Mangroves for the Future
INVESTING IN COASTAL ECOSYSTEMS

Mangrove-related policy and institutional frameworks in Pakistan, Thailand and Viet Nam

Food and Agriculture Organization of the United Nations

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Preface

Mangroves provide an array of benefits to coastal communities, including wood and non-wood forest products and environmental services encompassing coastal hazard protection, erosion control, water filtration and bio-diversity conservation. Mangroves are also valuable in terms of climate change mitigation due to high rates of primary productivity and the large amounts of carbon contained in above- and below-ground biomass and mangrove soils.

In spite of their many values, mangroves in Asia continue to be converted to other land uses and sustainable financing for their protection has not been forthcoming. This has resulted from limited length project cycles, lack of established Payment for Ecosystem Service (PES) schemes covering mangroves, unclear tenure in many mangrove areas, and the limited size of mangrove areas in relation to the economies of scale necessary to offset costs associated with accessing carbon payments.

This publication was prepared for the 'Income for coastal communities for mangrove protection' project (2015-2016) which aimed to develop a low-cost mechanism enabling public and private entities to responsibly promote mangrove conservation, carbon emissions reduction and sustainable development through the provision of incentives to local communities. The project was funded by the Swedish International Development Cooperation Agency (SIDA) through the International Union for Conservation of Nature (IUCN) and within the framework of the Mangroves for the Future (MFF) initiative. The project was implemented by the FAO Regional Office for Asia and the Pacific (RAP) in partnership with the USAID Lowering Emissions in Asia's Forests (USAID LEAF) Programme and UN-REDD. Pilot activities and information collection took place in Pakistan, Thailand and Viet Nam.

This is the second in a series of four publications intended to be used in conjunction in establishing sustainable financing for mangrove protection in Asia. The titles of the four publications are as follows:

1. Financing for mangrove protection;
2. Mangrove-related policy and institutional frameworks in Pakistan, Thailand and Viet Nam;
3. Mangrove carbon estimator and monitoring guide;
4. Incentive allocation for mangrove protection.

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Acronyms

ADB	Asian Development Bank
BEDO	Biodiversity-based Economy Development Organization (Thailand)
CBO	Community-Based Organisation
CPC	Commune People's Committee (Viet Nam)
CPF	Charoen Pokphand Foods Public Company Limited
DARD	Department of Agriculture and Rural Development (Viet Nam)
DHA	Defence Housing Authority (Pakistan)
DMCR	Department of Marine and Coastal Resources (Thailand)
DNP	Department of National Parks, Wildlife and Plant Conservation (Thailand)
FIPI	Forest Inventory and Planning Institute (Viet Nam)
FMB	Forest Management Board (Viet Nam)
FRDO	Fishermen Rural Development Organization
ICM	Integrated Coastal Management
IUCN	International Union for Conservation of Nature
KPT	Karachi Port Trust
LESS	Low Emission Support Scheme (Thailand)
MAP	Mangrove Action Project
MARD	Ministry of Agriculture and Rural Development (Viet Nam)
MCG	Mangrove Conservation Group
MCRM Act	Marine and Coastal Resource Management Act 2015 (Thailand)
MCZ	Mangrove Conservation Zone (Thailand)
MFF	Mangroves for the Future
MMU	Mangrove Management Unit (Thailand)
MoCC	Ministry of Climate Change (Pakistan)
MoNRE	Ministry of Natural Resources and Environment (Thailand, Viet Nam)
NESDP	National Economic and Social Development Plan (Thailand)
PES	Payment for Ecosystem Services
PFD	Provincial Forest Department (Pakistan)
PKR	Pakistani Rupee (currency)
PQA	Port Qasim Authority
RFD	Royal Forest Department (Thailand)
SBOR	Sindh Board of Revenue
SCDA	Sindh Coastal Development Authority
SFD	Sindh Forest Department
SUPARCO	Space and Upper Atmosphere Research Commission (Pakistan)
TGO	Thailand Greenhouse Gas Management Organization
THB	Thai Baht (currency)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID LEAF	United States Agency for International Development Lowering Emissions in Asia's Forests Program
USD	United States Dollar (currency)
VND	Viet Nam Dong (currency)

Summary of findings and recommendations

Pakistan

Pakistan has significant area of land available for mangrove restoration. Large areas of the Indus Delta have been abandoned due to saltwater intrusion, and Sindh Board of Revenue (SBOR) appears supportive of mangrove planting on such lands where not covered by land titles. Furthermore, abandoned privately owned land should probably be avoided due to potential tenure disputes. Due to high salinity and saltwater intrusion, species selection and planting location should be carefully considered in any planting efforts.

Mangrove areas managed by Port Qasim Authority (PQA), Karachi Port Trust (KPT) and the Defence Housing Authority (DHA) provide essential ecosystem services for the city of Karachi. However, as they are not openly accessible, the relevant agency would need to be approached and successfully engaged prior to implementation of any mangrove restoration or management activity.

Villagers in the Indus Delta understand the environmental and socio-economic importance of mangroves, and appear enthusiastic about mangrove planting and protection. Many have experience in mangrove planting via large-scale projects implemented by the Sindh Forest Department (SFD). Engaging with a reputable registered community-based organisation (CBO) is therefore likely to ensure community cooperation, reduce logistical costs and increase chances of success.

Channelling funding for mangrove restoration and protection through a community endowment fund can reduce the likelihood of misuse, create a sense of community ownership and ensure that funds benefit the community as a whole. Establishing crab ponds can provide incentives to maintain mangroves and could remove the need for ongoing financing for mangrove protection.

Both SFD and WWF have mangrove monitoring capabilities. SFD has the power to enforce laws but would need financial compensation for monitoring outside areas under its control.

Thailand

With introduction of the Marine and Coastal Resources Management (MCRM) Act 2015 and launching of national level mangrove reclamation activities by the Department of Marine and Coastal Resources (DMCR), the legal framework for mangrove management in Thailand is changing and opportunities for mangrove restoration look set to expand significantly. According to DMCR, plans have been developed to reclaim 300 000 rai (48 000 ha) of abandoned shrimp farms and illegally occupied mangrove areas nationwide. A third of this area will be allocated to local communities for utilization; in the remaining two thirds, mangroves will be restored. However, as outstanding land claims will need to be

dealt with, individually areas for restoration and regeneration are likely to be fragmented and the process may take some time.

One of the main challenges to mangrove restoration, management and protection in Thailand is unclear land tenure. As such, any mangrove restoration or protection initiative should make special efforts to consult with relevant stakeholders at the village, sub-district (*tambon*), province and national level, and ensure agreements over land and resource rights.

Community mangrove ownership and management rights are not supported in Thai law, although informal engagements that benefit communities and assist DMCR to reach targets have been successful. DMCR also does not object to local communities receiving direct incentives for restoring or protecting mangroves. Opportunities for externally supported mangrove restoration and protection on privately owned land are likely to be limited due to high economic returns from alternative land uses and private landowners' fears that restored mangrove areas will be claimed by the government.

In abandoned shrimp farms and illegally occupied mangrove areas, financing for mangrove restoration and protection is likely to provide a significant boost for both mangrove conservation and local livelihoods given the high although often unsustainable returns from alternative uses of these areas. Private-sector corporate social responsibility (CSR) efforts have been successful in restoring mangroves in many coastal areas, often with local community engagement. At present, various existing corporate actors are seeking to expand efforts and pursue longer-term commitments, while a number of others are showing interest in engaging in mangrove restoration activities.

DMCR is the leading government agency for mangrove management in Thailand, and should be consulted for site recommendations and collaboration at different levels. The evolving National and Provincial Committees on Marine and Coastal Resource Management Policy and Planning are also set to become key institutions in mangrove protection and management, and Tambon Administrative Organizations and provincial administrations may also need to be engaged.

Mangrove Management Units (MMUs) are potential partners in mangrove monitoring and in training communities in mangrove planting. The involvement of a competent NGO is likely to be necessary in establishing agreements with local communities and fostering continued cooperation. Whilst written agreements with local communities have been rare to date, they are likely to help secure long-term commitment to mangrove restoration and protection and would also provide communities with greater certainty.

Viet Nam

Mangrove areas allocated to private owners and Commune People's Committees (CPCs) in Viet Nam are relatively small and widely dispersed, whereas Forest Management Boards (FMBs) manage large areas of contiguous mangroves that have clear resource tenure and are directly linked to local households. Efficiencies of scale in efforts to restore and protect mangroves are therefore more likely in areas allocated to FMBs. Additionally, households contracted by FMBs are required to maintain 60 percent of their farm area under mangrove cover, and financial incentives could be used to help farmers improve compliance and strengthen monitoring frameworks.

FMBs do not object to investors signing mangrove-related agreements with FMB-contracted households, provided that regulations and harvesting plans are observed. FMBs may, however, need to approve mangrove restoration and protection agreements, or they may be involved formally as a party with specific responsibilities (such as monitoring and reporting). Relevant Provincial Departments of Agriculture and Rural Development (DARDs) and Provincial People's Committees (PPCs) would also need to provide approval. Agreements with communities or villages are not recommended as these entities do not have legal standing in Viet Nam.

Regarding monitoring, the Forest Inventory and Planning Institute (FIPI) has indicated willingness to interpret remote sensing imagery, which may be available for free or through requests to relevant national or international parties and organizations (such as the Asian Disaster Preparedness Center's USAID-funded 'SERVIR-Mekong' project). With respect to ground-level activities, FMBs have the capacity and the legal mandate to monitor mangroves, whilst FIPI has the capacity and willingness to provide relevant training (including in relation to carbon estimation). A national or international NGO could provide third-party verification.

Given the larger area of mangroves in southern Viet Nam and the areas of abandoned shrimp farms in Ben Tre and Tra Vinh provinces, potential rehabilitation and protection activities could focus on these areas. Opportunities may exist to support mangrove restoration and protection in support of organic or 'mangrove friendly' shrimp production if premiums from certified shrimp production prove insufficient to incentivise mangrove cover increase.

In terms of financing, several opportunities exist, including CSR funding from the growing number of Vietnamese companies interested in projecting an environmentally sensitive image, the UN-REDD program and Viet Nam's Payment for Forest Environmental Services (PFES) system. Development of PFES regulations for forest carbon sequestration and use of water from forest for aquaculture should also be monitored for ramifications regarding parties eligible to be compensated for mangrove restoration and protection.

1 Introduction

Many Asian countries, including Pakistan, Thailand and Viet Nam, have experienced high rates of mangrove destruction over the past 50 years. Mangrove loss has removed storm protection and livelihood support for local populations, while also reducing biodiversity in coastal areas and releasing large quantities of carbon dioxide into the atmosphere.

In planning efforts to restore and protect mangroves, knowledge of policy and institutional frameworks is essential. A key factor contributing to mangrove destruction has been the lack of clarity over rights and responsibilities. Standing at the interface of land and sea, mangroves are often claimed by competing ministries and managed according to both customary and statutory law. Unclear policy and institutional frameworks and consequent lack of investment have hindered sustainable management of mangroves.

Fortunately, sustainable coastal management is emerging as a key concern for governments in the region. Strengthening and clarifying policy and legislative frameworks is likely to significantly improve restoration and protection of mangrove habitats. Knowledge of existing and emerging frameworks and of lessons learned from past efforts to promote sustainable management of mangroves provides the necessary foundation for such actions.

This study provides an overview of policy and institutional frameworks for mangrove management in Pakistan, Thailand and Viet Nam. It has two main areas of focus:

1. Assessing the suitability of current and emerging policies and institutions to incentivise local communities to protect and restore mangroves, with focus on:
    - policies, laws and regulations covering mangrove areas, including those related to land and resource tenure; and
    - institutional frameworks for mangrove management, including local administrative structures.
2. Identifying lessons from previous and ongoing mangrove restoration and protection activities, with focus on:
    - Operating modalities;
    - Agreements between project managers, local communities and government authorities;
    - Sources of funding and/or other incentives;
    - Incentive allocation;

- Monitoring and reporting.

The report is based on literature review; consultations with staff from FAO, USAID LEAF, UN-REDD, MFF, and the Mangrove Action Project (MAP); and meetings with stakeholders in Pakistan, Thailand and Viet Nam, including representatives of government, non-governmental organisations (NGOs), the private sector and communities residing near mangrove areas. Physical inspections of mangrove sites in Pakistan, Thailand and Viet Nam further contributed to the review.

2 Pakistan

2.1 Mangrove resource

Pakistan's mangroves are located in the Indus Delta of Sindh Province and along the Balochistan coastline (Spalding, Kainuma and Collins 2010; USAID 2010). Estimates of the total national mangrove area published in recent decades have varied widely: 347 000 hectares (FAO 2005), 86 727 hectares (IUCN Pakistan 2005); 283 280 hectares (SFD 2015), 108 058 hectares (MFF Pakistan 2014). Better documented estimates place it at 85 000 – 95 000 hectares, and the FAO Forest Resources Assessment reporting a figure of 95 000 hectares in 2015 (FAO 2015a). According to the same assessment, mangrove area in the country has fallen from 207 000 hectares in 1990. Most mangroves are located in remote, sparsely populated areas and the mangrove-dependent coastal population totals around 210 000 people, 90 percent of whom reside in fishing towns and villages (IUCN Pakistan 2005; MFF Pakistan 2014).

