Chapter 16
Community-Based Mangrove Management in the Philippines: Experience and Challenges in the Context of Changing Climate

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Abstract This chapter synthesizes the experiences and challenges in community-based mangrove management in the Philippines in the context of changing climate. Over the past three decades, mangrove rehabilitation and protection has received considerable attention considering its declining condition vis-a-vis its ability to provide a mix of environmental goods and services including the potential to reduce climate change impacts and disaster risks. Community-based approach was lauded as a sustainable strategy to revert degraded mangroves back to their once verdant condition. However, major issues emerged in view of unclear access and utilization rights of local communities over the mangrove trees they planted and the poor ecological outcomes of many rehabilitation projects. The chapter recommends key strategies to overcome these challenges toward a more sustainable community-based mangrove management in the country while fostering climate-resilient local communities.

Keywords Climate change • Community based • Coastal • Mangrove rehabilitation

16.1 Introduction

As often described, forests are vital abode to countless organisms including humans. They play critical role in balancing global processes and providing a myriad goods and services. One of their very important functions is helping address

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R. DasGupta, R. Shaw (eds.), *Participatory Mangrove Management in a Changing Climate*, Disaster Risk Reduction, DOI 10.1007/978-4-431-56481-2_16

the climate change problem. Forest trees and soil absorb atmospheric carbon in their biomass. According to FAO (2010), there remains four billion ha of forest around the globe today which holds as much as 289 Gt of carbon. However, annual deforestation is still alarming at 13–16 million ha year^{-1}, thus losing 0.5 Gt C year^{-1}. Deforestation is even more serious in the tropics where more than 100 million ha has been depleted over the past one and a half decade (Williams 2002; FAO 2012). In South and Southeast Asian regions alone, denudation rate was estimated to 991,000 ha year^{-1}.

The Philippines shares a similar story where half of forest cover has been lost over the past century (Bankof 2007). This has contributed to at least 2 % of the total global carbon emission today (Lasco 1998; Sheeran 2006). Latest statistics also reported that there is 7.6 million ha of forest cover left in this country with an annual deforestation of 2.1 % (FAO 2010; FMB 2011). Forest conversion to agriculture, legal and illegal logging, timber poaching, and mining are just few of the major drivers of deforestation and forest degradation (Liu et al. 1993). On a broader perspective, deforestation is exacerbated by poverty, lack of secure land tenure patterns, inadequate recognition of rights and needs of forest-dependent indigenous and local communities, inadequate cross-sectoral policies, undervaluation of forest products and ecosystem services, lack of participation and good governance, the absence of economic support to facilitate sustainable forest management, illegal trade, and national policies that distort markets and encourage conversion of forest to other land uses (IFF 2000).

Among the tropical forest ecosystems, mangrove forest, which comprises 0.4 % of the world's forests, is the most threatened (Kathiresan and Bingham 2001; Spalding et al. 2010). Massive loss was observed in Asia where 1.9 million ha deficit from the 1980 figure, and rate of −102,000 ha year^{-1} was recorded (FAO 2007). In the Philippines, about half of its original mangrove forest has disappeared since its record during the early 1900s (Brown and Fischer 1920; Chapman 1976). Two of the major causes of this decline are overharvesting of mangrove trees for fuelwood and pole and massive expansion of aquaculture ponds over mangrove domains (Primavera 2000).

Local communities have critical roles in curving down deforestation. They need to be intimately involved in crafting sustainable forest management policies, plans, and programs to bolster their commitment in forest conservation efforts, as well as to ensure their equitable access to forest benefits (FPEP 2007). Unfortunately, current policies toward mangrove harvesting are punitive; hence, people who planted mangroves are disillusioned from being deprived of harvesting rights (Yao 2001; Camacho et al. 2011; Gevana et al. 2015). Furthermore, the quality of mangrove rehabilitation efforts was argued to be poor since monoculture planting (planting by convenience) became the usual practices (Primaver and Esteban 2008; Samson and Rollon 2008). Considering these limitations, this chapter aims to describe the success and pitfalls of community-based mangrove management in the Philippines. Local experiences and challenges were synthesized to distill lessons to improve community-based approach vis-a-vis fostering resiliency of coastal communities toward climate change.

