



# Synthesis

# State of the Mangrove in Central and Eastern Visayas: A Synthesis of Experiences, Lessons, and Management Recommendations

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## I. Bio-physical and Socio-economic Settings

Central and Eastern Visayas have a shoreline length of around 4,512.803 km and are composed of 10 provinces, 23 cities, 933 municipalities, and 6,836 barangays. These regions are inhabited by approximately 7.5 million people, 15 % of which live along the coast (**Table 1**).

The mangroves of Central and Eastern Visayas are recognized in providing various economic and ecological services. They function as breeding and nursery grounds for marine and terrestrial animals (e.g., fishes, invertebrates, and birds), and as source of food (e.g., fishes, crabs, clams, prawns, etc.) and various products derived from the forest (e.g., fuelwood, charcoal, timber, nipa shingles, medicines, honey, vinegar, wine, and coloring substance). Ecotourism was also reported as a source of income in the provinces of Bohol, Cebu, Samar and Leyte.

The reported ecological services of mangroves include shoreline protection from waves, storm surges, and coastal erosion. It is also acknowledged that mangroves help in mitigating the impacts of climate change through its carbon sequestration and shoreline stabilization capacities. The presence of mangroves also provide opportunity for the locals to collaborate with scientific community in doing research (in Bohol and Palompon).

**Table 1.** Provinces in Central and Eastern Visayas and their total and coastal population (nd = no data; source: PSA 2015a, 2015b).

Province/ Municipality	Total Population	Coastal Population
Biliran	171,612	nd
Bohol	1,313,560	516,776
Cebu	2,938,982	nd
Eastern Samar	467,160	nd
Northern Samar	632,379	333,044
Samar	780,481	nd
Leyte	1,724,679	nd
Southern Leyte	421,750	245,223
Negros Oriental	1,354,995	nd
Siquijor	95,984	nd
<b>Total</b>	<b>7,442,147</b>	<b>1,095,043</b>

The social-related problems reported from the communities are mainly rooted from high poverty incidence. Due to high population growth, the demands for space and food have increased. The increase in food demand resulted to the use of illegal fishing methods, particularly in Leyte and Samar. Aside from limited food source, marginalized communities have no access to potable water, proper shelter, and health services resulting to high number of informal settlers and high incidence of malnutrition.

## II. Status of the Mangroves

Mangrove areas in Central and Eastern Visayas are estimated at around 45,256.09 ha (**Table 2**). Bohol has the highest mangrove cover at 14,502 ha. The province with the highest species richness is Southern Leyte and Negros Oriental with 26 true mangrove species. Central and Eastern Visayas have higher diversity (with average of 22 true species) as compared to the reports in Northwest and Southern Luzon (average of 15 and 17 true species, respectively; **Table 3**). The most common mangrove species reported are *Avicennia marina*, *Ceriops decandra*, *Ceriops tagal*, *Excoecaria agallocha*, *Nypa fruticans*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Rhizophora stylosa*, *Sonneratia alba*, and *Xylocarpus granatum*. The species that are less common in the region include *Acanthus ebracteatus*, *Acrostichum aureum*, *Avicennia rumphiana*, and *Xylocarpus rumphii*.

## III. Issues and Threats

The existence and health of mangroves in the region are threatened by both anthropogenic and natural disturbances. Human-induced stresses

include coastal pollution due to improper solid/liquid waste management; land reclamation (fishpond expansion, industrial/commercial, infrastructures, and mining activities); and illegal extraction of other coastal resources (sand, gravel, and wood). Natural disturbances that affect mangrove forests include sea level rise, typhoons, and storm surge. Central and Eastern Visayas were the two most affected regions damaged by Super Typhoon (ST) Yolanda (international name: Haiyan) in 2013. In rare occasion, the occurrence of an earthquake submerged a mangrove forest in Tubigon Island and in the municipality of Inabanga in Bohol.

These threats caused several negative effects in the region. The most common is the decrease in fisheries production resulting to reductions in food source and income for the community. In Laoang, Northern Samar, the catch dropped from 20 kg per 3 to 4 fishing hours (in the 1980s) to only 4 kg per 7 hours (in 2012). Mangrove deforestation also endangers the coastal communities against storm surge, typhoons, and strong waves. In effect, the associated wildlife (aquatic organisms, migratory birds, etc.) are losing their habitat and source of food which eventually results to the decrease in biodiversity.

**Table 2.** Summary of the mangrove cover (ha) and classified as old, plantation, and protected area in the Central and Eastern Visayas (nd = no data).