Damming and barraging of rivers for irrigation has reduced flows of water and sediment from the Indus River, and freshwater discharged into the delta has fallen to one-fifth of its natural level (IUCN Pakistan 2005; SFD 2015). The consequent fresh water scarcity, lack of nutrients and increased salinity have caused large reductions in mangrove area and diversity, as well as stunting. In the 1950s, eight species of mangroves were present in Pakistan but as a result of saline intrusion this has been reduced to four (FAO 2015b); *Avicennia marina,* a highly salt-resistant species, accounts for over 95 percent of mangroves in the area (Hussein and Shah, 2015 Pers. Comm., 02 December).[1]

2.2 Key government agencies and legislation

The Republic of Pakistan is a federation, with each province having its own elected parliament and government. Mangroves are considered forests under Pakistan law; under the Constitution of the Islamic Republic of Pakistan 1973, forestry is a provincial rather than a federal matter. Federal government's role in forestry is limited to policy development, research and training, and compliance with international agreements (FAO 2005).

There is no single compendium of laws regarding forestland ownership rights and tenure arrangements in Pakistan. While provincial governments can pass forestry legislation, the key forest management legislation remains the Forest Act 1927.[2] The Punjab Land Revenue Act 1967 is the main legal instrument determining legal aspects of land ownership. There is no umbrella national legislation to protect coastal and marine resources in general (MFF Pakistan

[1] A.T. Hussain (Conservator of Forest, Sindh Forest, Environment and Wildlife Department, Sindh Province, Pakistan) and S.G.Q. Shah (MFF National Coordinator, IUCN Pakistan).
[2] The Sindh Forest Act is allegedly being drafted (Hussain 2016).

2014). Implications of the Forest Act 1927 and the Punjab Land Revenue Act 1967 on mangrove management are described in Section 2.3 below.

The **Federal Cabinet** and the **Ministry of Climate Change (MoCC)** are the key federal agencies for forest management.[3] Decisions of the Federal Cabinet, including the 1993 ban on commercial logging, serve as policy directives to ensure sustainable forest management in the provinces (Wani, undated). MoCC is the key national agency for environmental policy, and its Forestry Wing is responsible for national policy making, donor coordination, national forest surveys and assessments, and international agreements.

Provincial Forest Departments (PFDs) are responsible for forest protection, management and law enforcement, trade in forest products, and regulation of commercial forest harvesting (FAO 2005). PFDs own all forest trees on state land, but not the land itself, which is owned by provincial Boards of Revenue (as described below). Each PFD is headed by an administrative secretary and the Chief Conservator of Forest (the technical head). Chief conservators of forest, forest conservators, district forest officers, range forest officers, block officers and forest guards form the hierarchy of PFDs, and are responsible for forest management at the provincial, circle, district, range, block and beat levels, respectively (FAO 2005).

Provincial Boards of Revenue own all state land, and can issue land use rights to other public or private entities, including PFDs (Hussein and Shah, 2015 Pers. Comm., 02 December). They are also custodians of the rights of all private land owners, and maintain a land registry including all land titles (Hussain 2016).

2.3 Mangrove tenure

2.3.1 Forest tenure in Pakistan

Under the Land Revenue Act of 1967, land is classified as state land, privately held land, or land subject to communal rights under customary law. However, land ownership is rarely registered and titles to land are often determined by land revenue records (FAO 2005). Community titling of land is uncommon (USAID 2010).

State ownership, private ownership and community ownership of forestland are permitted under the Forestry Act 1927, which lists five categories of forestland based on ownership:

1. State-owned reserve forests. These are state-owned forests reserved for protection. Explicitly prohibited activities include forest clearing, land conversion and grazing cattle. Local populations' rights are limited to collection of fuelwood from fallen trees, and rights of way and water

[3] The Federal Forest Board was allegedly established in 2000, but appears to be dysfunctional (Hussein and Shah, 2015 Pers. Comm., 02 December).

(FAO 2005). Before 'reserving' any forests, provincial government must resolve existing land claims.

2. State-owned protected forests. Provincial government can designate any forest outside reserve forests as protected forest, and determine associated access and usage rights. Unless specifically prohibited by separate orders, all activities are allowed, including grazing and timber harvesting. Provincial departments can also reserve specific tree species in protected forests (SFD 2015).
3. Village forests. Provincial government may assign to any village community the rights to manage reserve forests, whilst stipulating the rules for such management. Little use has been made of this provision (SFD 2015).
4. Unclassed forests. Unclassed forests are uncultivated or uncultivable 'wasteland.' Provincial government reserves the right to make rules for management of unclassed forests (GoP 2015). However, in most regions, forests that are not protected or reserved are considered common property of a village, tribe, or clan, and are known as shamilat (USAID 2010).
5. Private-owned forests. If forestland happens to be on privately owned land, the owner can buy and sell the land, but only PFDs have the right to harvest trees; the land owner is not allowed to cut a single tree without the department's permission (FAO 2005). PFDs may also prohibit certain activities in privately owned forest for public safety reasons, such as protection against storms (GoP 2015).

The above classification was developed during the colonial era; since then, land tenure has been shaped differently across the provinces. Current tenure in forest and grazing lands is a mosaic, and rights vary from place to place. Village common lands and grazing lands are generally controlled by the Board of Revenue, and *Guzara* (subsistence) forests are under the control of PFDs, with varying levels of community participation (FAO 2005).

All forests in Sindh and Balochistan provinces (and consequently all mangroves) are state-owned. Further detail on mangrove tenure in each province is provided below.

2.3.2 Mangrove tenure in Sindh Province

Prior to 1958, all mangroves in Sindh Province were managed by the Sindh Board of Revenue (SBOR). In 1958, 364 000 hectares of mangrove forestland were transferred from SBOR to the Sindh Forest Department (SFD), and declared as protected forest (FAO 2005). Simultaneously, a separate directive was issued by SFD, declaring all mangroves as 'reserved' species as per the Forest Act 1927

(Hussain 2016). The Board of Revenue retained management of the remaining 272 485 hectares of mangrove forests in the delta (Qamar 2009).

In 1973, 64 400 hectares of mangroves were leased by SFD to the Port Qasim Authority (PQA) for port enlargement (IUCN Pakistan 2005). The lease contained a condition that mangroves would remain as protected forests and not be harmed (Qamar 2009). In addition, the Karachi Port Trust (KPT) manages a 500 hectare mangrove area east of Karachi, as shown in Table 1.

In 2010, the Sindh Government issued a notification declaring all mangroves as protected forests (Hussain 2016). Technically, this means that mangroves managed by SFD, SBOR, PQA and KPT are protected from harvesting and grazing, with human use limited to collection of deadwood for fuel. However, the reality has been different, as discussed in Section 2.5.

Table 1. Jurisdiction over mangrove forest in the Indus Delta.

Jurisdiction	Area (ha)
Sindh Forest Department	280 470
Sindh Board of Revenue	260 000
Port Qasim Authority	64 400
Karachi Port Trust/Karachi District government	500†
Defence Housing Authority (DHA), Karachi	Unknown*
Total	**605 370**

Source: IUCN Pakistan 2005.
† - The area of the mangrove is disputed, with some sources claiming it is closer to 2 000 ha (Nawaz, 2015 Pers. Comm., 03 December).[4]
* - Hussein and Shah, 2015 Pers. Comm., 02 December.

2.3.3 Mangrove tenure in Balochistan Province

Of 4 000 hectares of mangroves in Balochistan Province, only 294 hectares[5] are declared as protected forests and are under the control of Balochistan Forest Department. In these areas only dead, dying and moribund trees are permitted to be cut to meet subsistence requirements. Mangroves outside the protected forests remain the property of local communities or of the Board of Revenue (IUCN Pakistan 2005). Overall, data on tenure arrangements for forests and rangelands in Balochistan are scarce (FAO 2005).

2.4 Mangrove policy

Mangrove policies comprise statements, directives, guidelines and plans at the federal and provincial levels (Wani, undated). Key policy issues include 'lack of holistic visioning, inadequate coordination and disintegrated planning, in particular the approach of treating the coastal zone in isolation from the

[4] Mr. R. Nawaz (Senior Director – Biodiversity, WWF Pakistan).
[5] This figure is disputed and others quote 722 ha (MFF Pakistan 2014) or 980 ha (Hussain 2016).

terrestrial activities having an impact on the coast' (MFF Pakistan 2014). An example of these limitations is provided by the negative impact of upland damming on mangrove health in the Indus Delta.

As mentioned above, the federal government is responsible for forest policy, whilst provincial governments are responsible for forest policy within the national framework and forest management (FAO 2005; USAID 2010). Federal and provincial policies relevant to mangrove management are described below.

2.4.1 The National Medium Term Development Framework

The 2005-2010 National Medium Term Development Framework (MTDF) was developed by the national Planning Commission under the Ministry of Planning and Development, but there is no evidence of subsequent MTDFs. The overall national development framework is therefore unclear.

2.4.2 National forest policies and plans

The 2010 National Forest Policy was developed by the now-defunct Ministry of Environment (MoE Pakistan 2010). It was intended to be an umbrella policy guiding central, provincial and district government, with a stated objective of 'restoration, development, conservation and sustainable management of forests' (USAID 2010). The policy called for halting of conversion of forestland to non-forestry uses and promoted 'massive afforestation programmes, especially on all denuded, degraded and unproductive lands' (MoE Pakistan 2010).

For mangrove forests, the policy stated that 'proper arrangements shall be made for containing marine pollution, allowing sufficient water to flow down the Indus River and evolving an incentive-based system for sustainable management of these forests' (MoE Pakistan 2010). To ensure implementation, the policy stated that a 2010-2020 Action Plan will be prepared, and a Forest Development Fund will be established as an independent company at the national level to fund proposed measures from domestic and international sources (MoE Pakistan 2010). It appears that neither the Action Plan nor the Forest Development Fund has been established (Hussein and Shah, 2015 Pers. Comm., 02 December).

The draft 2015 National Forest Policy was formulated by MoCC and is intended to be funded by a combination of federal, provincial and outside sources. It does not explicitly mention mangrove-specific activities (MoCC 2015). The policy has been circulated by MoCC to all PFDs for review and comment (Hussein and Shah, 2015 Pers. Comm., 02 December).

The Forestry Sector Master Plan 1992 is mentioned in the reviewed literature, but according to FAO (2009), 'this master plan has not been implemented as progress could not be made in removing all major barriers and addressing constraints.'

2.4.3 National climate change policies

The National Climate Change Policy 2012 was prepared by the MoCC, and called for restoration of degraded mangroves in the Indus Delta and prevention of further degradation 'by allowing minimum necessary environmental flows downstream of Kotri' (MoCC 2012). The 2013 'Framework for Implementation of Climate Change Policy 2014-2030' emphasises international funding (including UN-REDD and the World Bank) and, among others, commits the Government of Pakistan to the following priority action: 'Initiate campaigns to plant mangroves, coastal palm and other trees suitable for coastal areas to control sand and soil erosion' (GoP 2013).

2.4.4 Provincial mangrove policies and plans

The SFD website states that SFD's primary goal is conservation and improvement of mangroves, including through mangrove planting on mud flats (SFD 2015). It also claims to distribute 'millions of saplings among farmers at subsidized rates' and to undertake planting, conservation and protection measures in mangrove areas under its management, as well as those managed by SBOR, PQA and private owners (Hussain 2016). In 2012, the Sindh government approved a project to plant 100 000 hectares of mangroves, to be implemented by SFD using the government's own resources over the 2013-2018 period.

SFD prepared forest management plans in 1963-64, 1984-85 and 2006-07, providing information about resources, distribution of forest stands, plant and animal species (Qamar 2009). It also developed two 20-year mangrove management plans and a 'Working Plan of Mangrove Forests from 1985-86 to 2004-2005.'

The various goals and plans of the SFD are, however, rarely implemented (MFF Pakistan 2014). For example, the 'Karachi Coastal Development Plan,' prepared in 1987-88 by the Karachi Development Authority in co-ordination with the United Nations Development Programme (UNDP), has not been implemented to date (MFF Pakistan 2014). Instead, mangrove-related activities have been largely project-based, with funding from domestic and outside sources (Hussain 2016). These projects are described in further detail below.

2.5 Mangrove management

2.5.1 Mangrove threats

As mentioned in Section 2.1, saltwater intrusion is the biggest threat to mangrove conservation in Pakistan, but there are also many other threats. Mangroves in Sindh province are 'reserved' under the Forestry Act 1927, meaning that clearance, harvesting, and animal grazing in mangroves are prohibited. However, grazing by camels, goats and buffaloes is widespread in the Indus Delta, and mangroves provide forage for around 8 000 camels, 5 000 buffaloes and 1 000 goats (FAO 2009). The biggest impact is from professional

herders, each managing hundreds of camels. The herders come into conflict with villagers, but the vast mosaic nature of the delta complicates grazing control (CBOs, 2015 Pers. Comm., 02 December; Hussain 2016).[6] On the positive side, there is no commercial exploitation of mangroves, no serious attempt to convert mangroves to aquaculture, and no high-grade pollution due to the lack of industry and human population in the area (IUCN Pakistan 2005).

In the Karachi area, industrial and urban development is leading to mangrove clearance and pollution. Whilst the mangrove area is not large, it is extremely important in mitigating the city's water and air pollution (FAO 2005; Nawaz, 2015 Pers. Comm., 03 December). Competition for land in and near Karachi is fierce, and two members of the Pakistan Fisherfolk Forum were allegedly killed in 2011 in a land dispute (PFF 2011). Additionally, Port Qasim Authority (PQA) and KPT have been accused of clearing mangroves for port expansion, and residents of densely populated ghettos regularly harvest mangroves for fuelwood and charcoal production (Qamar 2009). As SFD officials are not permitted to enter areas managed by PQA, KPT and the Defence Housing Authority (DHA) for monitoring, the only deterrent is to apprehend those involved as they exit the area (Hussein and Shah, 2015 Pers. Comm., 02 December).