16.2 Philippine Mangroves

The Philippines is known for its romantic moniker as *Perla del mar de oriente* (in Spanish) or Pearl of Orient Seas because of its splendid natural tropical resources. Among these is the verdant and blue coastal ecosystem which is fourth longest in the world with a length of 36,289 km. As an archipelagic country with 7107 islands, mangroves are very common. But in the turn of this century, mangroves became extremely pared. From once lush extent of about 500,000 in early 1920s (Brown and Fischer 1920; Chapman 1976), mangrove forest has been decimated to 247,362 ha today after a series of dramatic decline (Fig. 16.1). Primavera (1997) also demonstrated the relationship between loss of mangroves and increase in aquaculture ponds (Fig. 16.2). According to FMB (2010), aquaculture ponds comprise about 0.3 % (91,000 ha) of the total classified forest lands.

Notwithstanding this historical downtrend, mangrove deforestation is showing signs of ease over the past two decades. Deforestation rate has declined from 2300 ha year^{-1} in 1990 to about 2000 ha year^{-1} in the past half decade (FMB 2010). This can be attributed to mangrove conservation programs that involve local participation, and the growing awareness of ecological values such as climate change impacts mitigation, ecotourism, and biodiversity. In 2014, the national government has alloted one billion pesos (approximate 22.7 million USD) for the massive reforestation of coastal areas in the country, with primary focus on the Eastern Visayas region where *Typhoon Haiyan* ravaged. This has entailed massive involvement of local communities in providing labor for meeting reforestation targets. Further, the adoption of community-based forest management programs is now spurring efforts to rehabilitate coastal environment.

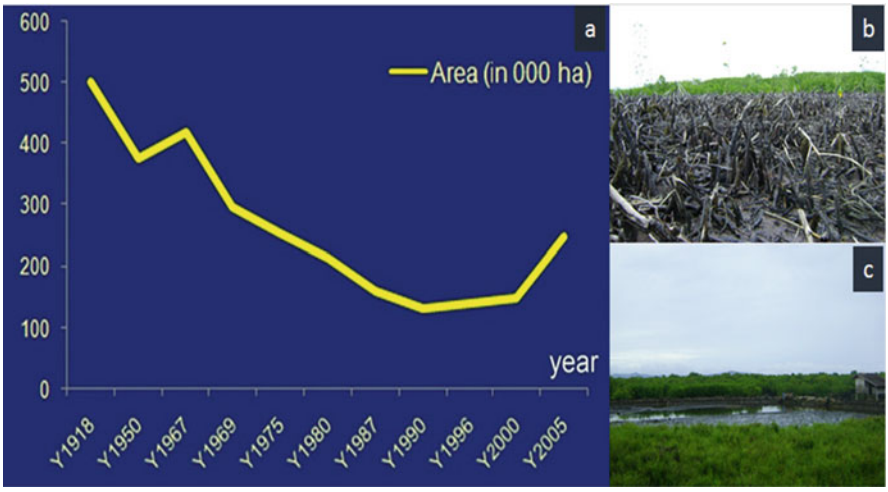

Fig. 16.1 Trend in mangrove cover (**a**) and major causes of mangrove deforestation: *cutting* (**b**) and *aquaculture pond development* (**c**) in the Philippines

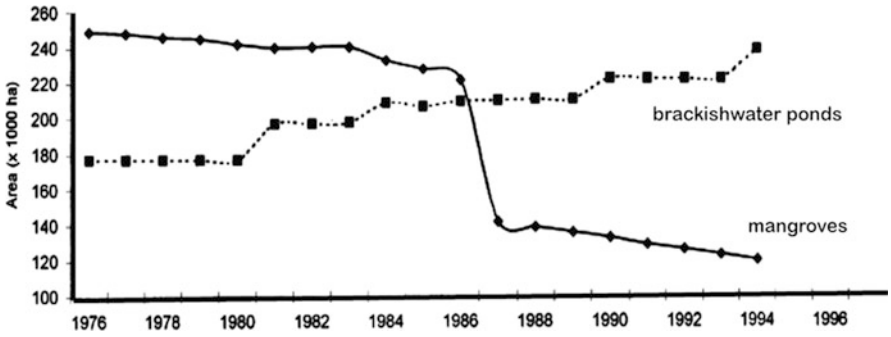

Fig. 16.2 Trend in mangrove cover vs. brackish water ponds in the Philippines (Primavera 2000)

In terms of taxonomic composition, Philippine mangroves have five distinct formations, namely, (a) *Rhizophora* stand along river and intertidal mudflats, (b) *Avicennia* stand at inundated beach and mudfalts, (c) *Sonneratia* at subtidal sediments, (d) *Rhizophora stylosa* along coralline substrates, (e) *Nypa* forest along brackish rivers and lagoons, and (f) mix trees, shrubs, and thorny bushes in elevated coasts (Fig. 16.3). Based on the listings of Fernando and Pancho (1980) and Primavera (2000), these formations harbor 40 species of major and minor mangroves that belong to 16 families and as much as 30 species of mangrove associates (primarily shrubs and vines).

