ADB

Regional Flyway Initiative · Site Study

May 2026

RFI Priority Site · Negros Occidental Coastal Wetlands Conservation Area (NOCWCA)

Prepared by Ding Li Yong & Mike Crosby, with additional input from Billy Fairburn, Kelvin Peh, Evelyn Pina-Covarrubias, Stefano Barchiesi and Radhika Bhargava

BirdLife International, University of Southampton, University of Singapore

Asian Development Bank

General Site Information

Country	Philippines			
RFI Site Name	Negros Occidental Coastal Wetlands Conservation Area (NOCWCA)		ID118	
City/ Municipality, Province, Region	Municipalities of Ilog, Binalbagan, Hinigaran, Pontevedra, San Enrique, Valladolid and Pulupandan, Negros Occidental			
Geographical coordinates	10°16'N 122°46'E	Area (has)	89,607.81	
Key species	Dugong, migratory shorebirds (e.g. Great Knot)			
Key habitats (biomes)	Mangroves, intertidal flats and seagrass beds			
Key ecosystem services	Provisioning services (fish), and regulating services (coastal protection)			
Key drivers of change	Development for housing and settlements, aquaculture expansion, unregulated harvesting of coastal resources			
Conservation status (mark all that applies)		Protected Area		Flyway Network Site
		Ramsar Site		Others _____
IBA/ KBA name (and number) and other designations	NA			
Management Stakeholders	DENR, PEMO, PENRO Negros Occidental, NOCWCAMA, LGUs			
With management plan?				
Project concept themes	Site protection and management, wetland restoration, fisheries. Also, tourism (to some extent)			
Length of project	5 years			
Sector/s	Fisheries, wetland management, tourism			
No. of potential beneficiaries	About 50,000 people			
Indigenous Peoples		No		Yes, _____
Anticipated Implementation Risks	Small-scale disturbance through infrastructure creation for tourism. Fishing policies, when implemented, may result in income loss for fishers.			
Estimated Project Budget (US$)	8,350,000 over five years			
Potential Source/s of Financing		Loan		Private Sector (to be identified)
		Grant (GEF, and other grants foe wetland management and fishery development)		Public-Private Partnership (to be identified)

Table of Contents

Abbreviations

ADB	Asian Development Bank
AMS	ASEAN Member States
ASEAN	Association of Southeast Asian Nations
AWC	Asian Waterbird Census
CEPA	Communications, Education and Public Awareness
CSO	Civil society organisation
DENR	Department of Environment and Natural Resource (of the Philippines)
DOI	U.S. Department of the Interior
DMC	Developing member country
EAAF	East Asian-Australasian Flyway
EAAFP	East Asian-Australasian Flyway Partnership
FSN	Flyway Site Network of the EAAFP
GEF	Global Environment Facility
IBA	Important Bird and Biodiversity Area
IUCN	International Union for the Conservation of Nature
KBA	Key Biodiversity Area
LGU	Local Government Unit
NOCWCA	Negros Occidental Coastal Wetland Conservation Area
NOCWAMA	Negros Occidental Coastal Wetland Area Management Alliance
RFI	Regional Flyway Initiative
SEP	Stakeholder engagement plan
SSTT	Site Selection Task Team
TA	Technical Assistance
UNDP	United Nations Development Programme

Executive Summary

The Negros Occidental Coast Wetland Conservation Area (NOCWCA) covers a 109 km-long strip of the coastline of Negros, and spans nearly 90,000 ha of land, coastal waters and the intertidal zone across three cities and 52 districts (= barangays). The site is recognized internationally as an East Asian-Australasian Flyway Network site (EAAF135) and a Ramsar Wetland of International Importance (Site 2271). NOCWCA is among the most important wetlands for migratory waterbirds in the central Philippines, supporting internationally important congregations of threatened and congregatory migratory waterbird species in the EAAF, including Chinese Egret *Egretta eulophotes* (VU), Far Eastern Curlew *Numenius madagascariensis* (EN), Great Knot *Calidris tenuirostris* (EN) and Spotted Greenshank *Tringa guttifer* (EN). Coastal waters along NOCWCA are also habitat to extant populations of the threatened Irrawaddy Dolphin *Orcaella brevirostris* (EN) and Dugong *Dugong dugon* (VU), and several species of sea turtles.

Fisheries are a major source of livelihood for local communities, and several fishery organisations and cooperatives have been established in NOCWCA, as are major shellfisheries for 'siwal' *Pholas orientalis*, nylon shell *Paphia textile*, green mussel *Perna viridis* and oysters *Crossostrea* sp., which are harvested and sold locally and regionally. The site also provides considerable ecosystem services in the form of coastal protection against flooding and other extreme climate events, on top of broader benefits offered by mangrove forest ecosystems. Livelihood opportunities however remain limited, and socio-economic assessments show that the poverty rate for coastal fisherfolk in Bago City and Pulupandan, remain high, at nearly 62%. In the future, the ecosystem services provided by NOCWCA's wetlands are expected to deteriorate unless its management is strengthened, providing local communities with improved access to sustainable livelihoods, while addressing the drivers of change impacting integrity of NOCWCA's ecosystems.

Sustainable management of the NOCWCA wetlands will require continued mangrove restoration work (mangrove cover is less than 500 ha currently), which should be scaled up to cover areas of the coastline that has been denuded by aquaculture and clearance, alongside active interventions to develop and implement a site management plan based on the principles of integrated coastal zone management, given the numerous land uses in and around NOCWCA. Ecotourism has been strongly advocated for by the local stakeholders and is another important area that can be developed, although the current infrastructure for tourism is limited. To address these gaps, there is a need to build institutional capacity for wetland-based tourism, and this requires further investment in tourist infrastructure such as shelters and boardwalks to observe wetlands and migratory birds. Livelihoods of small-scale fishers who operate in the NOCWCA coastal waters are among the most vulnerable stakeholders. A major intervention is to address livelihood needs of these small-scale fishers through capacity building for best practices, whilst improving their access to affordable credit under a micro-finance mechanism.

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 Negros Occidental Coastal Wetlands Conservation Area (NOCWCA)

Location: Negros Occidental Coastal Wetlands Conservation Area (NOCWCA) is located on the western coast of Negros Island in the Philippines, in Negros Occidental province, bounded in the north by Guimaras Strait and in the south by Panay Gulf.

