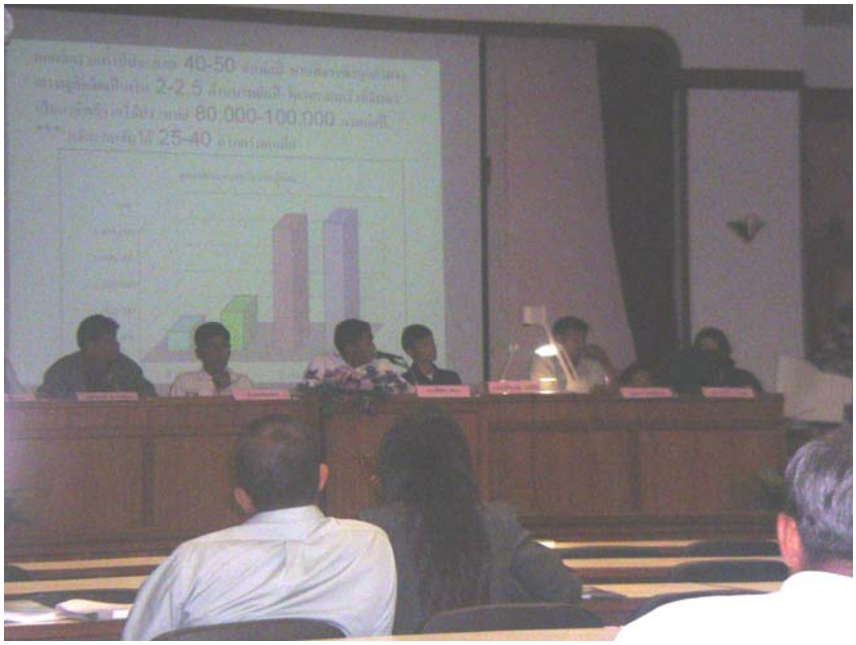


Plate 10: Members of Pred Nai participating in a community forestry conference in Bangkok shared a history of Pred Nai's experience with community-based management.

5.1 Introduction

This chapter will present and analyze the cross-scale institutional linkages found by the researcher to be significant in Pred Nai. The chapter starts off by outlining the key organizations involved at each individual scale of analysis (sub-district, provincial, etc). Next, this paper will present a discussion, diagrams, and analysis of the nature and origin of the key vertical and horizontal linkages present between Pred Nai and the institutions and organizations involved at each organizational level. The next section deals with the NGO RECOFTC and the important role that it has played, and continues to play, in the evolution and development of the conservation and management activities of Pred Nai. The remainder of this chapter outlines the efforts of replicating Pred Nai's success, the policy environment in Thailand, and closes off by examining an unusual interaction within the project.

5.2 Key Organizations Involved

See **Table 3** for a breakdown of the key organizations and partners involved with Pred Nai Community Forestry Group, by levels of organization.

5.3 Vertical Linkages

Phase 1: Conflict and Initial Community Resistance (1982-1987)

During the initial stages of the project (see **Figure 5**), when the village was locked in conflict with the large-scale logging and aquaculture operations which

Table 3: Cross-scale representation of community organizations and partners in Pred Nai Community Forestry Group (as of May 2005)

	Local	Sub-district	Province	National	International
Pred Nai Community Forestry Group	X				
RECOFTC					X
Trat Network			X		
Tambon HNK & Ao Yai Network		X			
Tambon HQ		X			
TAO		X			
Village savings group	X				
Women's Group	X				
Village home-stay group	X				
DMCR				X	
Royal Forestry Dept.				X	
Fisheries Dept.				X	
TRF				X	
World Bank					X
SIF				X	
Oamsin Bank				X	
Universities			X		
4-Province network				X	
Social Capital Development Office			X		
UNDP					X
Toyota Foundation					X
Wat Pilom		X			
CODI				X	
Royal Thailand Army				X	

Refer to page xi: List of Acronyms and Abbreviations for a complete list of all acronyms used

X	Level at which organization is based
	Level at which organization is active in relation to the Pred Nai project
	Level at which organization is not active in relation to the Pred Nai project

Note: There is a district level within the Thai administration, however, it was omitted from the table as it is noticeably absent of institutions, and in this case there were no significant linkages based at this organizational level.

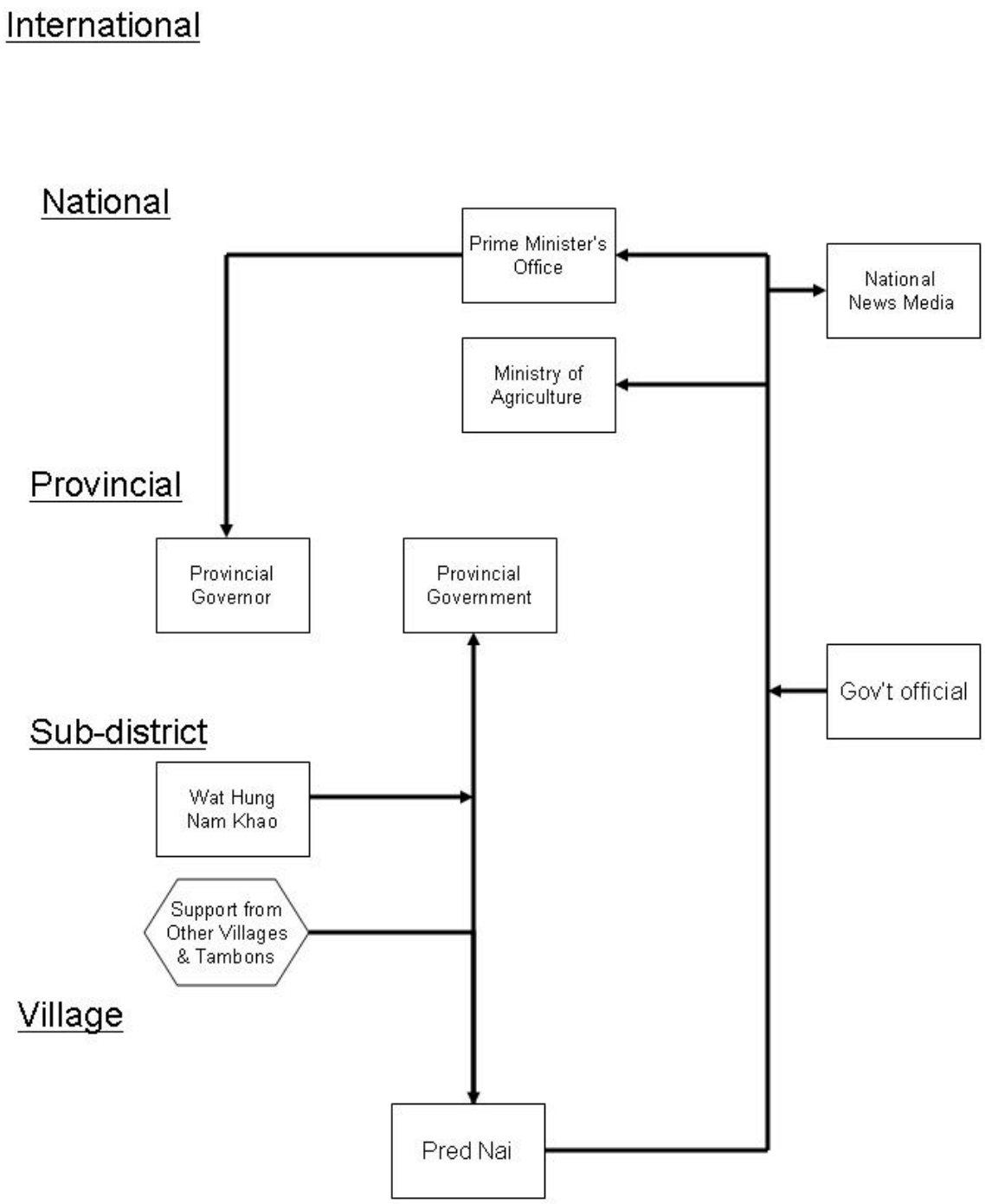


Figure 5: Network diagram showing institutional linkages during the initial stages of conflict (1982-1987)

threatened their mangrove forest, cross-scale vertical linkages were generally absent and those that did exist were often weak or ineffective. Pred Nai's attempts to have the RFD enforce existing national forestry regulations which were being violated by the corporations was quashed because the provincial Governor's office was in favour of economic development over conservation. Pred Nai's plight was finally given attention when a provincial government bureaucrat assisted the community to contact the media and bring their conflict to the attention of a national news audience. This forced the national government to become involved, and pressure was put on the provincial government to enforce the existing legislation and put a stop to the large-scale logging and aquaculture operations taking place in Pred Nai.

Phase 2: Informal Patrolling (1988-1997)

From 1988-1997 (**Figure 6**), Pred Nai was engaged in informal patrolling in their local mangroves and vertical institutional linkages were largely absent from the conservation group. The community was largely on its own, intent on protecting their mangrove forest from internal or external exploitation and degradation. Only two vertical linkages of any consequence existed at this time. The first was between the informal patrol group and the RFD. The RFD provided support to the patrol group and often assisted by arresting or fining individuals that the patrol group caught for offences in the mangrove forest. The RFD also provided some assistance to the community in their reforestation efforts, providing saplings and training to Pred Nai. The other significant vertical linkage was the intervention of a local monk from Wat Pilom, a Buddhist temple located in the nearby provincial capital. The monk came to Pred Nai and helped them to establish and operate a

