



State of the Mangroves in PANGASINAN



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I. INTRODUCTION

Pangasinan is one of the largest provinces in Region I and in the country. It is located in northwestern Luzon, bounded in the north by La Union province, in the east by Nueva Ecija province, in the south by Tarlac province, and in the west by Zambales province. Pangasinan covers a total land area of 536,818 ha with four cities, 44 municipalities and 1,364 barangays. Its 285.66 km coastline extends from San Fabian in the east to Infanta in the west, and is the longest in the region covering 2 cities, 12 municipalities and 123 coastal barangays. Most of the cities and municipalities lie along the historic Lingayen Gulf and Dasol Bay along the West Philippine Sea with an area of approximately 428,400 ha. The Gulf, along with 9,000 ha of communal bodies of water, is a major fishing ground of the coastal communities. Pangasinan is the third most populous province in the country and in Region I with a population of 2,906,085 people as of 2013. About 29% of the population resides in the coastal areas comprising around 135,000 families who are highly dependent on fishing as their main source of livelihood and income.

The province's coastal area is endowed with productive coastal ecosystems, such as seagrass, coral reefs and mangroves, that provide fishing grounds. Mangrove areas located in coastal areas and riverbanks presently cover 615.02 ha from an area of about 990 ha in 1978. These important marine ecosystems harbor high biodiversity. Other habitats include brackish water fishponds located in 14 coastal cities/municipalities and 4 inland municipalities covering a total area of 11,303 ha. These are utilized for bangus, shrimp and siganid culture. Fish farming in cages and pens started in the early 90s and intensified in the last decade, reaching a total of 2,825 units installed along the municipal waters of 11 LGUs. Due to the degradation of water quality that resulted to fish kills, LGUs have greatly regulated this industry resulting to only six LGUs presently

engaged in the management of this aquaculture method with a total 2,323 units (as of 2013). These aquaculture units are located in Alaminos City, Dagupan City, Anda, Bolinao, Agno and Sual.

Fishing is the main source of livelihood and income in the coastal areas. In 2013, there were around 8,162 units of motorized *bangkas* and 4,246 non-motorized *bangkas* operated by a total of 27,022 fishers. At present, there are 60 commercial fishing vessels with 1,212 workers, although only 44 vessels are registered in Region I. Other fisheries-related livelihoods include: (1) fish culture in fish cages and fishponds, (2) seashell/seaweeds gathering, (3) fish processing like bangus deboning and smoking, fish drying and *bagoong*-making. Based from OPAg reports in 2013, the total fish production is recorded at 124,863.304 mt. Fish sufficiency level in the province is high at more than 100%, which makes Pangasinan not only the major fish producer and supplier in Northern Luzon but also the fish bowl of Region I.

Other sources of livelihood in the coastal zones are mining and ecotourism. Some of the major industrial players like Team Energy Power Corp, Sual Port, Pacific Farms, Anjo Farms and several ecotourism establishments like the Bangrin MPA in Bani are located in the coastal areas. These industries provide not only employment and income to both the coastal and inland communities but also contribute a significant share to the provincial as well as the regional economy.

Over the years, Pangasinan has been exposed to various natural hazards such as floods, earthquakes and storm surges due to its geographical location, topography and the presence of vast rivers that greatly affect those living in the low lying areas. Aside from these natural calamities,





current trends in coastal migration and the increasing human activities on land, coasts and seas have exerted pressure on the sustaining capacity of coastal and marine areas. These also amplify the risks of environmental degradation, destruction of vital coastal habitats, loss of marine biological diversity and deterioration of near shore water quality. Coral reefs have experienced dramatic degradation and decline due to natural calamities, climate change impacts like coral bleaching and unabated human pressures like overfishing, sedimentation and domestic pollution. Most seagrass beds are moderately degraded and destroyed due to erosion and mine tailings.

Indiscriminate cutting of mangroves for fuel wood and conversion of mangrove forests for other uses contributed to deforestation of mangroves in the area. Destructive and illegal fishing practices like the use of cyanide, blast fishing and the use of fine mesh nets are also among the problems in the area, albeit at quite minimal levels. These illegal practices being done by some fishers may be attributed to weak coastal law enforcement.

Coastal pollution persists due to improper waste disposal from residential wastes and industries like mine tailings that discharge along the Agno River. Another perennial problem is the fish kill due to the indiscriminate aquaculture practices that release excess feeds and waste products, which increase nutrient and organic loading. Hence, the deteriorating water quality of Caquipotan Channel, which is used as a major fish farming site.

