

STATE OF THE MANGROVES IN SOUTHERN LUZON: A SYNTHESIS OF EXPERIENCES, LESSONS, AND MANAGEMENT RECOMMENDATIONS

Marie Nathalie S. Ting, Abigail Marie T. Favis, Anne Brigitte Lim, Severino G. Salmo III

I. Biophysical and Socio-economic Setting

Southern Luzon has a shoreline length of 3,932 km with a coastal area of 6,170,917.38 ha. It is made up of 5,071 barangays, 120 municipalities and 27 cities. It is comprised of 20.2 million (20,231,956) people with 32.93% living along the coast (**Table 22**).

Table 22. Provinces in southern Luzon showing total and % coastal population per province

Province	Total Population	Coastal Population (% of total)
Marinduque	234,521 (2015)	~119,136 (50.8%)
Romblon	292,781 (2015)	~259,696 (88.7%)
Palawan	1,104,585 (2015)	908,420 (82.24%)
Mindoro Occidental	487,414 (2015)	
Mindoro Oriental	844,059 (2015)	253,129 (29.99%)
Batangas	2,540,618 (2015)	366,850 (43.06%)
Cavite	3,678,301 (2015)	195,643 (5.32%)
National Capital Region	12,877,253 (2015)	4,559,547 (35.41%)
TOTAL	20,231, 956	6,662,421 (32.93%)

The coastal ecosystem of Southern Luzon is rich and varied with important socio-economic, cultural and ecological significance. These include bays e.g., Batangas, Balayan, Tayabas, and Ulugan bays; and marine corridors such as the Verde Island Passage.

Mangrove forests were reported to provide various services commonly ranging from socio-economic to ecological services. Socio-economic services include provision of food and other products for human consumption or as a source of income. Common products

are wood for charcoal or as housing material, fish, clams and shellfish; other products are honey, vinegar and traditional medicine. Aside from these products, tourism was also reported to be an additional source of income for the provinces of Marinduque, Romblon, Oriental Mindoro, Palawan, Batangas, and the National Capital Region (NCR).

As for ecological services, the most commonly reported benefits of mangroves are as wildlife habitat; as shoreline protection and stabilization; as protection from tsunami and storm surges, tides and currents; as water filtration; as flood and flow control; in breaking down of pollutants, and as a carbon sink.

In addition to these services, several provinces found historical, cultural and spiritual values from mangrove forests. Romblon and Cavite reported that mangrove forests help maintain spiritual and cultural values by providing spaces for recreation and reflection. NCR also mentioned the historical importance of Nilad (*Scyphiphora hydrophyllacea*) which used to be abundant in the area, and from which Manila derived its name.

The coastal residents of Southern Luzon primarily rely on fishing and agriculture for their source of income. Secondary to this is the income from other coastal resources, i.e. seaweed farming and shellfish cultivation. Other sources of income are blue-collared work such as carpentry and vending as well as employment in manufacturing industries for provinces with urbanized cities such as Batangas and NCR.

Poverty was identified to be the main social problem experienced by the coastal residents. Financial difficulties may be due to limited livelihood options and limited government and institutional support systems. Moreover, since most coastal residents rely heavily on coastal resources, the decline of fish harvest affects those in the provinces of Oriental Mindoro, Batangas and Cavite. This decline was attributed to overfishing, illegal fishing activities, and coastal reclamation and development. A

third social problem is poor sanitation along the coast. This is due to inadequate solid waste management systems as reported by Romblon, Batangas and Cavite. Other social problems include the lack of potable water system, low compliance with environmental laws and the lack of education.

II. Status of mangroves in Southern Luzon

More than half of the mangroves in the Luzon mainland is found in Southern Luzon. The bulk of this (86.19%) comes from the province of Palawan that has 63,532 ha of mangrove forests and distantly followed by Marinduque with 3,197.78 ha. The smallest share of mangrove forest comes from the more urbanized areas of Cavite and NCR with 150.39 ha and 65 ha of mangrove forests, respectively. Of these, approximately 3,196.96 ha are old stands, 3,521.29 ha are secondary growth forests, and 1,069.62 ha are mangrove plantations (**Table 23**).