In Balochistan, the biggest threats to mangroves are dune movements, fuelwood collection and erosion. Balochistan's mangroves also lack large freshwater inflows and are thus exposed to drought. The Balochistan coastline is also exposed to storms and extreme floods which put mangroves at risk (Ibrahim, 2015 Pers. Comm., 04 December).[7]

Forest law enforcement in Pakistan appears weak, and penalties devised by various legal instruments such as the Forest Act 1927 are ineffective (Wani, undated). PFDs have been unable to cope with forest encroachment and illegal logging, partly as a result of lack of financial resources (Wani, undated). According to USAID, 'every major forest type in the country is suffering from overgrazing, indiscriminate cutting, and poor management... [and] forest encroachment, illegal logging, and theft of non-timber forest resources are common' (USAID 2010).

2.5.2 Mangrove planting

PFDs are key agencies in mangrove planting. Between 1947 and 2012, SFD is reported to have planted 72 000 hectares of mangroves (ADB 2014). Balochistan PFD has planted 800 hectares to date (Ibrahim, 2015 Pers. Comm., 04 December).

[6] Community-based organisations, Keti Bundar Sub-District, Thatta District, Sindh Province, Pakistan.
[7] M. Ibrahim (Conservator of Forest, Balochistan Forest & Wildlife Department).

SFD's planting projects have been funded by donors such as World Bank, the Asian Development Bank (ADB) and IUCN, and also through its own resources (IUCN Pakistan 2005). In relation, the Government of Sindh approved three new projects in 2012 and 2013 (ADB 2014):

- Improvement of Major Fishermen Settlements and Rehabilitation of Flood-Affected Areas of Thatta and Badin (USD 7.95m);
- Conservation, Development and Management of Indus Delta Mangroves to Check Sea Intrusion (USD 6.99m); and
- Development of Coastal Areas of District Thatta (USD 9.94m).

In 2012, the Sindh government also approved a project for SFD to plant 100 000 hectares of mangroves using its own budget; by 2016, over 40 000 hectares had been planted (ADB 2014; Hussain 2016). SFD states that it employs local communities for mangrove planting and provides them with additional small-scale benefits such as solar panels (Qureshi, 2015 Pers. Comm., 03 December; Hussain 2016).[8] To date, SFD's planting has taken place in mangrove areas under its own jurisdiction. However, SBOR apparently does not object to SFD or other parties planting mangroves in SBOR-managed areas, as no change in land ownership is involved (Hussain 2016).

Box 1. "Idle land" in the Indus Delta

In the past, red rice was cultivated widely in the Indus Delta but saltwater intrusion has led to abandonment of large areas of land which are now suitable for mangrove planting. Around 100 000 hectares are suitable for mangrove planting in and around Keti Bundar subdistrict alone (Hussain 2016).

This 'idle land' falls under both SBOR and private ownership and, as mentioned above, SBOR reportedly does not object to mangrove rehabilitation activities in areas under its jurisdiction. According to SBOR, planting mangroves on private land would require permission from the land owner, even if the land is now submerged and the owner has long relocated and/or cannot be found (Hussain 2016). Reclamation of such abandoned land is currently being debated by the provincial government (Hussein and Shah, 2015 Pers. Comm., 02 December).

2.5.3 Community-based mangrove management

In Pakistan, communities do not have formal land use rights, but donor agencies including IUCN and WWF enter into agreements with community-based organisations (CBOs) to plant and protect mangrove areas. CBOs are formed around different issues, including mangrove management and allocation of grazing rights (FAO 2015b; CBOs, 2015 Pers. Comm., 02 December). Most CBOs are government-registered and represent all households within a community

[8] T. Qureshi (Senior Advisor – Coastal Ecosystems, IUCN Pakistan).

(typically a village). Registered CBOs have rules on how money should be spent and must keep bank account ledgers for government checks. CBO leaders are typically respected and better-educated members of the community and there is usually a fee associated with CBO membership, which complements revenues from projects.

CBOs generally receive funds for labour, i.e. undertaking planting. These funds usually go towards activities beneficial to the community as a whole such as construction of schools and water tanks. Payments are usually provided in two stages: upon planting (based on the number of seedlings planted) and up to one to two years later (based on seedling survival rate). An intermediary (such as a NGO or a local forest department) between the financier and the CBO usually increases the chances of successful outcomes (FAO 2015b). WWF-Pakistan's experience with CBOs in mangrove management has been largely positive, and an example of CBO involvement in a donor-funded project is provided in Section 2.6 below. (Nawaz, 2015 Pers. Comm., 03 December).

2.5.4 Mangrove monitoring

PFDs are responsible for patrolling mangrove areas under their control and enforcing laws. SFD has a fleet of boats and local staff including range forest officers, block officers and forest guards, and also engages community 'watchers' in return for monthly payments of 6 000 Rupees per 60 hectares of mangroves (FAO 2015b). Although SBOR, PQA, KPT and DHA are responsible for monitoring mangrove in areas under their control, they appear to lack the necessary technical expertise (Hussein and Shah, 2015 Pers. Comm., 02 December). In Balochistan Province, budgetary constraints mean that only five PFD staff are employed in patrolling mangroves, but assistance is provided by local NGOs financed by WWF and MFF (Ibrahim, 2015 Pers. Comm., 04 December).

The last nation-wide assessment of mangrove areas was conducted in 2009 by the Space and Upper Atmosphere Research Commission (SUPARCO, Pakistan's space agency). As detailed in Section 2.1, however, there is disagreement over the total area of mangroves in the country, and large-scale planting by SFD since 2009 has added to the uncertainty (Hussein and Shah, 2015 Pers. Comm., 02 December). SFD does not conduct regular mangrove inventories but instead prepares project-specific GIS maps to verify and record rehabilitation activities, sometimes with the use of drone technology. Similar project-specific monitoring and mapping activities are undertaken by other stakeholders, including IUCN and WWF (Hussain 2016). Balochistan PFD is in the process of mapping its mangrove areas (Ibrahim, 2015 Pers. Comm., 04 December).

2.6 Mangrove projects

Parties supporting mangrove projects in Pakistan include IUCN Pakistan, ADB, the United Nations Environment Programme (UNEP), WWF and Engro LNG Terminal Limited, among others. Private support for mangrove conservation is lacking, as CSR activities in Pakistan often focus on social rather than environmental outcomes (FAO 2015b).

This section describes the community-based restoration component of the ADB-funded Sindh Coastal Community Development Project (2009-2014), and mangrove restoration activities implemented by WWF-Pakistan since 2007.

2.6.1 Sindh Coastal Community Development Project

The Sindh Coastal Community Development Project was launched in 2009, with a USD 36m loan from ADB. It was implemented in the coastal areas of Thatta and Badin Districts by the Sindh Coastal Development Authority (SCDA)[9] through SFD, Sindh Fisheries Department, district governments, the National Rural Support Programme (NRSP)[10] and IUCN Pakistan.

One of the aims of the project was to establish sustainable, community-managed, income-generating mangrove stands. This involved planting mangroves on 8 000 hectares of government land, which was overseen by SFD, and on 350 hectares of community-owned land. IUCN coordinated planting on the community-owned land and monitored the overall project (ADB 2014).

Planting on government land focused on protected forest areas, although it is not clear whether these were under the jurisdiction of SFD or SBOR. Local communities were employed for mangrove planting, and SFD arranged community policing to guard the areas planted. In all, 10 259 hectares of mangroves were planted, exceeding the 8 000 hectare target, and the overall survival rate was above 95 percent (ADB 2014).

For planting on the community-owned land, IUCN Pakistan signed agreements with the Fishermen Rural Development Organization (FRDO, a registered CBO) to raise and protect mangrove plantations in Bhoori village, Keti Bundar Subdistrict, Thatta District.[11] The agreements outlined the responsibilities of both parties: IUCN was responsible for providing planting materials, training, and funding for

[9] SCDA is a government agency under the Sindh Department of Planning, tasked with promoting development in coastal areas. It has its own budget line, and works through other departments by providing them with additional funding (Hussein and Shah, 2015 Pers. Comm., 02 December).
[10] NRSP is a large Pakistani NGO focused on nationwide poverty alleviation.
[11] FRDO was established in 2007 and is led by a president, a secretary and a treasurer; the only literate people in the Bhoori village. All ~100 fishermen in the ~300 household villages are members and the organisation meets once per month. FRDO maintains a bank account, and used to collect PKR 10 at every meeting from each member; however, this practice has been abandoned (FRDO, 2015 Pers. Comm., 02 December).

mangrove planting and protection, whilst FRDO would plant, restock and protect the mangroves.

Planting of around 100 hectares took place primarily on land abandoned by a private owner. It was carried out over three 15-day periods in 2009, 2010 and 2011, with a separate agreement signed each year. Planting was done by 15-20 people who were each paid PKR 350[12] per day (FRDO, 2015 Pers. Comm., 02 December).[13] IUCN provided training and supervision in the field and conducted monitoring visits at three, six, twelve and eighteen months after planting. An incentive payment of PKR 0.5 per surviving seedling was made during the first monitoring visit, PKR 0.75 during the second visit, and PKR 1 during subsequent visits. Payments were made into the FRDO bank account and ceased after 18 months when FRDO was made responsible for protection of mangroves.

Rules of mangrove protection were discussed and agreed upon prior to planting. With income from seedling survival payments, two villagers were paid PKR 3 000 per month to stay in the mangroves during the daytime. This mangrove watching accounted for the bulk of expenditure of funds from seedling survival payments; remaining funds were used to help people in distress. FRDO representatives stated that protection was not difficult because the mangrove areas are clearly visible from the village and any illegal harvesting or grazing could therefore be seen. Instances of grazing that did occur were resolved via a community-wide meeting involving the village head (FRDO, 2015 Pers. Comm., 02 December).

Following cessation of IUCN payments FRDO has continued to protect the mangrove areas. Reasons given for their continued support include the following (FRDO, 2015 Pers. Comm., 02 December):

- There is no strong incentives to encroach on mangrove areas as there are plenty of other areas for livestock grazing and fuelwood collection;
- Ongoing protection is likely to attract attention of other donors, potentially leading to other benefits;
- Mangroves provide protection against cyclones and tsunamis, particularly given the barren nature of the landscape;
- Mangroves provide a breeding ground for crabs and fish, and a new species of fish (rays) has appeared; and
- Fallen mangroves produce timber for fuelwood and leaves for feeding livestock.

FRDO expressed its willingness to participate in further mangrove planting initiatives and claimed that ample land is available in Bhoori village. The total

[12] USD 1 = PKR 104.7 as of 20 May 2016 (www.xe.com).
[13] FRDO (Fishermen Rural Development Organization, Bhoori Village, Keti Bundar Subdistrict, Thatta District, Sindh Province, Pakistan).

area of the village is around 2 000 hectares; a quarter of this is privately owned, while the rest is wasteland managed by the SBOR. In terms of potential distribution of payments, spending decisions would be made by the whole community and identified priorities include building a school and raising housing to reduce the impact of floods (FRDO, 2015 Pers. Comm., 02 December).

2.6.2 WWF-Pakistan mangrove restoration activities

WWF-Pakistan became involved in mangrove restoration in 2007 via the 'Indus For All Programme' implemented jointly with SCDA.[14] Funded by the Dutch Embassy, the programme sought to rehabilitate 7 500 hectares of mangroves in the Indus Delta by restocking areas where mangroves had died. WWF continued activities after programme completion in 2012, and 10 000 hectares have been planted to date (Nawaz, 2015 Pers. Comm., 03 December).

WWF engages local communities in mangrove planting, with both parties' responsibilities outlined in simple written agreements. Initially communities were provided with transportation (i.e. boat and fuel) and wages for planting. However, Cyclone Gonu in 2007 led to greater awareness among communities about the importance of mangroves, and wages are no longer necessary (Nawaz, 2015 Pers. Comm., 03 December).

WWF also installs crab ponds in villages to incentivise mangrove protection. Mud crabs inhabit mangroves but engage in cannibalism and therefore very few reach full size. Installing crab ponds and feeding the crabs for three to four weeks allows them to grow ("crab fattening") and fetch a good price (WWF-Pakistan, undated).

To monitor the mangrove areas, villagers map them on foot or in boats using GPS units provided by WWF. In addition, WWF and SUPARCO have built 20 concrete pillars near mangrove restoration sites, which are used to monitor changes annually using fixed-point photography. WWF also undertakes regular field visits, and maintains a database of all recorded information. WWF Pakistan has expressed willingness to assist in monitoring future mangrove projects in the Indus Delta (Nawaz, 2015 Pers. Comm., 03 December).

[14] See www.foreverindus.org.

3 Thailand

3.1 Mangrove resource

Around 80 percent of Thailand's mangroves are located on the Andaman coast and the remaining 20 percent around the Gulf of Thailand (Spalding *et al.* 2010). Mangrove area decreased by 55 percent between 1961 and 1995 (from 372 356 hectares to 167 584 hectares), with the primary causes including charcoal production, shrimp farming/aquaculture, mining and resettlement (Aksornkoae 2004; MFF 2011a). Since the mid-nineties, however, national policy regarding mangroves has shifted from exploitation to conservation, and mangrove areas have recovered as a result of various initiatives outlined below. In 2015, the total national area stood at around 240 000 hectares (FAO 2015a).