Area: 89,607.81 ha

Altitude: 0-3 metres above sea-level.

Coordinates: Extends from 10°00'-10°35'N, 122°42'-122°53'E, central coordinates 10°16'N, 122°46'E

Description of site: NOCWCA lies along 109.52 km of contiguous coastline and includes 52 coastal districts (barangays) within three cities (Kabankalan, Himamaylan and Bago) and seven municipalities (Ilog, Binalbagan, Hinigaran, Pontevedra, San Enrique, Valladolid and Pulupandan). NOCWCA is characterised by extensive intertidal mudflats, mangrove forest (> 500 ha), fishponds, and adjacent rice paddies. There are patches of old-growth and planted mangroves along the coast which provide protection from soil erosion, storm surges, typhoons, and flooding. Further inland, there are patches of Nipa *Nypa fruticans* that serve both as sources of raw materials for roofing and protection against flooding, soil erosion, and storm surges. Three river systems, the Ilog River, Bago River and Binalbagan River flow into the sea in NOCWCA, draining the water from three major watersheds, the Northern Negros Natural Park, Mt. Kanla-on Natural Park and the Ilog-Hilabangan Watershed Forest Reserve.

Site administration, management and land tenure: NOCWCA is under the jurisdiction and management of Local Government Units (for the municipalities of Ilog, Binalbagan, Hinigaran, Pontevedra, San Enrique, Valladolid and Pulupandan, and the cities of Kabankalan, Himamaylan and Bago), under the Local Government Code of 1991; the Department of Environment and Natural Resources (DENR) under Presidential Decree 705 and the Republic Act 9147; the Department of Agriculture-Bureau of Fisheries and Aquatic Resources under Republic Act 8550; Negros Occidental Coastal Wetland Area Management Alliance (NOCWAMA) under Memorandum of Agreement 2014; Kabankalan Himamaylan Ilog Integrated Coastal Area Management Council (KAHIL-ICAMC) under Memorandum of Agreement 2009 and Central Negros Council for Coastal Resources Development (CENECCORD) under Memorandum of Agreement and Republic Act 9147. The management authorities are DENR Region 18–Negros Island Region, the Provincial Environment and Natural Resources Office, Negros Occidental (PENRO), the Provincial Environment Management Office (PEMO), and the Philippines Biodiversity Conservation Foundation, Inc. (PBCFI).

NOCWCA is under public ownership (provincial government and local authorities), and the surrounding area is under both public and private ownership, and land where people have customary rights.

Current land uses within NOCWCA include fisheries, exploitation of mangrove forests, nautical lanes and drainage. In the surrounding area, the land uses include housing and urban, commercial and industrial,

drainage, and aquaculture. Fisheries provide a major source of livelihood for local communities, and fishery organisations and cooperatives exist in the major cities along this site (Onate-Pacalioga et al. 2022). Important shellfisheries exist, and several species are harvested and sold locally and regionally, including siwal *Pholas orientalis*, nylon shell *Paphia textile* and green mussel *Perna viridis* (Posadas 2023). At least 62.50 metric tons of oyster shells *Crossostrea* sp. are harvested monthly in the areas of Ilog and Himamaylan City. Himamaylan City is the only known locality where nylon shells are produced and exported. In 2012, a total of 614,000 kilograms of nylon shells were harvested which generated PhP 4,298,000.00 (approximately USD 104,000) in tax revenues. Binalbagan, Hinigaran, Pontevedra, San Enrique, Valladolid and Pulupandan are producers of angel wings shells, with at least 22,701 kilograms harvested in 2010. Nipa *Nypa fruticans* is used as sources of raw materials for roofing as well as protection against flooding, soil erosion and storm surges.

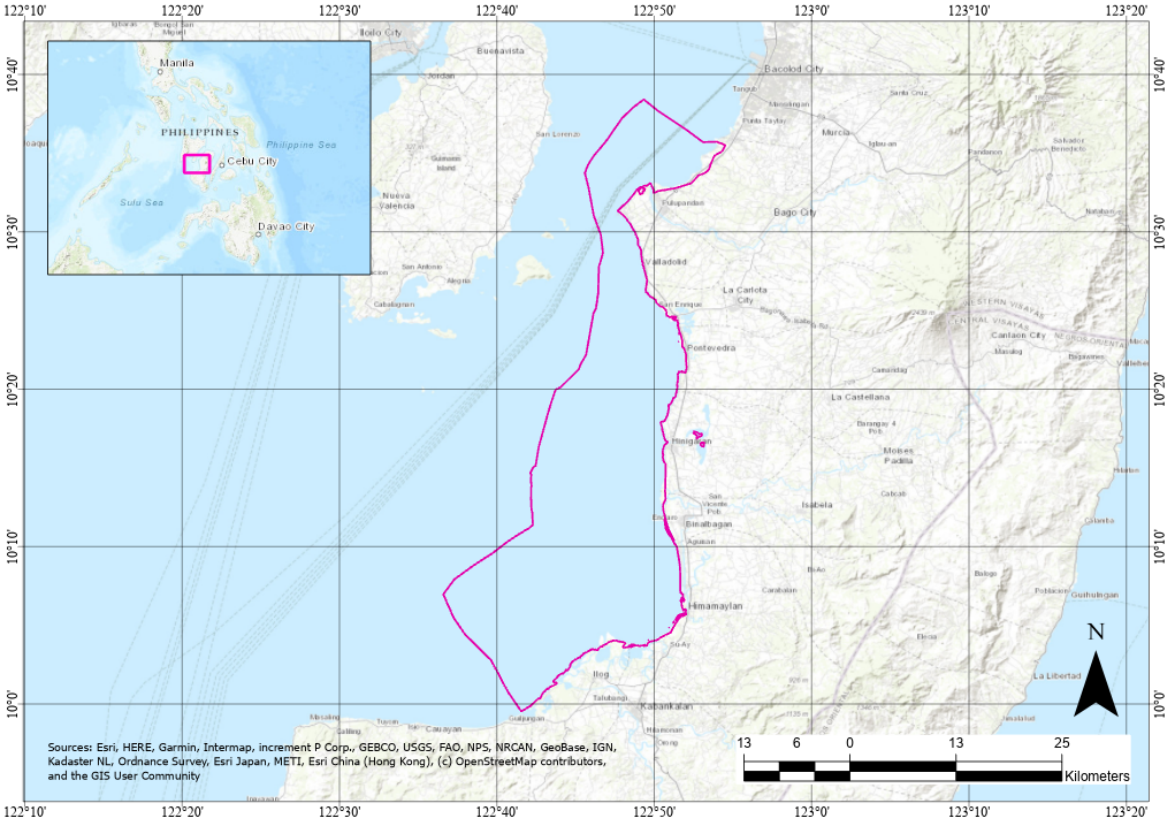

Figure 1 Map of Negros Occidental Coastal Wetlands Conservation Area (NOCWCA), showing the site boundary and location in the Philippines (Map: Evelyn Pina Covarrubias).

