



Regional Flyway Initiative · Site Study

May 2026

RFI Priority Site · North Manila Bay (Bataan)

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General Site Information

Country	Philippines		
RFI Site Name	North Manila Bay (Bataan)	ID125	
City/ Municipality, Province, Region	Balanga City, Bataan Province (Central Luzon Region)		
Geographical coordinates	14.69 N, 120.57 E	Area (has)	35 has
Key species	Far Eastern Curlew <i>Numenius madagascariensis</i> (EN), Red-necked Stint <i>Calidris ruficollis</i> (NT), Grey-tailed Tattler <i>Tringa brevipes</i> (NT), Spoon-billed Sandpiper <i>Calidris pygmaeus</i> (CR), milkfish <i>Chanos chanos</i> , and several sardines		
Key habitats (biomes)	Mangrove forest, intertidal flats, disused and active fishponds		
Key ecosystem services	Provisioning services (fisheries), cultural services (eco-tourism)		
Key drivers of change	Coastal mudflat accretion, marine pollution		
Conservation status (mark all that applies)	<input type="checkbox"/>	Protected Area	<input type="checkbox"/>
	<input type="checkbox"/>	Ramsar Site	<input type="checkbox"/>
IBA/ KBA name (and number) and other designations	North Manila Bay		
Management Stakeholders	Balanga City Government, Bataan Provincial Government		
With management plan?	Yes, under the Manila Bay Sustainable Development Master Plan		
Project concept themes	Nature-based tourism; sustainable livelihoods based on small-scale fishers (SSF) and artisanal food industries, biodiversity monitoring		
Length of project	5 years		
Sector/s	Fisheries (small-scale fishers)		
No. of potential beneficiaries	Up to 104,173 people		
Indigenous Peoples	<input type="checkbox"/>	No	<input type="checkbox"/>
Anticipated Implementation Risks	Wildlife disturbance during infrastructure development and wetland-based tourism operations		
Estimated Project Budget (US\$)	3,850,000		
Potential Source/s of Financing	<input type="checkbox"/>	Loan (to be identified)	<input type="checkbox"/>
	<input type="checkbox"/>	Grant (to be identified)	<input type="checkbox"/>

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Abbreviations

ADB	Asian Development Bank
AWC	Asian Waterbird Census
CSR	Conservation Status Review
DMC	Developing Member Country
EAAFP	East Asian-Australasian Flyway Partnership
ECA	Ecologically Critical Area
IBA	Important Bird and Biodiversity Area
IUCN	International Union for the Conservation of Nature
LGU	Local Government Unit
NGO	Non-governmental Organisation
OECM	Other effective area-based conservation measures
RFI	Regional Flyway Initiative
SLR	Sea Level Rise
TESSA	Toolkit for Ecosystem Services Assessment
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USAID	United States Agency for International Development
USD	United States Dollars

Executive Summary

Manila Bay covers more than 1,900 km² and encloses a low-lying coastline of around 196 km spanning the province of Cavite in the south to the provinces of Bataan, Pampanga, and Bulacan in the north. Manila Bay is rich in intertidal wetlands and contains significant intertidal areas with patches of mudflats, mangroves, and *nipa* swamps, and supports the largest congregations of migratory waterbirds in the Philippines. While the largest foreshore areas of wetlands are located in Bulacan Province (6,425 ha), there are also sizeable areas in Bataan (4,962 ha), part of which is protected within the Balanga Wetland and Nature Park. Balanga is administratively part of the Balanga-Pilar Wetlands that spans the Barangays of Sibacan, Puerto Rivas, Tortugas and Balut, Pilar Municipality. Balanga Wetland and Nature Park were declared as a community-based ecotourism zone in 2019. Despite its compact size, several globally threatened and near-threatened species have been reported here including Far Eastern Curlew *Numenius madagascariensis* (EN), Red-necked Stint *Calidris ruficollis* (NT) and Grey-tailed Tattler *Tringa brevipes* (NT) whilst field surveys recorded the first Spoon-billed Sandpiper *Calidris pygmaeus* (CR) in the Philippines. The coastal waters off Balanga support fish species of commercial importance, including milkfish *Chanos chanos* and several sardines.

Presently, wetland ecosystems in Manila Bay are highly fragmented, degraded, and are under significant anthropogenic pressure from existing and proposed reclamation, solid waste pollution, and coastal development with the expansion of Manila's and major infrastructural expansion, including a new airport. Tidal foreshore areas, riverine habitats (especially in the Pampanga River Estuary), and the remaining patches of mangroves continue to be converted to aquaculture and polyculture, which is evident from the extensive areas of fishponds, fish pens, and shellfish pens. Yet wetlands in the Bay continue to provide valuable provisioning, regulating and cultural ecosystem services used by over a million households. Regulating services, for instance flood hazard, storm hazard, and erosion regulation, are crucial for communities living in the coastal zone, and continually exposed to extreme weather events such as typhoons. Additionally, the wetlands of Bataan (as defined in this assessment) ranks well above both the national RFI and overall country averages in terms of total annual benefits per ha of mangroves (28,002 vs. 14,895 or 11,160 USD/ha). The coastal wetlands in Bataan, in the Balanga Wetlands, currently supports limited infrastructure targeted at domestic tourists but there is considerable scope for (1) strengthened management, and (2) ecotourism development, through the creation of new infrastructure managed by local stakeholders, including access boardwalks, observation towers, and shelters. There is a window of opportunity for Balanga Wetland and Nature Park as one of few protected and managed wetland sites in the wider Manila Bay region to be showcased as a model OECM given its importance to biodiversity, while paving the way in the longer term to be designated as a protected area.

Small-scale restoration of mangrove forests has been carried out along the coast of Bataan (including around Balanga) while the natural regeneration of mangroves against an accreting coastline (emergence of mudflats in and around Balanga) means that mangrove forest cover has increased in Bataan. However, there is scope for further restoration at disused fishponds along the Bataan coastline, this needs to be underpinned by further scoping studies to identify the best areas for successful restoration.