There is a total of 33 mangrove species present in Southern Luzon (**Table 24**). The province of Palawan has the highest species richness with 26 species followed by Mindoro Oriental with 21. The province with the least species richness is that of Romblon and Batangas with 13 and 12 species, respectively. The provinces of Marinduque and Cavite were not able to identify the existing mangrove species in their respective provinces. The mangrove species most commonly present among the provinces (in alphabetical order) are *Aegiceras corniculatum*, *Avicennia marina*, *Avicennia officinalis*, *Nypa fruticans*, *Rhizophora apiculata*, *Rhizophora mucronata* and *Sonneratia alba*. Species that are less common include *Acrostichum aureum*, *Bruguiera parviflora*, *Camptostemon philippinense* and *Sonneratia caseolaris*. The hybrid *Rhizophora x lamareckii* is reported in Palawan.

III. Issues and Threats

Similar to the Northern Luzon reports, there are contrasting figures on the actual mangrove extent and distribution practically in all sites. The differences in the estimates can be traced to varying methods and approaches as well as the availability of baseline data to compare with. Records on accounts of species presence and distribution per province are also inconsistent.

Nonetheless, apart from Palawan and Oriental Mindoro, all the other provinces in Southern Luzon reported a decline in their mangrove forests. Palawan reported an increase of 5,192 ha of mangrove areas within the years 2010–2015. Oriental Mindoro recorded a general increase in mangrove forests with losses only in some areas. Rates of losses for the other provinces are negligible. The issues and threats that have caused the decline of

mangrove forests have been identified in most sites. The most common anthropogenic issue identified is land conversion—either for aquaculture or legal/illegal human settlement. The second set of identified threats are natural hazards such as typhoons, storm surge, sea level rise, saltwater intrusion, flooding, soil erosion and sedimentation and other effects of climate change.

Other human-induced issues and threats mentioned were cutting of mangroves for materials (e.g. construction materials, firewood, tan barking, and charcoal-making); improper waste management; and incorrect mangrove reforestation practices such as planting of inappropriate species and in inappropriate substrates. The increase in population for residential or for tourist purposes also causes pressure on mangrove and other coastal resources. From 2010 to 2015, there has been an annual population growth rate of 0.59–3.80% in the provinces of Southern Luzon. The province of Cavite has the highest growth rate in the last five years. Provinces, which have experienced rapid urbanization and development along its coasts like Cavite, Batangas and the NCR also seem to have the least mangrove forest cover. A particular threat specific for the province of Marinduque is the occurrences of mine waste dumping along its coastal areas from 1975 to 1994. The mine wastes not only affected the mangrove areas of Marinduque but also the coral reefs, seagrass beds and other coastal habitats. Illegal beach quarrying was also mentioned as a threat for the province of Romblon.

Effects of Mangrove Decline

These issues and threats have various effects on the different provinces of Southern Luzon. The provinces of Marinduque, Romblon, Occidental Mindoro, and Oriental Mindoro reported a decrease in fish catch. Romblon reported an average of 2 kg of fish catch at present in the municipalities of Sta. Fe and Calatrava as compared to the years 2001 and 2005, respectively. Unfortunately, aside from this, there was no other quantifiable data to verify this mangrove decline.

The decline of mangroves also affects the availability of food and other resources for coastal communities. It also leaves coastal dwellers vulnerable to strong winds, tidal waves, storm surges, sea level rise, and coastal erosion. There has also been an observed effect on wildlife biodiversity, such as migratory birds. The LPPCHEA where NCR is located is a stopover for migratory birds journeying the East-Australian flyway. The decline of mangroves affects the availability of food for these birds. Another observed effect is that the seagrass ecosystem becomes prone to runoff and sedimentation with the decline of mangroves.