Province	Total area	Old stands	Secondary growth	Plantation	Protected area
Biliran	589 <sup>a</sup>	nd	nd	nd	nd
Bohol	14,502	nd	nd	2,832 <sup>b</sup>	17,415
Cebu	3,933	nd	nd	nd	75
Eastern Samar	324	nd	nd	nd	nd
Northern Samar	10,322	858	5,379	nd	nd
Samar	7,285	nd	nd	nd	nd
Leyte	5,686	nd	nd	nd	nd
Southern Leyte	963	864	63	nd	nd
Palompon, Leyte	1,321	1,234	87	nd	1,307
Negros Oriental	861 <sup>c</sup>	nd	nd	nd	nd
Siquijor	382.5 <sup>d</sup>	nd	nd	nd	33
<b>Total</b>	<b>45,256</b>	<b>nd</b>	<b>nd</b>	<b>nd</b>	<b>nd</b>

<sup>a</sup> Province of Biliran 2011

<sup>b</sup> Province of Bohol, 2016

<sup>c</sup> Yambao et al. 2001

<sup>d</sup> Chassels 2007

**Table 3.** List of true (A) and associate (B) mangrove species in Central and Eastern Visayas.

Species/Province	Local name	Bohol	Cebu	Samar	Leyte	Southern Leyte	Negros Oriental
A. True Species							
<i>Acanthus ebracteatus</i>	Tigbau			X			
<i>Acanthus ilicifolius</i>	Tigbau/diliuario		X			X	X
<i>Acrostichum aureum</i>	Lagolo	X		X		X	
<i>Aegiceras corniculatum</i>	Saging-saging	X	X	X	X	X	X
<i>Aegiceras floridum</i>	Tinduk-tindukan	X	X			X	
<i>Avicennia alba</i>	Bungalon puti			X	X	X	X
<i>Avicennia lanata</i>	Bungalon/piapi					X	X
<i>Avicennia marina</i>	Bungalon/piapi	X	X	X	X	X	X
<i>Avicennia officinalis</i>	Api-api	X		X		X	X
<i>Avicennia rumphiana</i>	Api-api/Miapi			X			
<i>Bruguiera cylindrica</i>	Pototan lalake	X	X		X		X
<i>Bruguiera gymnorhiza</i>	Busain	X	X	X			X
<i>Bruguiera parviflora</i>	Langarai	X		X			
<i>Bruguiera sexangula</i>	Pototan babae	X		X			X
<i>Camptostemon philippinense</i>	Gapas-gapas				X	X	
<i>Ceriops decandra</i>	Malatangal/ malatungog	X	X	X	X	X	X
<i>Ceriops tagal</i>	Tangal/tungog	X	X	X	X	X	X
<i>Excoecaria agallocha</i>	Buta-buta/alipata	X	X	X		X	X
<i>Heritiera littoralis</i>	Dungon late	X	X			X	X
<i>Lumnitzera littorea</i>	Tabau	X		X		X	X
<i>Lumnitzera racemosa</i>	Kulasi/sagasa/ baras-baras	X	X			X	X
<i>Nypa fruticans</i>	Nipa/sasa	X	X	X	X	X	X
<i>Osbornia octodonta</i>	Tualis/tualis			X		X	X
<i>Pemphis acidula</i>	Bantigi	X	X			X	
<i>Rhizophora apiculata</i>	Bakauan lalake	X	X	X		X	X
<i>Rhizophora mucronata</i>	Bakauan babae	X	X	X	X	X	X
<i>Rhizophora stylosa</i>	Bakauan bato/ bankau	X	X	X	X	X	X
<i>Scyphiphora hydrophyllacea</i>	Nilad	X		X			X
<i>Sonneratia alba</i>	Pagatpat	X	X	X	X	X	X
<i>Sonneratia caseolaris</i>	Pedada	X				X	X
<i>Sonneratia ovata</i>	Pagatpat baye	X				X	
<i>Xylocarpus granatum</i>	Tabigi	X	X	X	X	X	X
<i>Xylocarpus moluccensis</i>	Piag-ao	X		X		X	X
<i>Xylocarpus rumphii</i>	Piag-ao						X
<b>Total</b>		<b>26</b>	<b>18</b>	<b>23</b>	<b>12</b>	<b>26</b>	<b>26</b>

