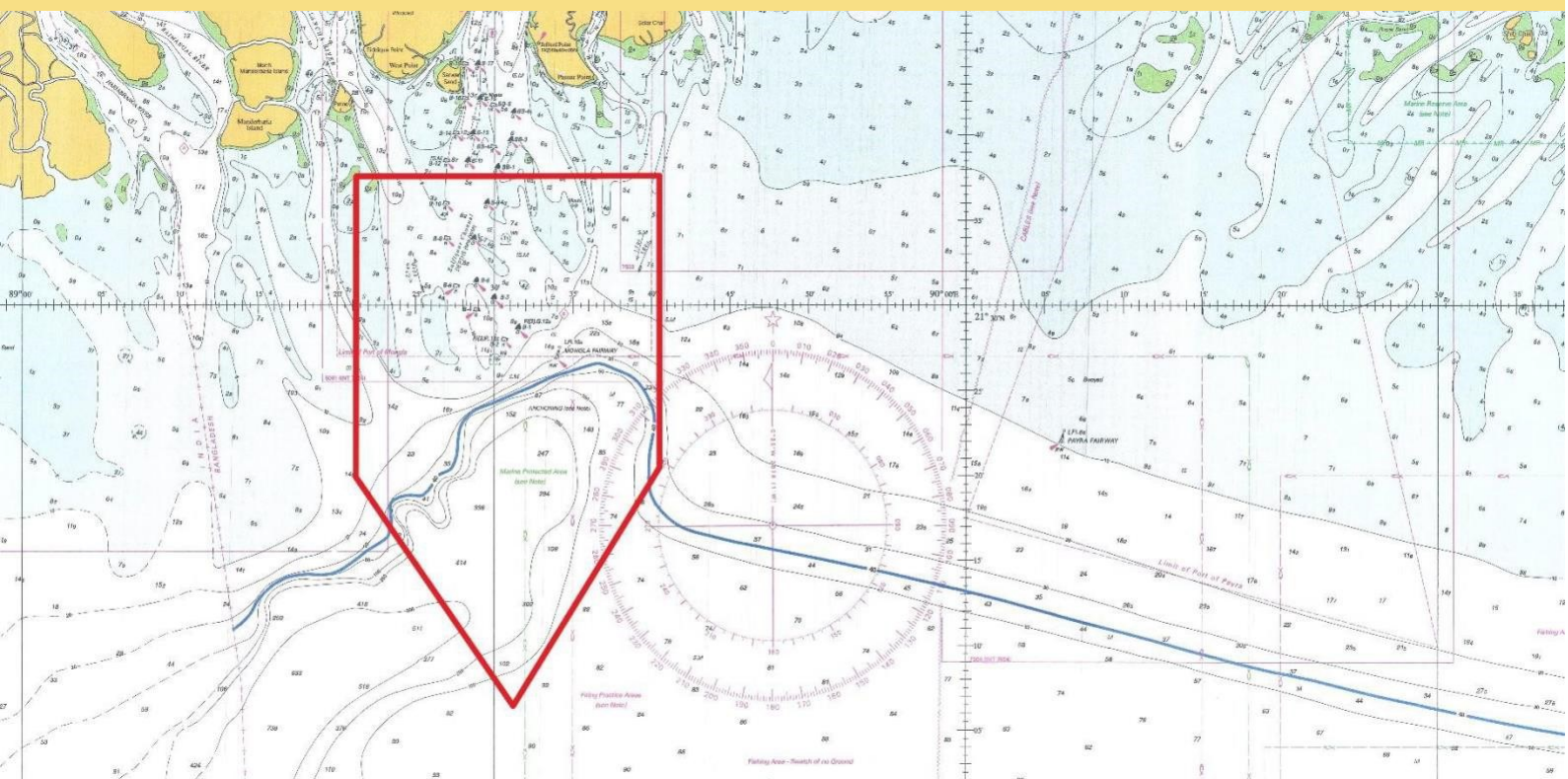
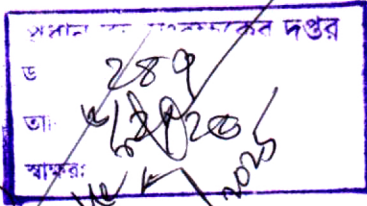


INTEGRATED MANAGEMENT PLAN FOR THE SWATCH OF NO-GROUND (SoNG) MARINE PROTECTED AREA 2024 – 2033

October 2024



Government of the People's Republic of Bangladesh



প্রশাসন, পরিবহন, ইভানচ
পত্র প্রাপ্তির তারিখ 06 FEB 2025
কর্মকর্তার স্বাক্ষর
শাখা প্রধানের স্বাক্ষর

তারিখ:	05 FEB 2025
প্রধান বন সংরক্ষকের দপ্তর	
প্রধান বন সংরক্ষক	
বন সংরক্ষক (প্রশাসন ও অর্থ)	
প্রধান সহকারী	
সংশ্লিষ্ট শাখা	MP

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয়
বন শাখা-২
www.moef.gov.bd

স্মারক নম্বর-২২.০০.০০০০.০৬৭.২২.০০১.২৩.৪৫

১২ মাঘ ১৪৩১
তারিখ:-----
২৬ জানুয়ারি ২০২৫

বিষয়: Integrated Management Plan for the Swatch-of-no-ground Marine Protected Area (2024- 2033) (SoNG-MPA) অনুমোদন প্রসঙ্গে।

উপর্যুক্ত বিষয় ও সূত্রস্থ পত্রের পরিপ্রেক্ষিতে জানানো যাচ্ছে যে, Swatch-of-no-ground Marine Protected Area সংরক্ষণ ও ব্যবস্থাপনার নিমিত্ত পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয় কর্তৃক Integrated Management Plan for the Swatch-of-no-ground Marine Protected Area (2024-2033) (SoNG-MPA) এর অনুমোদন প্রদান করা হলো।

০২। বিষয়টি নির্দেশক্রমে পরবর্তী প্রয়োজনীয় ব্যবস্থা গ্রহণের নিমিত্ত সকলকে অবহিত করা হলো।

সংযুক্তি: বর্ণনামতে।

(ড. মো: সাইফুর রহমান)

উপসচিব

ফোন: ২২৩৩৫৪৪১৮

E-mail: forest2moef@gmail.com

স্মারক নং- ২২.০০.০০০০.০৬৭.২২.০০১.২৩.৪৫

১২ মাঘ, ১৪৩১
তারিখ:-----
২৬ জানুয়ারি, ২০২৫

বিতরণ (জ্যেষ্ঠতার ক্রমানুসারে নয়):