3.2 Key government agencies and legislation

In Thailand, mangroves are regulated and managed by various entities, reflecting their location at the interface of marine and terrestrial environments (IUCN 2007; Lakanavichian 2004):

- Department of Marine and Coastal Resources (DMCR), within the Ministry of Natural Resources and Environment (MoNRE);
- Department of National Parks, Wildlife and Plant Conservation (DNP), within MoNRE;
- Royal Forest Department (RFD), within MoNRE;
- Ministry of Interior, responsible for land management and decentralisation policies;
- Department of Fisheries;
- Ministry of Agriculture and Cooperatives;
- Tambon Administrative Organizations (sub-district level local government units consisting of elected village representatives); and
- Royal Thai Navy, which controls mangroves within naval bases (Piriyayota et al. 2015 Pers. Comm., 14 Sept).[15]

Historically, policies and regulations pursued by the different entities have come into conflict, and the national decentralisation process has also led to disruptions. Conflict has been related primarily to simultaneous pursuit of mangrove conservation and shrimp farm expansion, although in recent years

[15] S. Piriyayota, P. Wanthongchai, and S. Poonpetch (representatives of the Department of Marine and Coastal Resources, Thailand).

declines in the profitability of shrimp production have reduced demands on land in mangrove areas (Memon and Chandio, 2011).

Established in 2002, DMCR is the key agency managing mangroves that lie outside national parks and naval areas. Its mandate includes implementation of government mangrove policy and regulatory oversight. DMCR has a central office in Bangkok, six regional offices, and 45 Mangrove Management Units (MMUs) responsible for mangrove monitoring and law enforcement, mangrove conservation and planting, and local education on the importance of mangroves (DMCR 2015).

Several laws are relevant for mangrove management, including the following:

- The Promotion of Marine and Coastal Resource Management Act 2015 ("MCRM Act" from here on);
- Forest Act 1941 (2484 B.E.);
- National Park Act 1961 (2504 B.E.), covering national parks and mangroves located inside national parks;
- National Reserved Forest Act 1964 (2507 B.E.);
- Wildlife Reservation and Protection Act 1992 (2535 B.E.), covering wildlife sanctuaries and non-hunting areas;
- Commercial Forest Plantation Act 1992 (2535 B.E.);
- Decentralization Act 1999 (2542 B.E.); and
- Land Code 1954 (2497 B.E.).

The MCRM Act has recently been launched and enforcement is expected to begin once related regulations have been issued. Under the Act, mangroves in national parks are managed by the DNP, whilst DMCR manages mangrove conservation zones[16] (MCZs) including those in reserve forests, which were previously managed by RFD. The MCRM Act requires that DMCR supports participation of coastal communities and local administrations in developing national and provincial policies and plans, but the Act does not provide these parties with legal powers (RTG 2015).

The MCRM Act stipulates establishment of a National Committee on Marine and Coastal Resource Management Policy and Planning, consisting of the Prime Minister, Minister of MoNRE, permanent secretaries of all relevant ministries, and at least 12 'qualified members' appointed by the Council of Ministers. The Committee's key responsibility is to prepare and monitor implementation of a national policy and a national plan on marine and coastal resource management

[16] In 2000, all mangrove areas were classified as 'mangrove conservation zones' to be maintained in accordance with the National Reserved Forest Act 1964 (Lakanavichian 2004; Memon 2011; Chotthong and Aksornkoae, undated).

(RTG 2015). Additionally, the Committee can approve new mangrove conservation areas, which may only be set up outside national parks, wildlife sanctuaries, non-hunting areas and privately owned land (RTG 2015).

Beneath the National Committee, Provincial Committees are to be established and tasked with preparing marine and coastal resource management plans that are consistent with the national policy and plan. Provincial committees should include the provincial governor, representatives of relevant departments and at least eight qualified representatives of civil society or coastal communities appointed by the provincial governor (RTG 2015).

3.3 Mangrove tenure

3.3.1 State ownership

In Thailand, mangroves are classified as forests. According to Section 4 of the Forest Act 1941, forest is any land which has not been acquired by an individual under the Land Code, and according to Section 54, all forest is state-owned (RTG 1941).

Regarding mangroves in national parks, Section 6 of the National Park Act 1961 states that only government can own and legally possess land in the national park, while Section 16 states that no person can hold or own land, or utilise forest in the national park. Section 30 states that if a new national park is declared in areas with active forest-utilizing concessions, licences or permissions, these are allowed to run their course (RTG 1961).

The 1994 Tambon Administrative Act and the 1999 Local Organization Decentralization Act gave Tambon Administrative Organizations responsibility to 'protect, look after and maintain natural resources and the environment' (RTG 1994) and to 'provide, maintain, and benefit taking from forestry, land, natural resources and environment' (RTG 1999). The 1999 act granted equivalent powers to Provincial Administration Authorities, and respective mangrove management responsibilities are therefore unclear.

3.3.2 Private ownership

Private land ownership is permitted in Thailand under the amended 1954 Land Code. Large areas of the country are, however, classified as government or public land and are not covered by land titles or are occupied under illegitimate land claims (RTG 2008; Samuiforsale 2015). The Land Department within the Ministry of Interior issues six types of land certificate to individuals, ranging from *Sor Kor Nung*, a notification form of possession of land with no real associated rights, to *Nor Sor Si Jor* or *Chanod*, a certificate of true ownership and the only

true land title deed (Samuiforsale 2015). All six types of land certificates are relevant for mangrove areas (Promthong, 2016 Pers. Comm, 19 May).[17]

In MCZs, human settlement and forest utilization for private use are technically prohibited. While there are no restrictions on entering the forest, people cannot own or exploit national reserved forest without a license or permission issued by MoNRE (Sudtongkong and Webb 2008; RTG 1964). Those with claims to land in areas subsequently classified as a MCZ can claim compensation but must relocate unless permission is issued by the Director-General of the DMCR, in which case the maximum period of residence is 30 years (RTG, 1964). While the private sector and households can own forest plantations and agroforests which they establish, issuance of land titles for forest land is prohibited (Lakanavichian 2004).

3.3.3 Community ownership

Both the 1997 and the 2007 Thai constitutions emphasise the right of local communities to participate in management of natural resources within their territories (RTG 1997b, 2007b). Every National Economic and Social Development Plan (NESDP) since 1997 has emphasised the same point, e.g. 'providing legal guarantees of the rights of local communities and small-scale fishers to participate in coastal resource management, as well as the conservation, rehabilitation and maintenance of mangrove areas' (RTG 1997).

Notwithstanding these commitments, community mangrove management is not formally recognised in Thailand. Although a Community Forestry Bill was drafted in 1992, it has not been ratified by Parliament (Lakanavichian 2004; Sudtongkong and Webb 2008). In spite of the lack of laws specifically designating community rights over mangroves, unsanctioned and semi-sanctioned management of mangroves by local communities does take place and, for example, reforestation activities by NGOs and local communities are permitted in MCZs (Enright,[18] 2015 Pers. Comm., 18 July).

Notwithstanding the above, Roberts (2005) mentions use of community land deeds (*chanod chumchon*) in Chiang Rai province. Such deeds have also been referred to by DMCR and may thus warrant further investigation (Piriyayota *et al.* 2015 Pers. Comm, 14 Sept).

3.4 Mangrove policy

Under the 2015 MCRM Act, the proposed National Committee on Marine and Coastal Resource Management Policy and Planning is responsible for preparing and monitoring implementation of a national policy and a national plan on

[17] Mr. Trithipâ Promthong (Technical Forestry Officer, Director of Mangrove Resource Conservation and Restoration Division, Office of Mangrove Resource Conservation, Department of Marine and Coastal Resources).
[18] J. Enright (Asia Coordinator, Mangrove Action Project).

marine and coastal resource management (RTG 2015). Until such time as these documents are prepared, the National Economic and Social Development Plan and the Thailand Mangroves Management Master Plan 2009 detail mangrove conservation and reforestation targets and related goals. A new initiative by DMCR also aims to reclaim some 300 000 rai of abandoned shrimp ponds.

Thailand's five-year NESDPs direct national development and guide line agencies in formulating policies and plans (NESDB 2015). Since 1997, each NESDP has contained national strategies and targets for mangrove conservation and rehabilitation, and local participation in mangrove management (RTG 1997, 2002, 2007). The 11th NESDP (2012-2016) contains the following targets (RTG 2012):

- At least 5 000 rai [800 ha] per year of mangrove coastal reforestation; and
- 'Communities should participate in the management of local coastal zones for sustainable fisheries'.

The Thailand Mangroves Management Master Plan 2009, developed by DMCR, aims to maintain a healthy mangrove ecosystem which delivers social, economic and environmental benefits, and improves local livelihoods. It also seeks to enhance the involvement and collaboration of stakeholders in mangrove management. The six strategies are as follows:

- Mangrove conservation and increasing mangrove forest area;
- Develop the mangrove resources and surrounding land for sustainable utilization without negative environmental impacts;
- Encourage partnerships in mangrove management for conservation, restoration and sustainability development;
- Database and research development for conservation, restoration and sustainability development;
- Establishment of demonstration areas; and
- Monitor and evaluate effectiveness of mangrove management (DMCR 2009).

According to DMCR, plans have been developed to reclaim 300 000 rai (48 000 ha) of abandoned shrimp farms and illegally occupied mangrove areas nationwide (Wipatayotin 2015; Piriyayota *et al.* 2015 Pers. Comm, 14 Sept). In consultation with DMCR Provincial Committees, 100 000 rai will be allocated to local communities for utilization, whilst in the remaining 200 000 rai mangroves will be restored. This constitutes the first serious nationwide effort to recover encroached-upon mangrove areas and owing to the need for DMCR to deal with each claim individually the process is expected to be long and complicated (see

Box 3). Piloting is currently taking place in a 27 000 rai area in Nakorn Sri Thammarat province (Sankham 2015).

3.5 Mangrove management

3.5.1 Mangrove protection

MMUs are responsible for mangrove monitoring and law enforcement outside of national parks and naval bases (DMCR 2015). Mangrove protection in Thailand is, however, hindered by lack of policy and legislative clarity, lack of human and financial resources, lack of local participation in mangrove management, and a lack of information on mangrove area boundaries (Sudtongkong and Webb 2008; Menon and Chandio 2011; Bennet *et al*. 2014; Enright 2014). An example of efforts undertaken by Samut Songkran Mangrove Management Unit and the challenges it faces is given in Box 2.

To address inadequate manpower and financing, MMUs sometimes cover the expenses of local volunteers to monitor mangroves and prevent encroachment. DMCR is also open to private funding being provided to local communities to support mangrove protection (Piriyayota *et al.* 2015 Pers. Comm, 14 Sept). Regarding information on mangrove area boundaries, MoNRE is currently mapping all forests; the resultant map should be completed in 2016 and will be used to map MCZs, amongst other purposes (Piriyayota *et al.* 2015 Pers. Comm, 14 Sept).

With respect to policy and legislative clarity, the following issues remain outstanding:

- While commercial exploitation of mangroves is not tolerated by MMUs, illegal small-scale harvesting of mangroves by local people is allegedly overlooked as a traditional right (Lakanavichian 2004; Enright, 2015 Pers. Comm., 18 July).
- Similarly, while those residing in mangrove conservation areas and national parks are supposed to be relocated, this has not always been the case (Piriyayota et al. 2015 Pers. Comm, 14 Sept). A Cabinet Resolution of 18 October 2000 permitted continued residence to those residing in mangrove areas prior to July 1991 (MFF 2011a). This resolution did not, however, provide mangrove utilization rights or a land licence and required annual renewal of permission to continue residing in the area.

Box 2. Samut Songkran Mangrove Management Unit monitoring activities

Samut Songkram MMU has only four monitoring staff and seven staff overall. This is despite the fact that it is responsible for monitoring mangroves in four provinces (Samut Songkram, Samut Sakhon, Samut Prakan and Bangkok). Rangers undertake monitoring visits twice per week to look for signs of illegal encroachment and to meet with local communities. Monitoring is done by car and, in local areas, by MMU boat; for areas further afield, a boat has to be hired. Google Earth is used to check condition of mangroves away from the shoreline, and local communities also report illegal encroachment. MMU reports any illegal activities to the regional DMCR office, which then sends officials accompanied by police, the village head and a representative of the Land Department to investigate.

Newly planted mangroves are visited every month for three months after planting, and at three month intervals thereafter. Mangrove condition and area are monitored, and the height of seedlings to the first branch is recorded in randomly placed 10m × 10m plots. The data is compiled into annual reports submitted to the DMCR regional office.

Currently, illegal mangrove encroachment on 50 sites covering ~160 hectares is being investigated by DMCR in Samut Songkram province. However, the fact that MCZs have not yet been mapped complicates investigations and can lead to disputes with the Department of Agriculture Extension under the Ministry of Agriculture and Cooperatives.

Source: Field visit to Bang Kaew, Samut Songkram Province, 16 September 2015, including discussions with C. Chonlasit (Forest Ranger, Mangrove Management Unit #7, Samut Songrkram Province).

3.5.2 Mangrove restoration

As mentioned in Section 3.4, the target for mangrove reforestation under the 11th NESDP (2012-2016) is at least 800 hectares per year. The responsibility for meeting this target lies primarily with MMUs, which actively seek new areas for planting including mudflats, degraded forests, and abandoned mining areas and shrimp ponds. Each MMU develops an annual planting plan which is submitted to the regional DMCR office and the Mangrove Conservation Bureau at the national level for approval. Upon approval, the MMU receives a budget for raising seedlings (THB 2 per seedling) and for seedling planting and maintenance (THB 440 per rai).[19] This budget complements MMU's fixed annual budget which covers salaries and operational costs (Chonlasit, 2015 Pers. Comm., 16 September).