**Table 3.** continuation

B. Associate species						
<i>Acacia farnesiana</i>	Aroma	X				
<i>Barringtonia asiatica</i>	Botong/bito-on					X
<i>Brownlowia</i> sp.	Amagos					X
<i>Calophyllum inophyllum</i>	Bitag			X		
<i>Derris trifoliata</i>	Tuble					X
<i>Dolichandrone spathacea</i>	Tui/bito-bitoon					X
<i>Finlaysonia maritima</i>	Balagon					X
<i>Intsia retusa</i>	Ipil laut					X
<i>Terminalia catappa</i>	Talisay	X		X		X
<i>Pongamia pinnata</i>	Bani	X				
<i>Premna odorata</i>	Alagao/abgao	X		X		
<i>Prosopis vidaliana</i>	Aroma					X
<b>Total</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
						<b>8</b>

#### IV. Mangrove Management

All provinces in Central and Eastern Visayas employed mangrove planting projects through Coastal Resource Management Programs (**Table 4**). Mangrove reforestation programs were implemented to increase coastal resiliency, especially after ST Yolanda devastated the Visayas region. These projects were mostly implemented and funded by various sectors – local government units, people's organization, non-government organizations, national government agencies, and academe. Subprograms include coastal mapping (e.g., Cebu), establishment of mangrove sanctuaries, training on mangrove-seagrass habitat assessment and monitoring, and providing support for livelihood projects.

Efforts in establishing teams for maintenance and monitoring of mangrove plantations were reported in the region, particularly in Cebu and Eastern Samar. The process and frequency of monitoring varied with provinces, as twice a week, to monthly, and quarterly. On the average, the survival rate in mangrove plantation

was estimated at 52.63 %. The range of survival rate was reported as: 86.50 to 100 % in Bohol, 19.5 to 90.75 % in Cebu, 25 % in Samar, and 0 to 100 % in Leyte. Similar with most places in the Philippines, there is no standard monitoring protocol yet; hence, these survival rates are somewhat inconsistent and need field validation. A case in point is the reported > 100 % survival in some provinces which is improbable as compared with the actual field observations. It is also possible that high mortality (as high as 100 %) is not reported due to various social and funding implications if the project will be perceived as a failure.

Factors affecting the survival rates in mangrove plantations include the occurrences of typhoons and strong waves; infestation of barnacles, insects, beetles; breakage due to boat navigation; improper garbage disposal; inappropriate choice of planting sites; inappropriate species-substrate matching; and improper handling of propagules (plant bags were not removed upon transplanting). Species and site mismatch were also documented in Palompon, Leyte in early 2000 which eventually led the municipality to refuse massive mangrove planting projects.

**Table 4.** Provincial mangrove planting programs.

Province/ Municipality	Name of Project	Duration	Funding and Implementing Agencies/Groups	Hectares of planted/ rehabilitated/ protected
Bohol	National Greening Program	2011-2017	Implementer and Funder: DENR; Other partners: BFAR, DepEd, MLGU, BLGU	2,340.5
	Sustainable Integrated Area Development and Management	2016-2017	Implementer and Funder: DENR; Other partners: POs, LGU	1,500
	Mangrove and Beach Forest Development Project	2015-2017	Implementer and Funder: DENR; Other partners: POs, LGU	--
Cebu	Mangrove Rehabilitation Program, nursery establishment training course, mangrove mapping, site validation for mangrove planting	2017-present	Implementer: Provincial Environment and Natural Resources Department, Coastal Management Section; Funder: Government; Other partners: RARE, OCEANA, LGUs, ZSL	7.5
Eastern Samar				
Northern Samar				
Samar	The Mangrove and Beach Forest Development Project (MBFDP)		Implementer and Funder: DENR; Other partners: NGOs, Pos	target: 50,000 ha
Leyte	Mangrove Support Fishery Production Livelihood of Coastal and Artisanal Fishing Communities	14 months (Sept 2017- Nov 2018)	Implementer: DENR, R8; Funder: Government Appropriation Act; Other partners: BFAR, EMB	on-going
Southern Leyte	1. Mangrove Rehabilitation Project, 2. Mangrove Plantation Project (abandoned fishponds and open areas without original stand), 3. mangrove enrichment project, 4. Mangrove nursery project, 5. others: Capacity Development of LGUs	2006-present	Implementer: PLGU-PENRMO -Coastal Habitat Protection Project- Logistical Technical, Financial Support. MLGU/BLGU- manpower, DENR/BFAR-Financial and Technical, manpower, other agencies-manpower/planting; Funder: PLGU-PENRMO, GIZ- EFOS, EDC; Other partners: EDC	--
Palompon, Leyte	Mangrove Plantation Project	2013-2015	Implementer: PAWA & BAKHAW; Funder: DENR	