Another alarming concern is the proliferation of informal settlers along the coastal areas, which cause not only pollution but also increase the areas' vulnerability to degradation, destruction and exploitation. The tendency of persistent overfishing of our marine waters and the declining fish catch may be attributed to poverty in the coastal areas and open access to the sea. Also notable in the coastal zone of Lingayen, Binmaley, Dagupan City, Labrador, and Alaminos City are fishponds that have already been converted for commercial, industrial and tourism development purposes.

Importance of Mangroves

Many significant benefits can be derived from mangrove reforestation projects. However, their impacts cannot be realized immediately, considering that mangroves reach sapling stage 5 to 8 years after planting. It is only during this stage that the mangroves can function as sanctuaries, breeding grounds and nursery grounds of fishes, crustaceans and migratory birds. Their specialized roots (i.e. pneumatophores) can trap sediments carried by runoffs from upstream. Mangrove roots also minimize erosion along riverbanks, thereby preventing sedimentation into seagrass beds and coralline areas.

Mangroves serve as barrier against storm surges and typhoons. In fact, some coastal residents of Anda and Bolinao that live near diverse mangroves have attested that they were not greatly affected by storm surges during typhoon Emong that hit the province in 2009. Mangroves help mitigate the effects of climate change, which is the most challenging problem of our country today.

Mangroves provide sources of livelihoods through aquasilviculture particularly in Alaminos City and the municipalities of Anda, Bani, Sual and Infanta. In Bugallon, Lingayen and San Fabian, *Nypa* leaves are harvested as shingles for house roofing and their saps are processed into wine (*tuba*) and vinegar. Likewise, the seeds of *Nypa* and *Dungon late* are used as decorative materials for various handicrafts.

II. STATUS OF MANGROVES

The province has experienced severe mangrove destruction due to illegal cutting and conversion for other uses. Deforestation of mangroves is a major factor contributing to the degradation of the marine ecosystem. At present, most of the remaining mangrove forests are secondary growth or in plantations and only few are from primary growth. Mangrove areas today cover some 615.02 ha from an area of about 990 ha in 1978 located in coastal areas and riverbanks. An estimated area of about 283 ha are old stand mangroves that are located along the coasts of Bolinao, Bani, Alaminos City, Anda, Dasol, and Infanta. **Table 12** provides a summary of the status of mangroves in Pangasinan whereas **Table 13** shows the distribution, present area of mangroves and potential area for planting mangroves by municipality.

Of the 47 mangrove species in the Philippines, about 25 species are reported in the province. These were identified as the following species: *Aegiceras corniculatum*, *Aegiceras floridum*, *Avicennia alba*, *Avicennia lanata*, *Avicennia marina*, *Avicennia officinalis*, *Bruguiera cylindrica*, *Bruguiera gymnorrhiza*, *Bruguiera parviflora*, *Bruguiera sexangula*, *Camptostemon philippinense*, *Ceriops decandra*, *Ceriops tagal*, *Excoecaria agallocha*, *Heritiera littoralis*, *Lumnitzera racemosa*, *Nypa fruticans*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Rhizophora stylosa*, *Sonneratia alba*, *Sonneratia ovata*, *Sonneratia caseolaris*, *Xylocarpus granatum*, and *Xylocarpus moluccensis*.

Table 12: State of mangroves in Pangasinan (in hectares)

Old Stand	Secondary Growth	Plantation
283.0	332.02	no data



Table 13: Mangrove distribution in Pangasinan and potential sites for planting.

Municipality/ City	Existing Area (ha)	Potential Area (ha)
Agno	104.97	23.26
Alaminos City	42.47	18.50
Anda	85.50	25.50
Bani	66.91	22.03
Binmaley	11.96	13.65
Bolinao	67.70	39.00
Bugallon	6.50	16.66
Calasiao	0.40	11.66
Dagupan City	20.33	3.22
Dasol	69.24	29.00
Infanta	20.66	14.66
Labrador	3.73	6.50
Lingayen	93.66	20.82
Mangaldan	3.17	16.66
San Carlos City	1.16	21.00
San Fabian	6.66	3.00
Sual	10.00	14.00
Total	615.02	301.12

Under the present leadership of Gov. Amado Espino, Jr., the province has continued building on past achievements in this area and has strengthened the program. Mangrove reforestation is a major component of the CRM program, and strategies in implementing this program to a successful state are borne on several elements namely: (1) mangrove seedling production, (2) mangrove reforestation, and (3) IEC campaigns, monitoring and linking.