NOCWCA is the first site in the Philippines where the local government units led the management of coastal wetlands in collaboration with the DENR and other stakeholders. A site management plan has been compiled, and the Negros Occidental Coastal Wetlands Conservation Area Management Alliance (NOCWMA) has been established to oversee its implementation. Coastal communities in the municipality of Pulupandan and Bago City mostly engage in fishing as a livelihood activity and are organised into several associations that cooperate to strengthen local livelihoods and address poverty issues (Aguilar & Tabujara 2022; Posadas 2023). Planning is underway to promote a range of ecotourism approaches within the NOCWCA Ramsar site. The municipality of San Enrique, which has been found to support high diversity (Posadas 2023), has constructed a bird hide for the public to view waterbirds, and the city of Himamaylan and Kabankalan (the Ramsar Site) have constructed a waterbird viewing deck for tourists and local people. The municipality of Pulupandan has created a birdwatching trail in abandoned fishponds and used this to promote waterbird conservation and ecotourism; they won a Department of Tourism Pearl Award for this new ecotourism product. The Philippines Biodiversity Conservation Foundation and Negros Bird Conservation Society have produced posters on waterbirds. Negros Occidental Tourism Office, in partnership with the Philippines Biodiversity Conservation Foundation, has conducted training for bird guides and in monitoring of waterbirds for DENR technical staff, and staff from the cities and municipalities within the Ramsar site.1

3. Biodiversity value of Negros Occidental Coastal Wetlands Conservation Area (NOCWCA)

3.1. Key habitats

NOCWCA is characterised by extensive intertidal mudflats, mangrove forest (> 500 ha), fishponds, and adjacent rice paddies. There are patches of old-growth and planted mangroves along the coast which provide protection from soil erosion, storm surges, typhoons, and flooding. Further inland, there are patches of Nipa *Nypa fruticans* that serve both as sources of raw materials for roofing and protection against flooding, soil erosion, and storm surges.

3.2 Importance of NOCWCA for migratory waterbird species

The extensive intertidal mudflats in NOCWCA serve as important feeding grounds for large congregations of waterbirds, which also utilise the mangrove swamps, fishponds and rice paddies.[12]. A total of 73 waterbird species has been recorded there to date, including both migratory species (covered in the RFI priority sites analysis) and non-migratory species. Most of the waterbirds concentrate within the coastal wetlands in the San Enrique – Pontevedra area.

Waterbird count data from the 2019 and 2021 Asian Waterbird Census was used in the RFI priority sites analysis for NOCWCA. For each species, the 2019 and 2021 counts were averaged and then compared against the EAAFP Conservation Status Review (CSR) 1% population estimates to calculate a score for each species. Eight (8) species were found to exceed the 1% population estimates, and the scores for these species were summed to produce the overall site score for NOCWCA (Table 1).

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

Scientific name	IUCN	Average count	CSR1	CSR1 score
Little Egret *Egretta garzetta*	LC	3,183	1,000	3.2
Black-tailed Godwit *Limosa limosa*	NT	4,030	1,600	2.5

[1] Ramsar Site Information Sheet: Negros Occidental Coastal Wetlands Conservation Area (NOCWCA). Available at: https://rsis.ramsar.org/ris/2271

[2] EAAFP Flyway Network Site Information Sheet: Negros Occidental Coastal Wetlands Conservation Area. Available at: https://eaaflyway.net/philippines/

Scientific name	IUCN	Average count	CSR1	CSR1 score
Kentish Plover *Charadrius alexandrinus*	LC	1,154	700	1.6
Caspian Tern *Hydroprogne caspia*	LC	376	250	1.5
Chinese Egret *Egretta eulophotes*	VU	101	75	1.4
Broad-billed Sandpiper *Calidris falcinellus*	LC	377	300	1.3
Great Knot *Calidris tenuirostris*	EN	5,380	4,300	1.3
Pacific Golden Plover *Pluvialis fulva*	LC	1,367	1,200	1.1
Intermediate Egret *Ardea intermedia*	LC	992	1,000	1.0

The AWC counts conducted between 2014 and 2016 found that the following 10 additional species exceeded the 1% of flyway population thresholds in at least one of the annual counts during that period: Black-winged Stilt *Himantopus himantopus*, Grey Plover *Pluvialis squatarola*, Lesser Sandplover *Charadrius mongolus*, Bar-tailed Godwit *Limosa lapponica* (NT), Red Knot *Calidris canutus* (NT), Red-necked Stint *Calidris ruficollis*, Asian Dowitcher *Limnodromus semipalmatus* (NT), Grey-tailed Tattler *Tringa brevipes* (NT), Spotted Greenshank *Tringa guttifer* (EN) and Common Tern *Sterna hirundo*.[34]

NOCWCA supports important populations of several globally threatened and near-threatened waterbird species, including the migratory Chinese Egret (VU), Curlew Sandpiper *Calidris ferruginea* (NT), Grey-tailed Tattler *Tringa brevipes* (NT), Asian Dowitcher *Limnodromus semipalmatus* (NT), Eurasian Curlew *Numenius arquata* (NT), Far Eastern Curlew *Numenius madagascariensis* (EN) (maximum count of 114 in 2015), Great Knot (EN), Red Knot *Calidris canutus* (NT), Red-necked Stint *Calidris ruficollis* (NT) and Spotted Greenshank (EN) (maximum count of 14 in 2015). In addition, the non-migratory Philippine Duck *Anas luzonica* (VU) had a maximum count of 2,189 individuals in 2014, which is more than 30% of the global population of this Philippine endemic species.