- ০১। নৌবাহিনী প্রধান, নৌবাহিনী সদর দপ্তর, বনানী, ঢাকা;
- ০২। সিনিয়র সচিব, জননিরাপত্তা বিভাগ, স্বরাষ্ট্র মন্ত্রণালয়, বাংলাদেশ সচিবালয়, ঢাকা;
- ০৩। সিনিয়র সচিব, নৌপরিবহন মন্ত্রণালয়, বাংলাদেশ সচিবালয়, ঢাকা;
- ০৪। সচিব, বেসামরিক বিমান পরিবহন ও পর্যটন মন্ত্রণালয়, বাংলাদেশ সচিবালয়, ঢাকা;
- ০৫। সচিব, জ্বালানি ও খনিজ সম্পদ বিভাগ, বাংলাদেশ সচিবালয়, ঢাকা;
- ০৬। সচিব, মৎস্য ও প্রাণিসম্পদ মন্ত্রণালয়, বাংলাদেশ সচিবালয়, ঢাকা;
- ০৭। সচিব, মেরিটাইম এ্যাফেয়ার্স ইউনিট, পররাষ্ট্র মন্ত্রণালয়, সেগুনবাগিচা, ঢাকা;
- ০৮। মহাপরিচালক, পরিবেশ অধিদপ্তর, আগারগাঁও, ঢাকা;
- ০৯। মহাপরিচালক, সদর দপ্তর, বাংলাদেশ কোস্ট গার্ড, আগারগাঁও, ঢাকা;
- ১০। চেয়ারম্যান, চেয়ারম্যান এর দপ্তর, মোংলা বন্দর কর্তৃপক্ষ, বাগেরহাট;
- ১১। চেয়ারম্যান, চেয়ারম্যান এর দপ্তর, পায়রা বন্দর কর্তৃপক্ষ, পটুয়াখালী;
- ১২। চেয়ারম্যান, বাংলাদেশ অভ্যন্তরীণ নৌ-পরিবহন কর্তৃপক্ষ, মতিঝিল, ঢাকা;
- ১৩। প্রধান বন সংরক্ষক, (ভারপ্রাপ্ত), বন অধিদপ্তর, আগারগাঁও, ঢাকা;
- ১৪। প্রধান নির্বাহী কর্মকর্তা (অতিরিক্ত দায়িত্ব), বাংলাদেশ ট্যুরিজম বোর্ড, আগারগাঁও, ঢাকা;
- ১৫। Dr Jahangir Alom, Country Director, Wildlife Conservation Society;

INTEGRATED MANAGEMENT PLAN FOR THE SWATCH OF NO-GROUND (SoNG) MARINE PROTECTED AREA 2024 – 2033



Copyright

© 2024 Ministry of Environment, Forest and Climate Change and Bangladesh Forest Department.

Reproduction of this publication for educational or other non-commercial purposes is permitted without prior written permission from the copyright holders, provided the source is fully acknowledged. However, reproduction for resale or commercial purposes is prohibited without the copyright holder's permission.

Citation

Ministry of Environment, Forest and Climate Change, Bangladesh Forest Department and Wildlife Conservation Society. 2024. Integrated Management Plan for the Swatch of No-Ground Marine Protected Area 2024-2033. Ministry of Environment, Forest and Climate Change, Dhaka, Bangladesh.

Published by

Ministry of Environment, Forest and Climate Change
Government of the People's Republic of Bangladesh, 2024

Available from

Ministry of Environment, Forest
and Climate Change
Bangladesh Secretariat
Dhaka 1100, Bangladesh

Bangladesh Forest Department
Bon Bhaban, Agargaon
Dhaka 1207, Bangladesh

Executive Summary

The Government of Bangladesh declared the country's first multiple-use marine protected area (MPA) in productive shallow waters offshore the Sundarbans mangrove forest and in deep waters at the head of the Swatch of No-Ground (SoNG) submarine canyon in the northern Bay of Bengal in November 2014. Declaration of the SoNG MPA recognized the strong potential of the area to protect globally significant populations of threatened marine wildlife from increasing threats and sustain productive, economically valuable fisheries from overexploitation. To guide conservation management in the SoNG MPA, the Ministry of Environment, Forest and Climate Change in consultation with other marine stakeholders prepared this ten-year Integrated Management Plan (IMP).

For the management plan, information from at-sea surveys, fishery investigations, Citizen Science Networks, community consultations, and a literature review were compiled and included in the first section on *Description and Evaluation of Existing Situation*, with subsections on the location and extent of the area, physical characteristics, bathymetry, climate, currents and tides, habitat types, biological characteristics, fishery characteristics, key stakeholders, national and international legal frameworks, and conservation threats.

The second section on *Proposed Management*, subsections are included on vision, mission statement, goals and objectives, management strategy, and management recommendations. Recommendations are organized according to marine spatial planning or zoning, fisheries, vessel traffic and pollution, dredging and oil and gas exploration and development, tourism, enforcement and monitoring, community engagement, livelihoods, and assessment and evaluation. Management zones include a Fish Spawning and Nursery Zone, Marine Wildlife Protection and Regulated Fishery Zone, and Sustainable Fishery Zone.

The third section is on *Administration* with subsections on management structure and responsibilities, infrastructure, equipment and resources, responsible agencies and estimated costs, and sustainable financing.

The fourth section is on *Proposed Actions for Implementing the IMP-SoNG MPA*, including a summary table of proposed actions with information on responsible agencies and a timeline. The first part of this section includes the MPA management recommendations on marine spatial or zoning plan, fisheries, vessel traffic and pollution, dredging and oil and gas exploration and development, tourism, enforcement and monitoring, community engagement, livelihoods, climate adaptation, and assessment and monitoring. The second part includes the management structure and responsibilities of the MPA Management Committee, MPA Research Unit, MPA Community Engagement Unit, MPA Enforcement and Monitoring Unit. The second part also includes the necessary infrastructure, equipment and resources for the management of SoNG MPA.

The fifth section is on a Proposed Extension of the SoNG MPA. This section recognizes that the value of the existing SoNG MPA for sustaining productive fisheries is limited due to its small size, while the marine wildlife it aims to protect is wide ranging with many species commonly found outside of the MPA, and hence the expansion of the MPA is required. This section therefore recommends that a major extension of the SoNG MPA be considered from its current size of 1,738 km² to a much larger area covering 6,866 km².

Implementing this IMP-SoNG MPA, including the proposed extension, will protect threatened marine biodiversity and strengthen its potential for sustaining productive marine fisheries and a national Blue Economy.

Acknowledgements

The Ministry of Environment, Forest and Climate Change (MoEFCC) extends its sincere gratitude to all individuals and organizations that contributed to the development of the Integrated Management Plan for the SoNG MPA (IMP-SoNG MPA). The collective expertise and dedication have been instrumental in shaping this comprehensive management plan.

The ministry expresses deepest appreciation to the Hon'ble Advisor, MoEFCC for providing wholehearted support and meaningful guidance in the process of approving this document. The ministry is thankful to concerned officials of the MoEFCC, for their invaluable contribution and commitment to this critical initiative. The ministry also acknowledges the significant contributions of the Bangladesh Forest Department for their cooperation in the preparation of the IMP-SoNG MPA.

The MoEFCC has been deeply grateful to the representatives from the Ministry of Fisheries and Livestock, Ministry of Commerce, National Board of Revenue, Bangladesh Coast Guard, Bangladesh Navy, Bangladesh Police, Department of Fisheries (DoF), Bangladesh Fisheries Research Institute (BFRI), Bangladesh Fisheries Development Corporation (BFDC), Bangladesh Tourism Board, the University of Dhaka, University of Chattogram, and Sher-e-Bangla Agricultural University and other organisations for their valuable insights and inputs.