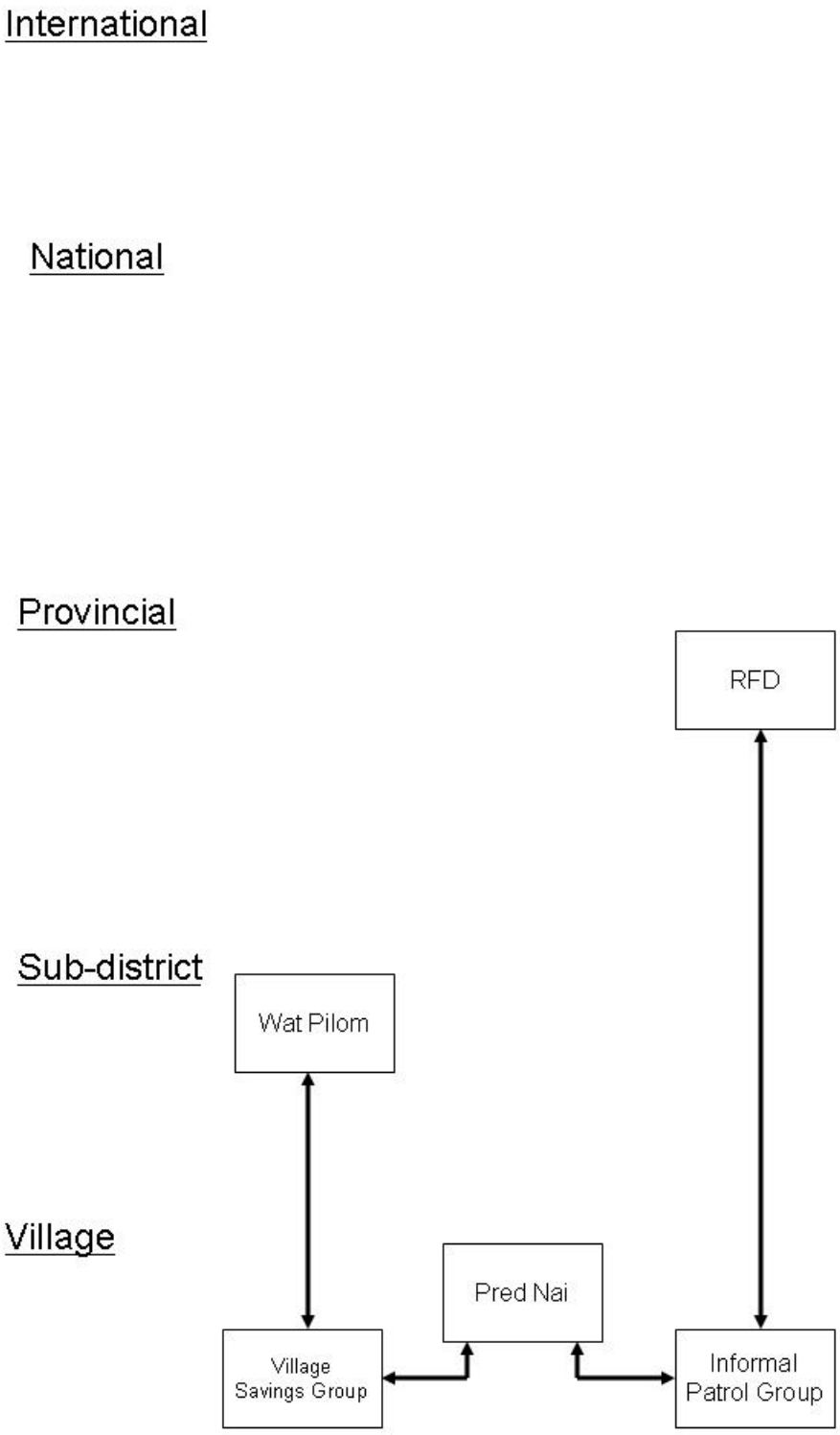


Figure 6: Network diagram showing institutional linkages during informal patrolling (1988-1997)

village savings group and also used the opportunity to teach the Pred Nai villagers more about conservation.

Phase 3: Formal Management (1998-2002)

The establishment of the Pred Nai group in 1998 as a formal management group coincided with a large increase in the establishment and development of important vertical institutional linkages (**Figure 7**). The first important linkage was established in 1999 when the Social Innovations Fund (SIF), administered by Oamsin Bank, provided funding to Pred Nai in order to: buy patrol boats, build a walkway through the mangroves, and build a cabin in the mangroves for patrol groups to stay over night. In 1999, after Pred Nai received funding from SIF, members of the NGO RECOFTC learned about Pred Nai and began their longstanding and fruitful relationship. During the early stages of their relationship RECOFTC provided capacity building and technical assistance in the form of a forest and social inventory. In 2001, RECOFTC began a participatory action research project in partnership with Pred Nai, with funding provided by the Toyota Foundation. In 2001 RECOFTC assisted Pred Nai in the establishment of the Trat Provincial Forestry Network. This linkage with RECOFTC proved to be an important step for the Pred Nai group, marking the beginnings of formal research in the community's local mangroves, further development of the community's management plan, and the beginnings of formal networking. Another important outcome of Pred Nai's relationship with RECOFTC was the function that RECOFTC served in helping Pred Nai to develop connections and relationships with other organizations, including: academics, government agencies, and NGOs. RECOFTC helped Pred Nai to initiate these linkages

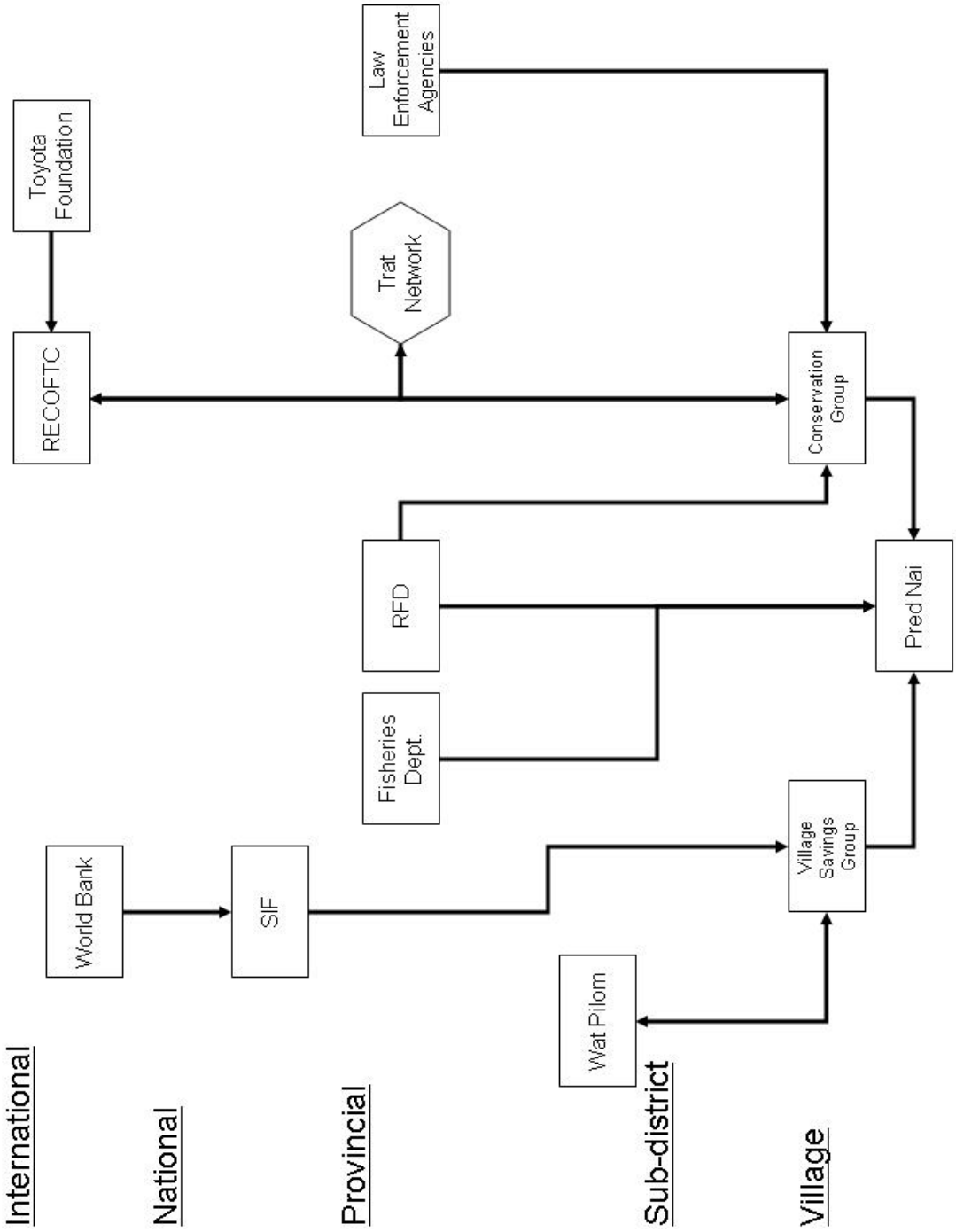


Figure 7: Network diagram showing institutional linkages during the beginnings of formal management (1998-2002)

by putting the community leadership in contact with the right person or organization after a problem or need was identified. RECOFTC also helped to promote the community's "eco-tourism" program and invite people that held interest or stood to learn from Pred Nai's experience.

During this period Pred Nai also co-operated with, and received training from, law enforcement agencies, such as the police, Coast Guard and locally based army units, to assist the community in their patrolling efforts. These agencies provided training in patrolling as well as navigation, legal issues, and specific tactics and techniques relevant to patrolling. They also provided direct assistance where officers would be tasked, or sometimes even volunteer in their own time, to help the Pred Nai group to patrol the mangroves. Having officers on some patrols increased the overall efficiency of the patrols as the officers were able to arrest or fine violators right on the site, which also acted to increase the legitimacy of Pred Nai's patrols. The RFD and fisheries department were also involved; the former in providing saplings for village reforestation efforts, and the latter by stocking young fish, shrimp and crab in the canals of the local mangroves.

Phase 4: Further Development and Networking (2002-Present)

As the project has become more established, the number and importance of vertical institutional linkages present in the project has increased accordingly (see **Figure 8**). At the Tambon, or sub-district, level there are two important linkages. First, with the TAO (Tambon Administration Organization) a sub-district level government organization recently created in order to assist with decentralization and act as an intermediary between local villages and national level government agencies. As this agency is

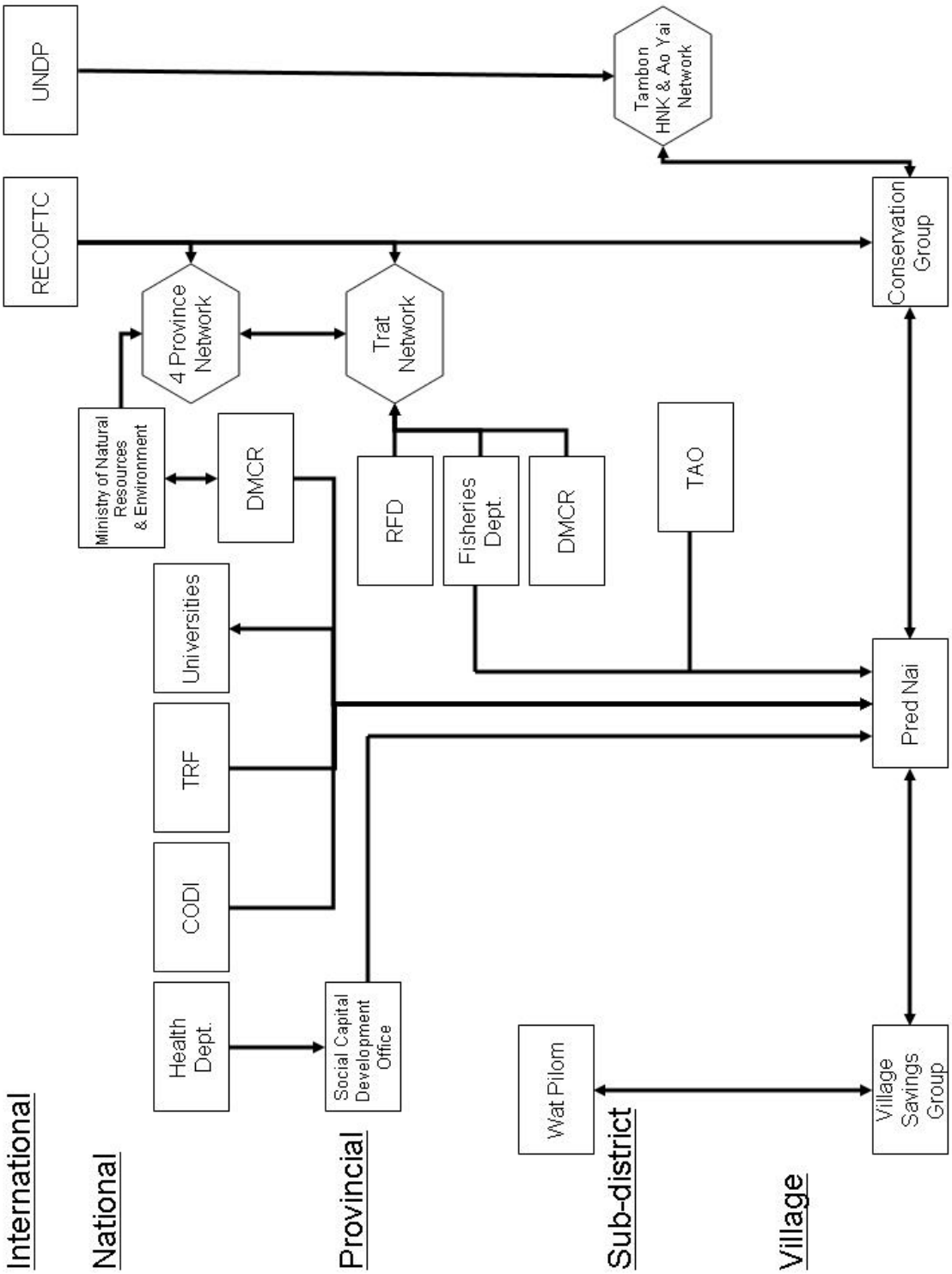


Figure 8: Network diagram showing institutional linkages during recent years (2002-Now)

relatively new there is little cooperation between Pred Nai and the TAO, although the mandate of the TAO promises that it will become more involved in local conservation efforts. The second important sub-district level institution is the Tambon Hung Nam Khao & Ao Yai Network This network, established in 2004, is funded by the UNDP (United Nations Development Project). In addition to networking and learning between communities, the primary goal of the Hung Nam Khao & Ao Yai Network is reforestation within the two sub-districts. Pred Nai's section of the sub-district is largely forested and Pred Nai's role in this network is principally advisory.