1. Background of the Regional Flyway Initiative

In July 2021, the Asian Development Bank made a commitment to develop a long-term Regional Flyway Initiative (RFI) in the East-Asian Australasian Flyway (EAAF) (Sovereign Project 55056-001) to protect and restore priority wetland ecosystems and the associated ecosystem services they provide in the EAAF, the most threatened migratory bird flyway globally. The Initiative is slated for implementation in nine ADB developing member countries (DMCs) in East, South and Southeast Asia: Mongolia, People's Republic of China (PRC), Bangladesh, Viet Nam, Cambodia, Philippines, Thailand, Malaysia and Indonesia. In 2023, the geographic scope of the RFI was further extended to two DMCs in Southeast Asia and the Pacific respectively, Lao PDR and Papua New Guinea.

The primary aim of the RFI is to enhance and expand the existing efforts in conserving and managing wetlands of the highest priority for migratory birds within the EAAF through innovative loan and grant financing, and at scale. Consultations and analyses over the development period help identify key interventions to strengthen the management of wetlands, enabling the implementation of nature-based solutions while strengthening biodiversity protection. Over time, the RFI seeks to leverage collaborative opportunities by developing partnerships among important stakeholders including national governments, civil society organizations, communities, regional organizations like the East Asian-Australasian Flyway Partnership (EAAFP), development agencies, the private sector, and other relevant entities.

Through the RFI Technical Assistance (TA) implemented over the RFI's development phase from 2021 to 2024, BirdLife International takes the lead in providing and coordinating technical support for development of the RFI. This is carried out in collaboration with the EAAFP and a consortium of international non-governmental organizations including Wetlands International and the Paulson Institute, as well as two universities, namely the University of Southampton, UK and the National University of Singapore. Over the development phase, the TA team undertook a site selection analysis to identify priority wetland sites in all 10 countries based on recent bird data benchmarked against internationally accepted criteria under the Convention on Wetlands of International Importance (or Ramsar Convention), EAAFP Flyway Network Sites and Important Bird and Biodiversity Areas (IBAs). The team further developed ecosystem services profiles for prioritised wetlands using a multi-pronged approach used the TESSA ecosystem services assessment tool, and data-driven modelling of water-based ecosystem services and stored carbon.

In the Philippines, a total of 20 wetland sites, including many Asian Waterbird Census count sites, were initially assessed through data analysis and expert consultation, of which twelve (12) were defined and identified to be RFI priority sites on the basis that they support more than 1% the flyway population of at least one EAAF migratory waterbird species. The majority of the RFI wetlands prioritised for the Philippines are coastal wetlands, a consequence of the country's long coastline, with the largest cluster of priority sites being North Manila Bay, which constitutes three sites across the provincial jurisdictions of Bataan, Pampanga and Bulacan. 28 EAAF species exceeded the 1% threshold at the site level, with species such as Chinese Crested Tern, Chinese Egret and the Tufted Duck.

2. Site profile of North Manila Bay (Bataan)

Location: North Manila Bay (Bataan) includes Balanga Wetland and Nature Park, which is part of the Balanga-Pilar Wetlands in Barangays Sibacan, Puerto Rivas, Tortugas in the City of Balanga, and Barangay Balut in Pilar Municipality. It is located in Bataan Province, in the western part of Manila Bay. The RFI site here is relatively small, and although it supports large numbers of migratory waterbirds, there are mudflats and fishponds along the shoreline and rivers elsewhere in Bataan Province that could potentially be added to increase the size and importance of the RFI site.

Area: The North Manila Bay (Bataan) RFI site has an area of 35 ha

Altitude: 0-3 m asl.

Geographical coordinates: 14.69 N, 120.57 E

Description of site: Manila Bay covers more than 1,900 km² and has a coastline of around 196 km from Cavite City to Bataan Province, including the coastline in Bataan Province. It is a large semi-enclosed bay fringed by shallow intertidal areas with relicts of mudflats, mangroves, and nipa swamps. The status and distribution of remaining habitats in Manila Bay was assessed and mapped during a series of rapid surveys in 2016-2018 (Jensen 2018). This found that the largest foreshore areas are located in Bulacan Province (6,425 ha), followed by Bataan (4,962 ha) and Pampanga (3,562 ha), although large areas of this habitat have been converted to fishponds. Mudflat is the single most important habitat for a large diversity of migratory waterbirds, notably shorebirds, but its area has been greatly reduced in Manila Bay, although important areas of semi-permanent mudflat are found scattered in drained fishponds and salt pans. Mangroves have also been greatly reduced in extent, with remaining areas in Bataan (37.4%), Pampanga (15.3%) and Bulacan (11.1%). Fragmented areas of seagrass survive, mostly offshore in Bataan and Bulacan provinces, a habitat that is the main growth areas for a large number of fish species vital for the local economy.

Site administration, management and land tenure: Balanga Wetland and Nature Park, located in Barangay Tortugas, City of Balanga, Province of Bataan, was declared in August 2019 as a community-based ecotourism zone¹. Viewing decks and other facilities have been built to enable visitors to encounter the migratory waterbirds², and the Department of Tourism recognises the park as one of the best bird-watching sites in the Philippines³.

Manila Bay is recognised as an Important Bird and Biodiversity Area (Mallari et al. (2001) and a Key Biodiversity Area (Conservation International 2006, IUCN 2014) because it supports internationally important populations of migratory waterbirds, including several globally threatened species.

There is also scope for the designation of Balanga as a formal protected area, and recognition as a Ramsar City in 2025⁴.