The MoEFCC would like to express its sincere appreciation to the Wildlife Conservation Society (WCS) Bangladesh for their exceptional technical support in developing the IMP-SoNG MPA and the accompanying background documents. Their dedication, coupled with the generous financial support from the WCS MPA Fund, the Rainforest Trust, and the Prince Albert II of Monaco Foundation, has been crucial to the project's success. Additionally, the Shark Conservation Fund, and the Marine Conservation Action Fund have enabled WCS to conduct vital research that underpins this plan.

Secretary

Ministry of Environment, Forest and Climate Change

Table of Contents

A. DESCRIPTION AND EVALUATION OF EXISTING SITUATION	1
1. Introduction	1
1.1 Name	1
1.2 Location and the extent of area	1
2. Rationale	2
3. Background information and attributes	2
3.1 Physical characteristics	2
3.1.1 Bathymetry	2
3.1.2 Climate, currents, and tides	3
3.2 Habitat types	3
3.3 Biological characteristics	4
3.3.1 Marine wildlife	4
(i) Cetaceans	4
(ii) Sharks	4
(iii) Rays	5
(iv) Marine turtles	7
(v) Sea birds	7
3.4 Fish diversity	7
3.4.1 Hilsa	7
3.4.2 Other finfishes	7
3.5 Fishery characteristics	8
3.5.1 Set-bag nets	8
3.5.2 Gillnets	9
3.5.3 Longlines	9
3.5.4 Trawl nets	10
3.6 Climate change	10
4. Key stakeholders	11
4.1 Government of Bangladesh	11
4.2 Fishing communities	11
4.3 Transport vessel operators and port authorities	12
4.4 Oil and gas developers	13
5. National and international legal framework	14
5.1 National laws and policies	14
5.1.1 Biodiversity	14
5.1.2 Environment	15
5.1.3 Fisheries	16
5.1.4 Poverty alleviation	17
5.1.5 National Environment Policy 2018	17
5.2 International conventions and agreements	17
5.2.1 United Nation Convention on the Law of the Sea (UNCLOS)	17
5.2.2 The Convention on Biological Diversity	17
5.2.3 United Nations Sustainable Development Goals (SDGs)	17

5.2.4 International Maritime Organization (IMO)	18
5.2.5 Convention on Migratory Species (CMS)	18
5.2.6 FAO Code of Conduct for Responsible Fisheries (CCRF)	18
5.2.7 United Nations Environment Programme (UNEP)	18
5.2.8 UN Framework Convention on Climate Change (UNFCCC)	18
5.2.9 South Asia Co-operative Environment Programme (SACEP)	19
6. Conservation threats	19
6.1 Bycatch of cetaceans and marine turtles	19
6.2 Targeted and non-targeted catches of sharks and rays	20
6.3 Overexploitation of fisheries	21
6.4 Oil and gas exploration and development	22
6.5 Vessel traffic	22
6.6 Climate change	22
B. PROPOSED MANAGEMENT	23
1. Vision	23
2. Mission statement	23
3. Goals and objectives	23
4. Methodology for the development of the IMP-SoNG MPA	23
5. Management strategy	24
6. Management recommendations	25
6.1 Marine spatial or zoning plans	25
6.1.1 Predictive mapping to inform marine spatial planning	25
6.1.2 Recommendations for management zones	29
(i) Fish Spawning and Nursery Zone	29
(ii) Marine Wildlife Protection and Regulated Fishery Zone	29
(iii) Sustainable Fishery Zone	29
6.2 Fisheries	30
6.3 Vessel traffic and pollution	31
6.4 Dredging and oil and gas exploration and development	32
6.5 Tourism	34
6.6 Enforcement and monitoring	35
6.6.1 Interagency government SMART patrols	36
6.6.2 Community monitoring patrols	36
6.7 Community engagement	37
6.8 Livelihoods	38
6.9 Climate adaptation	39
6.10 Assessment and monitoring	39
C. ADMINISTRATION	41
1. Management structure and responsibilities	41
1.1 MPA Management Committee	41
1.2 MPA Research Unit	42
1.3 MPA Community Engagement Unit	43
1.4 MPA Enforcement and Monitoring Unit	44

2.	Infrastructure	45
	2.1 Land-based infrastructure	45
	2.2 Sea-based infrastructure	46
3.	Equipment and resources	46
4.	Estimated costs for IMP-SoNG MPA operations and functioning	46
5.	Sustainable financing	46
D.	PROPOSED ACTIONS FOR IMPLEMENTING THE IMP-SoNG MPA	47
E.	PROPOSED SoNG MPA EXTENSION	56
	REFERENCES	58

List of Tables

Table 1.	Cetacean mortalities recorded between June 2015 and February 2019 by citizen science fishers from entanglements in large and medium mesh-size gillnets.	20
Table 2.	Summary table of proposed actions for implementing the <i>Integrated Management Plan for the Swatch of No-Ground Marine Protected Area 2024-2033</i> (IMP-SoNG MPA) with information on responsible agencies and timeline.	47

List of Figures

Figure 1.	The Swatch of No-Ground MPA includes shallow estuarine waters less than ten meters deep offshore the Sundarbans Reserved Forest, and over 100 m deep waters at the head of the submarine canyon from which the MPA gets its name.	1
Figure 2.	3D bathymetric model of Bay of Bengal (left) and Swatch of No-Ground (right) from Kader et al. 2013.	2
Figure 3.	Predicted distribution of sharks in the northern Bay of Bengal in Bangladesh based on 677 georeferenced catches recorded by citizen science fishers.	5
Figure 4.	Predicted distribution of all rays combined based on 381 georeferenced, photo-verified catches of rays recorded by citizen science fishers.	6
Figure 5.	Commercial vessel traffic to and from the Mongla and Payra ports will likely increase and could impact the SoNG MPA. High (dark red), medium (yellow to lighter blue) and minimum (purple) density of commercial vessel traffic in 2019 was derived from https://www.marinetraffic.com/en .	13
Figure 6.	Oil and gas exploration blocks in the Bangladesh EEZ in relation to the SoNG MPA, with shallow blocks (SS, white/green) <200 m deep and deep-sea blocks (DS, blue/green/orange) >200 m deep. Map reproduced from Hossain et al. 2014.	14
Figure 7.	Maps showing priority habitat for marine wildlife (cetaceans, sharks, rays, marine turtles) (top left), importance of adjacent mangrove-associated shallow estuarine waters for marine biodiversity according to distance from shore (top right), importance of open estuarine waters for hilsa productivity according catch density of juvenile hilsa or <i>jatka</i> (bottom left) and primary productivity according to chlorophyll levels (bottom right).	27
Figure 8.	High risk areas for threatened marine wildlife in and around the SoNG MPA according to gillnet fishing intensity (left) and distance from shipping routes (right).	28
Figure 9.	Marine spatial plan for the SoNG MPA with three management zones: Fish Spawning and Nursery Zone (red), Marine Wildlife Protection and Regulated Fishery Zone (yellow), and Sustainable Fishery Zone (green).	28
Figure 10.	Organogram for SoNG MPA management.	42
Figure 11.	Marine spatial plan for the extended SoNG MPA indicating the Fish Spawning and Nursery Zone in red, Marine Wildlife Protection and Regulated Fishery Zone in yellow, and the Sustainable Fishery Zone in green.	57