At the provincial level, Pred Nai is in contact with numerous government agencies, the RFD, the Fisheries Dept. and the newly created DMCR (Department of Marine and Coastal Resources). The Fisheries Dept. and RFD have largely continued their role with Pred Nai, with the notable difference that the DMCR, which was created in 2002, has now assumed legal responsibility for the management of mangrove forests in Thailand. The other significant linkage at the provincial level is the "Happy Communities Project" created by the Social Capital Development Office, a non-profit, private NGO which operates in numerous communities in Thailand and is funded by the national Health Department of the Thai government (This project is discussed in greater detail in Section 5.8 Unusual Linkages).

Another significant national level linkage with Pred Nai is the TRF (Thailand Research Fund). The TRF was established by the national government in order to provide funding for research, and their current focus is on community-based research and the local environment. The TRF has established and funded numerous research projects which involve partnerships between university researchers and rural communities.

Pred Nai is currently involved in a project with the TRF investigating local shoreline erosion and assessing methods of controlling it including the construction of off-shore bamboo "fences" to keep boats further from shore and fish houses constructed from old tires in order to slow the movement of waves and wake from boats. There are numerous universities involved in Pred Nai, some of which are involved through the TRF research project, while others are there to conduct their own research or to learn from Pred Nai's experiences with conservation and management. University participation varies in scale from individual students to entire classes. For example, while the researcher was conducting this research, two students from Chiang Mai University, in Chiang Mai, Thailand, were in the village for one month to conduct research into the village's ecotourism program and crab collecting industry. An additional linkage, which is still in the planning process, is a project initiated by the national office of the DMCR to build artificial coral reefs from large concrete blocks, in order to control coastal erosion, provide fish habitat and prevent fishing trawlers from coming too close to shore.

Although the participatory action research project ended in 2004, RECOFTC has remained an important partner for Pred Nai, remaining in direct, regular contact with the community and assisting them with conservation and management issues that arise. RECOFTC also remains actively involved in the Trat provincial network that they assisted Pred Nai in establishing. There has also been a new, regional level, network created. This "four-province" network received funding from Community Organization Development Institute (CODI), a Thai NGO, and aims to establish and strengthen communication between the provincial networks of four provinces in southeast Thailand (Trat, Chantaburi, Chonburi, and Rayong). This new network includes many

communities from Thailand involved in managing their local forests and also sees the involvement of many national-level government departments from within the Ministry of Natural Resources: DMCR, RFD, and the fisheries department.

5.4 Horizontal Linkages

Phase 1: Conflict and Initial Community Resistance (1982-1987)

During the first period of Pred Nai's conservation activities, from 1982 to 1987, horizontal linkages were few but still of some importance. Many of the residents from other villages within the sub-district supported Pred Nai in their struggle to halt the exploitive activities of the outside corporations in Pred Nai's mangrove forests. To this end villagers from the surrounding communities helped to apply pressure to large-scale logging and intensive shrimp aquaculture operations through complaints to their local government officials and participation in numerous rallies at the provincial capital in support of Pred Nai.

Phase 2: Informal Patrolling (1988-1997)

During the period of informal management and patrolling in Pred Nai, there were no significant horizontal linkages present. There was some communication between individuals in local communities but this was informal and unstructured and not of any serious consequence to conservation or development.

Phase 3: Formal Management (1998-2002)

Since the formation of the Pred Nai group as a formal entity in 1998, horizontal linkages amongst communities have become more common. Started on the initiative of Pred Nai's leadership, but with the assistance of RECOFTC and the RFD, the village conservation group began hosting community leaders who wished to learn about Pred Nai's community-based conservation and management efforts. These leaders came from villages all over Thailand. Thus leaders from other communities were able to learn about, and from, the organization and methods of the Pred Nai group. This allowed for the establishment of new community-based initiatives in other communities, helped leadership from existing community-based programs to learn about different approaches and techniques to conservation, and also helped to develop new partnerships.

The second and more significant development of horizontal linkages was the establishment of the Trat Provincial Forestry Network. This network, established by Pred Nai and RECOFTC, has been important in establishing and encouraging communication between communities within the province of Trat, allowing them to share knowledge and experiences relating to community-based forestry management. The network also gave communities a more significant political voice in the provincial and national arena as the network was able to provide one clear, strong voice for the numerous community-based conservation and management programs within the province.

Phase 4: Further Development and Networking (2002-Present)

Currently, the number of horizontal linkages connected to Pred Nai has increased dramatically. The community continues to operate its "eco-tourism" program allowing

leaders from other communities that manage community forests, or are beginning to manage community forests, to come and see the program in Pred Nai and learn from their experience. The provincial level network, Trat Network, also continues to function, still supported by RECOFTC, but there have also been new networks begun at different organizational levels as well. The original Trat province network has spawned a new "four-province network" involving communities from across the four coastal provinces of Trat, Rayong, Chantaburi, and Chonburi. This network functions similar to the Trat provincial network, but it is based at the regional level and thus has a greater political voice and a wider sphere of influence. The size of this network makes it less effective at providing assistance to individual communities but it has also increased communication between the existing provincial networks.

In addition, another network has been created to encourage networking between the two sub-districts of Hung Nam Khao, where Pred Nai is located, and Ao Yai, the sub-district to the south. This network was likely necessitated by geography, because the two sub-districts share a small peninsula (see **Figure 2**). This network was created with funding from the UNDP and focuses on reforestation within the two sub-districts. Pred Nai is participating in this network but its role is largely advisory, as Pred Nai's mangroves remain relatively intact. All three of the current networks that Pred Nai is involved in are important forums for communication and dialogue between communities and, because of the large number of communities participating, facilitate easier and more equal dealings with national and provincial branches of concerned government departments.

5.5 Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC)

RECOFTC is an international NGO which operates throughout Southeast Asia and aims to support and develop community-based natural resource management projects for optimum social, economic, and environmental benefits (RECOFTC, 2004). According to a senior RECOFTC manager, RECOFTC's involvement with Pred Nai has fallen into two distinct stages; the first phase consisted of the PAR project conducted with Pred Nai; and the second phase, which the relationship is currently in, is focussed on research with the community, capacity building, and ongoing community support.

RECOFTC became involved with Pred Nai in 1999, after Pred Nai was the recipient of SIF funding. The director of RECOFTC had been a part of the board that reviewed the SIF funding applications; and after learning about Pred Nai's conservation efforts he was intrigued and went to visit the community to learn more and initiate a relationship with the community. Soon after his visit RECOFTC began working with Pred Nai in their management efforts, assisting Pred Nai to conduct a forest inventory, a socioeconomic inventory, and helping to develop and revise the village's existing management plan. This early relationship culminated in a participatory action research (PAR) project between RECOFTC and Pred Nai which began in late 2000. This PAR project lasted approximately 3 ½ years and had three objectives: 1) Evaluation and monitoring of resource use; 2) Development of the management plan; and 3) Establishment of networking between stakeholders and communities. The PAR project was funded by the Toyota Foundation, providing 3,000,000 baht (approximately $75,000 USD) which allowed RECOFTC to hire two employees to work full time with Pred Nai.

There were a large number of important conservation and development measures implemented during this period, including: the establishment of a mud crab bank, which helped to increase mud crab (*Scylla serrata*) population levels (see section 6.2 for more details on the mud crab bank); the construction of "fish houses" from old rubber tires to provide habitat for aquatic wildlife; more active monitoring of fish and crab populations and harvests, and research into the effect of thinning the mangrove forest on the productivity of grapsid crabs.

The second stage of RECOFTC's relationship with Pred Nai began after the termination of the PAR in mid 2004. RECOFTC continues to maintain a close relationship with Pred Nai, although they are not as active in the community and no longer have a separate budget just for working with Pred Nai. In the words of one RECOFTC employee "Pred Nai and RECOFTC are like close friends, if they need assistance with something RECOFTC is there to help them." RECOFTC's current involvement with Pred Nai falls under four themes: 1) capacity building and networking; 2) Pred Nai as community learning resource; 3) community resource management planning; and 4) strengthening the relationship with the TAO and local government. RECOFTC is an important partner in community forestry all over Thailand and Southeast Asia, and they remain involved in both the Trat provincial level network and the "four-Province" regional network. RECOFTC's involvement with these networks ensures the continued functioning of these networks through their role as facilitator at meetings as well as administrative and technical support. The researcher noted while attending numerous network meetings that the meetings in which RECOFTC workers attended and acted as facilitator tended to run a lot smoother and seemed to be more productive.

RECOFTC also continues to provide both formal and informal capacity building for Pred Nai in the form of workshops and seminars that they run for the benefit of persons from community-based forestry programs from all over Thailand. Second, Pred Nai has also become an important community learning resource utilized by RECOFTC, allowing other communities to visit and learn from the people of Pred Nai, and their experiences. Third, RECOFTC provides ongoing help to Pred Nai in developing and adapting their management plan to meet changing conditions. Fourth, RECOFTC attempts to act as a facilitator to strengthen Pred Nai's connections with the TAO and other local government agencies in order to strengthen their communication and cooperation with government agencies.

Throughout the research it became increasingly evident that RECOFTC played a critical role in enabling and developing community-based management in Pred Nai. The origins of Pred Nai's conservation and management efforts lie in the grassroots efforts of the community, however, the involvement of RECOFTC acted as a key catalytic element enabling the community to further develop their management plan and activities, network with other communities, and engage in local research. RECOFTC was not only an important organization in and of itself, but also in the role that it played in initiating and developing new horizontal linkages with other communities and new vertical linkages with other organizations. Horizontal linkages were encouraged through the creation of community forestry networks at the provincial and regional scale; as well as through Pred Nai's hosting of leaders from other communities. Vertical institutional linkages were facilitated with government agencies and universities through RECOFTC and resulted in collaborative research projects between the community and universities; study tours of

the community by government officials and academics; as well as greater collaboration between Pred Nai and government departments. Due to their strong, grassroots origins Pred Nai likely would have continued to be a successful community-based organization without the help of RECOFTC, but RECOFTC's involvement increased the magnitude, scope and scale of the community's successful conservation and management efforts.