Mangrove planting is usually done by MMUs but in certain cases local community members are hired (Eiam & Tathuwan 2015, Pers. Comm. 14 Sept).[20] Voluntary involvement of government officials, the private sector, local

[19] USD 1 = THB 35.7 as of 20 May 2016 (www.xe.com).

[20] T.T. Eiam and T. Tathuwan (representatives of the Mangrove Forest Learning and Development Centre #2, Samut Sakorn province).

communities and students in replanting efforts is also encouraged (Aksornkoae 2004). Additionally, DMCR supports direct donor and private financing of local communities to undertake mangrove planting on government land. Such funding must be provided directly to communities as anti-corruption regulations prevent DMCR from accepting funds. MMUs can, however, provide training and technical assistance (Piriyayota *et al.* 2015 Pers. Comm, 14 Sept; Chonlasit, 2015 Pers. Comm., 16 September).

DMCR may also establish memorandums of understanding (MoUs) with private companies for long-term planting initiatives, and these are seen as preferable to one-day planting events (Piriyayota *et al.* 2015 Pers. Comm, 14 Sept; see Section 3.6.1 concerning a MoU between DMCR and CPF). DMCR does not encourage mangrove restoration on land where tenure is unclear or disputed, and can provide relevant guidance (as it has done in support of mangrove restoration efforts by the Electricity Generating Authority of Thailand and PTT) (Piriyayota *et al.* 2015 Pers. Comm, 14 Sept).

The restoration system generally works well, and such efforts have largely been responsible for the increase in Thailand's mangrove area over past decades. However, as mangrove planting targets are set centrally without consideration of available planting area, MMUs are sometimes forced to plant mangroves in inappropriate areas such as salt pans and mud flats (Enright, 2015 Pers. Comm., 18 July). The problem is exacerbated by widespread cases of unclear or disputed land tenure which local government agencies are reluctant to tackle (Enright, 2015 Pers. Comm., 18 July; Piriyayota *et al.* 2015 Pers. Comm, 14 Sept). DMCR is, however, aiming to tackle these issues in restoring mangroves in the large areas of abandoned shrimp ponds in Thailand, as detailed in Section 3.4 and Box 3 below.

Box 3. Restoration of abandoned shrimp ponds in Thailand

In recent years, disease outbreaks and reductions in the profitability of shrimp production have led to widespread abandonment of mangrove areas converted to shrimp farms since the 1960s (Southern Community Development Group 2002; Barbier 2006). These areas are now potentially available for mangrove restoration, and DMCR has launched a plan to reclaim 300 000 rai nationwide as outlined in Section 3.4. There are, however, numerous obstacles to be overcome (Enright 2014; Enright, 2015 Pers. Comm., 18 July; Chonlasit, 2015 Pers. Comm., 16 September):

1. Land is often claimed by the shrimp farmer or is illegally occupied and where multiple names are present on the land deed it is also difficult to obtain consensus on mangrove rehabilitation;
2. Abandoned ponds are generally small and geographically dispersed and many parties with differing land tenure claims must be dealt with;
3. Restoration of hydrology is often necessary but is expensive and currently not included in DMCR's budget;
4. Policies pursued by different government departments are in conflict and while DMCR aims to restore mangroves in abandoned ponds, the Land Department appears to be encouraging oil palm establishment.

Without land reclamation it is unlikely that farmers will restore mangroves in abandoned shrimp ponds, due to the lack of financial return in relation to alternative uses of the ponds (FAO 2015b; Nuamsiri,† 2015 Pers. Comm., 15 September). For example, Samut Songkram MMU reported that around 90 percent of abandoned shrimp farms in the province are used for other types of aquaculture, providing income of around THB 10 000 (USD 277) per farmer per month – an amount reflecting high demand for shrimp from Bangkok (Chonlasit, 2015 Pers. Comm., 16 September). To address similar issues in Viet Nam, the 'Mangroves and Markets' project sought to combine mangrove restoration with sustainable shrimp production, and the same model may have potential in Thailand (see Section 4.6.1).

† - V. Nuamsiri, Village Chief, Bang Bor village, Samut Songkram Province

Overall, mangrove restoration experience in Thailand has provided a wealth of information and experience, including the following lessons learned:

- To improve survival rates and overall mangrove restoration success, private support for mangrove restoration should aim towards long-term engagement, local participation and establishment of nurseries (IUCN 2007);
- To incentivise seedling survival and encourage monitoring and restoration of appropriate areas, such as abandoned shrimp ponds,

payments should be based on seedling survival rather than the number of seedlings planted;[21]

- To improve sustainability, seedlings should be selected according to local conditions and should include species other than *Rhizophora apiculata* and *R. mucronata*, which have been the focus in the past due to their high timber yields (Memon and Chandio 2011; Aksornkoae 2004); and
- To facilitate mangrove restoration on private land, reassurances may need to be given to owners that mangroves planting will not result in the land being claimed by the government given that all mangrove forest is state-owned (FAO 2015b).[22]

3.5.3 Community-based mangrove management

Coastal communities are often interested in gaining rights over local mangrove areas. Despite the lack of legal recognition of community forestry in Thailand, local authorities generally recognise the tradition of communities utilising local resources (Section 3.3.3; Sudtongkong and Webb 2008). In practice, the establishment of community-managed mangrove areas generally follows a three-step process:

- Local villagers establish an unofficial 'Mangrove Conservation Group' (MCG);[23]
- MCG invites provincial and district RFD and/or DMCR officials to participate in mangrove replanting, and pushes for legal recognition; and
- Officials eventually demarcate a community mangrove with boundary signs and recognise the right of the MCG to manage the area and exclude others (Sudtongkong & Webb 2008; Bennet et al. 2014; Chotthong and Aksornkoae, undated).

MCG's generally issue a set of regulations and divide the community mangrove area into three zones:

- Conservation area, with no access;
- Rehabilitation area, where replanting takes place; and
- Consumption area, where access is allowed with permission from the group.

[21] DMCR's linking of payments to the number of seedlings planted rather than seedling survival has sometimes led to planting and replanting of mangroves in inappropriate areas, lack of monitoring and avoidance of rehabilitation in abandoned shrimp ponds where hydrological restoration is required (Enright, 2015 Pers. Comm., 18 July).

[22] Whilst DMCR denies that such reclamations take place, only full land titles (*chanod*) are recognised as proof of private ownership (Piriyayota et al. 2015 Pers. Comm, 14 Sept).

[23] The names of such groups vary, including 'community forest user group', 'community forestry group' and 'community-based conservation groups'.

MCG membership requires participation in mangrove replanting and patrolling and affords harvesting rights. Outsiders must request permission and pay fees to harvest (Chotthong and Aksornkoae, undated; Enright, 2015 Pers. Comm., 18 July).

Depending on the size of the area, local people can be more effective at monitoring mangroves than understaffed MMUs, and community forests are sometimes in a significantly better condition than government monitored forests (Sudtongkong and Webb 2008). However, while the involvement of local leaders such as tambon chiefs and village heads can improve recognition of MCGs among villagers, they often lack formal processes for community consultation, enforcement and exclusion (Bennett *et al.* 2014). This can result in confusion and erosion of authority: a study in the northern Andaman coast of Thailand found that local rule enforcement occurred in only two out of seven villages studied (Bennett *et al.* 2014).

Box 4. Community-based mangrove management in Bang Kaew, Samut Songkram Province

The MCG in Bang Kaew village has 50 members from 10 nearby villages, and 7-10 core members are actively involved in decision making. The MCG has a bank account managed by the executive members, and all expenditure must relate to an action plan. Payments to villagers are *ad hoc* and based on the size of the task. The MCG's accountant produces an annual financial report.

Due to the site's proximity to Bangkok, many organisations have been involved in mangrove planting in the area including Chevron Oil, Mubadala Petroleum, Marriott Hotels and different universities. There are no signed agreements between the MCG and companies supporting mangrove planting, and there is usually no time limit on expenditure of donated funds. As the MCG has capacity to manage its finances and planting activities, there has been no NGO involvement in mangrove management in the area. However, the MCG has, in the past, planted mangroves on a mudflat where rates of seedling survival were low.

Land managed by the MCG is technically owned by the government. Although DMCR has shown limited interest in the planting activities and local government informally recognises the MCG, the latter has no legal standing under Thai law. As well as creating uncertainty for the villagers in the face of potential government claims on the land, this also leaves them exposed in other risks. For example, an area of abandoned privately owned land near Bang Kaew was replanted after construction of a bamboo barrier which allowed reclamation of the land. Once the land was restored, the owner returned to reclaim it, leading to legal conflict with the MCG.

Source: Field visit to Bang Kaew, Samut Songkram Province, 16 September 2015, including discussions with V. Nuamsiri (Village Chief, Bang Bor village) and C. Chonlasit (Forest Ranger, Mangrove Management Unit #7).

3.6 Mangrove projects

A large number of donors, NGOs and private companies have supported mangrove restoration in Thailand including UNDP, IUCN, WWF, PTT, the Mangrove Action Project (MAP), Kasikornbank, Nokia and Toyota. The following sections focus on three recent private-sector initiatives in Samut Songkram province which were investigated in detail during visits in September 2015.

3.6.1 Charoen Pokphand Foods Public Company Limited (CPF)

CPF is a Thai agro-industrial and food conglomerate focussing on livestock and aquaculture, including shrimp and fish farming (CPF 2015a). According to CPF, the company planted over 300 000 mangrove trees in 17 provinces between 1993 and 2013, including in Samut Songkram (CPF 2015b). Until recently, CPF's mangrove activities focused on one-day planting events run by individual CPF factories and farms. However, the company recently signed a national-level MoU with DMCR, and is centralising its CSR activities and engaging in larger, longer-term projects (Kalumpabutr, 2015 Pers. Comm., 14 September).[24]

CPF's 5-year "Grow Share Protect the Mangrove" project aims to conserve and restore over 320 hectares of mangrove, and establish mangrove learning centres in five provinces. Commencing in 2013, the project is implemented jointly with DMCR, the Biodiversity-based Economy Development Organization (BEDO) and the Thailand Greenhouse Gas Management Organization (TGO). Under the project, CPF evaluates mangrove restoration sites close to its operations and consults DMCR to ensure land tenure is secure. DMCR selects species and provides training to communities on mangrove planting and monitoring, whilst BEDO monitors biodiversity and production of ecosystem services derived from restored sites. CPF does not sign agreements with communities, and communities are not paid for mangrove planting (although meals are provided during planting) (Kalumpabutr, 2015 Pers. Comm., 14 September; CPF 2015b).

TGO has recently become involved in the project under its new Low Emission Support Scheme (LESS), and plans to estimate carbon sequestration by 100 rai of restored mangroves in Chumphon province. Based on sequestration rates, CPF will make carbon payments into a revolving fund from which local community members involved in mangrove planting and/or monitoring will be able to borrow to support livelihood activities, subject to their commitment to protect the planted area for at least two years. In addition to carbon payments, CPF will contribute THB 100 000 as the fund principal and will receive a certificate of recognition from TGO-LESS, specifying amounts of carbon sequestered (LESS 2015). According to TGO, site monitoring is to be undertaken by CPF (Yamyim, 2015 Pers. Comm., 15 October).[25]

[24] Ms. N. Kalumpabutr (General Manager - CSR and Sustainable Development, CPF).
[25] Ms. J. Yamyim, TGO LESS representative.

3.6.2 Mubadala Petroleum

Mubadala Petroleum is an international oil company, with headquarters in Abu Dhabi and an office in Bangkok (Mubadala Petroleum 2015). It is currently operating an oil field in Samut Songkram Province. In 2013, the company began implementing a two-year, USD 37 133 mangrove planting project in Bang Kaew Tambon, Samut Songkram, in collaboration with the MMU #7 and the Bang Kaew Mangrove Conservation Group (MCG) (Mubadala Petroleum 2013).

Mubadala purchased seedlings from Bang Kaew MCG for planting and replanting of 10 rai over two years. According to the company report, planting took place on state-owned forest land (Mubadala Petroleum 2013). Around 500 trees covering five percent of the project area were planted by Mubadala staff, while Mubadala provided funding for Bang Kaew MCG and local communities to plant the remaining 9 500 trees. Mubadala also financed necessary replanting, construction of bamboo bridges for easy access to the planted area, and construction of a 500-metre bamboo fence to protect the seedlings from erosion. All finances were transferred into a Bang Kaew MCG bank account, managed by the MCG committee (comprising the president, the deputy village chief and village community leaders). There was no official agreement signed between Mubadala and Bang Kaew MCG, and there is no time limit for spending the donated funds (Nuamsiri, 2015 Pers. Comm., 15 September).

Mubadala engaged King Mongkut University to act as a third party monitor, and visits are conducted two or three times per year (Mubadala Petroleum 2013). According to the president of Bang Kaew MCG, monitoring visits have been conducted as planned. However, survival rates in the planted area have been low, and Mubadala has shown very little interest in the success of the project (Nuamsiri, 2015 Pers. Comm., 15 September).