Table 23. Summary of mangrove information per province showing the total, old and new stands as well as the coverage of mangroves declared as protected areas (in hectares)

Province	Total (Area)	Old Stand	Secondary Growth	Plantation	Mangrove Protected Areas
Marinduque	3,197.78	2,000	747.78	450	-
Romblon	1,263.29	230.22	539.77	493.3	1,114.98
Palawan	63,532			66	63,532
Occidental Mindoro	~2,500	420	2080	0	-
Mindoro Oriental	2,391.72	-	0	219.8	180
Batangas	610.94	517.27	0	93.67	567.04
Cavite	150.39	0	117.74	32.65	-
NCR	65	29.47	36	0	204.47
TOTAL	73,711.12	~3,196.96	~3,521.29	~1,355.42	~65,598.49

Table 24. List of mangrove species in southern Luzon

Species	Marinduque	Romblon	Palawan	Mindoro Occidental	Mindoro Oriental	Batangas	Cavite	NCR
<i>Acanthus ilicifolius</i>		X			X			
<i>Acrostichum Aureum</i>			X					
<i>Aegiceras corniculatum</i>		X	X	X	X		X	X
<i>Aegiceras floridum</i>	X		X		X			
<i>Avicennia alba</i>		X	X		X	X	X	
<i>Avicennia lanata</i>								
<i>Avicennia marina</i>	X	X	X	X	X	X	X	X
<i>Avicennia officinalis</i>		X		X	X	X	X	X
<i>Avicennia rumphiana</i>		X			X			
<i>Bruguiera cylindrica</i>	X	X	X		X		X	X
<i>Bruguiera gymnorhiza</i>	X		X	X	X	X	X	
<i>Bruguiera parviflora</i>	X		X					
<i>Bruguiera sexangula</i>			X		X	X		X
<i>Campostemon philippinense</i>			X					
<i>Ceriops decandra</i>	X		X	X	X	X	X	
<i>Ceriops tagal</i>	X		X	X	X	X		
<i>Excoecarcia agallocha</i>	X			X	X	X	X	X
<i>Heritiera littoralis</i>	X	X	X	X				
<i>Lumnitzera littorea</i>			X	X	X			
<i>Lumnitzera racemosa</i>			X	X	X			X
<i>Nypa Fruticans</i>	X	X	X	X	X		X	X
<i>Osbornia octodonta</i>			X		X			
<i>Pemphis acidula</i>	X			X				
<i>Rhizophora apiculata</i>	X	X	X	X	X	X	X	
<i>Rhizophora x lamarckii</i>			X					
<i>Rhizophora mucronata</i>	X	X	X	X	X	X	X	X
<i>Rhizophora stylosa</i>	X		X	X		X	X	X
<i>Scyphiphora hydrophyllacea</i>			X					X
<i>Sonneratia alba</i>	X	X	X	X	X	X	X	X
<i>Sonneratia caseolaris</i>	X						X	
<i>Xylocarpus granatum</i>	X	X	X		X		X	X
<i>Xylocarpus moluccensis</i>			X	X				X
TOTAL	17	13	25	17	21	12	15	14