5.6 Replication

Replication of, and learning from successful projects is important as these successful projects are an important learning resource and can often form an example or solid foundation for new projects. Horizontal learning between communities is a key element in encouraging the development of new community-based projects. More importantly, however, horizontal learning between communities can increase the chances of new community-based initiatives to achieve success by allowing for support and mutual learning between communities.

In talks with the leaders from nearby communities all of the leaders mentioned that Pred Nai has provided important knowledge and experience in the areas of: organizing a conservation group, obtaining funding, and managing the mangrove forest. One member of the Tambon level network even commented that many communities will likely adopt and adapt Pred Nai's management plan for their own communities as a first step towards their own conservation groups. One leader from a nearby community also remarked that their affiliation with a successful group such as Pred Nai had been a credential that they used when applying for their own funding for reforestation.

Pred Nai villagers claimed that numerous new community-based projects have started as a result of the village's involvement in networking and its eco-tourism program. There were numerous examples of community-based projects that were initiated as a direct result of Pred Nai's successful conservation efforts. According to one of the village's leaders the conservation groups in the villages of Ban Ao Yai, Ban Laem Makam, Ban Bang Bow, and Tambon Chang Rak were inspired by Pred Nai's success and have all initiated their own community-based conservation projects with help from Pred Nai. It was apparent that Pred Nai's experience and success is important to other community-based projects as during every network meetings that the researcher attended, references were made to Pred Nai and their successful management efforts. In addition, Pred Nai has been important in sharing their experiences with other communities through the different networks and has often served as a model or framework for other community-based projects.

Horizontal learning among communities, supplemented by technical support from NGOs or government, appears to be an important factor in replicating successful initiatives and helping new projects to reach their goals. Instead of being told about an abstract concept from a NGO or development agency, communities seem to be more willing to try their own conservation or development projects when they can see the experiences and results from another community. Communities may also be more willing to work with individuals from other communities than with government representatives, especially if there is any existing conflict or mistrust. Additionally, when new projects partner with successful projects, such as Pred Nai, it can be seen as adding some credibility to their own project and increasing their chances of obtaining outside funding.

Pred Nai's experiences and horizontal networking have produced learning and knowledge that can contribute to the success of these new projects. Thus horizontal learning, in the form of community-forestry networking as well as individual connections between leadership, can play in important role in the replication of successful community-based projects, not only in initiating new projects but in assisting new or pre-existing projects by supplying knowledge and experience, connections with NGOs or government, and an example proving that success is possible.

5.7 Policy Environment

Thailand is currently at a crossroads in terms of the legal status of community-based forestry/management in the country. The national legislature is currently working on a Community Forestry Bill which will provide concrete legal status and a framework for all existing and future community-based forest management projects. The bill is still in development, and according to the researcher's contacts with academic and NGO workers, it is currently under debate on whether mangrove forests will be included within the forestry bill. If mangrove forests are excluded from the final community forestry bill Pred Nai's mangrove forests may be endangered as the conservation group would lack official recognition and legal authority. In addition, mangrove forests may be classified as "non-forested" land which is then more vulnerable to future commercial exploitation and degradation.

The success of Pred Nai appears to have improved the opinions of many local government officials towards community forestry. In Thailand, however, all policies are set at the national level and the community's success has not had much of an impact at

the national level. According to one academic that the researcher talked to, politicians are divided between those in favour of community-forestry, those that are afraid that local communities cannot handle the responsibility of managing local resources sustainably, and those who want to open natural resources for extraction and consumption by large businesses as they believe it to be the better route for the economic development of the country. Many politicians are against delegating any authority to communities out of fear they will overexploit the land and resources, an opinion common within governments all over the world. As the finalized version of the law has not yet been passed it remains to be seen how it will impact Pred Nai's conservation and management efforts.

Despite the lack of any official legislation the Pred Nai group has managed to work closely with numerous government agencies, principally the provincial offices of the DMCR, the RFD and the fisheries department. All of the government officials that the researcher talked to thought that Pred Nai's community-based management was having positive results and they all claimed to support the community's efforts. The RFD was one of the first government agencies to assist the community, helping with reforestation, patrolling the mangroves, and was particularly important in helping the community to develop their initial management plan. In the words of one official from the RFD: "Other villages can learn about good community forestry management from Pred Nai." His sentiment is echoed by the fact that even though the RFD is technically no longer involved with mangrove forests, the provincial office still works with Pred Nai to help teach other communities about community forestry practices. Pred Nai community members were also generally positive when discussing their interactions with government agencies, however, a recent disagreement between the Pred Nai group and the DMCR has

planted some seeds of mistrust within the community towards this one office of the government.

5.8 Unusual Cross-Scale Interaction

One interaction that struck the researcher as being unusual existed between Ban Pred Nai and the Social Capital Development Institute, a provincially based NGO (see **Figure 8**). This linkage was unusual for two reasons. First, whereas, many social and economic development projects target communities with the assumption that the benefits will trickle down to the individuals, this particular project was aimed at the household and individual level with the assumption that the aggregated benefits from individuals and households would eventually be seen at the village level. Second, this project attempts to reintroduce traditional Buddhist values as a means of improving economic and social welfare.

The relationship between these two groups was manifest in the "Happy Communities Project" funded by the National Health Department and administered by the Social Capital Development Office. This ambitious project is multi-faceted and aims to improve the lives of individuals and households in rural villages across Trat province. The four facets of this project are diverse and include: individual self-improvement in-line with Buddhist principles (reducing expenditures on entertainment and luxuries, and elimination of vices such as gambling or smoking), household budgeting, planting of organic "kitchen gardens" (growing herbs and vegetables for household use in order to minimize the need to purchase these items), and planting of trees around the house and yard for lumber (domestic use or for sale). The self-improvement facet is particularly

interesting, as it takes a practical approach and the results realized by individuals will directly benefit their households and community at large. The aspects involved include: reducing vices within the community, such as use of alcohol, tobacco and gambling; reducing the amount of money spent on entertainment, such as movies and extravagant foods; to seek balance in life, and to reduce the ego, or the importance of self.

Chapter 6: Application of Local Ecological Knowledge for Management

Plate 11: Village elders sharing local ecological knowledge with village children at Pred Nai's annual summer camp.

Plate 12: Local mangrove flora and fauna on display at the community learning centre. The centre is located in the village school and open to all.

6.1 Introduction

This chapter will discuss the nature and use of local ecological knowledge (LEK) within the conservation and management efforts of Pred Nai. It is important to distinguish that the knowledge displayed by the community is considered to be local knowledge rather than scientific knowledge because it is not based on western scientific frameworks but instead accumulated their own experiences and observations. It is also important to recognize that this is only a subset of LEK; the researcher did not deal with epistemologies or the more abstract elements of LEK, only LEK which was actually applicable to conservation or management.

This chapter will examine the nature of the LEK present in Pred Nai and identify the groups within the community that hold this LEK. This chapter will then examine the mechanisms that the community has adopted in order to preserve their local knowledge and transmit it to younger generations. The chapter closes by examining how LEK is received by organizations which Pred Nai interacts with and the progress towards the integration of LEK and conventional scientific knowledge within Pred Nai.

6.2 Nature of Local Knowledge

The knowledge used by the villagers of Pred Nai in the management of their mangrove forest is an interesting combination of both conventional scientific knowledge and local ecological knowledge. Local knowledge which is held by members of the community is commonly centered on the use or harvest of local resources but in many cases has been useful for conservation and management. Outside knowledge was brought

to the community largely by NGOs and government agencies involved with the community. Outside knowledge has largely been knowledge which is useful to the community, relating to reforestation, mangrove ecology, or other areas where the community asks for assistance. It is also important to note that knowledge is shared amongst communities involved in the various community forestry networks.

One of the best examples of the community's local ecological knowledge is the prohibition placed on crab collection during the spawning season. The crabs spawn during the full moon and the new moon period in the eleventh month of the Thai year (approximately November). The conservation group used the villagers' knowledge of the crabs' breeding cycle to implement a ban on collecting for one day before, during, and after both the new and full moon. This program has seen tremendous success in increasing the numbers of grapsid crab in the mangrove forest since its inception six years ago. Villagers indicated that their harvests of the grapsid crab had increased about ten-fold overall, with higher catch per unit of effort and a larger number of harvesters involved (**Table 1**). Crab collectors also reported a population increase, evidenced by the observation of large numbers of young crabs.

Another example of the villager's LEK is the household utilization of mangrove flora and fauna for both food and medicinal purposes. While walking through the mangrove forest visitors can read signs that give the common name and scientific name, as well as common household uses, for a large number of the trees and plants in the mangrove forest. A number of community members also shared with the researcher that there were three men in the community who specialized in traditional medicines, a "snake doctor", a traditional doctor who specialized in treating children, and a traditional doctor

who used herbs fermented in types of alcohol to treat common ailments. These individuals collected ingredients from the mangroves and created remedies to treat the ailments of villagers. The community members who spend a lot of time in the mangroves, for example the crab collectors, are also very familiar with the land itself and are able to share information on location, seasonality, and changes in the state of different flora and fauna in the mangrove forest. This information was useful when reforestation began as these villagers were able to advise on the best location, relative to the water level, for specific species of trees.

Pred Nai Community Forestry Group, in partnership with the provincial office of the fisheries department, also constructed a holding area for spawning mud crabs, locally called a "mud crab bank". The villagers started this project in order to help increase the numbers of crabs available for harvest. They requested the fisheries department to provide nets so that they could create an enclosure within one of the canals in the mangroves. After the creation of the enclosure, whenever villagers would catch gravid mud crabs or swimming crabs in their traps they would move the crabs to the enclosure. Within the enclosure the crabs were able to spawn and the movement of the water in the canals allowed the larvae to spread out naturally, thereby increasing populations. This successful project was made possible by the villagers' knowledge of the crabs and also by their knowledge of the water flow in the canals of the mangroves.

Local ecological knowledge has also played a role in assisting the community to conduct ecological monitoring and assessments. The community members' detailed knowledge of the mangrove forests, flora, and the terrestrial and aquatic fauna allows them to accurately monitor ecological variables such as species population numbers.

The large amounts of time spent in the mangrove forest by some members of the community, especially the crab collectors, also enables them to have an accurate and reliable level of knowledge of the state and condition of the flora and fauna in the mangrove forest. The information from this informal monitoring and assessment is useful not only for the community's conservation group but also for government agencies and NGOs which have an interest in the region.

Outside knowledge was also an important component of the conservation and management program within Pred Nai. Capacity building has played an important role in transmitting outside, often scientific knowledge to the leaders of the conservation group and the members of the village. Capacity building has come in the form of both formal and informal training by government, NGOs and universities; as well as knowledge exchange between communities within the framework of formal community forestry networks.

Formal and informal capacity building has been provided by government departments, including the RFD, DMCR, fisheries department, the army; as well as NGOs such as RECOFTC. Community members have learned and developed skills in community forestry management, map reading, the use of GPS, reforestation and replanting, networking, report writing, patrolling, forest inventory and mapping, networking, as well as how to help educate and train other communities.