¹ <https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/2/92727>

² <https://bataan.gov.ph/behold-bataan/city-of-balanga-wetland-and-nature-park/>

³ <https://beholdbataan.ph/city-of-balanga-wetland-nature-park/>

⁴ <https://www.ramsar.org/our-work/activities/wetland-city-accreditation>

Social and economic values: Manila Bay is very important for its fisheries production which supports the large urban population around the periphery of the Bay, with important species such as Milkfish *Chanos chanos*, tilapia (various species), shrimp and crab. There are high concentrations of various fish trapping devices, and extensive areas with fishpens in the open sea area, as well as aquaculture along the shorelines (Mialhe et al. 2015, BirdLife International 2017a). Aquaculture is estimated to account for nearly two thirds of the total economic value of Manila Bay (PEAMSEA, 2006).

The wetland ecosystems in Manila Bay are under significant anthropogenic pressure. Tidal foreshore areas, riverine habitats (especially in the Pampanga River Estuary), and the remaining patches of mangroves continue to be converted to aquaculture (UNEP-TEEB 2017) and polyculture (Mialhe et al. 2015) which is evident from the extensive areas of fishponds, fish pens, and shellfish pens throughout the bay. Other important issues affecting the wetlands include large-scale development projects and sea-level rise.

The Manila Bay Sustainable Development Master Plan (MBSDMP) was formulated through a bilateral project between the Governments of the Philippines and the Netherlands in 2019 to provide an overarching framework for development across all of Manila Bay. There are, however, major gaps in the development of the MBSDMP, including in the protection of critical habitats and the provisions for the management of biodiversity and ecosystems (Lopez 2019).

A private-public partnership covering an area of about 18,000 ha in Manila Bay is being assessed for implementation by the Department of Public Works and Highways (DPWH 2016, PPP Center 2016). It is named the Manila Bay Integrated Flood Control and Coastal Defence and Expressway Project, and it aims to reclaim coastal areas from Navotas City in Metro Manila to Bataan Province. The design includes the creation of five artificial islands in the habitats of commercially important fish species and areas where migratory waterbirds congregate (Daily Economic 2014, Mooyart et al. 2015, DA-BFAR 2015b, and this study).



Figure 1 Map of Balanga Wetland Park, a key component of North Manila Bay's coastal wetlands in Bataan, in Barangay Tortugas (Map: Ding Li Yong).

3. Biodiversity value of North Manila Bay (Bataan)

3.1 Key habitats

Manila Bay is a large semi-enclosed bay fringed by shallow intertidal areas with relicts of mudflats, mangroves, and nipa swamps. A series of rapid surveys in 2016-2018 (Jensen 2018) showed that the largest foreshore areas are located in Bulacan Province (6,425 ha), followed by Bataan (4,962 ha) and Pampanga (3,562 ha), although large areas of this habitat have been converted to fishponds. Mudflat is the most critical habitat for a large diversity of migratory waterbirds, notably shorebirds, but its area has been greatly reduced in Manila Bay, although important areas of semi-permanent mudflat are found scattered in drained fishponds and saltpans.

Mangroves have also been greatly reduced in extent all across Manila Bay, with remaining areas in Bataan (37.4% of the original extent), Pampanga (15.3%) and Bulacan (11.1%). Fragmented areas of seagrass survive, mostly offshore in Bataan and Bulacan provinces, a habitat that is the main breeding areas for a large number of fish species vital for the local economy.

3.2 Importance of North Manila Bay (Bataan) to migratory waterbird species

The coastal wetlands of North Manila Bay form the most important landscapes for migratory shorebirds in the Philippines. Jensen (2018) estimated that the Bataan coastline (2016-2018), supported easily 21-32,000 waterbirds in a season, including high concentrations of four egret species, based on peak counts. Waterbird count data from the 2019, 2020 and 2021 Asian Waterbird Census was used in the RFI priority sites analysis for North Manila Bay (Bataan). The counts from these three years were averaged and then compared to the CSR1 1% population estimates to calculate a score for each species. Two species were found to exceed the 1% population estimates (see Table 1), and the scores for these species were summed to produce the overall site score for North Manila Bay (Bataan).

Table 1 List of migratory species (based on the EAAFP list of species) with globally significant congregations in the coastal wetlands of Bataan.

Scientific name	IUCN	Average count	CSR1	CSR1 score
Kentish Plover <i>Charadrius alexandrinus</i>	LC	1,020	700	1.5
Great White Egret <i>Ardea alba</i>	LC	1,094	1,000	1.1

North Manila Bay (Bataan) supports important populations of several globally threatened and near-threatened species, including Far Eastern Curlew *Numenius madagascariensis* (EN), Red-necked Stint

Calidris ruficollis (NT) and Grey-tailed Tattler *Tringa brevipes* (NT) (AWC data). In 2023, field surveys carried out in the mudflats of Balanga Wetlands Park recorded the first Spoon-billed Sandpiper *Calidris pygmaeus* (Hutchinson et al. 2024) in the Philippines, followed by one of very few records of the Chinese Crested Tern *Thalasseus bernsteini* in Luzon (only other records are in Pangasinan) therefore continuing to demonstrate the high biodiversity value of this sector of the Manila Bay coastline.

3.3 Other notable biodiversity

Apart from migratory waterbirds, the coastal waters of Balanga support fish species of commercial importance, including milkfish *Chanos chanos* and several sardines.

4. Ecosystem services

4.1. Ecosystem services provided by North Manila Bay (Bataan)

The North Manila Bay (Bataan) site provides valuable provisioning, regulating and cultural ecosystem services (Figure 2), which benefit both adjacent and distant communities (Table 2). The results from the RFI workshop⁵ highlight the top ecosystem services provided by the site, emphasising their essential and non-substitutable nature (Table 2). Regulating services, particularly flood hazard, storm hazard, and erosion regulation, are crucial for the area benefitting adjacent and distant communities. Cultural ecosystem services include cultural aspects such as nature-based recreation and tourism, as well as knowledge systems and education. Both cultural services benefit adjacent and distant communities.