3.6.3 Marriott Hotels and Resorts Thailand

In 2013, Marriott Hotels and Resorts Thailand ("Marriott" from here on) signed a three-year MoU with IUCN. The MoU covers mangrove restoration activities, sourcing of handicrafts from local communities and sustainable seafood sourcing (Cadena, 2015 Pers. Comm., 15 September).[26]

As part of the MoU, Marriott runs a '$1/1 day' campaign, where customers at its two Thailand hotels are encouraged to donate USD 1 towards mangrove restoration for each overnight stay.[27] This campaign raised USD 30 000 in 2014 and USD 60 000 in 2015. The funds are donated to IUCN and used to finance

[26] Ms. A.J. Cadena (Programme Officer, IUCN Thailand).

[27] The campaign is run through the JW Marriott Hotel in Bangkok and the JW Marriott Phuket Resort and Spa in Phuket. According to IUCN, the campaign is more effective in Phuket where a larger share of clientele are tourists (Cadena, 2015 Pers. Comm., 15 September).

mangrove planting and establish village funds (Cadena, 2015 Pers. Comm., 15 September).

Marriott staff also engage in one-day planting events every three months across four sites (Rayong/Pattaya, Bang Kaew, Samut Songkram, Ko Samui, and Phang Na/Phuket). At each event ~4 000 seedlings are planted by around 60 staff, joined on occasion by hotel guests and local communities. Marriott also plans to restore mangroves on a 13 hectare former oil palm plantation in Phang Nga, and IUCN has requested the Mangrove Action Project (MAP) to conduct a site assessment (Panton, 2015 Pers. Comm., 15 September).[28]

IUCN's contribution to the MoU includes education on mangrove conservation for Marriott staff. Hotel staff, in turn, explain the value of the '$1/1 day' campaign to hotel guests. With assistance from DMCR, IUCN also identifies planting sites according to Marriott priorities, which include staff safety and ease of access (Cadena, 2015 Pers. Comm., 15 September; Panton, 2015 Pers. Comm., 15 September).

Marriott's engagement in mangrove restoration has resulted from the efforts of an energetic CSR Director with personal links with IUCN and the alignment of mangrove restoration with Marriott's "Spirit to Serve" initiative. Mangrove restoration is also an acknowledgement of the coastal location of many of Marriott's hotels and associated vulnerability to climate change (Cadena, 2015 Pers. Comm., 15 September; Panton, 2015 Pers. Comm., 15 September). According to Marriott, there is strong interest in the mangrove initiative from other hotels, including Amari Watergate (Panton, 2015 Pers. Comm., 15 September).

[28] Mr. S. Panton (Director of Corporate Social Responsibility and Corporate Experiences, JW Marriott Phuket Resort and Spa).

4 Viet Nam

4.1 Mangrove resource

In Viet Nam, mangroves are primarily located in the south of the country. The most extensive areas occur in deltas, and a large proportion of Viet Nam's mangroves are in the Mekong Delta and in Ca Mau province. Smaller areas remain in the Red River Delta in the north, including in Nam Dinh and Thai Binh provinces. There are also coastal belts of only a few hundred metres width occurring in patches along the remaining coastline (Spalding *et al.* 2010). Mangrove uses include shrimp and clam farming, firewood and timber production, fishing, raising ducks and bees, ecotourism, storm and sea dyke protection (Spalding *et al.*, 2010; Powell *et al.* 2011).

Following widespread destruction for many decades, Viet Nam's total mangrove area increased from a reported 73 000 hectares in 1990 to 270 000 hectares in 2015 (FAO 2015a). The main initial causes of conversion included the use of herbicides during the Indochina War, and conversion of mangroves for agriculture and aquaculture. From 1975 to 1998, an estimated 67 600 hectares of mangroves were planted in southern areas (mostly with state funding), and internationally backed efforts have since further increased mangrove area in the country (Spalding *et al.* 2010). Conversion of mangroves for export-oriented intensive shrimp production remains a substantial threat in many areas, although government policy is now moving towards greater protection for mangroves.

4.2 Key government agencies and legislation

Viet Nam's mangroves are regulated and managed by a number of agencies and departments, as illustrated in Figure 1. These include:

- Ministry of Natural Resources and Environment (MoNRE) is responsible for land management, and has departmental offices (DoNREs) at the provincial and district levels;
- Ministry of Agriculture and Rural Development (MARD) is responsible for forest and fisheries management, and has departmental offices (DARDs) at the provincial and district levels;
- Provincial, district and commune People's Committees, which represent the executive arm of the State;
- Forest Management Boards (FMBs); and
- State Forest Enterprises (SFEs).

Mangroves are considered forest ecosystems and are therefore subject to laws applicable to forestlands in Viet Nam, including:

- Law on Land (amended 2013);
- Law on Forest Protection and Development (2004);
- Law on Environmental Protection (2005); and
- Law on Biodiversity (2008).

Administrative responsibility for mangroves in Viet Nam is shared by two line ministries, MoNRE and MARD. MoNRE is responsible for land management, including land use planning, land surveying and land use mapping, land allocation and registration, and issuance of land use certificates, as well as biodiversity conservation, aquatic ecosystem management and protection, and climate change. MARD is responsible for forest and fisheries management, which includes developing forest protection and development plans, demarcating forest boundaries, forest allocation and leasing, making final decisions on forest conversion or re-categorization, aquaculture and fisheries management, and storm and flood control (Hawkins *et al.* 2010; MFF 2011b).

Both MoNRE and MARD have branch offices at the provincial and district level that oversee local management. If the forestland has been allocated to organizations such as SFEs or FMBs, these organizations are responsible for managing and protecting their allocated forest areas.

According to the Land Law and the Forest Protection and Development Law, MARD and MoNRE must coordinate their activities. This is important for many purposes including for transfer of information from MARD to MoNRE for issuance of accurate land use certificates to landholders for forestland. However, coordination at all levels is often very weak, leading to confusion and uncertainty in mangrove management (Hawkins *et al.* 2010). For example, MoNRE and DONREs (provincial agencies of MoNRE) often do not consider existing forest policies when planning development activities in coastal areas (Fenn, 2015 Pers. Comm., 25 May).[29]

To manage mangrove forests, MARD and MoNRE work with the People's Committees, which represent the executive arm of the State at province, district and commune levels and hold the highest decision-making power. The MoNRE and MARD departments at each level (e.g., provincial DONREs and DARDs) submit plans to the respective People's Committees for approval, and the Committees oversee implementation and enforcement of the Land Law within their respective jurisdictional boundaries. Provincial People's Committees are responsible for evaluating and approving organization's land and forest conversion plans, while District People's Committees evaluate and approve

[29] Mr. M. Fenn (Chief of Party, USAID-funded Vietnam Forests and Deltas Program).

household and individual plans. As mentioned above, Commune People's Committees (CPCs) act as temporary custodians of lands within the commune that have not been allocated to an entity.

Institutional structures for mangrove management in Viet Nam are shown in Figure 1 below.

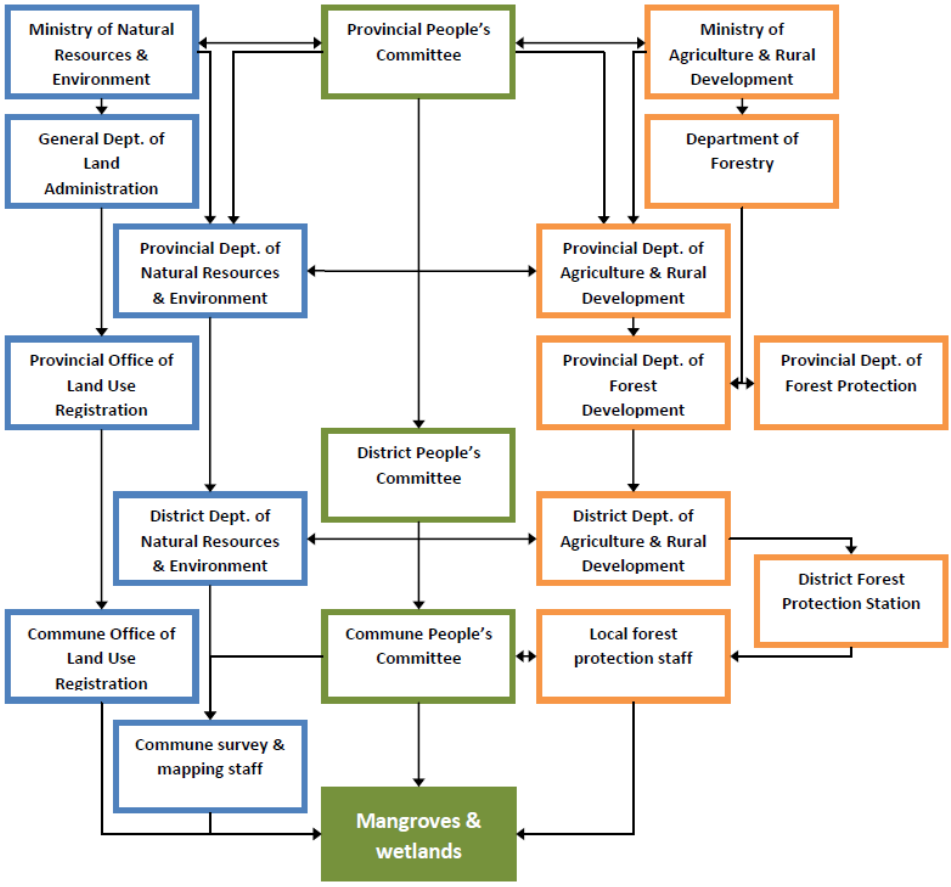

Figure 1. Institutional structures for mangrove management in Viet Nam
Source: Hawkins et al. 2010.

4.3 Mangrove tenure

According to the Law on Land (amended in 2013) and the Law on Forest Protection and Development (2004), land and forest resources belong to the people of Viet Nam and are managed by the State on the people's behalf. Current regulations stipulate that the State owns all naturally regenerated forests and forests established with state funds, regardless of land allocation (Hawkins *et al.* 2010). Private and community ownership of forest is not permitted.

4.3.1 Allocation and contracting of forestland

The State conducts land use planning and grants land use rights to individuals, companies or public entities for long-term management (up to 50 years for agriculture land and forestland, with possible extension). Landholders can sell, lease, exchange, inherit, transfer and mortgage land use rights, as well as receive compensation when the land is taken back by the State. However, they cannot change land use unless approved by the State (Hawkins *et al.* 2010; USAID 2012).

Decree 02 (1994) provides the legal framework for allocating forestland to public and private organizations, individuals and households for forestry purposes. Entities allocated forestland are entitled to receive land use certificates. The current allocation of mangrove forests in Viet Nam is as follows:

- 51 percent of mangrove areas are allocated to state-run FMBs, which are government entities reporting to the Provincial DARDs. The areas covered tend to be the largest contiguous mangrove areas;
- 29 percent of mangrove areas are managed by CPCs. Usually these are unallocated small coastal belt forests put under the temporary control of CPCs by default. As CPCs often lack the resources and expertise to exercise effective management, these areas often become de facto open-access;
- 10 percent are allocated to private companies; and
- 10 percent are allocated to communities, households and other stakeholders (Hawkins et al. 2010).

Decree 01 (1995) provides the framework for forestland contracting by parties that have been allocated forestland. Specifically, state organizations such as FMBs can contract their allocated forestlands to households and individuals, with rights and responsibilities of both parties defined in the contract. Contracted parties do not become owners and do not receive land use certificates but instead receive use rights and small payments for forest protection or reforestation activities.

Notably, unlike individuals or companies, communities and villages have no legal standing in Viet Nam, and thus cannot be allocated or contracted forestland.

4.4 Mangrove policy

Forests in Viet Nam are classified into three categories: special use forests, comprising national parks and nature reserves; protection forests; and production forests. Only special use forest cannot be harvested. Seventy percent of mangroves are classified as protection or special use forests, which limits their

allocation to non-state actors. All forest areas are clearly mapped, so there is no ambiguity regarding classification (Ho Kim Cuong, 2016 Pers. Comm., 21 Sept).[30]

In northern Viet Nam, most mangrove forests have protection status, are often owned and managed by state entities (e.g. FMBs, CPCs) and are not allocated to households and individuals. The primary purpose of mangroves is to provide a collective service in protecting coastal communities against storms. Local inhabitants are usually not allowed user rights and only a small number of individuals benefit from being contracted to plant or protect the mangroves (Powell *et al.* 2011). In southern Viet Nam, mangrove tenure systems are more diverse, and include individual tenure for production forests and collective tenure and co-management for protection forest.

4.4.1 Key regulations, policies and plans

Prior to 2003, there was no single legislation for wetlands in Viet Nam. In 2003, the government issued the first decree regulating the conservation and sustainable development of wetlands (Decree 109/2003/ND-CP). Despite this being the sole legal framework, MoNRE's and MARD's institutional responsibility for mangroves remains unclear (and in some cases overlapping), and attempts to manage mangrove forests are hampered by confusion and conflict. Furthermore, there is a lack of long-term inter-sectoral planning at all levels, and narrowly defined single-sector policies often fail to account for the interests of other sectors and stakeholders (Hawkins *et al.* 2010; MFF 2011b).

In recent years, the government of Viet Nam has adopted integrated coastal management (ICM) to help resolve conflicts. The Viet Nam Administration of Seas and Islands was established under MoNRE in 2008 to coordinate different ministries and agencies on the implementation of ICM plans and programs (Powell *et al.* 2011). The government issued a decree on ICM[31] in 2009, along with a national ICM program for 14 coastal provinces.[32] However, the results of national ICM work have been slow to reach practitioners and sub-national decision makers (MFF 2011b).