[3] Ramsar Site Information Sheet: Negros Occidental Coastal Wetlands Conservation Area (NOCWCA). Available at: https://rsis.ramsar.org/ris/2271

[4] EAAFP Flyway Network Site Information Sheet: Negros Occidental Coastal Wetlands Conservation Area. Available at: https://eaaflyway.net/philippines/

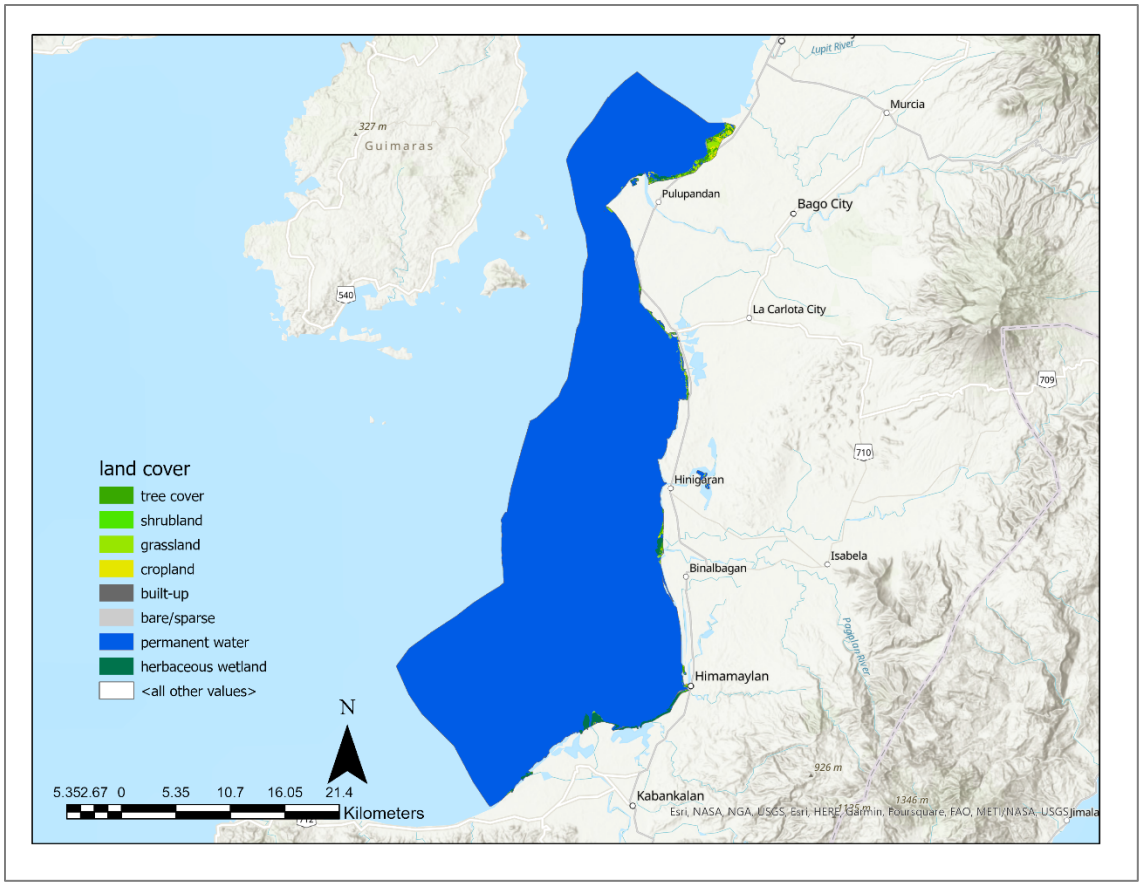

Figure 2 Map of Negros Occidental Coastal Wetlands Conservation Area (NOCWCA), showing key land cover types (Map: Radhika Bhargava).

3.3 Other notable biodiversity

NOCWCA supports three globally threatened marine turtle species, Hawksbill turtle *Eretmochelys imbricata* (CR), Green turtle *Chelonia mydas* (EN) and Olive Ridley turtle *Lepidochelys olivacea* (VU). Irrawaddy dolphin *Orcaella brevirostris* (EN) is found in the coastal waters off Bago City and Pulupandan, where the latest estimate of its population is 13 individuals (Aguilar & Tabujara 2022). A total of 23 species of mangroves and mangrove-associated plants have been recorded within NOCWCA, including the globally threatened *Avicennia rumphiana* (VU). Dugong *Dugong dugon* has also been documented in the coastal waters of NOCWCA (Posadas 2023).

4. Ecosystem services

4.1. Ecosystem services provided by NOCWCA

The Negros Occidental Wetland Conservation Area (NOCWCA) overlaps with diverse coastal wetland habitats, which in turn provide valuable provisioning, regulating, and cultural ecosystem services (Figure 3). The results from the RFI participatory workshop[5] in the Philippines last June 2023 highlights the top ecosystem services provided by the site, emphasising their essential and non-substitutable nature (Table 2). Provisioning services, particularly food provision, benefit communities both within, adjacent to, and distant from the site. Regulating services such as air quality, global climate, flood hazard, and storm hazard regulation are crucial, positively benefiting communities at all distances from the site. Cultural services, particularly recreation and tourism, also significantly benefit communities at all distances, reinforcing the wetland's importance to both local and broader populations.

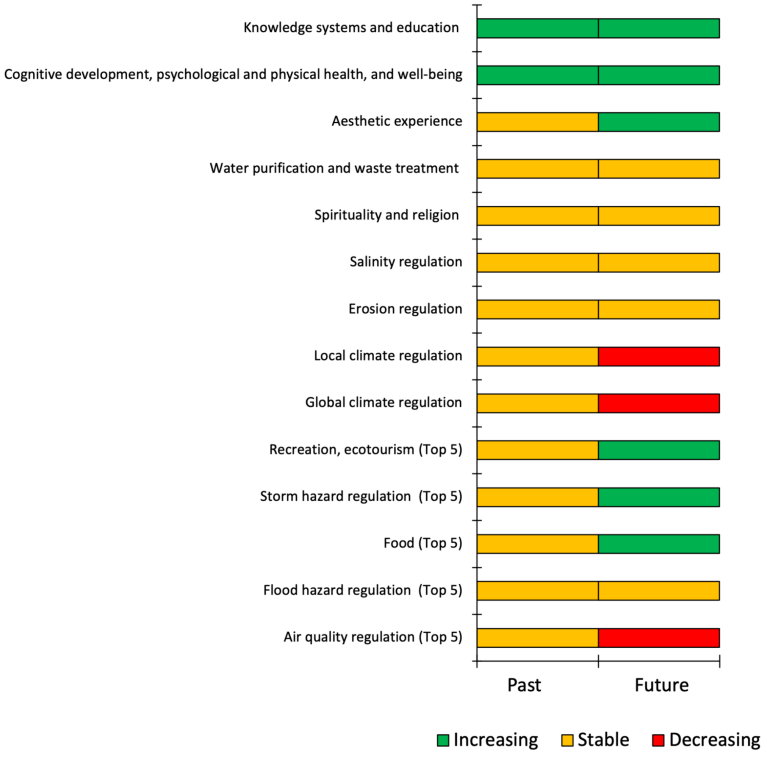

Figure 3 List of ecosystem services provided by NOCWCA wetlands, as identified through stakeholder consultation at the RFI workshop.