⁵ Asian Development Bank. (2023, June 27–30). *Philippines: Wetland Ecosystem Services Workshop* [Workshop]. Asian Development Bank Headquarters, Manila, Philippines. <https://events.development.asia/learning-events/philippines-wetland-ecosystem-services-workshop>

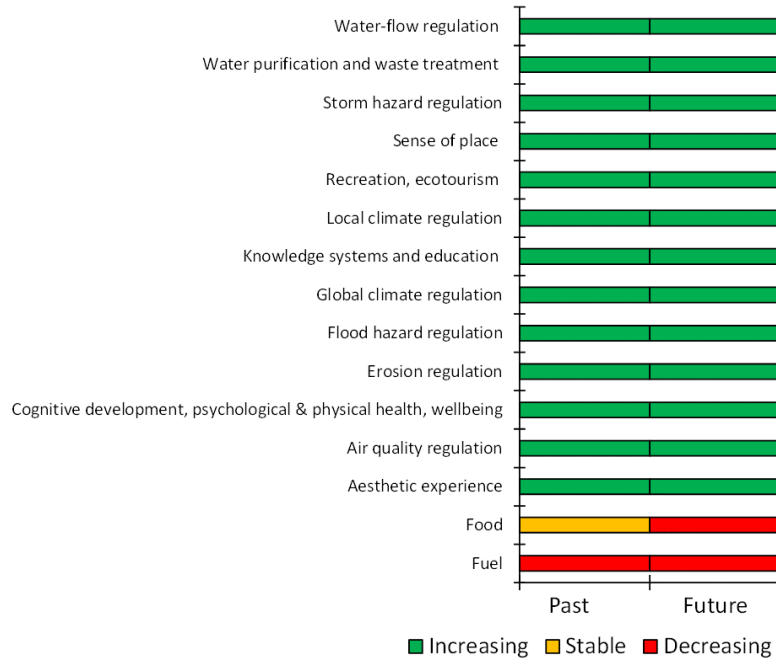


Figure 2 List of ecosystem services provided by North Manila Bay (Bataan), as identified through stakeholder consultation at the Regional Flyway Initiative workshop.

Table 2 List of top ecosystem services provided by North Manila Bay (Bataan).

Ecosystem services	Essential or non-substitutable	Benefits to communities			Change	
		Within the site	Adjacent to the site	Distant to the site	Past	Future
<i>Regulating services</i>						
Flood hazard regulation	Yes		✓	✓	Increase	Increase
Storm hazard regulation	Yes		✓	✓	Increase	Increase
Erosion regulation	Yes		✓	✓	Increase	Increase
<i>Cultural services</i>						
Recreation, ecotourism	Yes		✓	✓	Increase	Increase
Knowledge systems and education	Yes		✓	✓	Increase	Increase

4.2. Global climate regulating services

Based on systematic reviews (Chen and Lee, 2022; Stankovic et al., 2023), the amount of carbon stored in North Manila Bay (Bataan) is estimated to range from 2,420 to 18,000 tonnes, while the annual carbon sequestration rate is estimated to be between 20 and 39 tonnes.

4.3. Coastal protection services

The coastal protection services provided by North Manila Bay (Bataan) were assessed using both biophysical indices and monetary values (see Tables A1 and A2, and Annex 1 for details). Unfortunately, Bataan cannot be compared to the average risk levels of either the nine RFI coastal sites or of all other coastal areas in the Philippines because no biophysical data were available for this site due to its relatively small size (Table A3 in Annex 1).

In monetary terms (Table A4 in Annex 1), Bataan is well below the average of all RFI coastal sites in the Philippines regarding both total annual benefits (1.2 million vs. 16.4 million USD) and total benefits against 100-year return period storms (0.2 vs. 2.4 million USD) due to its small area. However, Bataan ranks well above both the national RFI and overall country averages in terms of total annual benefits per ha of mangroves (28,002 vs. 14,895 or 11,160 USD/ha).

5. Drivers of change and their potential impacts on North Manila Bay (Bataan)

5.1. Current drivers of change and their level of impact

Stakeholders in the RFI workshop⁶ identified 14 drivers of change impacting North Manila Bay (Bataan). These key drivers and their corresponding levels of impact on the wetlands of Bataan more broadly is diverse and include household sewage and urban wastewater from outside the wetland, which introduces pollutants and degrades water quality. Increased fragmentation within the wetland site disrupts habitat continuity, affecting species movement and ecological processes. Additionally, encroachment of mangroves (“invasive plant species”) into intertidal mudflats invasive plant species alter the wetland plant and animal communities, posing further complex bottom-up effects on community organisation.

⁶ Asian Development Bank. (2023, June 27–30). *Philippines: Wetland Ecosystem Services Workshop* [Workshop]. Asian Development Bank Headquarters, Manila, Philippines. <https://events.development.asia/learning-events/philippines-wetland-ecosystem-services-workshop>

Table 3 Drivers of change and their potential impact on the integrity of North Manila Bay (Bataan) based on consultations with stakeholders.

Driver of change	Impact
Household sewage and urban waste water from outside the wetland site	Medium
Increased fragmentation within the wetland site	
Invasive plant species	
Erosion and siltation/deposition	Low
Fishing, killing and harvesting of aquatic resources	
Garbage and solid waste	
Isolation from other natural habitats	
Logging and timber harvesting	
Marine and freshwater aquaculture	
Other 'edge effects' that degrade the wetland site values	
Recreational activities and tourism	
Research, education and other work-related activities	
Sewage and waste water from wetland site facilities	
Tourism and recreation infrastructure	

5.2. Potential alternative state of North Manila Bay (Bataan) under current drivers of change

Stakeholders at the RFI workshop⁷ defined the most plausible future alternative state (to 2035), and how this will translate to a net change in the cover of different types of wetland habitat types within this site (current habitat cover vs future alternative cover; see Figure 3). The alternative state of the site assumes there will be no changes in the current drivers of change impacting the site, and the current management regime.