Table 25. Provincial mangrove rehabilitation projects/programs

Province	Name of Project	Duration	Funding and Implementing Agencies/ Groups	Hectares of Mangrove Planted/No. of Propagules
Marinduque	DBP Forest Project	2007–2015	Implementer: Provincial Government (PGM), DENR, LGU of Sta. Cruz & Torrijos Funder: Development Bank of the Philippines (DBP)	100 ha & 250,000 propagules
Romblon	Provincial Mangrove Nursery	2012–2014	Implementer: ENRO Funder: Prov. Gov't	0.02 ha
	CRM Project – Mangrove Rehabilitation	2012–2014	Implementer: SIKAT, Inc., LGU Calatrava Funder: DENR, BFAR	25 ha
	Plant Now, Pay Later Program	2012–2014	Implementer: ENRO, MLGU, MFARMC, BFARMC, & POs Funder: Prov. Gov't	Total: 5.95 ha Sta. Fe: 2 Looc: <0.5 Odiongan: 0.35 San Agustin: 0.5 Romblon: 0.5 Banton: 0.5 Calatrava: 1 Magdiwang: 0.3 Cajidiocan: 0.3
		2000–2014	Implementer: LGUs, DENR, SIKAT, Inc. Funder: P/M/ BLGUs	Total: 10.53 Sugod: 0.6 Carmen: 1.8 Cabulutan: 6.1 Dubduban: 1 Dona Juana: 0.5 Bachawan: 0.5
	Planting of Bitaoag along coastal barangays	2012–2014	Implementer: LGU, RSU, DENR Funder: MLGU, RSU, DENR	–
	Mangrove Reforestation through Food for Work/ Cash for Work	Jun 2013 – Nov 2013	Implementer: ENRO Funding support: Department of Social Welfare & Development R4B	Total: 7 ha Magdiwang: 1 Cajidiocan: 1 Romblon: 1 San Agustin: 1 Looc: 1 Sta. Fe: 1 Alcantara: 1
	Integrated Community-Based CRMP (Rehab. & Conservation of Romblon Passage Marine Corridor)	2011–2013	Implementer: SIKAT, Inc. & LGUs of Romblon Funder: USAID	Planted: 4.3 ha Protected: 34,738 ha
	Integrated CRMP Comprehensive Site Dev.	2011–2012	Implementer: GOP, GEF, DENR, BFAR, DILG, PLGU-ENRO, MLGU, MAO, FARMC, Bantay Dagat Funding support: ADB	322 ha
	Subay Bay Mangrove Reforestation Project	December 2009	Implementation and Monitoring: LGU-Corcuera Romblon State University Funding support: NEDA	10 ha
Palawan	Pista ng Kalikasan program of the Prov. Gov't	Annual planting since 1994	Prov. Gov't, Municipal Government and partner private entities and NGOs	3 ha per year

Project Location/s	Monitoring Mode	Survival Rate (%)	Factors Affecting Survival
Sta. Cruz: 19 barangays Torrijos: 5 barangays	–	88	Typhoons, flooding, pests, resistance from the community to participate, low budget cost, low support from implementing partners and change of political leaders
Odiongan	Daily	70	Typhoons, pests, stray animals, no permanent worker & insufficient budget
Brgy. Balogo, Calatrava, Romblon	Monthly – inventory & mapping	65	Limited funds for seedlings, organizing, planning, mapping & people's participation
Sta. Fe, Looc, Odiongan, San Agustin, Romblon, Banton, Calatrava, Magdiwang, Cajidiocan	Quarterly	Sta. Fe: 75 Looc: 80 Odiongan: 60 San Agustin: 70 Banton: 50 Calatrava: 80 Magdiwang: 60 Cajidiocan: 80	Typhoons, monsoon rains, plastics and debris, abnormal weather, & irresponsible planters
Sugod, Carmen, Cabulutan, Dubduban, Dona Juana, Bachawan	Quarterly	Carmen: 50	Natural calamities, improper waste disposal, strong current and waves, stray animals & lack of fund
Brgy. Tan-Agan, Poblacion, Calunacon & Agpudlos of San Andres	–	30	Drought, human and animal destruction, insufficient fund for protection & monitoring, lack of information & dissemination
Magdiwang, Cajidiocan, Romblon, San Agustin, Looc, Sta. Fe, Alcantara	Twice only	Magdiwang: 20 Cajidiocan: 50 Romblon: 50 San Agustin: 5 Looc: 5 Sta. Fe: 5 Alcantara: 5	Typhoon, no sustainability, political intervention
Brgy. Ginablan, Li-o, Agnay, Mapula, Logbon, & Lonos in Romblon municipality	Twice a week; Semi-annual for mangrove assessment		Planted seedlings/propagules disturbed by shell/fish gatherer & waves; waste disposal; coastal development; delays in acceptance of community of cultural adjustment to resource use, project involvement, passage or approving agreement/ policies
Sta. Fe, Cajidiocan, Magdiwang, Odiongan & Ferrol		Sta. Fe: 90 Cajidiocan: 90 Magdiwang: 90 Odiongan: 90 Ferrol: 90	Typhoons & delayed payment of contracts
Subay Bay (Corcuera, Romblon)	Monthly	99	Lack of propagules
	Twice a year	60–70	Mortality of newly established plantation, inadequate fund for maintenance

Table 25 continued...