[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

Table 2 List of top ecosystem services provided by NOCWCA wetlands.

Ecosystem services	Essential or non-substitutable	Benefits to communities			Change	
		Within the site	Adjacent to the site	Distant to the site	5-years	Long-term
Provisioning services						
Provision of food	Yes	+	+	+	No change	Increase
Regulating services						
Air quality regulation	Yes	+	+	+	No change	Decrease
Flood hazard regulation	Yes	+	+	+	No change	No change
Storm hazard regulation	Yes	+	+	+	No change	Increase
Cultural services						
Recreation and tourism	Yes	+	+	+	No change	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 180,000 to 926,000 tonnes, while the annual carbon sequestration rate is estimated to be between 2,810 and 6,430 tonnes per year.

4.3. Coastal protection services

The coastal protection services provided by NOCWCA were assessed using both biophysical indices and monetary values (see Tables A1 and A2, and Annex 1 for details). When compared to both the average of the nine RFI coastal sites and the average of all other coastal areas in the Philippines (Table A3 in Annex 1), NOCWCA shows mixed results in terms of risk level:

(1) for the potential exposure to coastal hazards, NOCWCA is slightly below average (index: 2.55 vs. 2.70) compared to RFI coastal sites, but above average compared to all other coastal areas (index: 2.55 vs. 2.36);

(2) for the contribution to reducing coastal risk as a proportion of population density with 2.5 km of the coast, NOCWCA is below the average of RFI coastal sites (187 vs. 306 people/ha) but above average compared to all other coastal areas (187 vs. 122 people/ha); and

(3) for the contribution to reducing coastal risk as a percentage of the maximum potential exposure, NOCWCA is consistently below average (4.81% vs. 5.28% for RFI coastal sites and 6.60% for all other coastal areas).

In monetary terms (Table A4 in Annex 1), NOCWCA ranks below both the national RFI and overall country averages in terms of total annual benefits per ha of mangroves (11,160 vs. 14,895 or 11,160 USD/ha). However, NOCWCA is well above the average of all RFI coastal sites in the Philippines regarding total benefits against 100-year return period storms (5.5 vs. 2.5 million USD).

5. Drivers of change and their potential impacts on NOCWCA

5.1. Current drivers of change and their level of impact

Stakeholders at the RFI workshop[6] identified 37 drivers of change impacting NOCWCA. Table 3 highlights these key drivers of change and their corresponding level of impact on the wetland site. Restoration for conservation has moderately modified the site (medium impact). However, biological resources use, such as fishing, killing, and harvesting of aquatic resources pose substantial threats (i.e. high impact). Development within the site, particularly for housing and settlement, is noted to have a medium impact. Agricultural activities, such as marine aquaculture, show a medium impact. Transportation infrastructure, including utility lines, shipping lanes, and ports, also affects the site moderately (medium impact).

[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 NOCWCA based on consultations with stakeholders.

Driver of change	Impact
Fishing, killing and harvesting of aquatic resources	High
Housing and settlement	Medium
Marine and freshwater aquaculture	
Utility and service lines	
Shipping lanes and canals	
Ports with large scale loading and unloading of goods	
Restoration for conservation	
Commercial and industrial areas	Low
Livestock farming and grazing	
Roads and railroads	
Hunting, killing and collecting of terrestrial animals	
Collecting terrestrial plants or plant products (non-timber)	
Recreational activities and tourism	
Research, education and other work-related activities	
Activities of site managers	
Water extraction/diversion within the wetland site or catchment	
Excess ponding of water onsite	
Loss of hydrological connectivity	
Drought conditions	
Invasive animal species	
Pathogens	
Household sewage and urban waste water from outside the wetland site	
Sewage and waste water from wetland site facilities	
Industrial, mining and military effluents	
Agricultural and forestry effluents	
Garbage and solid waste	
Air-borne pollutants	
Volcanoes	
Earthquakes/tsunamis	
Avalanches/landslides	
Erosion and siltation/deposition	
Habitat shifting and alteration	
Droughts	
Temperature extremes	
Storm and flooding	
Loss of cultural links, traditional knowledge and/or management practices	
Natural deterioration of important cultural wetland site values	

5.2. Potential alternative state of NOCWCA under current drivers of change

Stakeholders at the RFI workshop[7] 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; Figure 4). 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.

[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

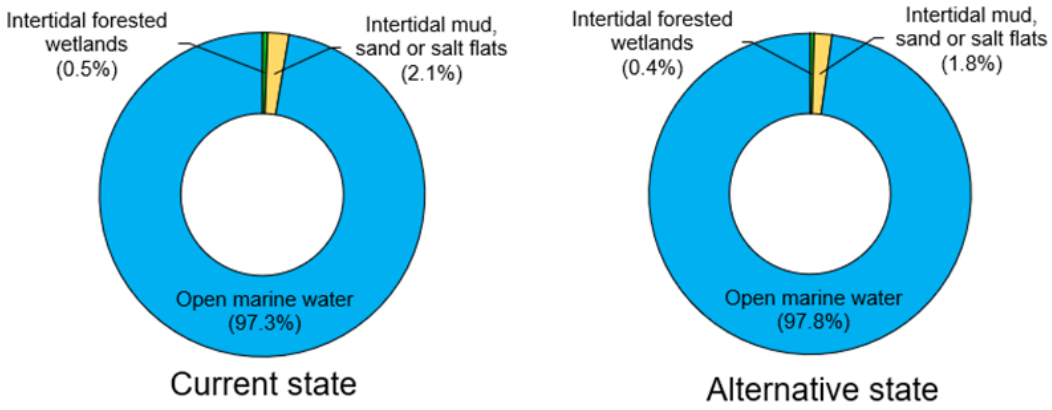

Figure 4 The proportional change in the extent of different habitat types between the current and alternative states of NOCWCA.