Project location/s	Monitoring frequency	Survival rate	Factors affecting survival
	Twice a week	100 %	Breakage due to boat navigation; Presence of algal bloom; Improper garbage disposal; Gleaning/shell gathering
Bien Unido, Buenavista, CPG, Getafe, Inabanga, Mabini, Talibon, Ubay	Monthly	--	Breakage due to boat navigation; Presence of algal bloom; Improper garbage disposal; Presence of insects and beetles; Gleaning/shell gathering
Bien Unido, Buenavista, Getafe, Inabanga, Pres. Carlos P. Garcia, Talibon, Calape, Loon, Maribojoc	Twice a week	86.50 %	Breakage due to boat navigation; Presence of algal bloom; Barnacle infestation; Turbid water; Improper garbage disposal; Presence of insects and beetles; Gleaning/shell gathering
Whole Cebu province	Quarterly	52-60 %	Improper planting practice; Absence of maintenance and monitoring
Province-wide	Quarterly	25 %	Improper handling of seedlings
--	Monthly	50-80 %	Big waves due to bad weather conditions (amihan, habagat, LPA, typhoons)
		Brgy. Maziwalo-33 % Brgy. Cangcosme-0 % Brgy. Parilla-81 %, Brgy. Plaridel-108 %, Brgy. Baguinbin- 4.47 %, Brgy. Duljugan-3.8 %, Brgy. Tinabilan-5.3 %, Cabgan Island-92 %, Gumalac Island-93 %	Typhoons; Kind of propagules; Contractors; Propagules are not match with the designated area.

## V. Experiences and Lessons

The mangrove protection and management programs in Central and Eastern Visayas can be traced back in the 1980s through CRM programs. Mangrove management programs have been more enforced after ST Yolanda devastated the Central and Eastern Visayas. There are several projects implemented—some were successful, others are still on-going, and many have failed. These experiences brought lessons that need to be shared.

Most of the provinces are recipient of funding grants in mangrove rehabilitation and restoration programs. Most of these are multi-million funded projects implemented within a span of two to three years. Funding sources are derived from corporate social responsibility (CSR) programs, others are from NGOs, but the most recent is the One-Billion Program of the DENR.

Most of the shared practices and thoughts during the Summit were based from the recent experiences in implementing mangrove rehabilitation projects. One of the major concerns deemed to be addressed was who/which organization is the best one to handle and coordinate mangrove-related projects. In the past, several agencies implemented mangrove rehabilitation and restoration programs. However, the information about these programs were lacking or somewhat disorganized. There was no updated database. Aside from lacking datasets, only few implemented

monitoring and evaluation programs. This program is very important to evaluate the successes and weaknesses of each project.

Several planting programs were implemented in these regions, especially after the onslaught of ST Yolanda. Despite several mangrove rehabilitation and management guidelines, many still implement the project inaccurately (e.g., planting in inappropriate sites and using inappropriate species). One important insight was the importance of restoring or reverting the abandoned fishponds into a mangrove forest.

Community-based efforts or projects implemented through POs were more effective and sustainable. The community earned a sense of pride when their rehabilitation and restoration programs succeed. They felt more responsible and accountable because they know they will be directly impacted when this ecosystem is not managed. However, they still need more capacity-building/technical assistance to fully grasp the science behind restoration programs. Ecotourism was also linked to mangrove rehabilitation efforts in these provinces. It is one of the ways to educate the tourists about the importance of mangroves to the community.

Linkages through community-based coastal resource management, community-based marine protected areas, and integrated coastal management have been adapted to address governance, socio-economic, and technical concerns.



## VI. Future Directions, Gaps, and Recommendations

The main challenges in the governance of mangrove management in the region are the conflicting policies and weak law enforcements. There is a lack of effective communication system among different tiers of government bureaucracy and even with the POs. The weak institutional systems disrupt the implementation of CRM programs. It will be helpful to align policies with the objectives of the local management institutions.

Public awareness and appreciation of the data can also gather additional support from stakeholders. Incorporation of coastal resource study to academic curriculum (similar to the program in Palompon) will engage the participation of stakeholders in mangrove management programs. Also, providing incentives through compensation or in-kind benefits may also increase the level of community participation.

While there are already substantial mangrove rehabilitation programs in Visayas, there is still a need for an improved and more systematic mangrove monitoring and evaluation system. There

is a need to develop expertise among LGUs, POs, and NGOs. These are vital in implementing a more science-based mangrove management intervention and in tracking the success (or failure) of mangrove management programs.

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