More than half of the country's 1500 towns and 42,000 villages are intimately dependent on marine ecosystems for food and other benefits (Primavera 2000). In the study conducted by Carandang et al. (2013) in a small community-managed mangrove (4426 ha) in Puerto Pricesa, Palawan Province, mangrove's annual direct use value was estimated to as much as US$ 567,148.4. This is reflective of the wide benefits that mangroves provide, namely, marine catch (fish, shrimp, and mollusk), timber, fuelwood, nipa thatching (*Nypa fruiticans*), and recreation.

The presence of mangroves has also been recognized as a mitigation strategy against natural disasters such as storm surge. In Samar Province, Mendoza and Alura (2001) associated the significant uprooting of coconut trees during storm with the lack of mangrove cover. They further noted that mangroves work synergistically with the adjacent ecosystems of sea grass and coral reefs to regulate tidal movements. Such observation conforms to the studies abroad. Macintosh and Ashton (2002) noted that coastal mangroves can significantly reduce wave force by as much as 70–90 % that is likely due to their dense root system. Harada et al. (2002) also underscored that mangroves are more effective wave barrier than concrete seawall in the event of tsunami since they can regulate and dissipate wave impact. Likewise, Mazda et al. (1997) observed that a 6-year-old mangrove forests of 1.5 km width can significantly reduce sea waves by 20 times its force.

Carbon sequestration is also a vital function of mangroves. In a natural *Rhizophora*-dominated stand in Batangas Province, Gevana and Pampolina (2009) estimated a carbon stock of 115 tC ha^{-1}. This value is already comparable

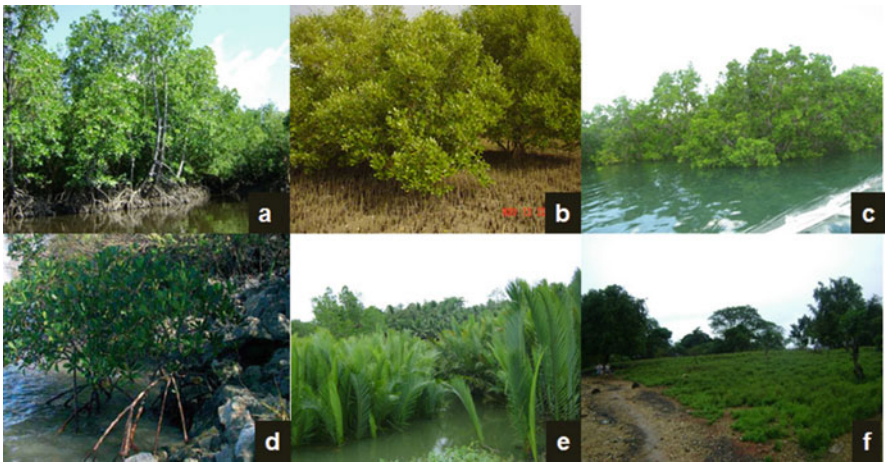

Fig. 16.3 Common mangrove formations in the Philippines: (**a**) *Rhizophora* along river, (**b**) *Avicennia* stand, (**c**) *Sonneratia* stand, (**d**) *R. stylosa* on rocky or coralline sediments, (**e**) *Nypa* stand, and (**f**) mixed species in elevated coast

with the average stock observed in an upland forest. Larger estimates were reported by Camacho et al. (2011) for a dense *Rhizophora stylosa* plantation in Bohol Province where a 40-year-old stand contributes as much as 370.7 tC ha^{-1}. Gevana et al. (2014) had estimated the potential value of a dense 55-year-old *Rhizophora* plantation to about USD1,209 ha^{-1} $year^{-1}$.