5.3. Expected changes in the ecosystem services of NOCWCA

Stakeholders in the RFI workshop[8] documented the future trends in the provision of ecosystem services in NOCWCA, indicating if the ecosystem services provided by this site (to 2035) will increase, decrease, or will remain stable if the current drivers of change impacting this site will continue in their present condition, with the intervention remains unchanged.

Figure 3 and Table 2 highlight that provisioning services, particularly food provision, are expected to increase in the long term. However, there is concern that regulating services, such as air quality and global climate regulation, as well as flood and storm hazard regulations may decrease in the long term, while cultural services, particularly recreation and tourism, remain stable.

In the alternative state, the loss of 24% of mangrove and 15% of intertidal mudflat are expected to result in a loss of stored carbon estimated to be between 2,870 and 197,000 tonnes and a loss of carbon accumulation by approximately 456 to 1,320 tonnes per year

A loss of 117.5 ha of mangroves as presented in Table A5, however equivalent to only 0.1% of the total land use for the site, is expected to result in roughly an 8% reduction in coastal protection. This may amount to approximately 198 thousand USD in lost total benefits per year (based on 1,687 USD per hectare of mangroves) and 432 thousand USD in lost total benefits per 100-year return period storm (based on the same 8% reduction 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 NOCWCA

Through the capacity needs questionnaire disseminated to stakeholders, respondents were also asked to estimate the current capacity of site managers to support RFI implementation by scoring 0 (no capacity) to 3 (high capacity). Respondents from NOCWCA recognized capacity gaps in relation to wetland research and monitoring and invasive species control. Waterbird monitoring and conservation scored highly (Table 4). Respondents were also asked who should be targeted by RFI capacity development activities. NOCWCA representatives prioritized protected area managers/rangers, as well as wetlands project/site managers directly engaged in project- and community-level activities.

Table 4 Current capacity of site managers and associated stakeholders to support RFI implementation at NOCWCA, from 0 (no capacity) to 3 (high capacity).

Capacity assessment of NOCWCA site managers	**Score**
Wetland research and monitoring	1
Invasive species control	1
Establishing positive incentives for wetland conservation	2
Communication, Education and Public Awareness for wetland conservation/sustainable use	3
Cross-sectoral/participatory management for wetlands	2
Wetland ecosystem services/values assessment	3
Wetland management planning	2
Project management	2
Climate change and disaster risk reduction	2
Eco-tourism	3
Sustainable livelihoods	2
Waterbird flyway conservation	3
Waterbird monitoring	3
Wetland management for waterbirds	3

At the RFI national workshop in the Philippines[9], participants representing each RFI site documented the stakeholders that currently have a role in wetland site management and conservation, and how those roles might change if positive alternative states for the sites were to be achieved by 2035. The important stakeholder groups identified at the local level varied from site to site but included: local government (Local Government Units and local DENR offices), local communities and Indigenous Peoples, farmers and farming organisations, fishers, local NGOs, development organisations, academia, and the private sector.

The priority stakeholder groups identified in relation to the RFI at NOCWCA specifically included LGUs, NGOs, Academe, private sector/business/tour operators, and the media sector.

[9] 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

Participants proposed capacity development actions that could support and empower priority wetland stakeholders to achieve positive alternative states at RFI sites. Priority capacity building actions at the site level included skills development for wetland managers and organisations (e.g. detailed ecosystem services assessment, strategic planning), support to local communities to adopt more sustainable practices (e.g. training & incentives for development of biodiversity-friendly enterprises), strengthening of site-based networks, and supporting/strengthening the voices of local wetland champions and leaders. For NOCWCA, LGUs and NGOs were identified as priority recipients of capacity development actions, to strengthen the local policy framework to support site conservation and RFI implementation, advocate for formal protection of NOCWCA and develop sustainable funding mechanisms (Table 5).

Table 5 Stakeholders and their roles in strengthening the management and protection of the NOCWCA coastal wetlands.

Stakeholder group	Current Role in wetland management	Capacity development needs
LGUs	Enactment of ordinances, including: ● the environment code ● Local conservation area ● allocation of funds	Targeted policy making (e.g. in relation to NBS)
Conservation NGOs	Technical assistance: providing capacity building/training, as well as proposal development /fund sourcing	Capacity development to support the declaration of NOCWCA as a formal protected area Public Private Partnership development Training on green accounting

7. Opportunities for RFI interventions

7.1 Recommended Interventions

Consultations with local stakeholders such as LGUs through RFI processes, and published studies on NOCWCA highlight several areas of interventions of priority for local communities (e.g. Aguilar & Tabujara 2022; Posadas 2023). The most important priorities for the site are livelihood programmes for local communities to alleviate the socioeconomic status of several fishing communities, as well as efforts to strengthen biodiversity protection across NOCWCA through mangrove replanting and protection, and enforcement activities against illegal encroachment. Existing consultations with local communities by Posadas (2023) and others identified livelihood support and programmes to alleviate social-economic conditions to be a priority, as are programmes to reduce dependence on resource uses, while creating incentives and livelihood assistance for local communities. Conservation-based alternative livelihoods were highlighted by Aguilar & Tabujara (2022) as means of empowering local communities in NOCWCA, while engaging their participation in the conservation of this wetland landscape. In this concept, we outline priority actions that can contribute to strengthening the conservation of NOCWA, through approaches focused on improving the evidence base for nature-based solution implementation and sustainable management while addressing local livelihoods and strengthening institutional capacity to manage the NOCWCA coast through NOCWANA framework.

Table 6 Key interventions recommended for the sustainable management of the NOCWCA wetlands.