The mangrove seedling production was created in support to the province's Mangrove Reforestation Project. It is a 2,000 m² mangrove nursery located at Arnedo, Bolinao (**Figure 6**). It was established in 2008 in partnership with the Sagip Lingayen Gulf Project (SLGP). With these mangrove nurseries, the Provincial Government aims to continuously produce and provide the seedlings required by the province's reforestation program, as well as continually aid in providing orientations on the importance of mangrove in environmental protection and marine ecology. Presently, the nursery has 26 units of hardening/seedlings beds, 1 unit potting shed, and a concrete water tank for storage of brackish water used in watering the mangrove seedlings. It is now a source of mangrove seedlings to sustain mangrove tree planting activities in the province. From 2008 to 2013, the provincial nursery was able to produce a total of about 451,070 multi-species mangrove seedlings. **Appendix E** provides a breakdown of the mangrove seedling production per year.

Threats and stressors of mangrove forests are typically manmade, particularly the cutting and conversion of mangrove areas for other purposes. Additional threats are natural such as typhoons, storm surge, sedimentation, and mortalities due to diseases and barnacle infestation.

III. MANGROVE PROTECTION AND MANAGEMENT

At present, 17 MPAs are already established in four LGUs found in the northwestern part of Lingayen Gulf (Bolinao, Anda, Bani, and Alaminos City) with a total area of about 361.21 ha excluding the Hundred Islands National Park (HINP) with an area of 1,844 ha. Of the 17 MPAs, 14 are located in coral reefs, one in seagrass beds, and two in mangrove areas, thus classified as "mangrove protected areas" (San Miguel, Bani with an area of 42.25 ha and Pilar, Bolinao with an area of 10.0 ha). All of these MPAs are primarily managed by local POs with support from the municipal, provincial and national government as well as private institutions.

Coastal Resource Management as implemented in the province has had a long history. It has always been considered a core and flagship program of provincial leaderships. This is because the province has always associated itself with beaches, seafood and the seascape.



Figure 6: Provincial Mangrove Nursery in Arnedo, Bolinao.

Mangrove reforestation includes activities such as planting of mangroves in new areas, rehabilitation of existing areas, and replanting in historical mangrove areas that have been severely distressed by both natural and manmade calamities. The several decades of effort on this front have been showing positive signs of improvement. The disastrous deforestation of our mangrove resources have been reversed and, just as importantly, have also made significant inroads in re-establishing this very important ecosystem.



IEC campaigns, Monitoring and Linkaging are very important support systems to the mangrove reforestation project. These ensure that the importance of the mangrove ecosystem to the environment and to the welfare of the community is established and that the community understands their role in the sustainability of this resource.

Honorable Governor Amado T. Espino, Jr., being the only Governor in Region I deputized by the DENR as the Special Environment and Natural Resources Officer for Pangasinan, has bolstered the Provincial Government's efforts to protect, preserve and enhance the environment for this and future generations.

Mangrove species being propagated in the nursery are *Aegiceras* spp., *Avicennia* spp., *Brugueira cylindrica*, *Brugueira gymnorrhiza*, *Ceriops tagal*, *Heritiera littoralis*, *Lumnitzera racemosa*, *Nypa fruticans*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Rhizophora stylosa*, *Sonneratia alba* and *Xylocarpus moluccensis*.



Figure 7: Mangrove planting activities along the riverbank and coastal area.

Table 14: Mangrove reforestation summary, 2008–2013

Year	Seedlings planted	Area planted	
		Hectare (coastal)	Kilometer (riverbanks)
2008	6,500	1.75	
2009	43,650	7.19	24.46
2010	46,811	10.14	9.04
2011	85,506	8.46	23.50
2012	76,331	11.99	15.95
2013	79,896	11.52	13.8
Total	338,694	51.05	86.75

Mangrove Rehabilitation

- Mangrove Reforestation

Wetlands and riverbanks along the coastal and inland municipalities are the planting sites of mangrove seedlings being propagated in our mangrove nursery (**Fig. 7**). Recipients are active fisherfolk organizations and barangay councils responsible in maintaining the project.

Since the start of the massive mangrove tree planting in 2013, a total of 338,694 seedlings have already been planted to date in 51.05 ha area along the coastal areas and 86.75 km stretch along riverbanks, as shown in **Table 14**.