6.3 Knowledge Holders

Within the village local knowledge is possessed primarily by the resource users. The local mangrove forests are an important economic resource for the village and they

are utilized by a large number of the people for a wide variety of different resources, including: fish and aquatic wildlife, tides and water circulation in the mangroves, terrestrial animals, trees, plants and herbs. As a good deal of the local ecological knowledge present is utilitarian in nature it is possessed in varying degrees by the resource users. During the fieldwork the researcher found that around 80% of interviewees indicated that mangroves provided at least part of their livelihoods, commonly gathering crabs, fish, and shrimp as a primary or supplementary economic activity. These were the individuals that were able or willing to share some of their LEK, including its application for conservation, with the researcher. Individuals that admitted to spending little or no time in the mangroves generally knew little about LEK or how it had been used for conservation. It was also pointed out to the researcher by numerous government members and NGO workers that Pred Nai possesses a great deal more LEK than most other local communities, largely due to the fact that most other communities have little or no local mangrove forest remaining and thus there is no means for people to acquire or pass on LEK. Thus, the LEK within Pred Nai is valuable not only to the community itself but also to other, nearby communities whose members may lack experience and LEK.

Two groups of people in particular stood out in terms of the quantity and quality of ecological knowledge that they possessed; these were the village elders, and the crab collectors. The village elders, largely due to their years of accumulated experience, displayed a wealth of ecological knowledge and were often called on to help educate children and other villagers. Some elders within the village also possessed more specialized knowledge relating to medicinal uses of various local flora and fauna.

The people of the village generally hold the elders in high regard, are willing to listen to them, and respect their opinions. The elders often share their opinions and knowledge during meetings of the conservation group, and the elders play an important role in helping to teach the young people of the village through the school and the annual summer camp for local children. The crab collectors' knowledge tended to be more utilitarian in nature, relating to the harvest and utilization of mangrove resources. In addition, since they spend a great deal of time in the mangroves they possess excellent knowledge of the local geography. Their strong ecological knowledge and familiarity with the land proved useful when creating rules for management and patrolling of the mangroves, and is borne out by the fact that crab collectors make-up the majority of the patrol members.

6.4 Mechanisms to Preserve and Transmit Knowledge

There are numerous mechanisms in place within the community of Pred Nai to preserve LEK and ensure that it is transmitted to younger generations in order to carry it on. Pred Nai utilizes their village school, an annual summer camp, and the widespread sharing of their knowledge in order to preserve that knowledge. Direct transmission between family members is an important mechanism but will not be discussed here as it is straightforward and common to most cultures and situations.

The village school within Pred Nai is one of the important mechanisms which assist in the transmission of local knowledge. The primary school is staffed by seven teachers and serves approximately 100 students from the village and surrounding area. In discussions with a teacher from Pred Nai's school the researcher learned that the school

has become involved with the community's conservation efforts in a number of different ways. Housed within the school is a community learning centre which serves as a classroom where students, as well as community members and outside visitors, can visit to view samples of mangrove flora and fauna preserved and displayed within glass cases. Students take trips into the mangroves with elders and other knowledgeable villagers in order to collect samples of flora and fauna (sometimes to add to the community learning centre), and to see the mangrove environment firsthand with local experts who can pass on knowledge directly to the children. The school also includes learning about local knowledge in their curriculum. This is accomplished by inviting knowledgeable individuals from the community to be a guest at the school and to share their specialized local knowledge with the students.

Another key mechanism for transmitting local knowledge is an annual summer camp held for the village children. This summer camp has been held in April, during the children's school break, since 2001. The camp is run by students from one of the universities which has cultivated a relationship with Pred Nai and is funded from numerous sources, including the university, the education department and the TAO. The summer camp focuses on teaching four themes: village history, history of the conservation and management of their local mangrove forest, utilization of the mangrove forest (flora and fauna), and local ecological knowledge. The camp involves many of the village elders and resource experts in teaching the children, while university students act as supervisors and organizers of the camp as a whole. The camp also includes a liberal mix of games, sports and plenty of hands-on learning in order to engage the children and make the experience fun as well as educational. Pred Nai's summer camp impressed the

researcher as one of the more important knowledge transmission mechanisms in the community because it successfully connected the local youth with the knowledge holders in the community. By successfully bringing together different generations in the community Pred Nai has created an excellent venue for passing on LEK and other local and historical knowledge to the youth of their community.

An additional method of preserving the community's LEK is through sharing their knowledge with other communities and government agencies. By sharing this knowledge the community ensures that it not only carries on over time, but that it receives wider application and assists other communities in conservation efforts. The community could be perceived to have lost "ownership" of their local ecological knowledge, or at the very least, for that knowledge to cease to become "local" knowledge. However, this did not appear to be an issue for community members, as all of the members that the researcher talked to expressed not only willingness, but often an enthusiasm for sharing Pred Nai's experiences and their own specific knowledge with others. For example, Pred Nai's prohibition on collecting grapsid crabs during the spawning season is a rule which 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. Another example of Pred Nai's willingness to share their knowledge shows up in the posters in the community centre and the signs posted in the mangrove forest which shares with visitors some of the community's knowledge about the local flora and fauna.

Local ecological knowledge is an important tool to aid communities in their conservation and management efforts. Pred Nai has numerous mechanisms in place in

order to preserve the community's local ecological knowledge and pass it down to future generations including: the community's school, an annual summer camp, and the sharing of their knowledge with other communities and concerned agencies.

6.5 Local Knowledge & Outside Organizations

Local ecological knowledge was important in Pred Nai's case, not only in the conservation and management of the local natural resources, but it also proved important in networking and working with other organizations.

In Pred Nai's case LEK was important in providing the hypothesis for numerous collaborative research projects that the community became involved in with other organizations. For example, the villagers' knowledge contributed to the formulation of Pred Nai's research with RECOFTC into the effect of mangrove tree density on grapsid crab (*Grapsidae* sp.) populations. The community's research, assisted by the TRF, on the efficacy of bamboo fences and fish houses to control shoreline erosion; and numerous other smaller social and ecological research projects conducted in cooperation with universities and university students. Pred Nai has also been involved with numerous social and ecological research projects conducted by various academics and university students, in which the community has cooperated but not been involved in the formulation of the hypothesis for research. Involving the community members and LEK directly with universities and researchers is probably one of the best methods for integrating LEK and scientific knowledge. By putting the community and academics together and encouraging dialogue between the two groups it encourages learning and a

two-way exchange of knowledge, and better understanding of the knowledge systems between the two groups.

Pred Nai has also been actively involved in sharing their knowledge and experiences, including LEK, with other communities, NGOs, and government agencies. In some cases from around the world communities possess LEK or TEK which they are hesitant to share with outsiders; this is not the case in Pred Nai. The people of Pred Nai have been eager to share not only their experiences in conservation and management but also their knowledge, including LEK, in order to assist other communities in their own conservation projects. Pred Nai villagers have shared knowledge about: the habitat, lifecycle, and harvest of grapsid crabs and other fauna commonly harvested from the mangrove forests; the traditional and medicinal uses of various plants, through their community learning centre and informational signs posted along the walkway through the mangroves; and they have shared their knowledge of the geography of their local mangroves with law enforcement agencies that have helped the community to patrol the mangroves. The community has also been eager to cooperate with researchers from universities and NGOs in order to share their knowledge and experiences with a wider audience. For example, during the conduct of this research two Thai university students were also guests within Pred Nai conducting research into the eco-tourism and the economics of crab-collecting.

In Pred Nai's case it is apparent that local ecological knowledge has played an important role, contributing not only to the community's conservation and management efforts but also to NGOs and government agencies involved with Pred Nai. A recent RECOFTC report summarizing the PAR project with Pred Nai noted "In some active

learning communities, linkages and integration of academic, technological and indigenous knowledge are necessary" (Kaewmahanin, 2004). This report from RECOFTC recognized the importance of local or indigenous knowledge in community-based management, not only within the community itself but that it can also contribute to outside agencies.

6.6 Integration of Local Knowledge and Conventional Scientific Knowledge

The integration of conventional, scientific knowledge and local ecological knowledge has been important within Pred Nai. Both knowledge systems have their strengths and by integrating the two knowledge systems communities, like Pred Nai, can take advantage of the strengths of both systems. For example, the Pred Nai group utilized local knowledge when creating the village management plan; however, they turned to the provincial RFD office when they began their first reforestation efforts because villagers had little or no experience in reforestation.

Much of the local ecological knowledge within the community deals with locating, harvesting and utilizing local mangrove resources; however, some of this knowledge is also valuable for management. For example, the crab collectors' knowledge of the breeding and life cycles of the economically important grapsid crab led them to suggest a ban on crab collecting during their spawning period. This highly successful rule was a direct result of the ecological knowledge and experience of the crab collectors. Local ecological knowledge also serves as a valuable source of hypotheses for research

projects. For example, there are currently a number of collaborative research programs underway with NGOs such as RECOFTC, such as researching the effect of thinning mature areas of mangrove forest in order to increase grapsid crab populations, and TRF (Thailand Research Fund), researching the effects of sea-fences and artificial rubber fish houses on reducing the rates of coastline erosion. In both of the examples given here the idea for the research as well as the hypothesis was brought forward by the community.

The villagers of Pred Nai also embrace scientific knowledge and are generally eager to learn more from outside 'experts'. Outside knowledge is generally sought in the areas of technical, ecological, legal, and administrative knowledge. For example, much of the community's knowledge concerning reforestation, aquaculture of fish (which replaced the unsustainable aquaculture of shrimp), conduct of research, patrolling of the mangroves, came from NGOs or government agencies that shared their expertise. Within Pred Nai's village school the community has built a learning centre which contains samples of many of the flora and fauna found in the local mangrove forest. The community learning centre was built to provide an opportunity for students, and other villagers, to learn about their local environment from both a conventional scientific perspective and a LEK perspective.

The practical integration of the two knowledge systems is visible in many forms. In their partnerships with RECOFTC the village has provided hypotheses for research projects; such as the current project examining the impact of thinning areas of mangrove forest on grapsid crab populations. With the guidance and assistance of the RECOFTC staff the conservation group has taken the role of conducting the research and gathering the necessary data. This relationship has further evolved with the TRF who has provided

funding and technical support to assist Pred Nai in studying various methods of keeping fishing boats away from shore and minimizing the effects of erosion on the shoreline (bamboo fences and fish houses made of tires). Pred Nai's work with universities has principally been in the other direction, where groups of students or academics come to the village principally to learn from the community members and the conservation group about mangrove ecology and successful community-based management. The researcher also observed a few examples where researchers from Thai universities conducted fieldwork in Pred Nai and the results of these studies were then shared back with the community in order for the community to derive benefit from the research.

A key component of this integration of knowledge systems, in Pred Nai's case, is that the villagers have remained in control of their management plan, allowing them to utilize outside knowledge which is of use to them. In the case of disagreement between scientific knowledge and local ecological knowledge it would seem that local knowledge is given priority. An example of this is evident in a current disagreement between the Pred Nai group and the local office of the Department of Marine and Coastal Resources. The DMCR had begun a program of cutting and burning certain fern species in the mangrove forest in order to open up land for the replanting of species that they find more favourable. The conservation group disagreed with this approach and reached an agreement with the DMCR to ban burning in Pred Nai's mangroves and allow for replanting only of non-forested or degraded areas. This example shows that the villagers maintain control of their community forest and also use local ecological knowledge as a check against potentially harmful activities or research.