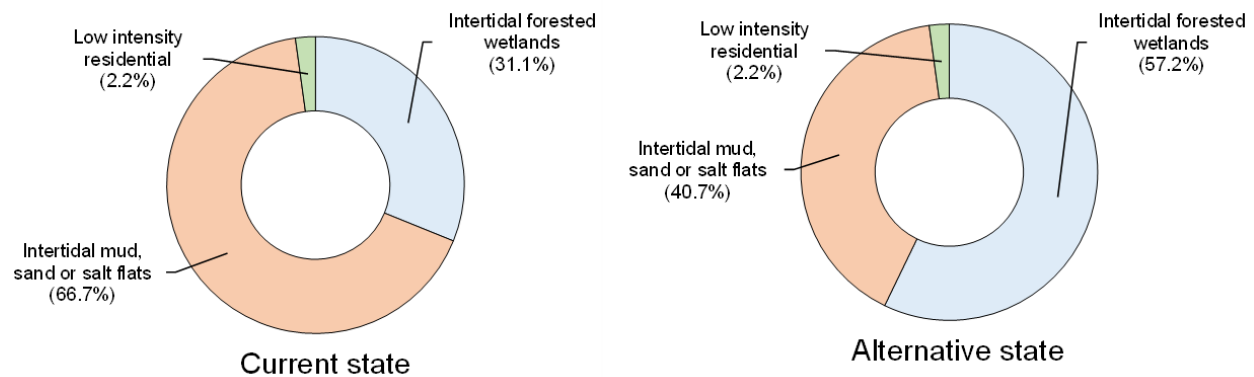


Figure 3 The proportional change in the extent of different habitat types between the current and alternative states of North Manila Bay (Bataan).

⁷ Asian Development Bank. (2023, June 27–30). *Philippines: Wetland Ecosystem Services Workshop* [Workshop]. Asian Development Bank Headquarters, Manila, Philippines. <https://events.development.asia/learning-events/philippines-wetland-ecosystem-services-workshop>

5.3. Expected changes in the ecosystem services of North Manila Bay (Bataan)

Stakeholders in the RFI workshop⁸ documented the future trends in the provision of ecosystem services in North Manila Bay (Bataan), indicating if the ecosystem services provided by this site (to 2035) will increase, decrease, or will remain stable, assuming that the current drivers of change impacting this site will continue in their present condition, with the intervention remains unchanged.

Figure 2 and Table 2 highlight that regulating services, particularly flood hazard, storm hazard, and erosion regulation, have shown an increase in the past, with further increases anticipated in the future. Cultural services, such as recreation and ecotourism, and knowledge systems and education, have increased in the past, and are expected to continue increasing in the future, reinforcing their growing significance to both local and wider populations.

In the alternative state, the encroachment of mangroves (an 83% increase in their extent) will lead to the loss of 39% of intertidal mudflats. This change is expected to increase carbon storage by 5,180 tonnes C and boost annual carbon sequestration (carbon accumulation rate) by an estimated 28 tonnes per year.

A gain of 9.1 ha of mangroves as presented in Table A5 is equivalent to 26% of the total land use for the site, which is expected to result in roughly a 21% increase in coastal protection. This may amount to nearly 255 thousand USD in gained total benefits per year (based on 28,002 USD per hectare of mangroves) and 43 thousand USD in gained total benefits per 100-year return period storm (based on the same 21% increase in coastal protection).

⁸ Asian Development Bank. (2023, June 27–30). *Philippines: Wetland Ecosystem Services Workshop* [Workshop]. Asian Development Bank Headquarters, Manila, Philippines. <https://events.development.asia/learning-events/philippines-wetland-ecosystem-services-workshop>

6. Capacity needs in North Manila Bay (Bataan)

Stakeholder consultations with representatives of the Balanga City Government, and other relevant government offices identified major capacity gaps for local tourism development and the development of businesses for smallholders involved in community-based products. There is also an opportunity for different stakeholder groups to support the establishment of a wider, integrated management plan for the Balanga coastline, to improve governance and guide sustainable development activities.

Table 4 Capacity needs for improved management of North Manila Bay wetlands, identified at the stakeholder level.

Stakeholder	Current Role in wetland management	Future role	Form of capacity development
NGA - DENR	Technical assistance Personnel & support Provide funding for rehabilitation and improvement of infrastructure in the area	Capacity building (completion of requirements and data information, training of stakeholders)	Bird and biodiversity monitoring training (bird ID/counting)
NGA - POT TIEZA			Training workshops
NGA - DA-BFAR			Capacity development for homestays
Local Government Units (PGB, COB, BLGU)	Promotion, management, monitoring of safety and security	Formulation/updating of an integrated management plan for wetland Involvement of other NGAs (DPWH)	Community-based product development
Community(s), visitors, SMEs	direct beneficiaries of fishery and livelihood and recreational activities	will have more active role in wetland activities, advocacy building, training other community members	Business development for local smallholders
Local/international CSOs		Designation of BWNP as a Ramsar site/flyway site	financial and project management support

7. Opportunities for RFI interventions

7.1 Recommended Interventions

The coastline of North Manila Bay is intensively used by local, mostly fishing, communities and there are ongoing major developments along some parts of the Bataan coastline. However, there are still significant stands of coastal mangroves, including remnant patches that fall within a locally protected area (Balanga Wetland Park). The park currently supports some infrastructure targeted at domestic tourists but there is good potential for, (1) site expansion, (2) strengthened management, and continued (3) ecotourism development, and infrastructure in the form of boardwalks. Some existing visitor infrastructure in Balanga (such as access boardwalks, observation towers, and the wetland center managed by local stakeholders) can be further improved. Overall, there is a window of opportunity for Balanga Wetland and Nature Park as one of the few wetland parks in the wider Manila Bay region to be showcased as a model OECM and wetland park, given its importance to biodiversity, and the strong involvement of local communities in the development of the park.