Province	Name of Project	Duration	Funding and Implementing Agencies/ Groups	Hectares of Mangrove Planted/No. of Propagules
Occidental Mindoro	Mangrove and Beach Forest Development Project (MBFDP)	2015	DENR, LGUs through the M/BFARMCs	767.1 ha
	DENR Initiative Planting (DENR-CENRO, San Jose)	2014		2 ha
Oriental Mindoro	Mangrove Forest Protection & Ecotourism Site through establishment of MPAs	2001–present	PGOM partner NGOs (CI, Malampaya Foundation)	219.8 ha
	Establishment of mangrove areas & mangrove rehabilitation	2001–present	Prov. Agriculture Office, Fishery & CRM division	
Batangas	Forest Management Project (Mangrove Rehab. & Conservation)	Nov 2008 – present	Prov. Gov't, PG ENRO, MENRO, NSTP (tree planting), academic institutions, MENRO (maintenance), First Gas (provision of seedlings), Harbor Star CSR (San Luis)	Total: 7.5 ha Lemery: 7.0 San Luis: 0.5
	Batangas Province Mangrove Rehabilitation Program	Nov 2009 – present	Municipality of Calatagan, CI-Philippines (financial and technical assistance), LGU-MAO (financial and logistic assistance), PO -Pro Mangrove Alliance & Implementing Team as Kilitisan's Advocates of Nature (PALITAKAN)- management body	7.5 ha
Cavite	Rehabilitation Program	2011		32.65 ha
	PPT Public Company mangrove rehabilitation project	2014	LGU-Noveleta, PPT Public Company Limited of Thailand	50,000 propagules
	Mangrove Planting project in celebration of PCG 133th anniversary	2014	PCG, DILG, MENRO, Bureau of Fire Protection, PNP Rosario, Petron Terminal, PCGA Squadron (103rd, 125th & 129th), NSTP students of AIMS, Processing Export Zone Authority (PEZA), Phil. Dental Association Cavite, Brgy. officials of La Isla Bonita and Brgy Ligtong II Rosario Cavite	Total: 2000 propagules La Isla Bonita: 1000 propagules Brgy. Ligtong: 1000 propagules
			Island Cove Hotel and Leisure Park LGU of Bacoar City Kawit Agriculture Offices, FARMC With support of PENRO and DENR-CALABARZON	1 ha
	CGS Cavite: Mangrove Planting & Coastal Clean-up	March 2014	Personnel of Coast Guard Station Cavite PENRO Cavite MENRO Noveleta COPS_EP0D	4000 propagules
NCR	Declaration of LPPCHEA (Pres. Proc. 1412)		PAMB of DENR-NCR	
	Declaration of Brgy. Ord. No. 04-S2011 Tanza as a Marine Tree Park		PAMB of DENR-NCR	

Project Location/s	Monitoring Mode	Survival Rate (%)	Factors Affecting Survival
6 municipalities			
1. MPA – Silonay, Calapan City; San Andres, Baco & Tabinay, Puerto Galera 2. Mangrove Rehabilitation - province wide (219.8 ha)	Monthly; every other week, if necessary	30–60	1. Mangrove cutting 2. Mangrove conversion into fishpond and residential 1. Assessment (substrate, species to be planted) must be done before planting National agency like BFAR, DENR implementing the same project must closely coordinate with local government and community
Lemery & San Luis		Lemery: 85 San Luis: 10	Typhoon & solid waste (upstream)
Calatagan “Ang Pulo”			Typhoon & solid waste (upstream)
Bacoar, Kawit, Cavite, Noveleta, Tanza, Rosario, Naic, Ternate & Maragondon			
Noveleta			
Brgy. Isla Bonita, Brgy Ligdong II of Rosario Cavite			
Bacoar			
Brgy. San Rafael IV, Noveleta, Cavite			
	Regular monitoring since 2008	70	
	Regular monitoring since 2008	70	