List of Appendices

Appendix 1.	Gazette Notification of the SoNG MPA.	62
Appendix 2.	Images of marine wildlife occurring in the SoNG	64
Appendix 3.	List of confirmed and suspected shark species in the SoNG MPA with their Global IUCN Red List status.	66
Appendix 4.	List of confirmed and suspected ray species in the SoNG MPA with their Global IUCN Red List status.	68
Appendix 5.	Biophysical, socioeconomic, and governance indicators with metrics and methods to evaluate the effectiveness of SoNG MPA management actions.	71
Appendix 6.	Consultations to inform the Integrated Management Plan for the Swatch of No-Ground Marine Protected Area 2024-2033 (IMP-SoNG MPA) with information on actions, participants, remarks and decisions.	75
Appendix 7.	Minutes of the meeting regarding the finalization of Integrated Management Plan for the Swatch of No-Ground Marine Protected Area (IMP-SoNG MPA) held on 07 July 2024.	78

Acronyms and Abbreviations

BCG	Bangladesh Coast Guard
BFD	Bangladesh Forest Department
BFRI	Bangladesh Fisheries Research Institute
BIWTA	Bangladesh Inland Water Transport Authority
BN	Bangladesh Navy
BTRC	Bangladesh Telecommunication Regulatory Commission
CBD	Convention on Biological Diversity
CCRF	Code of Conduct for Responsible Fisheries
CCF	Chief Conservator of Forests
CMS	Convention on Migratory Species
CPUE	Catch per Unit Effort
CR	Critically Endangered
DD	Data Deficient
DCCF	Deputy Chief Conservator of Forest
DoF	Department of Fisheries
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EN	Endangered
FAO	Food and Agriculture Organization of the United Nations
ESBN	Estuarine Set-bag Net
GoB	Government of the People's Republic of Bangladesh
GPS	Global Positioning System
IMMA	Important Marine Mammal Area
IMO	International Maritime Organization
IMP	Integrated Management Plan
IOTC	Indian Ocean Tuna Commission
IUCN	International Union for Conservation of Nature
JMC	Joint Monitoring Cell
KAP	Knowledge, Attitude, and Practice
LC	Least Concern
LMGN	Large-mesh Gill Net
MCS	Monitoring, Control, and Surveillance
MMGN	Medium-mesh Gill Net
MoCAT	Ministry of Civil Aviation and Tourism
MoEFCC	Ministry of Environment, Forest and Climate Change
MoFA	Ministry of Foreign Affairs
MoFL	Ministry of Fisheries and Livestock
MPA	Marine Protected Area
MPEMR	Ministry of Power, Energy and Mineral Resources
MSBN	Marine Set-bag Net
MSDS	Material Safety Data Sheet
MSP	Marine Spatial Planning
NGO	Non-Government Organization

NT	Near Threatened
PA	Protected Area
PAM	Passive Acoustic Monitoring
PSSA	Particularly Sensitive Sea Area
RFMO	Regional Fisheries Management Organization
SBN	Set-bag Net
SDG	United Nations Sustainable Development Goal
SMGN	Small-mesh Gillnet
SMART	Spatial Monitoring and Reporting Tool
SoNG	Swatch of No-Ground
SOP	Standard Operating Procedure
UNCLOS	United Nation Convention on the Law of the Sea
UNEP	United Nations Environment Programme
VGf	Vulnerable Group Feeding
VHF	Very High Frequency
VU	Vulnerable
WCS	Wildlife Conservation Society

A. DESCRIPTION AND EVALUATION OF EXISTING SITUATION

1. Introduction

1.1 Name: Swatch of No-Ground Marine Protected Area

1.2 Location and the extent of area: As per Government Gazette Notification (Appendix 1) published on 3 November 2014, under the Wildlife (Conservation and Security) Act, 2012, 1,738 km² in the northern Bay of Bengal of Bangladesh were declared by the Ministry of Environment, Forest and Climate Change (MoEFCC) as the *Swatch-of-No-Ground Marine Protected Area* (SoNG MPA) (Figure 1) according to the geographical coordinates for the corner points listed below.

Location	Latitude	Longitude
North	21.37'35"	89.30'22"
North West	21.37'35"	89.21'13"
North East	21.37'35"	89.40'30"
South West	21.19'57"	89.21'13"
South East	21.20'28"	89.40'30"
South	21.06'25"	89.31'14"

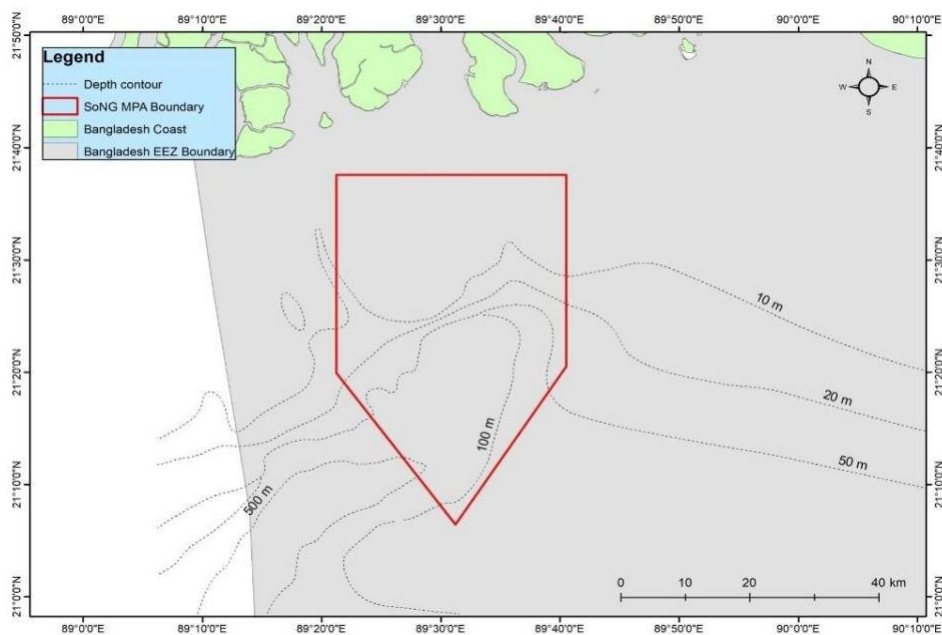


Figure 1. The Swatch of No-Ground MPA includes shallow estuarine waters less than ten meters deep offshore the Sundarbans Reserved Forest, and over 100 m deep waters at the head of the submarine canyon from which the MPA gets its name.

2. Rationale

Declaration of this MPA responds to the commitment of the Government of the People's Republic of Bangladesh (GoB) to marine conservation and sustainable fisheries as well as to the United Nations Sustainable Development Goals (SDGs) and international obligations under the Convention on Biological Diversity (CBD) Kunming-Montreal Global Biodiversity Framework to achieve 30 % terrestrial and inland water areas, and marine and coastal areas protection in its Exclusive Economic Zone (EEZ) by 2030.