16.3 Key Mangrove Policies

The Presidential Decree No. 705 of 1975 or the *Revised Forestry Code of the Philippines* defines *mangrove* as a forest ecosystem that thrives on tidal flats and sea coast and those that extends through streams where the water is brackish. Section 16 of this policy states that those mangrove stands of at least 20 meters wide are declared as state owned thus cannot be alienated nor disposed. However, Section 13 put an exception on landuse conversion such that mangrove stands that are not needed for shore protection but suitable for fishpond purposes can be developed into aquaculture ponds. The massive and unabated conversion of mangrove areas to fishponds has led tremendous loss in mangrove cover over the past decades. For this reason, the government passed a number of legislations that ban the cutting in all mangrove areas. These include Republic Act 7161 or *Act of Incorporating Certain Sections of the National Revenue Code* in 1991, Republic Act 7586 or *National Integrated Protected Areas System Act* (NIPAS) of 1992, and Republic Act 8550 or *The Philippine Fisheries Code of 1998*. By the virtue of Section 71 of Republic Act 7161, the government prohibits commercial cutting of all mangrove species for timber or firewood. On the other hand, Section 2 of Republic Act 7586 had further

placed mangrove as an initial component in the list of protected areas; hence, any land use other than protection is not allowed. Lastly, Section 94 of the Republic Act 8550 expresses that it is unlawful to convert mangroves into fishpond or any land uses. Further, those fishponds that were abandoned and left unproductive shall be reverted back to mangrove forest through reforestation.

In general, the focus of mangrove management policies and programs over the past four decades is protection and rehabilitation. This is largely reflective of the need to arrest the mangrove deforestation. Recognizing the vital role of local communities in pursuing this direction, the Department of Environment and Natural Resources (DENR) has placed a number of implementing rules and regulations to effectuate these mangrove policies. These include the following:

- DENR Administrative Order (DAO) 76 (1987): Local communities and fishpond leasers are required to establish a mangrove buffer zones of (a) 50 meters fronting seas and oceans and (b) 20 meters along riverbanks.
- DAO 34 (1987): Guidelines on Environmental Clearance Certificate (strict permitting system that applies to fishpond development over mangrove areas).
- DAO 123 (1989): Local mangrove planters are awarded with a 25-year tenure through the *Community Forestry Management Agreement*; hence, domestic mangrove use, establishment of *Rhizophora* and *Nypa* plantation, and aquasilviculture are allowed.
- DAO 15 (1990): (a) Mangrove Stewardship Contracts (similar to DAO 123) are given to local communities and fishpond leasers, stipulating therein all the rights, roles, and responsibilities to conserve mangrove resources; (b) abandoned fishponds are required to be reverted back to mangrove forest through reforestation; (c) ban tree cuttings in fishpond leased areas; and (d) prohibit conversion of thickly vegetative areas.

In terms of tenure security, the Executive Order 263 or *community-based forest management* (CBFM) and DAO 10 (1998) or *Guidelines on the Establishment and management of CBFM Projects with Mangrove Areas* have provided the opportunities for local communities to have legal access and management and utilization rights (to some extent, i.e., for domestic or noncommercial purpose) over mangrove forests.

16.4 Community-Based Mangrove Management

Like in the uplands, community forestry became a key forest management paradigm in mangroves today (Gilmour and Fisher 1991; Pulhin 2000; Walters 2004). Community-based mangrove management is promoted enthusiastically by governments, nongovernment organizations, and aid agencies as it helps cultivate sense of stewardship among the local people toward mangrove resources (Kaly and Jones 1998; Melana et al. 2000; Walters 2004). So far, the Philippines has 1.6 million ha of forest lands that are under CBFM tenure agreement. This comprised 10.7 % of

the total forest lands, of which 1900 Peoples Organizations (POs) enjoy access and management rights (FMB 2010). Roughly 15 % of CBFM projects are situated in mangrove forests. Pulhin et al. (2008) noted that the increase in the role of local communities in forest management is reflective of the effectiveness of CBFM as an approach to forest rehabilitation.

A number of successful stories about the significant contributions of community-based approaches in mangrove conservation were documented. For instance, Primavera and Esteban (2008) reported some low-budget and yet thriving community-based afforestation and reforestation projects in the country. These include the mangrove sites of Pagangan in Bohol ($80\ha), Buswang, Kalibo in Aklan (initial loan of $23,100 or PhP 561,705), and Bani, Pangasinan ($21,500 or PhP 522,000). About 90 % survival rates were reported for these sites. A community-initiated reforestation case of Banacon Island in Bohol Province is also lauded as one of the most successful cases.