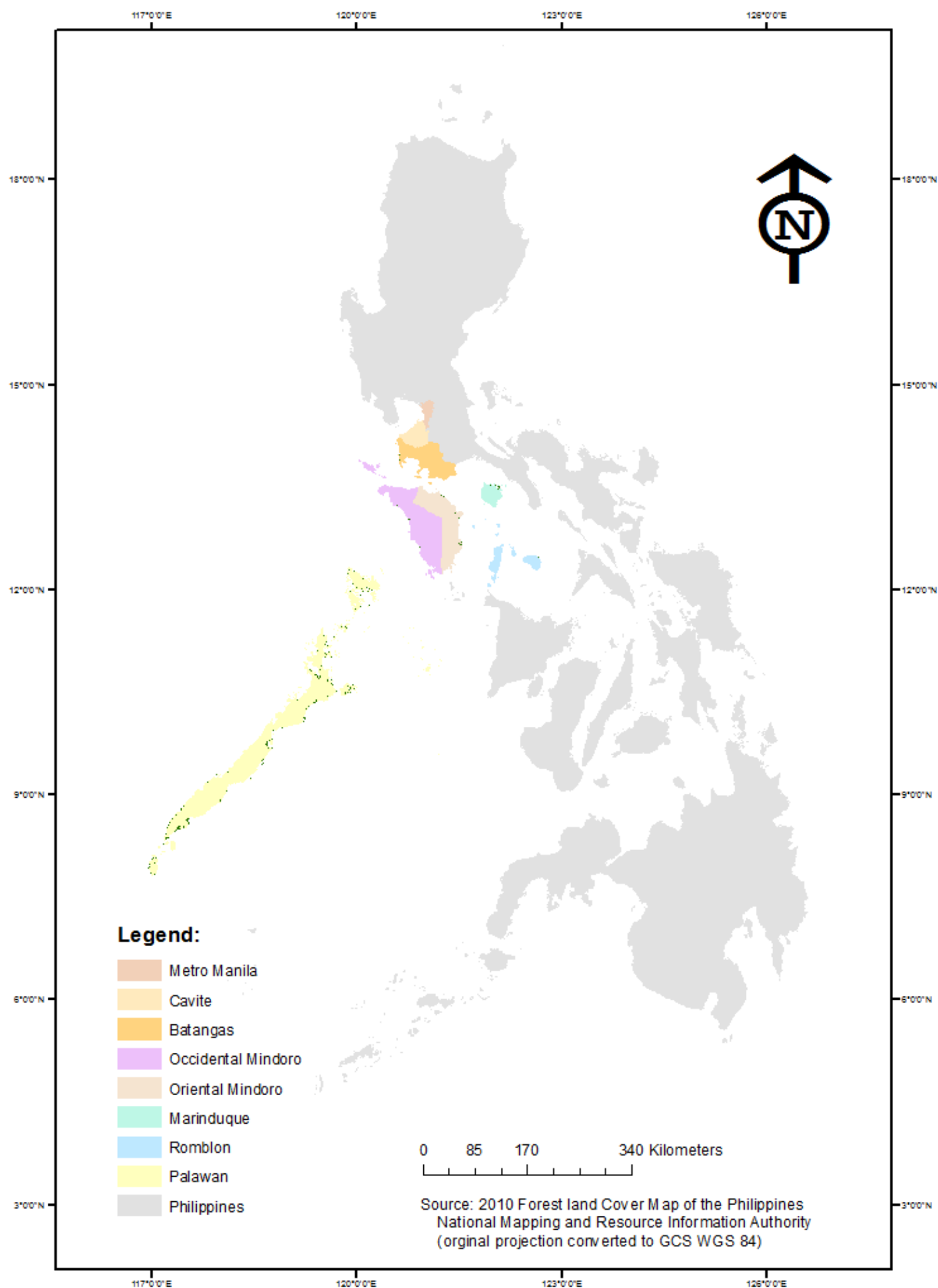


Figure 33. Mangrove map of Southern Luzon (map provided by ACastillo, ERDB and USQ)