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
Component 1. Enhancement of wetland-based ecotourism in NOCWCA					
Developing a coordinated wetland-based tourism plan for NOCWCA	Cohesive and inclusive wetland-based tourism in NOCWCA 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 NOCWCA and disseminated to key stakeholders. Number of stakeholders engaged for the development of the	200,000.00	1.5 years	Department of Environment and Natural Resources DENR PENRO Negros Occidental Department of Tourism People Organisations Concerned provincial and

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
		wetland-based tourism plan for NOCWCA			municipal government units Conservation organisations (including bird and community-focused NGOs)
Build institutional capacity of key stakeholders, with focus on local government units, 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 operators) Improved capacity of key stakeholders about wetland-based 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 capacity-building activities administered with concerned stakeholders Number of stakeholders (target of up to 100) benefitting from the capacity-building activities	110,000.00	5 years	
Improving wetland-based tourism infrastructure including boardwalks, shelters, and signages	Stronger (and functional) infrastructure to host tourists, including boardwalks, shelters, and signages	Number of infrastructure established/ improved (i.e., at least 0.5 km boardwalks and hides) constructed	500,000.00	3 years	

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
Component 2. Coastal wetland management and protection					
Develop a site management plan, with principles of integrated coastal zone management, developed for NOCWCA.	Cohesive and integrated coastal zone management implemented for NOCWCA Site management strategy and plan developed with inputs from key stakeholders Patrol and enforcement are improved in the site.	Baseline studies completed to guide site management planning for NOCWCA Updated NOCWCA management plan, with principles of integrated coastal zone management, and framework for site patrolling and law enforcement. Number of stakeholders engaged for the development of the site management plan for NOCWCA	250,000.00	2 years	Department of Environment and Natural Resources DENR PENRO Negros Occidental Research Institutions People Organizations Concerned provincial and municipal government units Conservation organizations (including bird and community-focused NGOs)
Establish a local-led biodiversity and wetland monitoring scheme focusing on shorebirds	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	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, with	100,000.00	5 years	

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
	group led by concerned LGUs	participation of vulnerable groups			
Strengthen the protection of high-tide roosts for shorebirds	Potential high tide roosts for shorebirds identified and verified on the field and integrated in the NOCWCA management plan. Quality of shorebird roosts improved through restoration activities. Increased protection of areas where large flocks of shorebirds roost	Baseline information about high-tide roosts for shorebirds generated, presented to key stakeholders, and integrated in the NOCWCA management plan. Number of restoration and/or protection related activities for the shorebird's habitat Number of engaged stakeholders for protecting and restoring important shorebirds habitat	200,000.00	5 years	
Component 3. Sustainable coastal fishery management					
Develop a sustainable coastal fishery management plan for NOCWCA, with guidance on fishing quota and no-take zones over the fishing season. Promote sustainable fisheries	More sustainable coastal fishing practices adopted by small fishers Sustainable coastal fishery management plan developed to support selected LGUs to increase the capacity of small-scale	Baseline information generated and presented to key stakeholders for the management plan development Sustainable coastal fishery management plan developed for NOCWCA and rolled out to fisherfolk and other relevant	500,000.00	3 years	Department of Environment and Natural Resources DENR PENRO Negros Occidental DA- BFAR Research organizations People Organizations

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
practices for small-scale fishers	fishers to undertake sustainable fishing practices Sustainable coastal fishery strategy and management plan developed with inputs from key stakeholders	stakeholders. Regular fish monitoring surveys carried out at selected priority fishing areas to determine fish recovery			Concerned provincial and municipal government units Conservation organizations
Build institutional capacity for small-scale fishers through cooperatives.	Improved capacity for sustainable fishing practices of local communities Training and capacity needs for small-scale fishers assessed Relevant training modules developed and implemented with key stakeholders (e.g., DENR, concerned LGUs, provincial government, DA) Improved capacity of key stakeholders about sustainable	Training Needs Assessment on sustainable fishing practices completed and disseminated to concerned stakeholders Number of training modules developed based on the results of training needs assessment Number of capacity-building activities administered with concerned stakeholders Number of people benefitting from the capacity-building activities, especially those from the vulnerable groups	100,000.00	5 years	

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
	coastal fishing practices				
Develop financing instruments, including through microfinance for small-scale fishers, and capacity building.	Improved capacity for financial management of local communities Financial mechanism and management board established to manage disbursement of small loans and grants relevant to site management Better fishing practices documented in the areas covered by the capacity-building activities	Financial mechanism and management board established to manage disbursement of small loans and grants. Microfinancing mechanism for small grants/loans to fishers strengthened or established to at least 2 barangays. Up to 100 small loans for small scale fisherfolk disbursed.	200,000.00	5 years	
Component 4. Restoration of degraded and cleared mangroves in NOCWCA					
Upscale of mangrove restoration plots at cleared or degraded areas of mangroves along the Negros coastline	Wetland under sustainable management scaled up; degraded mangrove areas restored and more resilient to coastal action resulting to an increase of	Area of restored mangrove areas, with a restoration target of up to 150 ha of degraded land and degraded mangroves restored at selected plots, including unutilized aquaculture ponds,	200,000.00	5 years	Department of Environment and Natural Resources DENR PENRO Negros Occidental DA- BFAR People

Intervention	Outcome	Indicators	Cost	Timeframe	Potential Stakeholders
	mangrove cover to at least 600 ha	and the edges of aquaculture areas.			Organisations Concerned provincial and municipal government units Conservation organisations
Total investment for five years			**8,350,000**		

7.2 Potential Financing

The estimated project cost is USD 8,350,000 over five years. This project budget supports the strengthening of local nature-based tourism, the protection of roosting shorebirds' habitats, the development of financing mechanisms, influencing sustainable coastal fishery practices with local communities, the restoration of degraded mangrove areas, and the institutionalization of a biodiversity monitoring system.

If the proposed USD 200,000 investment over five years is allocated to scaling up mangrove restoration along the Negros coastline, it could enable the rehabilitation of up to 150 hectares of degraded or cleared mangroves, including disused aquaculture ponds. With estimated coastal protection benefits of USD 1,687 per hectare annually (see Section 5.3), this nature-based intervention could yield approximately USD 253,050 in annual benefits—amounting to over USD 1.26 million over five years. This suggests a benefit–cost ratio of over 6:1, underscoring the cost-effectiveness of investing in mangrove restoration for long-term resilience. In addition to enhancing protection from coastal hazards, expanding overall mangrove cover to at least 600 hectares would contribute to ecosystem recovery and support biodiversity and sustainable livelihoods. In contrast, allowing degraded areas to remain unrestored—or maintaining disused aquaculture ponds—would result in foregone protection benefits and reduced ecosystem functionality over the long term.