Support for the application under the Ramsar initiatives can also be explored, especially that Balanga City has been recently recognized as a Ramsar wetland city.⁹ Alongside this, there is a need to continue working with DENR and the Provincial Environment and Natural Resources Office (PENRO) to build local capacity in biodiversity monitoring.

Small-scale restoration of mangrove forests has been carried out along the coast of Bataan (including around Balanga), while the natural regeneration of mangroves against an accreting coastline (emergence of mudflats in and around Balanga) means that mangrove forest cover has increased in Bataan. However, there is scope for undertaking further mangrove restoration at disused fishponds along the Bataan coastline, and there is a need for targeted field work studies to identify potential landscapes for long-term restoration.

Consultations with local stakeholders, including during an RFI meeting¹⁰ in Balanga in June 2023, further identified livelihood support for small-scale fishers (SSF) and fish-based product industries (smoked fish or *'tinapa'* and shrimp paste or *'bagoong'*) as a priority for the local government. The Philippines' Agricultural Credit Policy Council (ACPC) survey of 'Small Farmers and Fisherfolk Indebtedness' (SFFIS) revealed that almost 90 percent of respondents consider access to credit to be important (Badiola et al. 2021). Strengthening existing frameworks to support small-scale fishers and local industry for marine-based products, including the establishment and strengthening of cooperatives can ensure the local communities can more equitably benefit from Balanga's provisioning services. This can be achieved

⁹ <https://www.ramsar.org/our-work/activities/wetland-city-accreditation>

¹⁰ Asian Development Bank. (2023, June 27–30). *Philippines: Wetland Ecosystem Services Workshop* [Workshop]. Asian Development Bank Headquarters, Manila, Philippines. <https://events.development.asia/learning-events/philippines-wetland-ecosystem-services-workshop>

through capacity building and the strengthening for fishers and food producers, including through microcredit schemes with favorable interest rates.

Table 5 Key interventions recommended for the sustainable management of the Bataan coastal wetlands, with a focus on Balanga Wetland Park.

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
<i>Component 1. Enhancement of sustainable wetland-based ecotourism</i>					
Develop a coordinated wetland-based tourism plan for Manila Bay	Cohesive and inclusive wetland-based tourism implementation for Manila Bay Wetland-based tourism strategy and plan developed with inputs from key stakeholders	Feasibility studies related to wetland-based tourism completed. One wetland-based tourism plan developed for Manila Bay and disseminated to key stakeholders Number of stakeholders engaged for the development of the wetland -based tourism plan for Manila Bay	200,000.00	1.5 years	Department of Environment and Natural Resources Department of Tourism People Organizations Concerned local government units Conservation organizations (including bird and community-focused NGOs)
Build the capacity of tourism operators on wetland-based tourism	Training and capacity needs for wetland-based tourism assessed Relevant training modules developed and implemented with key stakeholders (e.g., DENR, LGUs, provincial government, DoT, tourism	Training Needs Assessment on wetland-based tourism completed and disseminated to concerned stakeholders Number of training modules developed based on the results of training needs assessment Number of	500,000.00	2 years	Tourism operators

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
	operators) Improved capacity of key stakeholders about wetland-based tourism	capacity-building activities administered with concerned stakeholders Number of tourism operators (target of up to 50) benefitting from the capacity-building activities			
Improve ecotourism infrastructure including viewing platforms, boardwalks, and signages	Stronger (and functional) infrastructure to host tourists, including platforms, boardwalks, and signages	Number of infrastructure established/ improved (i.e., at least 0.5 km boardwalks and hides) constructed	100,000.00	3 years	
<i>Component 2. Wetland habitat protection and management</i>					
Establish a local-led biodiversity and wetland monitoring scheme	Biodiversity and wetlands monitoring framework and mechanism for the site established. Improved local biodiversity and wetland information for better site management. Formation of a locally led conservation monitoring group led by concerned LGUs	Biodiversity and wetlands monitoring framework identified and used for site monitoring Number of monitoring reports on the biodiversity and wetland status generated, especially during the migration season A locally led conservation monitoring group organized	100,000.00	5 years	Department of Environment and Natural Resources Concerned local government units Conservation organizations (including bird and community-focused NGOs) Research institutions

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
Strengthen legal protection status for Balanga wetlands	<p>Boundaries expanded and delineated, in consultation with local communities.</p> <p>Increased legal protection for Balanga wetlands through its designation as a protected area under national and provincial legislation</p> <p>New protected area and model OECM established</p>	Number of facilitated national and international legislation to protect the Balanga wetlands	50,000.00	5 years	
<i>Component 3. Improvement of local livelihoods through microfinance mechanisms</i>					
Develop financing instruments, including through microfinance for fishers, and capacity building.	<p>Improved capacity for financial management of local communities</p> <p>Financial mechanism and management board established to manage disbursement of small loans and grants relevant to site management</p> <p>Better fishing</p>	<p>Financial mechanism and management board established to manage disbursement of small loans and grants.</p> <p>Microfinancing mechanism for small grants/loans to fishers strengthened or established to at least 2 barangays.</p> <p>Number of small loans for fisherfolk disbursed.</p>	100,000.00	5 years	<p>Department of Environment and Natural Resources</p> <p>Department of Agriculture</p> <p>BFAR</p> <p>Existing cooperatives</p> <p>Concerned local government units</p> <p>Conservation organizations</p>