3. Background information and attributes

3.1 Physical characteristics

3.1.1 *Bathymetry*

Nearshore waters of the SoNG MPA are shallow with sandbars and sea-bed ridges. The SoNG submarine canyon is eroded by sedimentation discharged by the Ganges-Brahmaputra-Meghna River system, and it is the most prominent bathymetric feature in the northern Bay of Bengal (Figure 2 - left).

The head of the canyon lies within about 35 km of the southern edge of the Sundarbans mangrove forest at the 50-m depth contour, continuing towards the sea in a southwest direction ranging between 900-1,500 m deep. The canyon is cone shaped, ranging from about six km wide at its head to 40 km wide at its mouth (Figure 2 - right). The walls are relatively steep (12-15°) with plateaus on both sides (Sengupta et al. 1992). The bottom of the canyon floor is mainly mud and coastal silt with turbidity currents forming complex channel-levees (Subrahmanyam 2008).

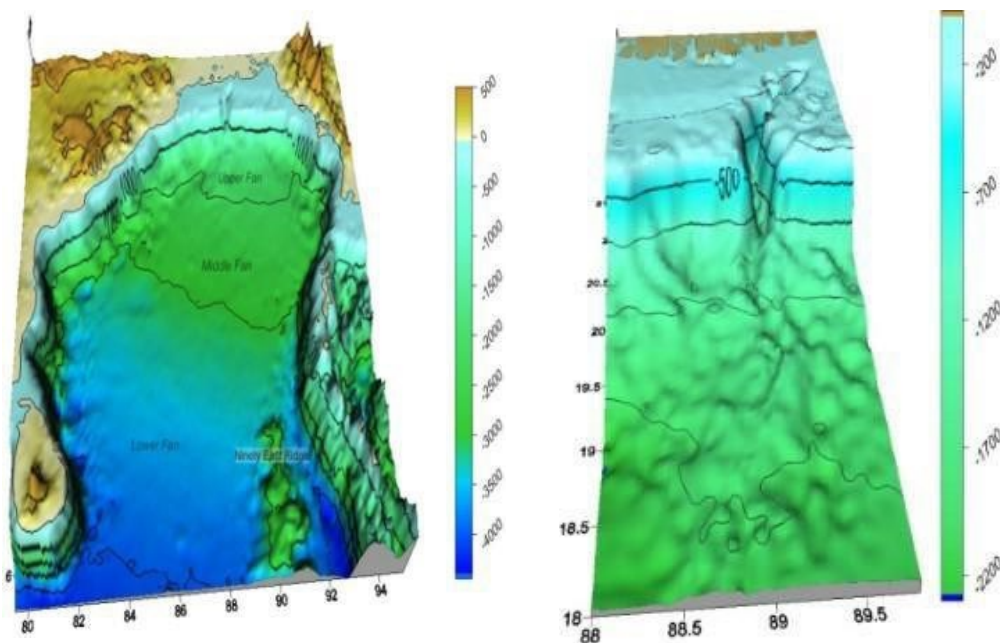


Figure 2. 3D bathymetric model of Bay of Bengal (left) and Swatch of No-Ground (right) from Kader et al. 2013.

3.1.2 *Climate, currents, and tides*

Climate at the head of the Bay of Bengal is characterized by a seasonally reversing monsoon system which is mirrored by a reversing cyclonic current with associated meso-eddies that retain nutrients. From May to September, the southwest or summer monsoon system is characterized by heavy wind and rain originating from the Arabian Sea. From December to February, a high-pressure system over the Tibetan plateau initiates the normally calm and dry northeast or winter monsoon (Kuehl et al. 1997).

Strong southeast winds during the summer monsoon drive counterclockwise currents while relatively light northeast winds drive clockwise currents during the winter monsoon (Kottke 2003). Frequent cyclones, which are increasing in frequency and magnitude due to climate change, occur particularly in May and October, which are transition months between the two different seasons (Kudrass et al. 1998).

3.2 Habitat types

The SoNG MPA includes two major habitat types in a relatively small space. These include (i) shallow open estuarine waters where freshwater, sediments, and nutrients from rivers draining the Sundarbans mangrove forest mix with seawater in a seasonally reversing current, and (ii) deep, upwelled marine waters at the head of the SoNG submarine canyon. The relative rarity of this magnitude of freshwater inputs, combined with a seasonally reversing current and upwelling at the head of the SoNG submarine canyon, makes this MPA globally unique.

Discharge from the Ganges-Brahmaputra-Meghna River system passes an estimated freshwater flow of 1,400 km³/year (Shiklomanov 1993) and more than 10⁹ tons of sediment per year (Milliman and Syvitski 1992). The average monthly water flow varies from 190 m³/sec in March to 7,650 m³/sec in August (Michels et al. 2003). The SoNG canyon supports the world's largest submarine fan with sediments transported by strong turbidity currents (Kudrass et al. 1998, Subrahmanyam 2008).

There is a great deal of variability in salinity during different times of the year, which is linked to seasonal precipitation, evaporation, river discharge, and tidal patterns. During the southwestern monsoon season, salinity ranges between 5-18 parts per thousand (ppt) in the estuarine waters adjacent to Sundarbans mangrove forest (Aziz and Paul 2015). During at-sea investigations conducted in the northeast monsoon season in 2010-2013, the Wildlife Conservation Society (WCS) recorded a salinity between 10-28 ppt and sea surface temperature between 20-28° Celsius in shallow waters (4-23 m) at the northern edge of the SoNG MPA. WCS recorded an average surface water temperature of 23.5° C (range = 21.6-25.6) and an average salinity level of 26.9 ppt (range = 16.1-30.4) in the northeastern monsoon season.

3.3 Biological characteristics

3.3.1 *Marine wildlife*

The diverse and dynamic habitat of the SoNG MPA is illustrated in Appendix 2 with photographs of selected marine wildlife.

(i) Cetaceans

The SoNG MPA lies within an *Important Marine Mammal Area* (IMMA), defined as a discrete portion of habitat, important to marine mammal species that has the potential to be delineated and managed for conservation. The SoNG MPA supports a large diversity of cetaceans (dolphins, whales, and porpoises), including species at immediate risk of extinction in numbers generally much greater compared to neighboring populations of the same species.

Cetacean distribution is closely tied to environmental gradients (Smith et. al 2008). Endangered (EN) Irrawaddy dolphins (*Orcaella brevirostris*) and Vulnerable (VU) finless porpoises (*Neophocaena phocaenoides*) occur most often in nearshore, turbid, low-salinity waters. VU Indo-Pacific humpback dolphins (*Sousa chinensis*) occur in slightly deeper waters where the color turns from brown to green. Near Threatened (NT) Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), Least Concern (LC) pantropical spotted (*Stenella attenuata*) and spinner (*S. longirostris*) dolphins, and LC Bryde's whales (*Balaenoptera edeni*) occur in deep, clear, high-salinity waters at the head of the SoNG submarine canyon.