Conservation organisations lead existing projects and activities in NOCWCA, which can be scaled up under this proposal.

7.3 Proposed Institutional Arrangements

The project is proposed to be implemented over a time frame of at least five years.

7.4 Project Beneficiaries

The Ramsar Information Sheet for NOCWCA indicated about 50,000 direct and indirect beneficiaries.

There are no indigenous people in this landscape, but several mechanisms and structures have been established with support from the local government, to include local people in decision-making processes (e.g. NOCWCAMA). There are opportunities for stronger inclusion of women, and small-scale fishers in these existing mechanisms.

7.5 Anticipated Implementation Risks

Environment: Nature-based ecotourism 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 NOCWCA. 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 NOCWCA mangroves is not impacted by proposed development.

Social Safeguards: Introduction of fishery guidelines may have a short-term impact on the incomes of small-scale fishers. Scoping studies will be needed to assess the impact of these regulations on domestic incomes and the challenges of implementing these restrictions in a complex environment.

References

Aguilar, V.R. & Tabujara, D.I.M. (2022) Engaging Fisherfolk Organizations in Conservation-Based Alternative Livelihoods and Conservation of the Habitats of Irrawaddy Dolphins in Negros Occidental. *Philippine Journal of Fisheries* 29(1): 53-66.

Asian Waterbird Census (AWC): *Philippines data for 2019-2021*. See https://eaaflyway.net/asian-waterbird-census

Chaplin-Kramer, R., Neugarten, R.A., Sharp, R.P., Collins, P.M., Polasky, S., Hole, D., Schuster, R., Strimas-Mackey, M., Mulligan, M., Brandon, C., Diaz, S., Fluet-Chouinard, E., Gorenflo, L. J., Johnson, J.A., Kennedy, C.M., Keys, P.W., Longley-Wood, K., McIntyre, P.B., Noon, M., Pascual, U., Reidy Liermann, C., Roehrdanz, P.R., Schmidt-Traub, G., Shaw, M.R., Spalding, M., Turner, W.R., van Soesbergen A., and Watson, R.A. (2023) Mapping the planet's critical natural assets. *Nature Ecology & Evolution* 7: 51–61.

De La Paz, M.E., Luther, J.N., Espinosa, S.M., Festin, B.C., Santillan, R.M., Gabriel, J.P., Sombito, L.V.U., Hisu-An, J.G., Salvilla, R.A.R., Cardinal, J.M., Lotayco, T.M., & Montoya, P. (2021). Marine mammals occurring in the Negros Occidental Coastal Wetlands Conservation Area, Philippines. *The Philippine Journal of Fisheries* 28 (2): 119-132.

EAAFP Flyway Network Site Information Sheet: Negros Occidental Coastal Wetlands Conservation Area. Available at: https://eaaflyway.net/philippines/

IUCN Red List of Threatened Species. Available at: www.iucnredlist.org

Menéndez, P., Losada, I.J., Torres-Ortega, S., Narayan, S., and Beck, M.W. (2020) The Global Flood Protection Benefits of Mangroves. *Scientific Reports* 10: 4404

Morata, A.S., Caligan, J.T., Capio, T.B., & Regatalio, K.D. (2019). Water quality and removal efficiency of suspended solids, copper, lead, and oil/grease in Malihao River, Negros Occidental, Philippines using Bivalve Shells. *Kimika* 30 (2): 49-60.

Mulligan, M. (2022). Documentation for the Co$tingNature Model V3. www.policysupport.org/costingnature

Mundkur, T. & Langendoen, T. (2022) Report on the Conservation Status of Migratory Waterbirds of the East Asian – Australasian Flyway Partnership. First Edition. Draft Report to the East Asian – Australasian Flyway Partnership. Wetlands International, Ede, The Netherlands. Available at: https://www.wetlands.org/publication/eaaf-conservation-status-review1/

Onate-Pacalioga, J. & Hisuan, J.G. (2022) Fish and invertebrate species composition in Estuarine areas of Bago-Pulupandan, Negros Occidental, Philippines. *Manila Journal of Science* 15(2): 46-59.

Posadas, M.F.G. (2023). Community validation of threatened species in Coastal Wetland Areas of Negros Occidental, Philippines. *Journal of Environmental Science and Management* 26(1): 45-58.

Ramsar Site Information Sheet: Negros Occidental Coastal Wetlands Conservation Area (NOCWCA). Available at: https://rsis.ramsar.org/ris/2271

Scott, D.A. (1989) A Directory of Asian Wetlands. IUCN: Gland, Switzerland & Cambridge, U.K. Available at: https://portals.iucn.org/library/node/5933

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 NOCWCA 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)	12.42 – 18.08
Current maximum coastal risk to be mitigated, or potential exposure to coastal hazards (unitless index)	*2.50 – 2.59*
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)	3.00 – 3.11
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)	3.15 – 3.26
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)	3.27 – 3.39
Current proportional risk reduction, nature's contribution to reducing coastal risk as a proportion of maximum coastal risk (unitless index)	0.11 – 0.13
Nature's contribution to reducing coastal risk as a proportion of population density within 2.5 km of the coast (# of people per hectare)	*1.50 – 2.23*
Nature's contribution to reducing coastal risk as a percentage of the maximum potential exposure (%)	*4.5 – 5.1*

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 NOCWCA 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$)**
Mangrove extent (hectares)[2]	565 – 2,412
Annual expected flood protection benefits to people (number of people)	138 – 3,453
Annual expected flood protection benefits to Industrial Stock (US$)	76,797 – 1,924,706
Annual expected flood protection benefits to Residential Stock (US$)	118,639 – 2,973,356
Annual expected flood protection benefits to Total Stock (US$)	*192,716 – 4,829,865*
Annual expected flood protection benefits to Industrial Stock per hectare of mangroves (US$ per hectare)	*129 – 3,244*
1-in-100-year return period damage in terms of area flooded (number of hectares)	122 – 1,145
Total expected flood protection benefits of mangroves per 100-year return period storms (US$)	*(176,575) – 11,131,570*

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
Kabasalan-Siay 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-Siay 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 NOCWCA 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	492.5	0.5	375.0	0.4
Intertidal mud, sand or salt flats	1883.8	2.1	1600.0	1.8
Open marine water	87231.5	97.3	87,632.8	97.8
Total area	89607.8	100.0	89,607.8	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.