The Pred Nai case presents an interesting example of the integration of conventional scientific knowledge and local ecological knowledge. Pred Nai Community Forestry Group has, since its inception, shown a great interest in technical and academic support/training often preferring this form of support to financial support in the form of direct funding. This thirst for knowledge 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. It is also significant that knowledge transmission between partners is never one way, in all of the cases observed or discussed with villagers there is mutual sharing of knowledge and experience.

Chapter 7: Conclusion

Plate 13: A small mangrove tree nursery started by villagers in order to assist with reforestation efforts.

Plate 14: A crab collector (seated in centre of photo) teaching village children at Pred Nai's annual summer camp.

7.1 Introduction

This chapter will summarize the lessons learned from the researcher's work in Pred Nai that may be useful in other, similar, cases around the world. The chapter then outlines some of the lessons learned from this case which are not applicable to other cases and provides the reasons why they are not transferable. The chapter then finishes off with a discussion of possibilities for further research connected with the Pred Nai case.

7.2 Lessons Learned

Pred Nai Community Forestry Group has demonstrated itself to be a successful community-based group, both conserving biodiversity and enhancing socio-economic development. This research was conducted in order to learn lessons from this case. Analysis of the results obtained during research produced nine key lessons learned from Pred Nai which may be valuable in other community-based management cases. The first six lessons pertain to self-organization, while the lessons seven and eight fall into cross-scale linkages, and the ninth lesson relates to local ecological knowledge.

1. Availability of funding to proceed in small, practical steps

It is a common conception in the mind of westerners that funding must be available in order to proceed with any type of natural resource management. The experiences from Pred Nai suggest that, although funding was necessary, it may not always be necessary in the amounts and in the forms that people from developing countries typically perceive. Although Pred Nai's conservation and management efforts

did receive some large inputs of funding in order to construct the walkway through the mangroves and purchase patrol boats, it seems that these elements were supplemental to the project. The success of the project instead relied upon the determination of the local population and some funding which was available in order to meet expenses and enable the community to proceed unhindered by the limitations of their own personal finances. For example, in Pred Nai's case as RECOFTC helped the community to set up the provincial community forestry network, the NGO often provided money to the leadership of Pred Nai and other communities in order to cover all or part of their fuel expenses to travel between communities and attend meetings. This assistance, although relatively small to the funding agency can make a huge difference to the participants; allowing them to participate in the networking process while minimizing their own personal expenses. By providing funds for smaller steps which met immediate needs the funding agencies also minimized the risk for waste or corruption. Pred Nai's experience also suggests that external funding may not always be necessary for the long-term sustainability of community-based management projects.

Another point of note in regard to funding is that prior to the availability of funds, the community was already involved in conservation and management activities and had already begun establishing an organizational structure. When allocating funding for community-based projects it may be best to provide funds to communities which have already shown initiative in engaging in conservation or management. This allows funding agencies to capitalize on existing capacities within the community and to increase the chances of success. Alternatively, communities with less social capital in place may benefit more from funding of capacity building activities or assistance in the form of

technical or managerial expertise, whereas placing funds directly under their control increases the chances of misuse of the funds.

2. A village savings group provides capital, training, and lends credibility to the community

Pred Nai's case also illustrates the important role that a village savings group or micro credit program can play in achieving successful community-based management. There are four fronts in which a village savings group can assist a community; first, by providing capacity building and increasing the social capital in the village; second, increasing the available capital and improving the financial positions of individual households; third, by creating a formal organizational structure in the community and lending credibility to the group's ability to handle finances without misuse or corruption; and fourth, by helping to build unity and a greater sense of belonging within the community.

The village savings group has provided a form of self-administered capacity building in the village. Although a local Buddhist monk was key in initiating the program and providing the initial training the villagers participation in administering and organizing the savings group provides invaluable experience which is also applicable to conservation and resource management. Participation in the savings group helps build skills in money management (individually & collectively), managing people, and creating and operating a formal organization (including running meetings).

The savings group also provides financial capital for the villagers who participate in the program in two ways. First, the savings group acts as a mechanism for villagers to

save some income in a regular and relatively safe manner, by requiring villagers to commit to buying a given amount of "stocks" in the savings group every month. Once the villagers have saved up 40,000 baht (approximately $1,000 USD) worth of stocks they are permitted to withdraw up to half of the money to spend on whatever they wish. The second and more important financial benefit from the savings group is its loan program. Villagers who are members of the savings group can apply for a low-interest loan from the savings group. The village committee which administers the program decides on loan approvals with priority given to loans which will be used for education or healthcare.

In Pred Nai, the community had organized themselves informally in order to defend and conserve their local resources but the village savings group was an important formal organization implemented by the villagers with some outside help. The creation of the savings group likely impacted on the villagers' decision to formalize their conservation group. The savings group not only helped the villagers in the creation, organization, and administration of the conservation group but also helped to create more confidence in the conservation group by outsiders. The savings group has demonstrated that the community is not only organized, but is also able to manage and account for significant sums of money, thereby increasing the chances of obtaining outside funding for the conservation group.

3. A number of steps leading to formal management

An important lesson learned from Pred Nai is that community involvement in informal conservation or development activities prior to engaging in active management can form a foundation for the success of formal management. In Pred Nai's case, the

creation of the formal conservation group and the concurrent active management of their forest grew as a natural progression from the community's informal conservation and environmental protection efforts. Pred Nai's active involvement in conserving and protecting their mangrove forest helped to establish a strong conservation ethic among community members, increased the unity and cohesiveness within the community and also facilitated a natural development of leaders within the community. The development of the village savings group acted to further increase the community's unity and also acted to build the social, financial, and technical capacity amongst individuals in the village. In addition, the savings group also helped to improve money management skills for community members and demonstrated organizational responsibility, which gave the community more credibility when seeking outside funding for their formal management group.

By engaging in conservation and development activities, prior to assuming the responsibility for management of their resources, communities gain valuable skills and important experience which helps them to succeed in future formal management. Communities which become involved in management of their local resources without any prior management or organizational experience would likely face a higher rate of failure due to a lack of experience. In cases of grassroots initiative for conservation and management these steps of increasing involvement may be even more important as they allow the community in question to not only build capacity within the village but also establish linkages, with NGOs, government agencies and other communities, which may be critical to their success in management.

4. Step-wise evolution allows for capacity building over time

Capacity building is widely recognized as an important part of community-based management. Pred Nai's success demonstrates that many skills and abilities relating to community-based management can be obtained prior to engaging in formal management, and in some cases, of the community's own initiative. The case of the Pred Nai group provides an excellent example of capacity building over time, accumulated from both within and outside of the community, as the community progressed towards management of their local resources.

In cases of grassroots community-based resource management the steps which occur prior to engaging in management activities are important in equipping the community with the knowledge, skills, and connections necessary to succeed in natural resource management and conservation. Pred Nai's case shows a considerable amount of capacity building which was provided in the form of training, carried out mostly by NGOs and government agencies. This formal training took place in conjunction with the activities of the village and conservation group which also helped to build capacity within the village. Pred Nai's case demonstrates that communities can, through their own means and organization, undertake internal or self-initiated capacity building which, although often limited in depth and breadth, will assist in conservation and management efforts. For example, in Pred Nai's case internal capacity building was both formal and informal and ranged from activities as diverse as forming and operating the informal patrol group; initiating a summer camp to teach village children about local history, the conservation group, and the mangrove forest; and early efforts at reforestation done without outside support.

In many cases within Pred Nai it is difficult to differentiate between internal and external capacity building. For example, the idea for the savings group and the initial training was provided by a local monk, however, once established it was relatively self-contained and the villagers who administered the group gained many valuable skills. This also shows that successful capacity building by outside agencies does not necessarily have to be in the form of classes or formal training but may be delivered simply by facilitating or providing opportunity for the village to undertake activities which will provide members with valuable experiences and learning opportunities.

5. Interplay of leadership, community cohesion and NGO support

Pred Nai's success in conservation and natural resource management is due to a complex interplay of community involvement, support from outside institutions and communities, and strong, honest leadership. When villagers were asked the reasons why they thought that Pred Nai had been so successful in their conservation and management efforts, the three most common responses given were: 14 people indicated the unity of the community, 9 people indicated the leadership within the community, and 6 people indicated the support of outside organizations. Community involvement and support for the project is critical, as participation provides the foundation for community-based management; unity within the community ensured that the villagers continued to support and participate in their conservation efforts. Strong, honest, accountable leadership is needed to provide direction to, and focus for, community-based initiatives as well as to ensure that the community remains in control and the project is not hijacked by outside organizations. In this case, leadership is also a culturally significant factor, as Thai

society is recognized as being strongly patriarchal in nature (Boyle, 2003). Linkages with NGOs, government agencies and other communities are critical for capacity building, as well as legal, institutional and technical support. Although the Pred Nai group came from grassroots origins, these outside linkages were important in this case in order to help the Pred Nai group to improve and develop their conservation efforts. In the case of Pred Nai, according to the opinions of the villagers, these three pillars were critical to the success of the project. The researcher's observations of events on the ground and understanding of the history and development of the Pred Nai group corroborated these findings.

6. Leadership key to grassroots movement

Leadership, as mentioned in the previous section, is one of three key elements, including community unity/support and NGO support, to the success of community-based management. The role of leadership, as exemplified by the case of Pred Nai, appears to be even more important as strong leaders may be able to develop unity within the community and cultivate the requisite support from NGOs and government agencies.

Strong leadership is important within most organizations in order to provide direction and guidance. Within community-based management initiatives leadership is important for these same reasons but also for many more unique to community-based projects. For example, charismatic leaders can act: to increase community participation; they can act as a strong unifying force within the community; leaders serve as focal points for networking with government, NGOs, and other communities. In addition, in many cases leaders are from more privileged socioeconomic classes and thus have more

education and training, and more personal resources, including time and money, available to them.

Within Pred Nai strong leadership appears to be a key to the success of the project. For example, during interviews when people were asked why Pred Nai had been so successful in their conservation and management endeavors the most common answer given was due to the strong leadership in the community, with many interviewees pointing to one or another leader. Currently, there are two important leaders within the community, the chairman of the conservation group and the village headwoman. Both are actively involved in different facets of the management effort, including working with stakeholders within the village and networking with communities and organizations outside the village.

7. Partnership with a key organization for building capacity and establishing linkages

Cross-scale institutional linkages are recognized as being critical to the success of community-based management projects. Within projects that have grassroots origins, however, these linkages are not likely to be present at the project's outset. NGOs can play an important role in facilitating the initiation and development of these cross-scale linkages. In Pred Nai's case the NGO RECOFTC, was a critical enabling organization in developing the conservation group and management plan and in creating and developing both horizontal and vertical institutional linkages. RECOFTC became involved with Pred Nai soon after the establishment of the formal conservation group and in late 2000 they began a participatory action research project with the community which served as an

important catalyst for the conservation group. RECOFTC's involvement was multi-faceted and resulted in co-operative surveys of the mangrove forest, refinement of the management plan, capacity building and technical support. Horizontal linkages were encouraged through the creation of community forestry networks at the district, provincial and regional scale. Vertical institutional linkages were facilitated with government agencies and universities through RECOFTC and resulted in collaborative research projects between the community and universities; study tours of the community by government officials, academics, and other community leaders; as well as greater collaboration between Pred Nai and local government departments. The case of Pred Nai shows that NGOs can act as important catalysts in the development of community-based projects that are grassroots in nature.