During dedicated cetacean surveys conducted by WCS, one sighting each were made of false killer whales *Pseudorca crassidens* and rough-toothed dolphins (*Steno bredanensis*) in the SoNG submarine canyon. In 2018, a single orca (*Orcinus orca*) was photo-documented by WCS citizen science fishers 10 kms west of the SoNG MPA.

(ii) Sharks

The diverse and productive habitat in the SoNG MPA, fed by reproduction in the Sundarbans mangrove forest, supports many globally threatened sharks. The roots of mangroves provide attachment sites for egg laying or oviparous species (e.g., grey bamboo shark (*Chiloscyllium griseum*)) and nursery areas for viviparous sharks (e.g., hammerheads (*Sphyrna spp.*) and blacktip sharks (*Carcharhinus limbatus*)) that give live birth to pups which find shelter from predators among mangrove roots.

At least 11 shark species were recorded by WCS in the SoNG MPA during at-sea investigations and by citizen science fishers. These include Critically Endangered (CR) scalloped hammerhead and EN whale sharks. Considering the habitat types available within the SoNG MPA and records of their occurrence elsewhere in the Bay of Bengal, it is likely that the SoNG MPA supports another 27 shark species of which three are CR, six are EN, 10 are VU, three are NT, and five are LC (Appendix 3).

The predicted distribution of sharks was modeled using a maximum entropy modelling approach (MaxEnt) that predicts species occurrence by finding the most widespread distribution considering environmental variables of known locations of the species (Phillips et al. 2006, Kumar & Stohlgren 2009). Using georeferenced data from 309 catches of spadenose (*Scoliodon laticaudus*), 95 of blacktip (*Carcharhinus limbatus*), 71 of pigeye (*Carcharhinus amboinensis*), 60 of scalloped hammerhead (*Sphyrna lewini*), 47 of tiger (*Galeocerdo cuvier*), and 38 of bull (*Carcharhinus leucas*) sharks, as well as 57 shark catches identified to three genera, a map was generated of their collective predictive distribution. This map confirmed the importance of the SoNG MPA as a highly suitable habitat for sharks (Figure 3).

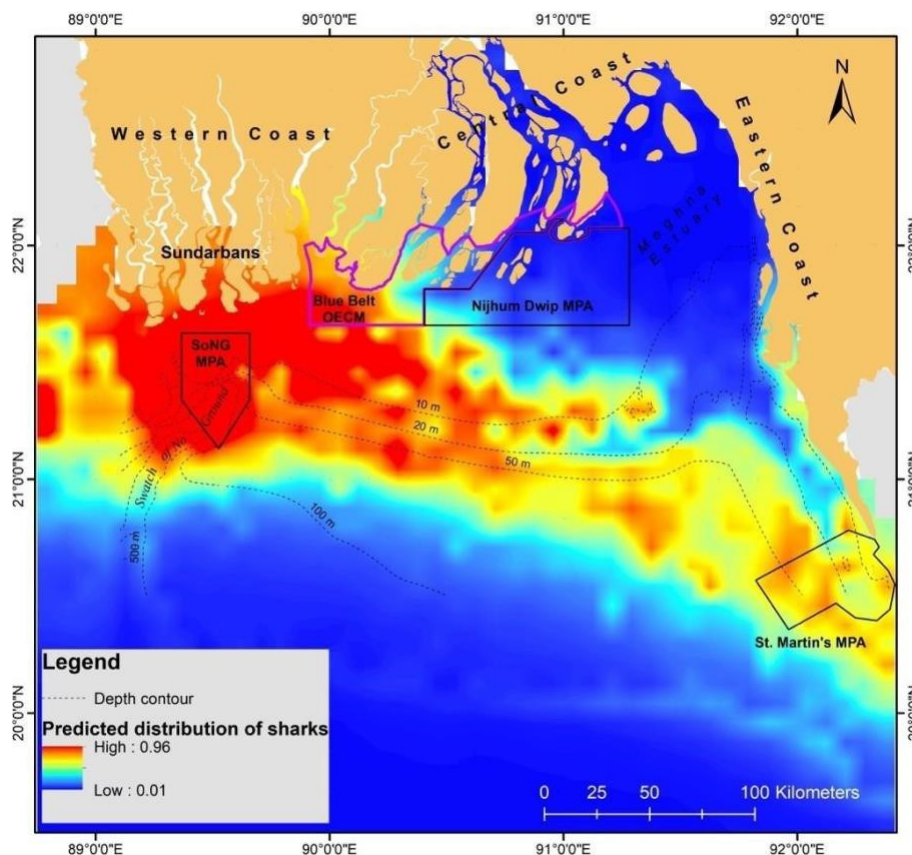


Figure 3. Predicted distribution of sharks in the northern Bay of Bengal of Bangladesh based on 677 georeferenced catches recorded by citizen science fishers.

(iii) Rays

Mangrove channels and shallow estuarine waters adjacent to the SoNG MPA are ideal habitats for bottom dwelling rays (e.g., mangrove (*Urogymnus granulata*) and giant freshwater (*Urogymnus polylepis*) whiprays)) while deep waters in the SoNG support pelagic rays (e.g., devil (*Mobula spp.*) and eagle (*Aetobatus spp.*) rays)). During formal and informal consultations, fishers reported that mangrove channels adjacent to the SoNG MPA are ideal habitat for sawfishes.

Another 48 species of rays are suspected to occur in the SoNG MPA based on their occurrence in neighboring waters in Bangladesh or in similar habitat in other countries bordering

the Bay of Bengal (Appendix 4). Of these species, nine are listed as CR, 21 as EN, 11 as VU, three as NT, two as LC, one as Data Deficient (DD) in the Global IUCN Red List, with one not yet assessed.

According to the community consultations, rays, especially rhinorays (guitarfishes, wedgefishes, and sawfishes), are targeted in the Sundarbans and adjacent shallow coastal waters using unbaited bottom longlines.

Using the same maximum entropy MaxEnt modelling described above for sharks, the distribution of rays in Bangladesh was predicted based on 57 catches of giant freshwater whiprays, 53 catches of sharpnose guitarfish (*Glaucostegus granulatus*), 32 catches of Bleeker's whiprays (*Pateobatis bleekeri*), 21 catches of honeycomb whiprays (*Himantura undulata*), 18 catches of longtail butterfly rays (*Gymnura poecilura*), 17 catches of shorttail stingrays (*Dasyatis brevicaudata*), 15 catches of narrow cowtail rays (*Pastinachus sephen*), and 168 ray catches that were identified to 10 genera. The most suitable habitat for rays was predicted in the estuarine nearshore shallow waters extending from the Sundarbans across the central coast to the Meghna estuary, thus underscoring the importance of the SoNG MPA as priority ray habitat (Figure 4).