To attain the sustainability of the reforestation project, the Provincial Government of Pangasinan is presently implementing a multi-sectoral adaptive approach in reforestation. Some of these strategies include the following:

1. Establishing implementation protocol in mangrove reforestation project to attain better survival rate.

Phase I. Pre-Implementation Information, Education and Communication

- a. Identification of mangrove beneficiaries and steward (fisherfolk associations)
- b. Submission of Resolutions/Letter of Intent to the Governor
- c. Project Assessment
 - Consultation dialogue with LGUs and proposed beneficiaries
 - Organization profiling
 - Project site validation and assessment
- d. Submission of Assessment Report to the Governor and approval

Phase II. Implementation

- a. Project orientation
 - b. Site preparation - Fencing and installation of nets if needed
 - c. Distribution, hauling and acclimatization of mangrove seedlings
 - d. Planting
 - e. Provision of technical assistance and monitoring
2. Networking to strengthen the implementation of mangrove reforestation projects thru signing of MOA between the Provincial Government of Pangasinan and Department of Environment and Natural Resources and the Bureau of Fisheries and Aquatic Resources.
 3. Organization and Mobilization of Communities.



The Provincial Government greatly considers coastal communities as partners in undertaking environmental management projects like the Mangrove Reforestation Project since they are the stewards of this important habitat. Their involvement can also increase their awareness on the importance of mangroves in the ecosystem. Partner stakeholders in mangrove tree planting activities include civic organizations, LGUs, national government agencies and the academe.

- Information, Education and Communication (IEC)

Information, Education and Communication (IEC) is considered as an important tool in advocating the sustainable management, utilization, and protection of natural resources. It is in this context that the Province in partnership with the Sagip Lingayen Gulf Project (SLGP) embarked in the establishment of two units of Learning Centers: the Mangrove Information Center in Brgy. Arnedo, Bolinao, and the CRM Learning Center in Barangay Libsong, Lingayen. These facilities serve as venues in promoting advocacies on the importance of mangrove resources to the environment thereby ensuring that the community understands their role. These also serve as a major stopover for the study tour of government employees, students, local and foreign tourists, the media, and the academe.

On the other hand, a more formal and ordered system in disseminating CRM information is now implemented in 14 elementary schools located in Anda, Bani, Alaminos City and Bolinao; and eight secondary schools located in Lingayen, Anda, Bani, Alaminos City and Bolinao. This is a scheme initiated by the SLGP through the localization and integration of Coastal Resource Education in the basic curriculum of the DepEd, particularly in the Science subject of Grade VI and First Year High School students.

The importance of mangroves and other environment-related advocacies, which include climate change orientation, are also disseminated to students in the elementary and secondary schools along the coastal LGUs. Students are being oriented on the importance of conserving and protecting our environment as well as measures in addressing various problems as part of the outreach program. Information dissemination on Environmental Protection through exhibits has been regularly conducted at the Capitol Beachfront during Special Events like *Pistay Dayat* and environment-related celebrations.

Development, reproduction and distribution of IEC materials are being done to disseminate some measures in protecting and conserving our environment like the brochure *Bakawan ng Pangasinan*. Audio-visual presentations on the management of coastal and inland resources are also being produced by the Provincial Information Office and these are shown to visitors coming to the province.

The Provincial Government likewise considers the giving of recognitions and incentives in the form of contests as another approach in IEC for coastal and non-coastal LGUs. The annual search for the cleanest coastal municipality/city dubbed as *Dayat ko, Aroen ko* Program was carried out for almost ten years already. It was administered by a search committee chaired by the PENRO with the DILG, PSU, PNP, NGO and the Provincial Government as members employing a set of criteria prepared by the committee. This was an all out campaign of the Provincial Government to protect, preserve and conserve Pangasinan seas and coastal environs. It is a year-round activity of the province and culminates in an awarding ceremony held during the province's *Pista'y Dayat* festivities. The province allocates a yearly budget for this undertaking; however; national government agencies and capable private companies in the province were also solicited as sponsors for prizes to the winning LGUs. Prizes given are in the form of appropriate projects for implementation in the locality.