16.4.1 Banacon Island: A Community-Initiated Mangrove Rehabilitation

Banacon Island is located at the northwestern part of Bohol Province covering two small *barangays*[1], namely, Banacon and Jagoliao that are home to at least 300 households (Fig. 16.4). The main island has an area of about 660 ha that lies along 10° 03′ 30″ to 10° 15′ 30″ N and 124° 03′ 30–124° 14′ 30″ E and forms part the eco-diverse protected marine sanctuary of Danajon Double Barrier Reef (Pichon 1977). Roughly 1115 ha of the nearby marine-protected sandbars and sea grasses were additionally devolved by the DENR and Municipal Government of Getafe to the local community as expansion sites for their mangrove afforestation projects. The climate of the island belongs to Type IV of the Corona Classification which depicts "no distinct dry season." Its sediment is typically sandy to mud with pH ranging from 7.65 to 8.59.

Historically, the main island was used to be devoid of good mangrove cover in early 1950s (Walters 2004). Sandbars and reefs were very common in the area with just few strips of heavily deforested natural mangroves. Many local residents cut *Sonneratia, Rhizophora,* and *Avicennia* trees during those times which they later sell to bakeries in the nearby city of Cebu. Recognizing the huge economic gains from fuelwood, many residents started planting mangroves in their backyard in hope that they will get profitable income from the trees in the future. This initiative was inspired by a local resident known as *Mr. Eugenio Paden* who developed a dense planting method[2] of raising *R. stylosa* propagules on sandbars and shallow

[1] *Barangay* pertains to village or smallest political or administrative division in the Philippines.

[2] Direct field planting of *R. stylosa* propagules with a distance of 0.5 × 0.5 m to ensure greater survival and faster growth.

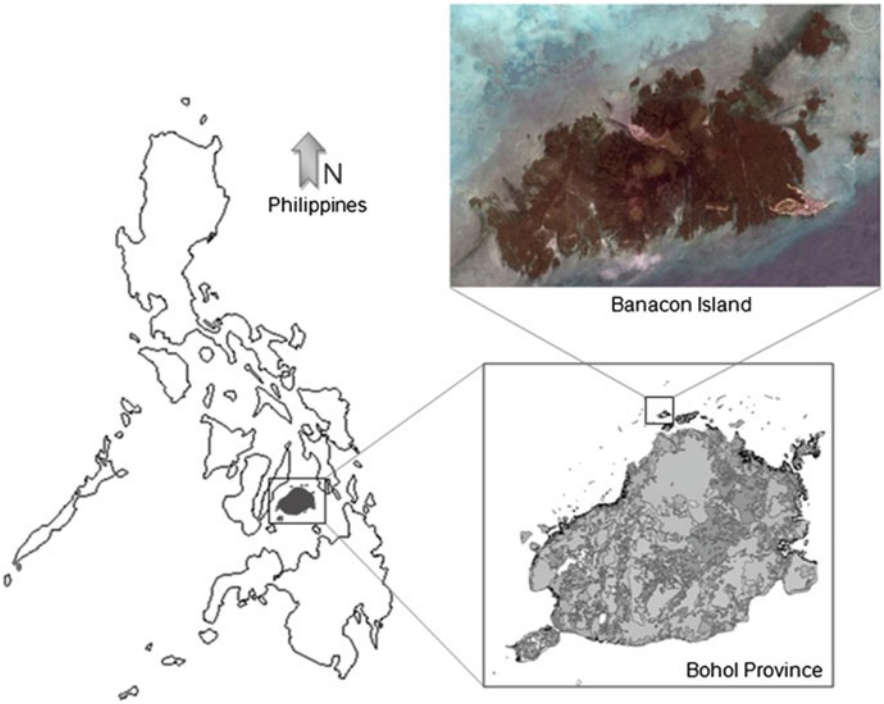

Fig. 16.4 Location map of Banacon Island, Getafe, Bohol, Philippines

mudflats. Exhibiting ease in harvesting and planting propagules, other residents have then followed him. This initiative eventually became a traditional practice that was carried through by their succeeding generations even though they faced the unexpected cutting ban policies of the government in early 1990s.