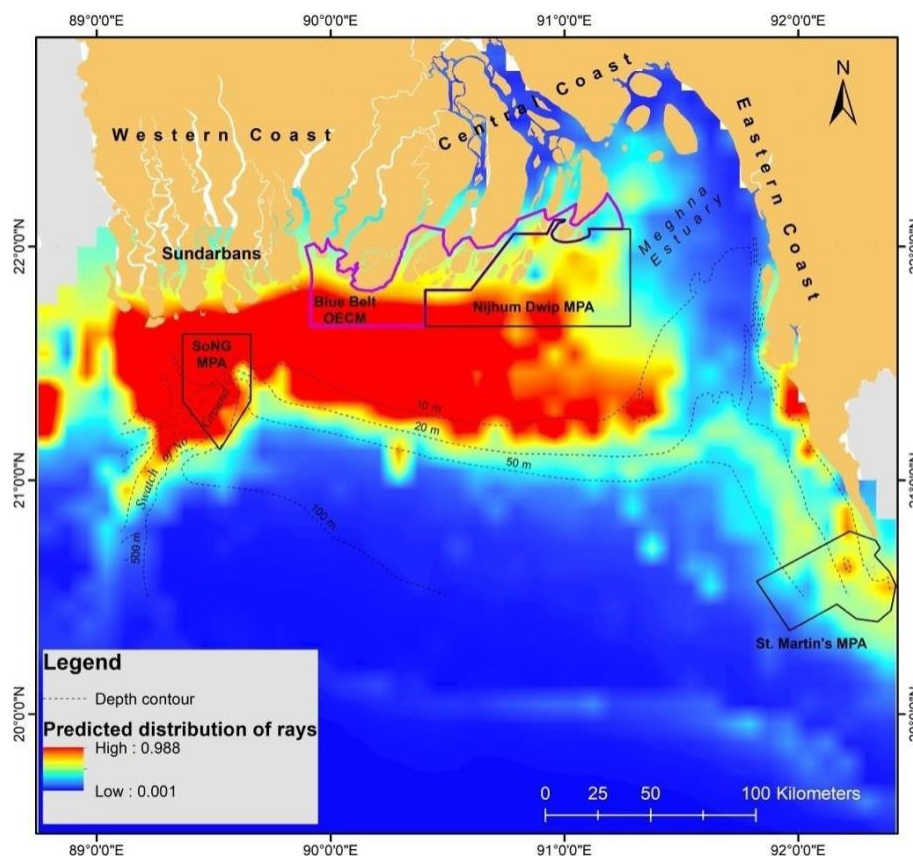


Figure 4. Predicted distribution of all rays combined based on 381 georeferenced, photo-verified catches of rays recorded by citizen science fishers.

(iv) Marine turtles

WCS at-sea investigations and catch records from citizen science fishers confirmed the occurrence of CR hawksbill turtles (*Eretmochelys imbricate*), EN green turtles (*Chelonia mydas*), and VU olive ridley turtles (*Lepidochelys olivacea*) in the SoNG MPA. During surveys conducted in the SoNG MPA during northeast monsoon seasons between 2004-2018, WCS recorded multiple pairs of mating olive ridley turtles in waters deeper than 100 m.

(v) Sea birds

During at-sea surveys in and around the SoNG MPA, WCS recorded brown-headed gulls (*Larus brunnicephalus*), greater crested terns (*Thalasseus bergii*), black-headed gulls (*Larus ridibundus*), lesser crested terns (*Thalasseus bengalensis*), Pallas's gulls (*Larus ichthyaetus*), little terns (*Sternula albifrons*), and whiskered terns (*Chlidonias hybrida*), common terns (*Sterna hirundo*), and a pomarine jaeger (*Stercorarius pomarinus*). The masked booby (*Sula dactylatra*), western gull (*Larus occidentalis*), and storm petrel (Hydrobatidae family) were reported by the Isabela Foundation.¹ None of these species are of conservation concern.

3.4 Fish Diversity

3.4.1 Hilsa

Hilsa shad (*Tenualosa ilisha*) is the most economically valuable fish species in Bangladesh (DoF 2016) with more than a half million tons landed per year and supporting the livelihoods of at least 2.5 million people (Islam et al. 2016). The SoNG MPA and surrounding waters are favorable habitat for hilsa that migrate from the Bay of Bengal to estuaries and freshwater rivers for spawning.

Between October 2015 and March 2018, high quality data were collected by trained members of the WCS *Citizen Science Fishers Safety Network* from 1,010 medium-mesh gillnet sets targeting hilsa concentrated mainly offshore the Sundarbans with the majority in the SoNG MPA. Altogether 90.7% of medium-mesh hilsa gillnet sets resulted in the catch of at least one hilsa with an average of 245 fish per net set. Small size hilsa or *jatka* (<10 inches or 26 cm in length) comprised approximately 14.1% of the total hilsa catch by number and 5.4% by weight.

3.4.2 Other finfishes

Citizen scientist fishers recorded 20 bony finfish families in medium-mesh gillnet sets inside or near the SoNG MPA. The most common were shad (Clupeidae – including hilsa) and scad (Carangidae), both appearing in more than 50% of 1,010 net sets with a decline in catch frequency between 31% for Bombay duck (Harpadontidae) and 33% for threadfin sea catfish (Ariidae), and less than 20% for the remaining 16 families with only five families, including ribbon fish (Trichiuridae), pomfret (Stromatidae), Gangetic whiting (Sillaginidae), and four finger

¹ <https://www.thedailystar.net/backpage/swatch-no-ground-treasure-trove-marine-lives-1407508>

threadfin (Polynemidae), caught in more than 10% but less than 20% of the net sets, and the remaining 11 families in less than 10% of the medium-mesh gillnet sets.

Citizen scientist fishers also collected high quality data during large-mesh finfish gillnet sets. A large portion of these large-mesh gillnet sets were concentrated in deeper offshore waters in the SoNG MPA and adjacent waters to the west and east, with substantial overlap with medium-mesh gillnet sets targeting hilsa in the SoNG MPA.

Sixteen families of bony finfishes were recorded in large-mesh gillnets in the SoNG MPA and adjacent waters, with the most common being scad (Carangidae), sea catfish (Ariidae), and queen fish (Scombridae) recorded in more than 50% of 155 net sets, with a major decline in the catch frequency to less than 40% for the remaining 13 families. Of the remaining families, only fourfinger threadfin (Polynemidae) and pomfret (Stromatedae) were caught in more than 20% of the large-mesh gillnet sets, and four families, including snapper (Lutjanidae), sardine (Clupediae), croaker (Sciaenidae), and needle fish (Belonidae), were caught in more than 10% but less than 20% of the net sets, with the seven remaining families caught in less than 10% of the net sets.