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
	practices documented in the areas covered by the capacity-building activities				
Build institutional capacity for small-scale fisheries through cooperatives.	<p>Improved capacity for sustainable fishing practices of local communities</p> <p>Training and capacity needs for fisherfolk assessed</p> <p>Relevant training modules developed and implemented with key stakeholders (e.g., DENR, concerned LGUs, provincial government, DA)</p> <p>Improved capacity of key stakeholders about sustainable fishing practices</p>	<p>Training Needs Assessment on sustainable fishing practices completed and disseminated to concerned stakeholders</p> <p>Number of training modules developed based on the results of training needs assessment</p> <p>Number of capacity-building activities administered with concerned stakeholders</p> <p>Number of people benefitting from the capacity-building activities, especially those from the vulnerable groups</p>	100,000.00	5 years	
<i>Component 4. Restoration of degraded wetlands</i>					
Expand mangrove restoration plots at	Wetland under sustainable management scaled up; degraded	Area of restored mangrove areas, with a restoration target of up to 20	100,000.00	5 years	DENR Provincial Government

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
degraded areas of mangroves	mangrove areas restored and more resilient to coastal action.	ha at identified plots			municipal LGUs local communities Conservation organizations
Total investment for five years			3,850,000		

7.2 Potential Financing

The estimated project cost is USD 3,850,000 for over five years. This project budget supports the improvement of wetland-based tourism, the restoration of degraded areas, strengthening the legal protection for Balanga wetlands, the establishment of financing instruments, and the institutionalization of a biodiversity monitoring system.

If the proposed USD 100,000 investment over five years is allocated to expanding mangrove restoration in North Manila Bay (Bataan), it could support the rehabilitation of up to 20 hectares of degraded mangroves at identified priority sites. With estimated coastal protection benefits of USD 28,002 per hectare annually (see Section 5.3), this intervention could generate approximately USD 560,040 in annual benefits—amounting to over USD 2.8 million over five years. This reflects a benefit–cost ratio of over 28:1, demonstrating the high cost-effectiveness of mangrove restoration in this densely populated and risk-prone coastal zone. In addition to reducing exposure to coastal hazards, the intervention would contribute to long-term wetland sustainability and support the recovery of degraded ecosystems. Leaving these areas unrestored would represent a missed opportunity to regain high-value protection services and strengthen the resilience of the surrounding landscape.

7.3 Proposed Institutional Arrangement

The City Government of Balanga and Barangay Tortugas are expected to be key implementing partner, and potentially with LGUs in the adjacent districts of Limay, Orion and Pilar.

The Provincial Environment and Resources Office (PENRO) for Balanga City has played a major role in promoting wetland conservation at Balanga Wetland Park and will be a critical partner for the development and implementation of this project, together with the Department of Tourism (DOT) and Department of Environment and Natural Resources (DENR)

7.4 Project Beneficiaries

The estimated population of Balanga City, based on the Philippine Statistics Authority 2020 data, is 104,173¹¹. Although its ecosystem benefits are felt beyond Balanga, this population estimate can provide a good starting point for potential direct and indirect beneficiaries.

Proposed interventions are expected to involve the participation of LGUs and stakeholder groups from the local communities in the barangays around Balanga wetlands, with strong representative of women and disadvantaged groups. This includes fisherfolk, small businesses (in production of seafood-based food products) and representatives from tour guide cooperatives. There are no indigenous or minority peoples in this landscape. Indigenous minorities are not represented in this landscape.

7.5 Anticipated Implementation Risks

Environment: Wetland-based tourism has been identified as a key project concept theme. The proposed interventions include new infrastructure, possibly shelters and boardwalks, that would enhance the tourism experience in the wetland. Building these infrastructures, however, would induce noise that may disturb the wildlife in the area. Planning with the stakeholders is critical before any infrastructure development.

Poorly planned establishment of mangrove plantings may lead to loss of foraging habitat for some waterbirds and is a known issue in many parts of the Philippines where coastal restoration is being implemented. Evidence-based scoping needs to be carried out to identify key restoration plots.

Feasibility studies on the impact of expanding large-scale tourism are also necessary (rather than specialized ecotourism), and it is important that development that can drive mangrove loss must be averted – further safeguarding is needed to ensure the integrity of the Balanga wetlands is not impacted by proposed development.

¹¹ <https://psa.gov.ph/classification/psgc/barangays/0300803000>

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Annex 1. Supplementary information on coastal protection services

To further validate the identification of the top ecosystem services by means of stakeholder consultation, an expectedly essential or non-substitutable regulating service across all RFI sites, namely coastal protection and flood mitigation (i.e., storm and flood hazard regulation), was assessed based on a combination of globally available datasets supplemented by web-based tool Co\$tingNature (Mulligan, 2022). Estimates for coastal protection by mangroves (after the effects of coral reefs) were spatially inferred in QGIS from a selection of metrics expressing different biophysical and monetary values modelled by Chaplin-Kramer et al. (2023) and Menéndez et al. (2020), respectively.

The key metrics selected for biophysical values (Table A1) were current maximum potential exposure to coastal hazards, which is a vulnerability risk index calculated in InVEST^[1] for several hazard variables (i.e., wind, waves, sea level rise, geomorphology, and bathymetry) in the hypothetical absence of current mangrove extent, and nature’s (i.e., the mangroves’) contribution to reducing this coastal risk, both as an absolute value multiplied by the local population affected and a percentage of the maximum potential exposure.

Table A1. Contribution of mangroves to coastal protection as a critical natural asset in Bataan based on site-level (biophysical) values inferred from Chaplin-Kramer et al. (2023) and expressed as ranges to represent the resulting uncertainty. Key metrics are in italics.