According to Yao (2001), efforts to legalize local community's rights to harvest their plantations were initiated as far back as 1978 when the Bureau of Forest Development (now Forest Management Bureau or FMB) of the DENR has placed their plantations under the Community Tree Farm Program. However, this was not sustained because the DENR later implemented the Integrated Social Forestry Program (ISFP) in 1982 which required a different tenure instrument called Certificate of Stewardship Contract (CSC) allowing the community to manage and harvest their plantations for at least 25 years. Before even before CSC was issued, Presidential Proclamation No. 2151 (Declaring Certain Islands and/or Parts of the Country as Wilderness Areas) was enacted in 1981 declaring all mangrove forests as protected area. With these unenduring frustrations, some of the local residents have started harvesting and selling trees illegally. To avoid the risk of being caught, they sold poles and fuelwood on-site at a very low cost. This then became a major problem since mangrove plantations are slowly being peeled off undervalued and unaccounted.

To arrest deforestation, DENR has provided the local community with a tenure program called *Community-Based Forest Management Agreement* (CBFMA). Thinning or selective cutting was then allowed for domestic use but not for commercial purpose. This tenure program also led to the organizing of the local community into a formal organization called *Banacon Fisherfolks and Mangrove Planters Association* or *BAFMAPA*. Of the 300 households, 100 of them became members of this organization. CBFMA has further bolstered the mangrove-planting tradition of the local community since regular funds for plantation development were created. With vast areas of plantations today, there is also a strong local interest to commercially harvest them for additional income. DENR however remain rigid on the cutting ban because of the enduring rule of Republic Act 7161. In hope that this policy will someday be revised to favor commercial cutting in plantations, BAFMAPA has prepared its Community Resource Management Framework (CRMF) which is a plan or document to "sustainably" harvest and replant plantations for commercial purpose.

Despite seemingly hopeless right for commercial harvesting, the local community did not stop in planting mangroves. This tradition has attracted private companies such as the Kanepackage Philippines Inc. or KPG (an international corrugated box production company) to invest in mangrove plantation as part of their corporate social responsibility (CSR) project and potential source of carbon credits in the future (Fig. 16.5). According to Camacho et al. (2011), the mature (30–55 years old) plantations of Banacon Island contain about 145.6–359.2 tC ha^{-1}.

Fig. 16.5 Mangrove plantation establishment in Banacon Island

The success story of Banacon has been well recognized in the country and abroad. In 1981, BAFMAPA received the *Likas Yaman Award* or the Natural Resources Award from the DENR for their exemplary performance in coastal reforestation. In 1991, they also received the prestigious *Outstanding Tree Farmer Award* from the Food and Agriculture Organization (FAO). These achievements have attracted international research institutions such as the ASEAN-Korea Environmental Cooperation Project (AKECOP) to document their sustainable mangrove management system.

16.4.2 Palompon Mangrove Rehabilitation Subproject in Palompon, Leyte

The Palompon Mangrove Rehabilitation Subproject (PMRSP) is one of the projects funded by the Japan Bank for International Cooperation (JBIC) implemented in the Philippines which aimed to: (1) reverse the process of mangrove degradation, (2) ensure long-term sustainability in the management of natural resource-based enterprise and community development, and (3) improve the well-being of the local communities. Covering around 1396.3 ha, PMRSP is under the administrative boundaries of barangays Cruz, Plaridel, Baguinban, and Cangcosme all of the municipality of Palompon, province of Leyte.

The province of Leyte is one of the six provinces of Eastern Visayas Region in Central Philippines. The eastern portion of Leyte has a Type II climate. It has no distinct wet or dry season but with pronounced rainfall from November to January. The western part of Leyte has a Type IV climate where rainfall is evenly distributed all throughout the year.

Average annual temperature in Leyte is 27.3 °C, while average annual rainfall is 2153 mm. May is the warmest month, while January is the coldest month. Average temperatures in May and November are 28.2 °C and 26.0 °C, respectively. The driest month is March with an average precipitation of 80 mm, while the wettest month is November with an average of 301 mm.

Topography of Leyte is relatively flat to gently rolling, but it becomes mountainous and rough in mountain ranges.

PMRSP has four components: community organizing, comprehensive site development, monitoring and evaluation, and infrastructure. To prepare the local communities in implementing the rehabilitation project, community organizing started to take place in 2000. A nongovernment organization named Eco-Environmental Development Concern Association, Inc. (EDCAI) was commissioned by the DENR to assist the local communities and do the community organizing activities. Such activities led to the formation of the local communities' organization called Bililhong Ani sa Katunggan Hangtud sa Walay Katapusan (BAKHAW), Inc. Total membership of BAKHAW Inc. is 210 members most of whom are fishermen and housekeepers.

