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## I. INTRODUCTION

The province of Bulacan has one city and four municipalities located along the coast, which together comprise 15 coastal barangays. The coastal barangays are the following: barangays Pamarawan, Masile, Caliligawan, Babatnin and Namayan for Malolos City; barangays Puga, Tibaguin, San Roque and San Pascual for the municipality of Hagonoy; barangays Masukol and Sta. Cruz for the municipality of Paombong; barangays Taliptip and San Nicolas for the municipality of Bulakan; and barangays Binuangan and Salambao for the municipality of Obando.

Based on the total land area of these barangays, the province's coastal area measures about 12,189.8 ha with a shoreline length of 43 km (GIS-PPDO). Out of a total population of 2,924,433 in the province, 43,005 live in the coastal barangays (SEP 2010).

The primary sources of income of the coastal residents are capture fishing, fish processing, fish vending, fish culture and "fish worker."

Increase in population has been identified as one of the social problems encountered by coastal residents. Based on the historical population derived from the actual census conducted in 1995–2010, there is a significant increase from 10% in 2000, 23% in 2007 and 26% in 2010. The poverty incidence of Bulacan also increased from 6.9% in 2009 to 7.3% in 2012. These indicate an increase in population of the vulnerable or marginalized sector, which most farmers and fisherfolk are part of.

Another social problem is the limited livelihood opportunity of coastal residents. Most of them are geographically confined within their areas where available livelihood solely comes from fishing and fishery-related activities such as fish processing, fish vending and labor

to fishpond operation. Consequently, they also have limited access to education—with primary education being the highest level—and to basic health services (e.g. vaccination) at barangay health centers. Fishing/passenger boats are the only means of transportation available to reach the mainland for their children to attend school or bring patients to the hospital.

### *Importance of Mangroves*

The province identified four main ecological and socio-economic significance of mangroves in the area. First, it is a source of food. Second, it provides a good addition as a site for eco-tourism. Third, it provides ecological services for the community such as shoreline protection and erosion control. And lastly, it is a source of livelihood for the coastal residents. People earn income from products sourced from mangroves such as nipa hut materials, fish, prawns, crabs, shellfish, clams and nipa vinegar and syrup.

## II. STATUS OF MANGROVES

Bulacan has a total of 585.14 ha of mangroves. **Table 1** shows the old stand, secondary growth and new plantations of mangroves in the province. The mangrove planting program started in 2008.

The true mangrove species planted in Bulacan are the *Avicennia lanata*, *Avicennia marina*, *Avicennia officinalis*, *Bruguiera cylindrica*, *Bruguiera gymnorrhiza*, *Rhizophora*

**Table 1:** State of mangroves in Bulacan (in hectares)

Old Stand	Secondary Growth	Plantation
72.43	318.71	194.0





*apiculata*, *Rhizophora mucronata*, *Rhizophora stylosa*, and *Sonneratia alba* (CENRO-Tabang, Guiguinto Bulacan, 2010).

The minor mangrove species and associate plants are *Acacia fernasiana*, *Acanthus sp.*, *Achostichum aureum*, *Caesalpinia nuga*, *Dolichandrone spathacea*, *Exoecaria agallocha*, *Ipomea pes-caprae*, *Morinda citifolia*, *Nypa fruticans*, *Sesuvium ilicifolius*, *Terminalia catappa*, *Thespecia populnea*, and *Sonneratia caseolaris*. (CENRO-Tabang 2010).

#### *Degradation of Mangrove Forests*

The decline of mangrove stands in the province are due to the (1) conversion of mangrove areas to fishponds, (2) reclamation for resettlement of coastal communities, (3) cutting of mangroves for firewood and housing materials, and (4) flooding, soil erosion and sedimentation.

The decline of mangroves exposes the community to the dangers of sea level rise, tidal flooding, storm surge and increasing siltation. This also decreases the habitat for feeding and breeding grounds of many fishes, which affects its survival and reproduction. Thus, fisherfolks experience a decrease in fish catch.

To address the decline of mangroves, the following activities are being carried out in the province: the implementation of Integrated Coastal Management Program with PEMSEA, the implementation of Municipal Fisheries Ordinance (MFO), mangrove-planting led by the BFAR and initiated by the LGU, tree planting in upland areas to prevent further soil erosion, and the dredging of rivers and tributaries.

#### *Threats to Mangrove Forests*

Bulacan experiences a number of threats to its existing mangrove stands. One set of threat is from household and industrial pollution. The lack of proper household waste disposal system forces residents to throw household waste into the nearest body of water. Together with industrial pollution from manufacturing industries, these pollutants contribute to the degradation of the coastal environment and increase mortality of aquatic organisms.

Another set of threats is from aquaculture practices. First is the unregulated fishpond operation, which caused siltation, and narrowing and shallowing of rivers. Second is the unregulated use of commercial feeds by fishpond operators. This shortens fish growout period but increases the effluents from ponds, which contributes to the water pollution in the area.

Lastly, the direct threats to the decline of the mangroves in Bulacan is the unregulated cutting of mangroves for firewood, housing materials and other products.

### III. MANGROVE PROTECTION AND MANAGEMENT

As a means to protect and rehabilitate mangrove forests in the province, various efforts have been implemented. First is the establishment of a 24.64 ha protected mangrove area known as the Bulakan Mangrove Eco-Park in Sitio Wawang Capiz, Brgy. Taliptip, Bulacan .

The Municipal Fisheries Ordinance of coastal towns serves as a protective policy measure. This is supplemented by other programs such as the Fisheries Resource Management for Improved and Sustainable Harvest (FISH), Philippine National Aquasilviculture Program (PNAP), Save Manila Bay Project and the DENR-Mangrove Planting Project.

The managers of the existing mangrove stands are the local government units (LGUs), Fisheries & Aquatic Resource Management Councils (FARMCs), Fisherfolk Organizations (FOs) and Non- Government Organizations (NGOs).

#### *Monitoring and Evaluation*

The mangrove species *Rhizophora apiculata*, *Rhizophora mucronata* and *Rhizophora stylosa* are planted in the area and have a survival rate of 40–50%.

#### *Impacts of Mangrove Rehabilitation*

Continuous efforts in rehabilitating mangrove areas have heightened the awareness and elicited the support of the coastal community. The community has realized that in addition to the valuable timber products, mangroves provide protection to coastlines by breaking the waves during storms, and serve as sources of food and nursery areas for many aquatic species.

### IV. SUMMARY AND RECOMMENDATIONS

There is a need to to raise environmental awareness of the community, to obtain their support in coastal resource protection and management and empower them. The awareness of the stakeholders on the value of mangroves, the effects of its loss on the coastal environment, and on the emerging environmental issues will enhance their appreciation on the need for management interventions for mangroves. Other steps that need to be undertaken are the promotion, establishment and management of mangrove nurseries, and mangrove-friendly aquaculture (MFA) or aquasilviculture.





## V. REFERENCES

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