IV. Mangrove Management in Southern Luzon

Mangrove management in Southern Luzon may be traced to the declaration of mangrove swamp forest reserves in December 1981 such as that of Sibuyan Island of Romblon as well as the entire island of Palawan (Presidential Proclamation 2152). Since then various mangrove protected areas, marine protected areas and protective ordinances have been declared in the national and local levels.

Apart from the NCR, which reported the declaration of LPPCHEA and Tanza Marine Tree Park as protected areas for their main program, most provinces of Southern Luzon reported the implementation of various mangrove rehabilitation projects or programs. All reported projects or programs involve various stakeholders from national government agencies, local government units, civil society organizations, people's organizations, and even private companies. These rehabilitation projects/programs have been in existence since the year 2000 but the bulk of these activities happened within the last 10 years.

Most of the reported projects are integrated within the respective Integrated Coastal Resource Management programs of the provinces with activities varying from mangrove planting, coastal cleanup and establishment of mangrove nursery for seedlings. Based on provincial reports, there is approximately 1,355.42 ha of mangrove plantation in Southern Luzon, excluding that of Occidental Mindoro and the NCR, which were undeclared. Monitoring of planted seedlings were generally declared to be on a monthly to quarterly basis. Oriental Mindoro has a commendable mangrove restoration and management program. They clearly envisioned that in the year 2020, there will be a 50% increase in forest cover and also 50% of abandoned fish ponds are reverted to mangroves. Along with this vision, is the manifestation of the need to have a clear and accessible records of FLAs.

Oriental Mindoro has declared an established monitoring and evaluation team i.e. the Oriental Mindoro Resource Monitoring team. This group is composed of trained technical personnel that conducts yearly monitoring surveys, which are recorded and analyzed. Romblon, Palawan, Batangas and the NCR also mentioned having monitoring systems, but their systems were not reported in detail. The process of monitoring varies and is not standard across the provinces. Batangas mentioned that monitoring was mostly done by groups who planted them and the process of monitoring was done through counting. On average, the survival rate of planted mangrove seedlings is 62.86%. In particular, the range of the survival rate of mangroves from the declared provinces are as follows: 88% in Marinduque, 5–99% in Romblon, 60–70% in Palawan, 30–60% in Oriental Mindoro, 10–85% in Batangas, and 70% in the NCR.

Factors affecting the survival of the planted seedlings include typhoons, monsoonal rains and flooding, strong current and waves, pests and stray animals, drought, improper waste disposal (e.g. plastics, debris); weak mangrove management, lack of information and dissemination to affected communities; wrong planting method in wrong substrates; and weak implementation of laws, which encourages illegal mangrove cutting and poor coastal development. Low budget, low support from implementing partners, change in political leaders were likewise mentioned.

Table 25 provides a summary of the declared mangrove projects/programs of the Southern Luzon provinces, its duration, agencies involved, number of areas planted, monitoring and survival rates as well as the factors affecting its survival.

V. Experiences and Lessons

The mangrove management experiences in Southern Luzon have evolved over three decades, providing us with a good number of lessons that are relevant in developing the mangrove management system of the country. Across the provinces, the most common experience is the establishment of policies that secure or protect mangrove ecosystems. From the large mangrove swamps of Palawan to the smaller but critical habitats of LPPCHEA and Tanza Marine Park of NCR, Southern Luzon provinces have protected areas that are intended for mangrove conservation and other purposes such as ecotourism and livelihood. Laws may be passed as a means of environmental protection for the ordinary Filipino because of political issues in the country. These laws legitimize the existence of protected areas and provide a concrete basis for claims that may further enhance mangrove conservation and protection.