On December 29, 2000, BAKHAW Inc. was awarded to do comprehensive site development of the PMRSP for a contract price of PhP 20 M. Aside from undertaking the reforestation activities at PMRSP, BAKHAW Inc. also engaged themselves to other livelihood projects. Two years after, BAKHAW Inc. was awarded a Community-Based Forest Management Agreement (CBFMA) to manage the PMRSP (Commission on Audit, 2007). Similar to the BAFMAPA, the PO that managed the Banacon Mangrove Rehabilitation Project, BAKHAW, Inc. received numerous awards/recognitions. These include (1) Ten Outstanding PO, (2) Best PO of the Mangrove Forestry Sector Project (funded by Japan Bank for International Cooperation or JBIC) in Region 8, and (3) Certificates of Appreciation from different awarding bodies.

Based on the monitoring and evaluation report, the average percent survival of the plantation is 82.77 %. In 2006, however, it was reported that percent survival in the reforestation areas declined. Percent survival ranges from 3.94 to 90.91 % or an average of 62 %. The survival rate of the plantation declined because of the following reasons: (1) strong waves in the area, (2) destructive fishing, and (3) illegal sand extraction.

In 2005, an assessment of the PMRSP was undertaken by the Commission on Audit. Results of the assessment showed that the maintenance and protection activities of the established plantation were not regularly conducted because the POs were busy with their other livelihood projects. This contributed to the reduction of the percent survival of the planted seedlings.

Using the carbon density estimate of 115 tC ha^{-1} derived by Gevaña and Pampolina (2009) from a mangrove stand in Batangas Province, total carbon is expected to be stored in the mangrove reforestation site in PMRSP once the trees planted reached maturity amounts to 160,574 tC. The capacity of mangroves to hold substantial amount of carbon in their biomass and soil shows their vital role in mitigating climate change.

Aside from the mangroves' mitigating role, accounts of local communities residing near the coasts show that mangroves also served as their shield during the Typhoon Haiyan. This resulted to reduced negative impacts of the typhoon to the households.

16.5 Key Issues in Community-Based Mangrove Management

Notwithstanding the growing appreciation of community-based approaches, a number of issues and challenges were identified. These include (1) elusive tenure rights of the local people toward the mangrove trees they planted, (2) insufficient alternative livelihoods, (3) wrong motivation for participation in reforestation projects, (4) poor species-site match in reforestation, and (5) poor coastal landuse zoning.

16.5.1 Elusive Tenure Rights

The *Community-Based Forest Management Agreement* (Executive Order 263) and DAO 123 (1989) provide the local communities with utilization rights over timber they raised in the designated production zones. However, such privilege does not apply for mangroves since there is a higher-level policy, i.e., Republic Act 7161 which prohibits commercial cutting for all mangrove species. Given this, many local communities are disillusioned to participate in reforestation projects since they cannot realize the financial benefits from the trees they planted.

The reversion of unproductive aquaculture ponds back to mangrove forests (by the virtue of Republic Act 8550) appears to be a big responsibility in CBFM. First, many abandoned fishpond leased areas had already been illegally disposed and converted to private ownership, thus creating overlap with those areas that were designated for community management under CBFM. Second, local communities assume huge and difficult tasks to rehabilitate degraded mangroves because they lack basic technical skills and financial means.

16.5.2 Insufficient Alternative Livelihoods

Poorly managed mangroves are likely attributable to insufficient livelihoods that should sustain local commitments over their conservation. As seen in the case of Leyte, the low survival rate of plantations was very much linked to the limited role of local community in mere providing labor during field planting. Primavera and Esteban (2008) underscored the need to consider the perpetual roles of local people in taking care of mangroves; hence, livelihood programs to encourage their commitment in natural resource conservation are needed. In their case study of New Busuang Mangrove Project in Aklan, Philippines, one of the success factors identified for an effective community-based mangrove management was the provision of less extractive alternative livelihoods such as tourism enterprise (e.g., conference/seminar and training services and boat ride tour) and handicraft making. These alternative livelihoods have relieved dependency pressures on mangroves in terms of timber, fuelwood, and aquaculture production.

16.5.3 Wrong Motivation for Participation in Reforestation Projects

In Negros Island, Philippines, Walters (2004) noted the wrong motivations for participation in mangrove reforestation project. First, the local community sees their participation as an opportunity to expand their claims over the open intertidal

spaces they planted. A de facto[3] ownership is likely to be acquired by the planter's hence securing access and utilization rights over the plantation they grown. There is also a greater chance that other members will allow planters to convert their plantations into aquaculture ponds or settlement area.