'Decision 186/2006/QD-TTg dated August 14, 2006 of the Prime Minister on promulgating the regulation on forest management' requires that households and organizations allocated or contracted submerged land can only use 40 percent of the area for agriculture or aquaculture activities. As such, shrimp farmers in protection and production forests must maintain at least 60 percent

[30] Mr. Ho Kim Cuong (Programme Support Officer, Ca Mau Province, IUCN).
[31] 'Decree 25/2009/ND-CP on Integrated Management and Protection of Natural Resources and Environment of Seas and Islands'.
[32] 'Decision No. 158/2007/QD-TTg of the Prime Minister on the approval of the Integrated Coastal Zone Management Program for North Central Region and Central Coastal Provinces until 2010 and Orientations until 2020'.

mangrove canopy cover. Failure to comply may result in the household's lease or contract being revoked or not renewed.

'Decision 178/2001/QD-TTg dated November 12, 2001 of the Prime Minister on the benefits and obligations of households and individuals allocated, leased, or contracted forests and forestry land' provides detailed regulations on timber-related benefit sharing between households and the state in protection and production forests. When exploitation of protection forest is permitted, households are allowed to engage in selective cutting intensities of not more than 20 percent during any one period. The harvested area must be replanted and further harvesting cannot occur until the replanted area is at least three years old. The exploitation plans have to be in accordance with the respective DARD's 5-year or 10-year plans, and have to be approved by relevant local agencies of DARD.

For production forests, allocated or contracted households do not have to comply with the 20 percent restriction, but still need to meet the 60 percent mangrove cover requirement stipulated in Decision 186. The definition of 'forest' in such cases usually is interpreted to include replanted areas that do not meet official definitions of 'forest' based on tree height and/or canopy cover. This means that 100 percent of the forest can be harvested as long as it is immediately replanted. For both production and protection forests, households are entitled to up to 95 percent of the revenues from timber exploitation.

'Decree 117/2010/ND-CP date December 24, 2010 of the Government on organization and management of the special-use forest system' regulates the management of special use forests. Special use forests are divided into subzones: strictly protected subzone; ecological restoration subzone; and service and administrative subzone. In the strictly protected subzone, no activities are allowed apart from building of tourism trails by park rangers. In the service and administrative subzone, collection of dead timber trees, broken and felled trees and forest flora is allowed. In addition, sustainable exploitation of non-timber plants that are not on the endangered, rare and precious species list is allowed in the ecological restoration and service and administrative sub-zones with approval from relevant government agencies.

'Decision 78/2002/QĐ-BNN-KL dated August 28, 2002 of Minister of MARD promulgating technical procedure on forest and forestland monitoring of forest ranger' provides detailed technical requirements for forest and forestland monitoring, and assigns responsibilities to forest protection agencies at different levels. DARD forest rangers are required to frequently update changes in forest and forestland, including changes in forest area, type, title, etc. and causes of change.

Forest Protection and Development Plan for the period 2011-2020 (Decision 57/2012/ND-CP) covers recovery and development of mangrove and coastal

forest ecosystems. The plan contains the national target of 60 percent forest cover (MFF 2011b).

MARD's National Programme to Restore and Develop Coastal Mangrove Forest for the Period 2008-2015 is a national program for protection and restoration of mangroves. Its objectives include:

- Protection of the existing 210 000 hectares area of mangrove forest in order to bring the total coastal mangrove area to 300 000 hectares in 2015;
- Prioritization on plantation and protection of 500-meter wide mangrove belts in front of sea dykes;
- Development of models for mangrove rehabilitation, development and protection; and
- Development of a national database for mangrove management (MFF 2011b).

Coastal Forest Protection and Development Plan to Respond to Climate Change for the period 2015-2020 seeks to protect the current 310 695 hectares of coastal forest and plant 46 058 hectares of forests by 2020, thus increasing coastal forest coverage to 19.5 percent. The plan was approved via Decision 120/2015/QD-TTg of the Prime Minister, with estimated capital requirement of VND 5.415 billion (FSSP 2015).[33]

Lastly, the government is developing a new policy on 'Coastal Forest Management, Protection, Rehabilitation and Development in Response to Climate Change' with assistance from the USAID-funded Viet Nam Forests and Deltas program. The policy seeks to strengthen coastal forest management and protection by: prohibiting conversion of coastal forests except for reasons of national importance; moving construction works and production units that might negatively impact the protection functions of coastal forests out of the areas planned for critical watershed protection forests; and withdrawing coastal forest areas used or converted for wrong purposes. The draft policy has been endorsed by MARD and has been submitted to the Ministry of Justice for a legal review (Fenn, 2016 Pers. Comm., 11 Jan).

4.4.2 National Payment for Forest Environmental Services (PFES) scheme

Viet Nam's PFES scheme operates under the 'Policy on Payment for Forest Environment Services (PFES) (Decree 99/2010/ND-CP) dated September 24, 2010'. The policy defines four eligible environmental services:

- Watershed protection;
- Landscape and biodiversity protection payments for tourism purposes;

[33] USD 1 = VND 22 316 as of 20 May 2016 (www.xe.com).

- Forest carbon sequestration; and
- Protection of spawning grounds, sources of feeds and natural seeds, and use of water from forest for aquaculture.

To date, 98 percent of generated payments have been in watershed protection, while payments from tourism have been minimal, and institutional mechanisms for carbon and aquaculture are still under development. Both carbon and acquaculture services could be relevant to mangrove protection and restoration (USAID LEAF 2015). However, the rights of different stakeholders to mangrove forests and forestland will affect their eligibility to receive revenues from PFES, as described below.

Private landholders (individuals, households, private companies, joint-stock companies, and other economic organizations). As mentioned above, these landholders are eligible for allocation of land and production forest, and are entitled to 50-year land use certificates. They are also entitled to economic benefits derived from allocated land and forest (including revenues from PFES), except those from naturally-regenerated forests and forests planted with state funds, which officially belong to the State.

Forest Management Boards. Many FMBs have been granted long-term land use certificates and are entitled to revenues from PFES. All FMBs operate with state funding, and some are reluctant to contract local people for forest protection as it involves sharing this funding. Decree 99 attempts to address this by mandating that FMBs can only retain 10 percent of the PFES revenues and must distribute 90 percent to local people. There is, however, a risk that revenues from PFES will be captured by FMBs.

State Forest Enterprises. SFEs hold similar rights to private landholders and are entitled to revenues from PFES. They may also contract with households and individuals and channel PFES revenues to local people.

Commune People's Committees. CPCs are temporary custodians of unallocated land and do not hold formal titles over land or forest, so it is unclear how PFES revenues could be distributed to local people. One possible measure is to use co-management arrangements to grant rights and responsibility to forest users, or for CPCs to contract local households to protect and manage forests.

Communities. Large areas of forest in Viet Nam are managed by communities. However, as customary rights are not recognized by the law and communities are not legally-recognized entities, they cannot enter into legal contracts. As a result, the official landholder will be entitled to PFES revenues rather than the communities with customary rights. Since land use rights are allocated to individual households rather than communities, any mangrove protection agreement would need to be signed by all relevant households. Communities can also be represented by local administrations, as seen in some mangrove co-

management 'agreements' in Viet Nam.[34] In such cases, the 'agreements' are in the form of local legislation and do not involve communities as consenting parties with rights as well as responsibilities.

Mass organizations (e.g., women's union, youth union, veterans' union). In some cases, such as in Son La Province in the northwest of the country, large areas of forest have been allocated to these organizations with long-term use certificates. However, these organizations are not recognized legal entities and therefore cannot enter into PFES transactions (Hawkins *et al.* 2010).

Cooperatives (e.g., agriculture and aquaculture cooperatives). According to 'Decision 151/2007/NĐ-CP dated October 10, 2007 of the Prime Minister on organization and activities of cooperatives', cooperatives can work directly with domestic and international organizations and individuals to expand production and business. Cooperatives can also enter legal contracts. However, establishing cooperatives is legally complicated and expensive, and thus may not be an efficient way to engage with local communities (Ho Kim Cuong, 2016 Pers. Comm., 21 Sept).

4.5 Mangrove management

The information in this section focuses on mangrove management in the southern provinces of Viet Nam, and thus might not be applicable to northern provinces.

4.5.1 Mangrove management

FMBs are responsible for mangrove restoration and planting in their allocated areas. They are usually staffed by local individuals assigned by DARD for a term of five years, and are located at management stations scattered within the FMB area. For example, Nhung Mien FMB in Ca Mau Province has 45 officials (including a three-person Board of Directors) and eight management stations with three-four officers located at each. Mangrove planting by FMBs is funded from the central government budget (Tran Van Duy, 2015 Pers. Comm., 22 Aug).[35]

FMBs often contract individual households to manage three-four hectare plots of production and protection forest (including mangroves) for duration of 20-25 years. Households must protect and manage the forest in accordance with both the contracts and the national and provincial laws. Households have annually updated maps of forest areas in their plots and are permitted to harvest mangroves and develop aquaculture (Khai, 2015 Pers. Comm., 23 Sept).[36] The

[34] For example, co-management agreements under the MFF Small Grant projects in An Thuy Commune of Ba Tri District and in Thanh Phong Commune of Thanh Phu District in Ben Tre province.
[35] Mr. Tran Van Duy (Director, Nhung Mien Forest Management Board).
[36] Mr. Khai (Director, Dat Mui Forest Management Board).

largest areas of contracted mangroves are in Ca Mau Province, where the contracted households use the land for integrated mangrove-shrimp aquaculture (McEwin, 2015 Pers. Comm., 21 Sept).[37]

Contracted households develop annual harvesting plans, which are forwarded to FMBs for approval. FMBs, in turn, develop 5- and 10-year land use plans, which are sent to DARD for approval (Khai, 2015 Pers. Comm., 23 Sept). In accordance with the Forest Protection and Development Plan 2020 and Decision 186/2006/QD-TTg described above, activities pursued by contracted households, FMBs, DARDs and MARD are meant to pursue the national 60 percent forest cover target, and contracted households are meant to keep 60 percent of their plots under mangrove cover. However, this rule is loosely enforced, and contracted households with less than 60 percent mangrove cover remain contracted and are permitted to harvest mangroves (Tran Van Duy, 2015 Pers. Comm., 22 Sept; McEwin and McNally 2014).

Contracted households with mangrove cover below 60 percent are encouraged by FMBs to plant mangroves and are also offered technical assistance, free seedlings and occasional financial incentives. Mangrove planting usually takes place on platforms created in the middle of shrimp ponds, although FMBs cannot order households to plant (Khai, 2015 Pers. Comm., 23 Sept). Contracted households are allowed to keep six percent of harvested timber sales value, whilst the rest is collected by FMBs and channelled to the central government. Consistent with Decision 178/2001 and as an incentive to allow mangroves to mature, household's share of the sales value increases by six percent per year to a maximum of ninety-five percent .

FMBs' representatives have no objections to donors or private entities establishing mangrove-related agreements with individual farmers, as long as management is in compliance with regulations and annual harvesting plans (Tran Van Duy, 2015 Pers. Comm., 22 Sept). There are many abandoned shrimp farms with potential for rehabilitation in Ben Tre and Tra Vinh provinces in southern Viet Nam (Ho Kim Cuong, 2016 Pers. Comm., 21 Sept).

4.5.2 Mangrove monitoring

The national forest monitoring system in Viet Nam is relatively well-developed and is being improved. FMBs are responsible for field monitoring of mangroves, which includes patrolling on boats and on foot. Forest rangers employed by the Forest Protection Department within DARD assist FMBs and also monitor mangroves allocated to households and private companies, whilst Provincial People's Committees (PPCs) are responsible for monitoring mangroves allocated to state forest enterprises and national parks. Apart from regular patrols to

[37] Mr. A. McEwin (Mangrove and Community Engagement Expert and a consultant for the 'Income for coastal communities for mangrove protection' project).

monitor illegal activities, FMBs and forest rangers undertake annual monitoring of planting and harvesting (Nguyen Nhu Do, 2016 Pers. Comm., 23 Sept).[38]

FMBs do not have authority to enforce laws. Consequently, forest violations observed by FMBs and households are reported to and verified by forest rangers. However, illegal harvesting is rare, on a small scale, and mostly for house construction or charcoal production (Khai, 2015 Pers. Comm., 23 Sept; Tran Van Duy, 2015 Pers. Comm., 22 Sept).

FMBs and forest rangers do not use maps or satellite images when monitoring mangroves. Instead, they rely on local knowledge and record findings on paper. This is at least partially due to lack of capacity to interpret satellite images and enter information into mapping software (Khai, 2015 Pers. Comm., 23 Sept; Tran Van Duy, 2015 Pers. Comm., 22 Sept; Pham Trong Thinh, 2015 Pers. Comm., 21 Sept).[39]

Most government figures on mangrove cover are based on FMB reports and do not make use of remote-sensing information. However, the Forest Inventory and Planning Institute (FIPI)[40] is currently conducting a mangrove inventory, which should provide a baseline for monitoring change in mangrove areas. The inventory should be completed by 2016 and will include the following:

1. A ground-checked forest map for each province based on 2012 SPOT5 satellite imagery;
2. An overall estimate of forest biomass based on sample plots; and
3. An estimate of above- and below-ground biomass, carbon stocks and carbon sequestration from total forest biomass (Pham Trong Thinh, 2015 Pers. Comm., 21 Sept).

The Southern Sub-Institute of FIPI covers 23 out of 58 provinces in Viet Nam. It has the capacity to interpret high-resolution satellite imagery of mangrove areas for private- or public-funded mangrove projects, and can also provide mangrove monitoring training for communities and/or FMBs (Pham Trong Thinh, 2015 Pers. Comm., 21 Sept).