It is also important to note that although RECOFTC was a critical organization and offered important support to Pred Nai, it was the initiative of the community which begun the conservation and management efforts. The community had already begun their conservation group, developed a rough management plan and was engaged in managing their mangrove forest when RECOFTC became involved. Thus RECOFTC acted as an important catalyst in helping the project to become successful and especially in developing linkages but the community had acted on their own initiative and had already achieved a number of successes. NGOs appear to be critical in supporting community-based projects; however, it may be best if they become involved after the community has initiated the process on their own. This allows the community to build on experience, establish what their needs are for support and assistance, and to build community support and ownership of the project.

8. Horizontal learning among communities is the key to replication

Community-based management projects have been split between successful and unsuccessful cases. An important consideration for development and funding agencies is how to replicate, or facilitate the replication, of these successful projects within other communities. Pred Nai's case illustrates that horizontal sharing and learning, through networks and direct intercommunity connections, is an effective means of both replicating and initiating new community-based projects. In addition, horizontal learning and sharing between communities increases the probability of success for a given community-based project as it allows for the community, which is starting out, to draw from the knowledge and experiences, both successes and failures, of more experienced communities.

Horizontal learning among communities, supplemented by technical support from NGOs or government, may be the key to replicating successful initiatives and helping new projects to reach their goals. Instead of being told about an abstract concept from a NGO or development agency, communities seem to be more willing to try their own conservation or development projects when they can see the experiences and results from another community. The initiation of networking between communities allows communities which have not started their own conservation projects to learn about the process of organizing and administering projects, where to obtain outside support and funding, and how to overcome common obstacles.

9. Local ecological knowledge as the foundation for environmental stewardship

There is a growing recognition within academic literature of the important role that local ecological knowledge can play within natural resource management and conservation. Within the context of community-based or co-management arrangements, where the community is the operative level, local ecological knowledge can be especially important. In many cases, local ecological knowledge forms the foundation for the community's relations to the environment.

The case of Pred Nai is a prime example where a community's local ecological knowledge forms the foundation for environmental stewardship by contributing to their conservation and management efforts. For example, the crab collector's precise knowledge of the spawning cycles of grapsid crabs enabled the conservation group to construct the rules prohibiting collecting crabs during the crab's spawning period. Pred Nai's case also illustrates that although local ecological knowledge can be an important ingredient for successful community-based management it is rarely sufficient on its own. Within Pred Nai, local ecological knowledge was useful for management but could offer the community little assistance in their mangrove restoration efforts. In this case the community's partnerships with government agencies, which had knowledge on mangrove restoration, proved useful as the government agencies were able to provide needed, practical knowledge. This knowledge of mangrove restoration can then be maintained within the community through the same mechanisms used to transmit local ecological knowledge.

The potential also exists for the integration of local forms of environmental knowledge and conventional scientific knowledge. Local and traditional ecological

knowledge can serve to act as hypotheses for collaborative research projects with universities or government agencies. More importantly for community-based management and local capacity building, there is often an opportunity for the community itself to become involved in the design, conduct, and analysis of research projects. For example, Pred Nai is currently engaged in collaborative research projects with: RECOFTC, testing the effect of thinning the mangroves on the populations of grapsid mangrove crabs; and the TRF testing the effectiveness of bamboo fences and artificial rubber "fish houses" on reducing shoreline erosion. In situations where the community becomes involved in the conduct of the actual research they stand to benefit not only from the results of the research, but also from their participation in the research process itself.

7.3 Lessons which were not transferable

There are two elements which contributed to the success of Pred Nai which are not necessarily transferable to projects in other areas of the world. The first is that within the project there was minimal internal conflict within the village. When conflict was present it was largely suppressed and kept from escalating. For example, there was an existing conflict and power struggle ongoing between two of the key leaders of the project. Despite this the two were openly willing to work together in the interests of the project and it took the researcher over a month in the field to discover the existence of the conflict at all. Although in some circumstances it is best to resolve conflicts as they appear, the low-intensity nature, and relative lack, of open internal conflict within Pred Nai appears to have led to an ease of internal management and helped contribute to the

community's success. The lack of conflict in the community is due to two factors. First, avoidance of conflict has been noted as being characteristic of Thai society (Boyle, 1993) and second, the tight-knit, almost family like, character of the village has also contributed to the civility and lack of conflict in the community. Within different cultural settings where open conflict is not as strong of a social taboo, community-based management is likely to be impeded and made more difficult through internal conflicts between stakeholders and different user groups within a community.

The second element which contributed to the success of the conservation group in Pred Nai is the patriarchal nature of Thai society (Boyle, 1993). As discussed earlier, leadership is a key element of community-based projects. Within a patriarchal society the task of leadership becomes somewhat easier as there is a cultural tendency to follow those perceived as leaders. This characteristic, although not unique to Thai culture, is not common to all cultures throughout the world; thus, in some circumstances, leadership within a community may face a more difficult task in rallying community support and administering the community's conservation or management effort. The patriarchal nature of society also contributes to low levels of conflict in the project as villagers are often more willing to follow their leadership even in cases where they may not agree with their actions or decisions.

7.4 Recommendations to improve this case

Pred Nai Community Forestry Group has achieved great success in achieving both environmental conservation and economic development. Despite the success of the conservation group, however, the project does suffer from shortcomings in a number of

areas. First, Pred Nai has developed from a largely independent, grassroots project to a community which stands as a central node for a large number of linkages with other organizations which have become involved in the project. The Pred Nai group would be well served by implementing an effective method of dealing with the many outside organizations which are involved, or want to become involved, with Pred Nai. It may even be necessary to limit the number of outside organizations to a manageable level. The project also needs to develop a better system of disseminating information about these outside organizations to community members. One of the complaints voiced by villagers was that there were simply too many organizations involved with Pred Nai and the average community member had no idea who these organizations were or how they were involved in the community.

A second and related problem identified by the leadership of the community was that they were simply becoming overwhelmed dealing with the many meetings and conferences required to administer the conservation group and maintain the linkages with the networks and outside organizations involved. The large amounts of time required of the village leadership has begun to detract significantly from their time spend on livelihood activities and with their families. For example, one senior leader in the conservation group shared that he had meetings or conferences, many in distant parts of Thailand, scheduled for 24 days in the month of June alone. If Pred Nai is able to better manage or streamline its linkages with other organizations this would assist in reducing the workload of project leadership. It may also be important to begin including more people in leadership positions, possibly based upon a mentoring relationship with current leaders. A mentoring system for leadership would involve more people in the

administration of the project and also act to help to train future project leadership. If a system cannot be found to reduce the time required of Pred Nai's leadership then it may be necessary for the village to seek some outside funding and compensate the leaders for the time that they devote to the project.

7.5 Further Research

Pred Nai provides an interesting and fruitful case study for numerous reasons, including: their success with their community-based conservation and management, their vast network of linkages and partnerships at different organizational levels, their use of local ecological knowledge contributing to their mangrove management, and the strong grassroots origins of their community-based initiative.

There are numerous additional areas in this case that are interesting and worthy of further academic investigation. The first area which merits further investigation is measurement of the degree of improvement of ecological conditions due to Pred Nai's conservation and rehabilitation efforts in the mangroves. It is apparent from the responses of the community members that the local ecological conditions and harvests have improved as a result of the Pred Nai community's conservation and rehabilitation efforts. However, a quantitative study would be needed to document the true extent of ecological improvements, but baseline data are lacking.

Another area for further research is a detailed investigation into the community forestry networks which Pred Nai is involved in. Although the networks were examined, the focus in this project was how the networks related specifically to Pred Nai. A detailed examination of the composition, funding, activities, and origins of each of the networks

as well as comparison between the networks which operate at the different organizational levels will allow for more detailed learning about the role that networks play in community support and replication of new initiatives. The networks from South-eastern Thailand which Pred Nai is involved with provide excellent cases for study because there are numerous networks all operating at different levels, including sub-district, province, and region. In addition each of these networks is quite different in their purpose, structure and in their levels of support.

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Appendix A: Key Contacts

Mrs. Samnao Pedkaew
Village Headwoman
Pred Nai Village, Hung Nam Khao District
Trat Province, Thailand

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Appendix B: Question Schedule for Semi-Structured Interviews

Self-Organization

- What led to the formation of Pred Nai Community Forestry Group? Whose idea was it? Was there anything that acted as a catalyst for its formation?
- How was the project actually implemented?
- What other organizations played a role in the formation of the project? How did they become involved?
- Who were the key individuals involved in the formation of the project? What role did they play?
- What were the key organizations involved in the formation of the project? What role did they play?
- How were the initial resource management objectives decided upon? Have they changed over time?
- Was there funding provided to help initiate the project? If so, who provided it?
- What changes and adaptations has the program undergone during its operation?

Cross-Scale Linkages

- What are the key organizations/authorities involved in at different organizational levels (local, regional, state, national, international)? (Use table to illustrate location and influence)
- What kinds of linkages exist between Pred Nai Community Forestry Group and these other organizations? What is the nature of the linkage (financial, advisory, technical, etc)? Who initiated the linkage?
- What are the key horizontal linkages? What is the nature of the linkage (networking with other community groups, NGOs)? How was the linkage initiated?

- How is authority and accountability shared between local institutions and government agencies?
- Has the success of Pred Nai Community Forestry Group led to similar initiatives in other communities?
- How does the policy environment affect the project? What are the expected impacts of the proposed Community Forestry Bill before the Thai Legislature? Did the success and recognition of Pred Nai affect the development of this legislation?
- Are there any unusual interactions/linkages amongst government agencies, NGOs, development agencies that impact the project positively or negatively?

Local Ecological Knowledge

- How was local ecological knowledge used in the management or use of resources in this project?
- Who in the community holds this local knowledge? How is it transmitted to those who do not possess it?
- Were any traditional institutions/authorities incorporated into the Pred Nai project?
- How were local ecological knowledge and conventional scientific knowledge used within this project? Were they complementary or adversarial?
- Do outside agencies and institutions recognize the validity of local ecological knowledge? Do they encourage or discourage its use?

Appendix C: Equator Initiative Checklist of Questions

University of Manitoba
Center for Community Based Resource Management

Dr. Fikret Berkes and Dr. Cristiana Seixas

November 2004

The following is a list of questions and items that we should know about for each EI case. We are calling it a "checklist" because these are not the detailed research questions or objectives but items that you would want to make some notes about. They do not replace your objectives. Some may be very short; some may simply mean rechecking information that is already available. Some of the items are detailed aspects of the two main objectives (organization and cross-scale linkages) to make sure that we cover all the angles but not necessarily in detail. The checklist was revised and modified after discussion with the four first students who used it. As we gain more experience with the cases, the list will continue to evolve. We are hoping for feedback.