Another good lesson from Southern Luzon is the need for a holistic and well-informed management of mangrove resources. Most Southern Luzon provinces have created sub-programs to complement their planting activities. These include cash-for-work programs, IEC, livelihood, and management trainings that answer to the socio-economic needs of the communities involved. These sub-programs are haphazard, varied, and far from perfect, yet it is necessary to acknowledge their relevance in garnering community support and aiding in the transition from mere mangrove-users to mangrove protectors. Moreover, practices such as scientific research in the provinces of Oriental Mindoro, Palawan and Batangas also prove to be extremely relevant in making decisions for mangrove management.

Table 26. Comparative table of mangrove areas in Cavite, Batangas, Palawan, Oriental Mindoro and Occidental Mindoro (in hectares)

Province	Long et al (2011)	Songcuan et al (2015)	Reported by Provinces
Cavite	29.23	137.4	150.39
Batangas	503.3	397.6	610.94
Palawan	56,660	43,000	63,532
Oriental Mindoro	2,227	3,260	2,391.72
Occidental Mindoro	1,041	1,386	2,500

Mangrove management will also be effective when it involves a wide range of stakeholders from different organizational levels. Each province reported a certain level of involvement either from national government agencies (NGAs), municipal and barangay local government units, private organizations, non-governmental organizations, people's organizations, and other civic organizations. A wide range of stakeholders secures a wider variety of inputs from political enforcement, personnel, funding, to sharing of best practices and innovative solutions for mangrove management. In addition to this, we also find the involvement of communities to be important in keeping mangrove interventions effective at the local level.

Lastly, the experiences in Southern Luzon emphasize the need to look at the larger picture of mangrove management. As mentioned in Dr. Mamauag's and Dr. Aliño's reports, coastal habitats are interconnected. Mangrove ecosystems are vital to its adjacent ecosystems, namely, seagrass and coral reefs, and vice versa. This characteristic of interconnectedness invites us to review current mangrove management measures. It calls for the development of holistic and integrated CRM in the country, which will help provide answers to the knowledge gaps in the sustainability of mangrove management programs.

VI. Future Directions, Gaps and Recommendations

We synthesize the knowledge gaps that may be necessary to tackle in order to shape the future of mangrove management in the country. An observable gap reported by the provinces is having weak institutional systems. Weak institutions affect the implementation of laws and policies that govern, protect, and conserve mangrove

areas. Weak institutions may also be traced back to conflicting agencies and redundant inter-agency policies. A case in point is the abandoned fishpond areas (originally mangrove areas) governed by a Fishpond Lease Agreement (FLA) provided by BFAR. Since the lease is still in effect, owners are not compelled to rehabilitate or reforest these areas despite it being underutilized. Perhaps the existence of a National Mangrove Committee could be helpful in aligning the policies and governing bodies on mangrove resources.

Similar to the experiences in Northwestern Luzon, we emphasize a need to develop monitoring and evaluation systems for mangrove rehabilitation. Southern Luzon provinces have very weakly established systems for monitoring despite projects and programs for >10 years already. Only Oriental Mindoro claims to have an established monitoring system. Standardizing monitoring systems is vital in tracking mangrove forest growth not only in Southern Luzon but across the country. Standardized systems may also result to uniform baseline data, which is also another noticeable gap.

Baseline data collection is an essential starting point for effective interventions. This, as well as data from mapping is extremely relevant in strengthening mangrove management. As mentioned in the study by Songcuan et al. (2015), mapping is essential in visualizing land and sea-use plan. Comparing the data from Long et al. (2011) and Songcuan et al. (2015) versus those reported by the provinces, there is a noticeable difference in the figures (Table 26). We are not in the position to claim, which one is more accurate but the point is a uniform baseline data must be identified by aligning methodologies used in gathering it.