Further, local communities are compelled to plant because the DENR and local government require them. Many reforestation programs were not sustained because the local communities see their role as mere provider of labor rather than stewards. Reforestation also competes with their already productive livelihoods since plantation sites are placed in areas (particularly sea grass beds) where the local community catches shrimp, crabs, and fish.

16.5.4 Poor Site-Species Matching

Samson and Rollon (2008) conducted an extensive assessment of the growth and survival of monoculture plantations in Southern Luzon, Central Visayas, and Mindanao. They reported that reforestation sites which used *Rhizophora* spp. gained dismal outcomes. High mortality and poor growth performance of *Rhizophora* seedlings was linked to their poor adaptive capacity on-site conditions (e.g., sediment quality and exposure to wind and tide) of their nonnatural habitat. The lack of understanding on the ecological context of mangrove reforestation has also resulted to habitat degradation since natural sea grass bed and tidal mudflat ecosystems were preferred as plantation sites rather than the abandoned and degraded aquaculture ponds that needed rehabilitation (Primavera and Esteban 2008; Samson and Rollon 2008).

16.5.5 Poor Coastal Landuse Zoning

Mangrove deforestation is reflective of the poor coastal landuse planning. One good case is Manila (national capital) where the eventual peeling off of mangrove cover was observed to favor industrial port development and land reclamations. The name Manila was coined after a mangrove shrub called *nilad (Scyphiphora hydrophyllacea)* which used to be the predominant vegetation along its scenic bay. Furthermore, Courtney and White (2000), Yao (2001), and Primavera (2000) stressed the lack of clear landuse zonation results to poor community-based mangrove management. Without proper demarcation of the protection and production zones, the local community tends to either overprotect or overutilize mangroves,

[3]Members of the local community recognize the access and management rights of an individual over the mangrove area he/she planted despite the absence of a government-issued tenure certificate.

hence prompting conflicts between their desire to protect and needs to utilize mangrove timber and fuelwood.

16.6 Conclusions and Recommendations

Local communities play a significant role in mangrove conservation. Their recognition of mangrove's benefits (e.g., storm surge break, carbon sequestration, and provision of mangrove goods and services) provides impetus for active participation in mangrove rehabilitation programs, thereby increasing their resiliency toward potential impacts of climate change. As seen in the case of Banacon Island, community-initated reforestation is likely if the local community has deeper appreciation of mangrove management vis-a-vis the capacity of mangroves to provide them goods and services in meeting their needs. The role of government and funding institutions is also vital to bolster community initiatives. In the case of Palompon in Leyte, sustained technical and funding support is needed to ensure the success of community-managed mangrove rehabilitation projects.

Bolstering the positive outcomes of community-based approach requires collective action among local stakeholders to address the key issues identified in this paper. In view of elusive tenure rights, policy overlaps in the commercial utilization of monoculture plantations in production zones should be assessed by the government in terms of their socioeconomic impacts on local communities. Recognizing the increasing clamor for real sustainable community development, local communities who are good performers in managing monoculture plantations may be allowed to utilize and earn from the timber they have grown.

To relieve pressures from natural and old-growth mangrove stands that are intended solely for forest protection, incentive-based conservation mechanisms should be explored. For intance, carbon offset projects could provide viable income opportunities for local community because of the huge carbon stock that mangroves sequester. Pursuing this project will also help augment local resiliency against storm surge since a good mangrove cover is kept for better carbon stock production. Furthermore, less extractive and participatory livelihoods such as community-based mangrove ecotourism enterprise and cottage-based handicraft production offer good alternatives for the local community to earn together. It is critical though that the government should provide necessary techinical and financial support to ensure the sustainability of these livelihoods.

Pursuing sustainable mangrove management will surely demand a sound landuse management plan. This can be achieved through an integrated coastal zone management approach which will help harmonize the varying stakes and goals of institutions involved. Local participation in all landuse planning aspects is a prerequisite to adequately infuse community's rights, roles, and interests in the plan. This will help avoid the wrong motivations of local people in joining mangrove rehabilitation projects. Furthermore, landuse planning will also guide

stakeholder rehabiliation efforts by adhering to ecological principle of site-species suitability match.

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