Critical contribution of mangroves to coastal protection (metrics)	Risk levels
Current population density within 2.5 km of the coast (number of people per hectare)	No Data
<i>Current maximum coastal risk to be mitigated, or potential exposure to coastal hazards (unitless index)</i>	<i>No Data</i>
Maximum coastal risk to be mitigated, or potential exposure to coastal hazards in 2050 according to IPCC’s Shared Socioeconomic Pathway #1 ‘Sustainability’ (unitless index)	No Data
Maximum coastal risk to be mitigated, or potential exposure to coastal hazards in 2050 according to IPCC’s Shared Socioeconomic Pathway #3 ‘Regional Rivalry’ (unitless index)	No Data
Maximum coastal risk to be mitigated, or potential exposure to coastal hazards in 2050 according to IPCC’s Shared Socioeconomic Pathway #5 ‘Fossil-fueled Development’ (unitless index)	No Data
Current proportional risk reduction, nature’s contribution to reducing coastal risk as a proportion of maximum coastal risk (unitless index)	No Data
<i>Nature’s contribution to reducing coastal risk as a proportion of population density within 2.5 km of the coast (# of people per hectare)</i>	<i>No Data</i>
<i>Nature’s contribution to reducing coastal risk as a percentage of the maximum potential exposure (%)</i>	<i>No Data</i>

The key metrics selected for economic values (Table A2) were the annual expected flood protection benefits to total stock, which is the monetary value of the averted damages to the industrial and residential stocks (i.e., property) in 2015 US\$, the same total annual benefits expressed per hectare of mangroves, and the total benefits in the event of a 100-year return period storm, which are the rarest of cyclonic conditions but cause the most flood damages to property (i.e., maximum level of coastal protection by mangroves).

Table A2. Coastal protection benefits offered by mangroves in Bataan based on site-level (monetary) values inferred from Menéndez et al. (2020) and expressed as ranges to represent the resulting uncertainty. Key metrics are in italics.

Benefits of mangroves in terms of coastal protection (metrics)	Avoided costs (US\$)
Mangrove extent (hectares) ^[2]	18 – 69
Annual expected flood protection benefits to people (number of people)	427 – 1,197
Annual expected flood protection benefits to Industrial Stock (US\$)	311,031 – 871,401
Annual expected flood protection benefits to Residential Stock (US\$)	338,031 – 947,046
<i>Annual expected flood protection benefits to Total Stock (US\$)</i>	<i>635,092 – 1,779,308</i>
<i>Annual expected flood protection benefits to Industrial Stock per hectare of mangroves (US\$ per hectare)</i>	<i>14,731 – 41,272</i>
1-in-100-year return period damage in terms of area flooded (number of hectares)	2.0 – 2.1
<i>Total expected flood protection benefits of mangroves per 100-year return period storms (US\$)</i>	<i>195,649 – 209,216</i>

Table A3. Biophysical benefits from RFI coastal wetland sites (expressed as ranges to represent the resulting uncertainty) and at the national level.

Site name	Max pot exp (index)	Risk reduction (index * pop)	Risk reduction (% max pot exp)
Bangrin Marine Protected Area	No Data	No Data	No Data
Kabalan-Siy Wetland Area	2.24 (±0.03)	50 (±13)	8.2 (±0.2)
Negros Occidental Coastal Wetlands Conservation Area (NOCWCA)	2.55 (±0.04)	187 (±37)	4.8 (±0.3)
North Manila Bay (Balanga Wetlands Park)	No Data	No Data	No Data
North Manila Bay (Pampanga River East Bank)	3.16 (±0.03)	296 (±451)	3.3 (±0.6)
North Manila Bay (Sasmuan Pampanga Coastal Wetland)	2.99 (±0.06)	18 (±28)	5.3 (±1.3)
Olango Island Wildlife Sanctuary	2.77 (±0.09)	496 (±87)	7.7 (±0.2)
Panabo Coast	2.40 (±0.05)	1,537 (±617)	8.1 (±0.5)
Tubbataha Reef Natural Park	2.82 (±0.04)	Not Applicable	0.8 (±2.1)
Philippines RFI average	2.70	306	5.28
Philippines national average	2.36	122	6.60

Table A4. Monetary benefits from RFI coastal wetland sites (expressed as ranges to represent the resulting uncertainty) and at the national level.

Site name	Total annual benefits (US\$)	Per mangrove area (US\$/ha)	For 100-yr return period storms (US\$)
Bangrin Marine Protected Area	1,045,290 (±98,880)	15,294 (±1,447)	331,327 (±31,342)
Kabasalan-Siy Wetland Area	86,324,218 (±160,880,759)	12,182 (±22,704)	1,571,774 (±3,587,626)
Negros Occidental Coastal Wetlands Conservation Area (NOCWCA)	2,511,290 (±2,318,575)	1,687 (±1,557)	5,477,498 (±5,654,072)
North Manila Bay (Balanga Wetlands Park)	1,207,200 (±572,108)	28,002 (±13,270)	202,433 (±6,784)
North Manila Bay (Pampanga River East Bank)	3,621,601 (±33,678,493)	4,200 (±39,060)	6,609,485 (±106,458,484)
North Manila Bay (Sasmuan Pampanga Coastal Wetland)	3,621,601 (±102,747)	28,002 (±794)	607,298 (±17,229)
Olango Island Wildlife Sanctuary	No Data	No Data	No Data
Panabo Coast	No Data	No Data	No Data
Tubbataha Reef Natural Park	No Data	No Data	No Data
Philippines RFI average	16,388,533	14,895	2,466,636
Philippines RFI total	98,331,201	Not Applicable	14,799,814
Philippines national average	1,849,798	11,160	4,933,082
Philippines national total	789,863,793	Not Applicable	2,136,024,319

Table A5. Key habitat types in North Manila Bay (Bataan) based on stakeholder-based assessment at the Regional Flyway Initiative workshop in June 2023.

Habitat type	Current state		Alternative state (2035)	
	Area (ha)	Cover (%)	Area (ha)	Cover (%)
Intertidal forested wetlands	11.0	31.1	20.1	57.2
Intertidal mud, sand or salt flats	23.5	66.7	14.3	40.7
Low intensity residential	0.8	2.2	0.8	2.2
Total	35.2	100.0	35.2	100.0

[1] <https://naturalcapitalproject.stanford.edu/invest/coastal-vulnerability>

[2] The reference value used by Menéndez et al. (2020) for their modelling is c. 565 ha, remote sensing data from ESA World Cover 2020 map at 10m resolution.