1. **Contact information: Location, address, key persons**

2. **Community organization**
    a. Origins of the project
        i. Date of community initiation
        ii. Date of formally established (EI date)
        iii. What inspired or precipitated the project? What were the sources of inspiration for the project?
            1. Whose idea was it? Locals, outsiders, gov't, NGOs, etc
            2. Trigger event, if any.
            3. Catalytic element, if any
            4. Other?

    b. Leadership and key people (note gender)
        i. Individuals: locals and/or outsiders (e.g., local leaders, researchers, entrepreneurs). What role did they play? How did their role change during the course of the project?
        ii. Key organizations: locals and/or outsiders (e.g., traditional authority, gov't, NGOs). What role did they play? How did their role change during the course of the project?

c. Funding and other resources
    i. If there was funding for initial community organization, who provided the funding?
    ii. If there was capacity building, including training workshops, who funded it?
    iii. If there was initial investments, who funded it?
    iv. If there was funding for office, office personnel, vehicles, etc., who funded them?
    v. Human resources for initial organization (in-kind work as opposed to money)
        1. Volunteer support from pre-existing groups
        2. NGO and Gov't personnel providing their time or services for free
        3. Enlisting free help from outside groups, e.g., proposal writing, information, contacts, communication, etc.
        4. Were there pre-existing relationships between these groups and the community?
    vi. Use of free facilities (e.g., community radio, office space, community television)

d. Knowledge (note gender)
    i. Sources of knowledge: local/TEK and/or outside knowledge
    ii. If there is local knowledge and if relevant, who holds this knowledge?
    iii. If there is outside knowledge used in the project, was there capacity building (education, training, knowledge exchange)? Who was involved in providing capacity (e.g., other communities, NGOs, Gov't, universities, researchers)?
    iv. Were there other ways of integrating knowledge systems?
    v. Were there *learning networks* (self-organized groups consisting of people from different organizations, who are engaged in problem-solving, subsequently recycling their experience to tackle new problems)?

3. Cross-scale linkages

a. Identification of main stakeholders (community groups, business groups, gov't, NGOs, development agencies) by levels of organization. Produce a table (see example attached) as way of checking off all the combinations, and enter the names of organizations/agencies into the matrix of the table.
    i. local/community/village level
    ii. regional administrative level: municipality, district, etc. as appropriate
    iii. state/provincial level
    iv. national, including national NGOs
    v. international, including international development agencies

b. Institutional linkages related to the project
    i. Produce a diagram (see example attached) indicating key linkages
    ii. Key horizontal institutional linkages (i.e., linkages across space and sectors, such as networking with other community groups, NGOs, development agencies, etc)
        1. facilitating/enabling the project
        2. as barriers/hindrance to the project
        3. Whose initiative established these linkages?
    iii. Key vertical institutional linkages (i.e., linkages across levels of organization, such as linking with key gov't agencies)
        1. facilitating/enabling the project
        2. as barriers/hindrance to the project
        3. Whose initiative established these linkages?
    iv. How does the policy environment impact the project? (e.g., policies, legislation, political space for experimentation)
    v. What change (if any) did the project trigger in government legislation or policy?

c. Are there any unusual interactions among gov't agencies, NGOs, development agencies, etc, that impact the project positively or negatively (e.g., competition over gov't department jurisdiction, or NGOs competing over funding)? What motivates these linkages? What are the drivers of positive or negative interactions?

4. Biodiversity conservation and environmental improvements

a. Conservation/improvement of what target resources (species and environmental resources)
b. Changes in resource state
c. Indicators of biodiversity conservation or improvement (e.g., birds or butterflies started to come back; water became clearer, etc)
d. Was there any reduction on threats to biodiversity?

5. Poverty reduction

a. Indicators of poverty reduction (e.g., number of jobs, increased income etc)
b. Improvements in community well-being (e.g., access to clean water, new village school, waste management etc.)
c. Was there any reduction on threats to human well-being?

6. Detailed analysis of community-based conservation (CBC)

a. Mechanisms, dynamics, drivers
    i. Analysis of catalytic element that made the initiative work
    ii. Decision-making process (e.g., participatory, transparent, responsible)

iii. Conflict-management mechanisms
iv. Conflict resolution and enforcement

b. Learning and Adaptive Management
    i. How did previous observations lead to project formation and development?
    ii. How was experience incorporated into subsequent steps of the project? What learning processes did the different parts of the project go through? (project – including all stakeholders)
    iii. What was the role of experimentation, if any?
    iv. Role of memory, novelty, innovation
    v. How monitoring (e.g., rare species) informs the project
    vi. Barriers to CBC, and how the barriers were overcome
    vii. Combining knowledge systems to solve problems
    viii. Was there adaptive management (learning-by-doing) with the organization structure and/or with ecosystem management?

c. Community benefits from biodiversity conservation and environment improvements
    i. What direct benefits were observed (e.g., improvement in resource base to be further exploited; alternative income sources (e.g., tourism))
    ii. What indirect benefits were observed (e.g., awards and recognition; publicity; increased funding opportunities for conservation)

d. Livelihood strategies, coping and adapting
    i. How did involvement in the project affect other livelihood pursuits, negatively (e.g., time, resources) or positively (e.g., synergies, increased capital)?
    ii. How did the project affect the ability of households and the community to adapt to changes (e.g., markets)?

e. Resilience of communities, livelihoods and management systems
    i. Did the project add options (e.g., livelihoods, alternative management possibilities, new coping and adapting strategies)?
    ii. Did the project create learning opportunities (see under learning)?
    iii. Did the project create self-organization opportunities (see under community organization)?

f. Transferability of the lessons from this EI case
    i. Which lessons were likely transferable? Why?
    ii. Which lessons were not transferable? Why?

g. Recommendations (to improve your EI case), if any

Appendix D: Brief Script for introductions in the community

Hello. My name is Jason Senyk and I am a graduate student from the University of Manitoba, Canada. I am here conducting research on the organizational characteristics, institutional linkages, and local ecological knowledge of Pred Nai Community Forestry Group that contributed to the success of the project. The research will be used to complete my thesis in Natural Resources Management. This research is being sponsored by the Social Sciences and Humanities Research Council of Canada and International Development and Research Centre. It has been approved by the Joint-Faculty Research Ethics Board at the University of Manitoba

In the cases of individuals that may be identified for future research, the following question will be posed: Would you mind if I asked you a few questions?

If you have any further questions regarding this research please do not hesitate to ask. Concerns about the nature of this research may be directed to the Human Ethics Secretariat at the University of Manitoba (204-474-7122), or to my advisor, Dr. Fikret Berkes, Professor, who may be contacted at 204-474-6731. Please be advised that the staff at these offices speak only English.

Appendix E: Translator Confidentiality Agreement

UNIVERSITY OF MANITOBA

Natural Resources Institute
70 Dysart Rd,
Winnipeg, Manitoba
Canada R3T 2N2
General Office (204) 474-7170
Fax: (204) 261-0038
http://www.umanitoba.ca/academic/institutes/natural_resources

Research Project Title: **Conservation and Development in Cooperation: Lessons Learned from a Community-Based Natural Resource Management Program in Thailand**

Researcher: **Jason Senyk**

You have been recruited to provide translation services for the research study of Jason Senyk. The purpose of the study is to understand the organizational characteristics, institutional linkages, and local ecological knowledge of Pred Nai Community Forestry Group that contributed to the success of the project. This research is being sponsored by the Social Sciences and Humanities Research Council of Canada and the International Development Research Centre. Please take the time to read this carefully and to ask questions if clarification is necessary.

Translation will be required for a variety of research activities, including semi-structured interviews, participatory mapping of the area, focus group discussions, timeline construction and institutional network diagramming. Participants will be asked a series of questions throughout these exercises that will help me to understand the role of self-organization, local ecological knowledge and cross-scale institutional linkages of Pred Nai Community Forestry Group. It is critical that you provide me with the most accurate translation of the information provided. Your opinion on the subject should not be imposed on the responses provided by the participants.

Research participants are free to withdraw from the study at any time, and/or choose not to answer any questions they may not be comfortable with. Refusal to participate in the study or answer any questions will not result in any negative consequences. Additionally, the participants are ensured the information they provide will be kept in the strictest of confidence, i.e., they will not be personally identified with any of the information provided. You will be asked to not share any of the information provided by participants with anyone other than the researcher and her advisor.

Do you understand and agree to the above terms?

Yes, I _____ agree to keep all participants responses in confidentiality. The information I receive will not be shared with anyone but the researcher.

_____ _____
(Signature) (Date)

_____ _____
(Researcher's signature) (Date)

Appendix F: Informed Consent Form

UNIVERSITY OF MANITOBA

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Winnipeg, Manitoba
Canada R3T 2N2
General Office (204) 474-7170
Fax: (204) 261-0038
http://www.umanitoba.ca/academic/institutes/natural_resources

Research Project Title: **Conservation and Development in Cooperation: Lessons Learned from a Community-Based Natural Resource Management Program in Thailand**

Researcher: **Jason Senyk**

Proposed script for verbal recruitment of research participants in the semi-structured interviews:

I am currently in the process of conducting my Masters Thesis research. The purpose of this study is to understand the organizational characteristics, institutional linkages, and local ecological knowledge of Pred Nai Community Forestry Group that contributed to the success of the project. This research is being sponsored the Social Sciences and Humanities Research Council of Canada and the International Development Research Centre. It has been approved by the Joint-Faculty Research Ethics Board at the University of Manitoba (Canada).

This consent letter, a copy of which will be left with you for your records and reference, is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like know more detail about something mentioned here, or more information not included here, please feel free to ask for clarification. Please take the time to read this carefully and to understand this information.

You will be asked a series of questions that will help me understand the role that self-organization, cross-scale linkages and local ecological knowledge have played in contributing to the success of Pred Nai Community Forestry Group. You will be requested to participate in an interview session that will last in between 30 minutes and 1 hour. If more time is required, a subsequent meeting can arranged at your convenience. These interviews may be conducted at your place of work, home, or at another location of your preference. After the interview you may be contacted and asked to participate in further research activities such as timeline construction, network diagramming or resource mapping.

Your responses to questions during interviews, mapping exercises, timeline construction and network diagramming will be written down in a notebook. Your name will not be recorded with the responses to ensure that your identity remains confidential. Your name

will be recorded in a separate notebook for organizational purposes; for example, in case you need to be contacted for further information or clarification. There will be a focus group discussion conducted near the end of the research in order verify the information collected from participants. The data provided will be used to complete a technical report, my Master's thesis, and will potentially be published in an academic journal. You will not be identified by name in any such publication.

You are free to decline to participate in this research, withdraw from the study at any time, and/or choose not to answer any questions you may not be comfortable with. If you do decline to participate in the study or answer any questions, you will not face any negative consequences. If I have not explained the study clearly, please feel free to ask for clarification or additional information at any time throughout your participation.

If you have any complaints or further questions about the nature of this research, your concerns may be directed to the Human Ethics Secretariat at the University of Manitoba (204- 474-7122), or to my advisor, Dr. Fikret Berkes, Professor, who may be contacted at 204-474-6731. Please be advised that the staff at these offices speak only English. Questions and complaints can also be directed to Supaporn Worrapornpan (01 694 4660) who will forward any concerns to the offices mentioned above.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this affect your legal rights nor release the researchers, sponsors, or involved institutions from their responsibilities. You are free to withdraw from the study at any time, and /or abstain from answering any questions you prefer to omit, without any second thought. Your continued participation should be as informed as your initial permission, so you should feel free to ask for clarification or new information throughout your participation.

_____

Participant's Signature Date

_____

Researcher's Signature Date