In 2009, the province realized that the strategy that brought so much success to the *Dayat ko, Aroen ko* Program could be refocused to address the environmental problems besetting its riverways. The program was dubbed the *Ilog ko bilayen tan aroen ko* Program, which is a contest similar to what was undertaken in the coastal LGUs. It is an annual search for the cleanest river/river bank. Since 2009, this program has become a mainstay in the environmental efforts of the province. It is also hailed as a best practice program garnering awards and citations at the regional level. This search does not only focus on monitoring LGUs' performances in the utilization, protection and conservation of river ecosystems. It also strengthens partnership through the provision of incentives/recognitions as a way of motivating them to do their responsibilities in managing this resource.

An inter-agency evaluation committee composed of the DENR, BFAR, PSU, DILG, DPWH, NIA, PGP and an NGO has been organized. They conducted field evaluation





and validation using the prescribed search criteria. It has two categories: Municipal and Barangay for Inland and Coastal River. The barangay level was further classified into two categories namely: (1) Barangay Sub-Category A, concerning LGUs benefited with the river clean-up conducted by the Task Force Kalikasan of the Provincial Government, and (2) Barangay Sub-Category B, which includes LGUs that have not been reached yet by the river clean-up project. Prizes given to the winning LGUs are in the form of projects and cash.

Monitoring and Evaluation

Generally, agencies that are in charge of reforestation/afforestation projects in the province directly monitor the status of their respective projects. The Provincial Agriculture Office monitors projects through ocular inspection. In 2012, it was revealed that seedlings planted along river banks have greater survival with a rough estimate of 53% compared to those planted along intertidal flats with only 45% survival rate. Factors such as wave action, barnacle infestation, algal blooms that entangle newly planted seedlings, and sedimentation affected the survival of plantings along intertidal flats. Rapid currents, sedimentation and flooding were observed to cause mortalities among seedlings planted in riverbanks. The municipality of Bani adapted a more scientific monitoring tool for determining the status of their mangrove plantation.

Impacts of Mangrove Rehabilitation

Some valuable information gathered from fisherfolks in Binmaley, Lingayen, Dagupan City, Bolinao, Anda, Bani, Mangaldan, San Fabian and Alaminos City revealed that fish/seashell catch in areas near mangrove sites that were reforested has increased—an indication that the habitat has been enhanced ecologically, resulting in higher income for fishers in the locality. The continuous implementation of this reforestation project would definitely rehabilitate, albeit on a staggered basis, the mangrove habitat as breeding and nursery grounds of fishes.

The exemplary performance of the province in the area of coastal resource management where mangrove development is a major component has been recognized by the Regional Development Council as the *Most Outstanding LGU Coastal Resource Management Program Implementer – Provincial Government Category* from 2008 to 2010. Because of this, the province was elevated to the Hall of Fame for CRM Implementers in 2011. In recognition of the province's laudable efforts, DENR has provided funds in the

amount of P287,500 as an incentive for the rehabilitation of about 25 ha of mangroves. The municipalities of Infanta and Dasol were identified as planting sites in 2011.

In 2012, the Provincial Government bagged the *Likas Yaman Awards* for Environmental Excellence as the *Best LGU Initiated Environment – Project Category*, which was organized by the DENR. Recently, the Bureau of Fisheries and Aquatic Resources (BFAR) also recognized this noble project of the province, which was awarded with the *Gawad Pagkilala Award* during the Fish Conservation week celebration in October 2014.

IV. SUMMARY AND RECOMMENDATIONS

With the available potential areas for mangrove tree planting estimated at 301.12 ha along the coastal areas and along riverbanks, the province shall carry on this project by intensifying its mangrove seedling propagation. This hopes to obtain greater impact in conserving the ecosystem and in protecting the communities residing in the coastal areas from intense typhoons and storm surge. Support from barangay councils and community-based organizations in the protection and maintenance of this project shall be further strengthened.

Eight units of fishponds, acquired by the government through the Fishpond Lease Agreement, has been recently terminated by the BFAR and have been included in the targeted total area of 33.39 ha mangrove reforestations in Alaminos City, Sual and Anda.

Climate change mitigation and adaptation measures are priority concern of the government where mangrove reforestation is a major component. Thus BFAR, DENR, LGUs, NGOs and other environmental partners must prepare a more comprehensive plan, particularly on the role of mangroves. In this manner, a more unified approach shall be obtained that would eventually address problems on planting sites, budget, monitoring, and functions/responsibilities of each agency involved with the DENR as the probable lead agency.

V. REFERENCES

- Municipal Government of Bani Pangasinan. (n.d.) Municipal or City Profile. Philippines.
- Provincial Government. (n.d.) Pangasinan Facts and Figures. Philippines.