4.5.3 Key challenges to policy implementation

Implementation of mangrove protection in Viet Nam is challenged by high population pressure and high opportunity costs.[41] Government agencies at all

[38] Mr. Nguyen Nhu Do (Director, Provincial Forestry Department, Ca Mau Department of Agriculture and Rural Development).
[39] Dr. Pham Trong Thinh (Director, Southern sub-institute of FIPI).
[40] FIPI is an institute under MARD, responsible for producing forest inventories and monitoring forest condition.
[41] For example, in Xuan Thuy National Park (Nam Dinh Province), an individual contracted for forest protection and development activities receives about VND 200 000/ha/year from the government, whereas he/she can earn VND 100 000/day from collecting shellfish and VND 60 000-

levels have in the past prioritized aquaculture, tourism and infrastructure development. Mangrove management is also hindered by MoNRE's and MARD's unclear and overlapping mandates; in some cases, these overlaps create a regulatory void where neither agency supervises or provides support (Hawkins *et al.* 2010; Powell *et al.* 2011).

Even where authority is clear, mangrove management is hindered by the lack of resources and expertise. For example, since the Red Cross program's support to mangrove projects in northern Viet Nam ended in 2006 (see Section 4.6), some monitoring and protection teams have dissolved entirely. Local authorities and government agencies also sometimes lack an understanding of laws, rights and responsibilities related to mangroves, while local communities lack awareness of their legal obligations and the benefits from protecting mangroves. They also lack alternative livelihoods, and knowledge of sustainable harvesting and cultivating practices (Hawkins *et al.* 2010; Powell *et al.* 2011).

Enforcement of and compliance with mangrove protection regulations are also weakened by conflicts of interest where government officials own aquaculture ponds or receive payments from pond owners. In addition, local people are often not deterred in breaking laws by the lenient penalties, which forest protection officials are sometimes reluctant to impose on their fellow community members.

Another factor hindering policy implementation is the overlap between customary and prescriptive rights. For example, Xuan Thuy National Park in Nam Dinh Province was designated as a protection forest in which local inhabitants had no user rights. However, those who had been living in and using the forests for years, and particularly women, had no alternative livelihoods and therefore continued to enter the forests to harvest non-cultivated seafood (Hawkins *et al.* 2010; Powell *et al.* 2011).

4.6 Mangrove projects

There have been many mangrove protection and restoration projects in Viet Nam in recent years, mostly funded by the government or international donors. Six recent large-scale projects are discussed below. In addition, the UN-REDD Programme in Viet Nam may become a source of financing for mangrove conservation in the future. Phase 2 of the programme seeks to reduce emissions in six provinces (including Ca Mau) through engagement with provincial, district and commune-level authorities, local communities and the private sector (UN-REDD Programme 2015). Provincial REDD+ Action Plans are under development

120 000/day from dynamite fishing. Aquaculture is even more lucrative, and communities near the national park earned a total of VND 7-8 billion from selling clams in 2004-2005. Similarly, local authorities can earn much more from leasing mudflats for aquaculture development rather than using them for mangrove plantation (Hawkins *et al*. 2010).

and in Ca Mau province sustainable management and/or restoration of mangrove ecosystems is likely to be a key focus.

4.6.1 Mangroves and Markets: Supporting Mangrove Protection in Ca Mau Province, Viet Nam

The 'Mangroves and Markets' project (2012-2016) is funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, and implemented by IUCN, SNV Viet Nam and Minh Phu Company (the largest shrimp producer and exporter in Viet Nam). Project activities are supported by a MoU between Minh Phu, IUCN/SNV, Ca Mau DARD and Nhung Mien FMB.

The project seeks to increase mangrove cover of shrimp farms in protection and production forests in Nhung Mien forest, Ca Mau province by promoting certified organic shrimp production under the Naturland scheme (SNV 2015). The scheme stipulates that mangrove cover in the farm area must be at least 50 percent. Under contracts with individual farmers, Minh Phu Company purchases all organically produced shrimp at a 10 percent premium. Monitoring and verification is carried out every year by the Institute for Market Ecology, a third-party verifier. Between audits, an Internal Control System team monitor compliance using ground inspections supplemented by satellite-based analysis. The cost associated with Naturland certification and internal audits are covered by Minh Phu (Nguyen Thi Bich Thuy, 2015 Pers. Comm., 21 Sept).[42]

SNV and Nhung Mien FMB provide annual training to farmers on the Naturland standard, aquaculture practices, mangrove restoration, environmental value of mangroves, and sanitation. The training cost is around USD 25 per farmer per year. The project also provides farmers with seedlings, and pays for 50-70 percent of the cost of planting and rehabilitating mangroves, which stands at around USD 1 000 per hectare. It also provides farmers with toilet kits to reduce human waste input into shrimp ponds (Nguyen Thi Bich Thuy, 2015 Pers. Comm., 21 Sept).

By September 2015, 1 150 individual contracts had been signed with Minh Phu. However, due to declining shrimp prices, the premium has been reduced to VND 300 000 per hectare of mangroves and VND 3 000 per kilogram of shrimp. Given an average shrimp price of VND 240 000, this equated to a premium of less than 1 percent. To improve chances of the model becoming self-sufficient, the project is exploring less expensive certification standards that facilitate access to the US market (Nguyen Thi Bich Thuy, 2015 Pers. Comm., 21 Sept; Ho Kim Cuong, 2016 Pers. Comm., 21 Sept).

To date, 1 330 farmers in 35 farmer groups have been trained (Nguyen Thi Bich Thuy, 2015 Pers. Comm., 21 Sept). Farmers have expressed their intent to

[42] Ms. Nguyen Thi Bich Thuy (Manager, Mangroves and Markets project, Viet Nam).

continue with improved aquaculture and mangrove management practices even without certification and financing from Minh Phu or the project, as the resultant higher-quality shrimp is more profitable (Huỳnh Văn Nghề *et al.*, 2015 Pers. Comm., 22 Sept).[43]

The project is seeking to expand to Ben Tre and Tra Vinh provinces in 2016, with potential participation of Quoc Viet, another large shrimp company (IUCN 2015; SNV undated; IUCN 2014). Other shrimp companies are allegedly starting similar initiatives. However, the project manager was not confident that mangrove restoration and sustainable aquaculture practices will continue after project elapses unless additional financing becomes available (for carbon sequestration, for example) (Nguyen Thi Bich Thuy, 2015 Pers. Comm., 21 Sept).

4.6.2 Mangrove Plantation and Disaster Risk Reduction program

The 'Mangrove Plantation and Disaster Risk Reduction program' (1994-2005), funded by Danish Red Cross and Japanese Red Cross, supported planting and management of mangroves in northern provinces to increase the resilience of communities to natural disasters and climate change. The program restored 8 961 hectares of mangroves that protect 100 kilometres of sea dykes (IFRC 2011). The mangroves created additional income from aquaculture, although regulations prohibited collection of non-cultivated aquaculture products in some areas zoned as protection or special use forests.

The program was implemented by the Viet Nam Red Cross Society and its province, district and commune level chapters (IFRC 2011). The program signed agreements with each household participating in planting or protecting mangroves and upon evaluation of results, the provincial Red Cross chapter made direct payments to households (Đinh Nguyên Đậu, 2015 Pers. Comm., 16 Jul).[44] Since Red Cross funding ended in 2006, however, the compensation received by local participants has reduced substantially, which has led to illegal cutting and mangrove encroachment (Powell *et al.* 2011).

4.6.3 Coastal Wetlands Protection and Development Project

The World Bank-funded 'Coastal Wetlands Protection and Development Project' (1997-2007) took place in Soc Trang, Bac Lieu, Ca Mau and Tra Vinh provinces. Inputs focused on mangrove forest protection zones, the inhabitants of which were relocated to buffer zones where schools, clinics, roads, water and sanitation were provided. The project established 4 662 hectares of mangroves in the protection zones and 983 hectares in the buffer zones. Close to 8 000 households in the buffer zones were incentivised to protect newly planted areas

[43] Mr. Huỳnh Văn Nghề, Mr. Nguyễn Văn Chương, Mr. Nguyễn Nam Cường, Mr. Võ Việt Tấn and Mr. Cao Đình Tụng (Leaders of farmer groups, Mangroves and Market project, Nhung Mien forest, Ca Mau).

[44] Mr. Đinh Nguyên Đậu (former head of Xuan Thuy commune Red Cross chapter, Nam Dinh Province).

with production forest land leases, contracts for mangrove protection and maintenance, and training and credit to support improved livelihoods. As a result of the program, forest law violations along 470 kilometres of coastline declined from over 1 700 incidents in 2002 to 318 in 2006. The program also increased biodiversity and reduced coastal erosion in Ca Mau province by 40 percent between 2000 and 2007 (World Bank 2009).

4.6.4 Community-Based Mangrove Reforestation and Management

The 'Community-Based Mangrove Reforestation and Management Project' (2006-2009) in Thanh Hoa Province was funded by CARE. The project planted 200 hectares of mangroves on a mudflat in front of a sea dyke, and established a community management board to oversee planting and maintenance in the entire area. The board comprised local representatives and officials, and was democratically elected. The project secured a decision by the Hau Loc District People's Committee to grant three core villages formal use rights and management responsibility over the mangroves.

CARE provided an allowance of VND 200 000 per person per day for mangrove planting and maintenance, along with technical and management support. Once CARE support ended, the long-term impact of the project depended on the ability of the village boards to implement their management plans and the ability of the district to provide necessary technical support to protect and monitor the mangroves and ensure benefits were shared appropriately. There was, however, no evidence that this occurred (Kempinski and Nguyen 2009).

4.6.5 Management of Natural Resources in the Coastal Zone of Soc Trang Province

'Management of Natural Resources in the Coastal Zone of Soc Trang Province' (2007-2014) was funded by the German Federal Ministry for Economic Cooperation and Development (BMZ). The project developed a co-management model in the pilot site in Au Tho B village. Local communities and authorities negotiated to define the rights and responsibilities of communities in managing mangroves and sharing related benefits. The project incorporated ICM principles and zoned separate conservation and economic development areas. The project successfully established a clam-raising collective and encouraged the use of improved efficiency wood burning stoves (Hawkins *et al.* 2010). Efforts were also made to set up a payments for ecosystem services scheme to achieve sustainable financing (Asia-Pacific Adaptation Network 2012; Schmitt 2013). In 2014, the project was scaled up to a program that includes four other Mekong Delta provinces (An Giang, Bac Lieu, Ca Mau, and Kien Giang) with financing from BMZ and the Australian government (Schlegel 2013).

4.6.6 Sustainable Use of Mangroves to Benefit Poor Women through a Co-management Pilot Project in the Core Zone of Xuan Thuy National Park.

The project 'Sustainable use of mangrove resources to benefit poor women through a co-management pilot in the core zone of Xuan Thuy national park' (2011-2013) was funded by the Mangroves for the Future (MFF) Small Grant Facility. It aimed to develop a model of mangrove co-management and integrate it into the Xuan Thuy National Park management system. The model was developed to protect 1 000 hectares of mangroves and facilitate benefit sharing with the poor fishing-women.

The Xuan Thuy National Park entered into separate agreements with local individuals under which individuals had the right to rent mudflats in the core zone for clam seed beds (USD 25-150/hectare/year), access the core zone for seafood collection (small fee, no subcontracting allowed), access credit and technical knowhow, and participate in developing regulations and monitoring implementation. The agreements also specified that they had to abstain from harmful practices such as converting natural habitats, using destructive fishing practices, polluting the environment and hunting. The agreements were endorsed by local government and the project set up a local committee consisting of 15 representatives from the park, local authorities and communities to monitor implementation of the agreements. The resource gatherers (mostly women) were organized into self-management teams that undertook peer-monitoring of harvesting activities. The fisherwomen could also access small loans on a rotational basis from a livelihood fund set up by the park.

Through this system, collecting practices were rendered less damaging and the park was able to officially accept the presence of local fisherwomen in the core zone. "Ecosystem service fees" for accessing the core zone and fees for mudflat rent also helped fund conservation activities. To sustain project activities after project completion, the park proposed a fee of VND 50 000/collector/month to cover the operational costs of the monitoring committee and to contribute to the livelihood fund (Nguyen 2014). It is unclear whether or not this proposal has been accepted by the local community.

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Mangroves provide a wide array of benefits to coastal communities, including wood and non-wood forest products and a wide range of environmental services encompassing coastal hazard protection, erosion control, water filtration and bio-diversity conservation. Mangroves are also valuable in terms of climate change mitigation due to high rates of primary productivity and the large amounts of carbon contained within above- and below-ground biomass and mangrove soils. In spite of their many values, mangrove areas continue to diminish in size around Asia and sustainable financing for their protection has not been forthcoming.

This publication was prepared for 'Income for coastal communities for mangrove protection' project (2015-2016) which sought to develop a low cost mechanism enabling investors to responsibly promote mangrove conservation, carbon emissions reduction and sustainable development through the provision of funding to local communities.

This is the second in a series of four publications intended to be used in conjunction in establishing sustainable financing for mangrove protection in Asia. The titles of the four publications are as follows:

1. Financing for mangrove protection with emphasis on Pakistan, Thailand and Viet Nam
2. Mangrove-related policy and institutional frameworks in Pakistan, Thailand and Viet Nam
3. Mangrove carbon estimator and monitoring guide
4. Incentive allocation for mangrove protection

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