3.5 Fishery Characteristics

3.5.1 *Set-bag nets*

Waters in the SoNG MPA less than 10 m deep are dominated by set-bag nets (SBN) which are responsible for nearly 28% of the total small-scale marine fishery landings in Bangladesh (Nabi and Ullah 2012). Set-bag nets or '*behundi*' or '*badha jaal*' include estuarine set-bag nets (ESBN) and marine set-bag nets (MSBN), the latter being larger and deployed in deeper water. The Marine Fisheries Rules 2023 that supersede those from 1983 do not regulate SBNs, but Section 31 1(Ka) of the Marine Fisheries Rules 2023 empowers the Director General of the Department of Fisheries to issue directives as per previous regulations. As per gazette notification of 31 May 2004 under the Marine Fisheries Rules, 1983, the minimum legal mesh-size at the cod end for MSBNs is 45 mm. As per Protection and Conservation of Fish Rules, 1985, Rule 12 Sub-rule 4(b) (gazette notification 7 April 2013), the use of ESBNs of any size, type, or mesh size in waters less than 10 m depth at high tide is prohibited year-round. During at-sea investigations in 2017-18, WCS recorded mesh-sizes for 13 ESBNs and MSBNs with an average of 30 mm (5-100 mm) mesh-size at the cod end and set at 4.5-23.1 m depths. During the at-sea investigation, 85% of the set-bag nets that were recorded were illegal according to mesh size or depth. Set-bag nets were the second most common fishing gear used in the SoNG MPA during these surveys, accounting for 41% of all gears sighted.

ESBNs and MSBNs are among the most destructive fishing gear types because they are non-selective, catching large numbers of small juvenile fish and crustaceans that are mostly processed into low-value poultry or fish feed (Nabi and Ullah 2012). In the winter of 2001-02, about 20,000 fishers operated almost 3,000 SBNs offshore the Sundarbans near the northern boundary of the SoNG MPA (Hoq 2008). This number has almost certainly increased from this estimate made more than twenty years ago.

3.5.2 Gillnets

According to the Department of Fisheries (DoF) Fisheries Yearbook 2019-20, more than 20,000 mechanized and nearly 17,000 non-mechanized vessels operate almost 120,000 gillnets in coastal and marine waters of Bangladesh. At-sea surveys conducted by WCS in 2017-18 covering 145 linear km in the SoNG MPA revealed that 43% of all active fishing gears were gillnets, making it the most common fishing gear type operated in the SoNG MPA.

Drifting gillnets used in the SoNG MPA can be divided into large-mesh (LDGN) (>13 cm), medium-mesh (MDGN) (8.0-12.5 cm), and small-mesh (SDGN) (2.5-7.5 cm) drifting gillnets. MDGNs target hilsa, while LDGNs target larger finfishes such as barramundi (*Lates calcarifer*), grouper (*Epinephelus spp.*), sea catfish (*Arius spp.*), and fourfinger threadfin (*Eleutheronema tetradactylum*), and SDGNs target smaller finfishes such as Bombay duck (*Harpadon nehereus*), croakers (e.g., *Dendrophysa*, *Johnius*, *Otolithoides spp.*), and anchovies (e.g., *Setipinna* and *Coilia spp.*).

Fixed gillnets occur in smaller numbers mostly in shallow nearshore waters targeting smaller bony finfishes such as Indo-Pacific king mackerel (*Scomberomorus guttatus*), moustached thryssa (*Thryssa mystax*), paradise threadfin (*Polynemus paradiseus*), and spined anchovy (*Stolephorus tri*).

Based on data from the 1,010 net sets provided by citizen science fishers, MDGNs targeting hilsa were deployed in waters generally less than 20 m deep but also as deep as 200 m, concentrated mainly offshore the Sundarbans with the majority in the SoNG MPA. Based on data from 146 net sets provided by the citizen science fishers, LDGNs targeting larger finfishes were set in waters generally deeper than 20 m with a few in waters deeper than 200 m inside the submarine canyon.

During consultations in coastal fishing communities (see below), fishers reported that foreign fishing vessels often deploy illegal monofilament gillnets in the SoNG MPA.

3.5.3 Longlines

According to the DoF Fisheries Yearbook 2019-20, more than 3,000 longline vessels operate in the Bangladesh EEZ. WCS investigations found that longliners operating in the SoNG MPA target mainly pike conger (e.g., *Congresox* and *Muraenesox spp.*), croaker (e.g., *Johnius*, *Dendrophysa*, *Pama*, and *Protonibea spp.*), grouper (e.g., *Lutjanus spp.*) and sea catfish (e.g., *Arius spp.*). The dried air bladders or maw of these species, especially Indian pike conger and croaker, are sold for high prices to traders who export them to China.

A different type of longline with thousands of unbaited hooks targeting rays, particularly CR rhinorays, are reportedly used along the northern edge of the SoNG MPA. The sharp hooks are set just above the bottom and snag rays in water less than 10 m deep. The average length of six unbaited longlines measured during WCS at-sea investigations was about 4,000 m (range of 3,710-4,800 m).

The Government of Bangladesh has earmarked 61.7 crore Taka (USD 7.6 million) for purchasing three industrial deep-sea longline vessels for harvesting pelagic fish beyond currently utilized fishing grounds. This pilot project aims to encourage private investments in industrial fisheries.² Pelagic longlines targeting tuna and billfish incidentally catch large numbers of marine turtles, sharks, and rays, and often entangle or hook marine mammals and seabirds.^{3,4}

3.5.4 Trawl nets

According to the DoF Fisheries Yearbook 2021-22 Bangladesh has 231 registered industrial trawl fishing vessels operating 660 gears. Despite being banned since 2016, bottom trawl nets are the main gear type used by industrial trawling vessels in Bangladesh. This gear is a major threat to marine biodiversity because it is non-selective and destroys seabed habitat (Palanques et al. 2001).

According to DoF directives, all bottom trawlers should be converted into ‘ecofriendly’ mid-water trawlers for catching pelagic species (e.g., anchovies, sardines, tuna) in waters deeper than 40 m.^{5,6} Fishers interviewed during WCS at-sea investigations reported that industrial trawlers discard large amounts of undersized fish and that wooden trawlers from India often fish illegally in the SoNG MPA.

During recent WCS investigations, small-scale fishing vessels were observed with a metal tripod mounted on their deck for manually hauling bottom trawl nets at fish landing sites in the coastal districts of Bagerhat, Pirojpur, Barguna, and Patuakhali.

3.6 Climate Change

Ocean warming is predicted to cause a major reorganization of marine communities with a substantial loss in species diversity at lower latitudes (Whitehead et al. 2008). In many areas, such as the eastern Pacific and Atlantic oceans, mobile species may be able to shift their ranges poleward in response to warming ocean temperatures. However, in other areas, such as the Bay of Bengal, these species occupy ecological “cul-de-sacs” or dead ends where poleward range shifts are impossible due to land barriers. The consequences of habitat loss in these cul-de-sacs are potentially catastrophic for species that cannot adapt to changing ocean conditions.

² <https://www.newagebd.net/article/116647/govt-embarks-on-tuna-mission-in-bay-of-bengal>

³ <https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-pelagic-longlines>

⁴ <https://www.bmis-bycatch.org/bycatch-species-groups>

⁵ <https://www.daily-sun.com/post/148058/How-to-stop-bulldozing-the-Bay-of-Bengal>

⁶ Marine Fisheries Rules, 1983

Submarine canyons have been described as “keystone structures” in contributing to the ecology and biodiversity of the world’s oceans. They play a major role in supporting fisheries, carbon sequestration, marine megafauna and seabird diversity and abundance, and source populations for enhancing the productivity and species diversity in surrounding waters (Vetter et al. 2010; Fernandez-Arcaya et al. 2017). Submarine canyons are also important refuges for mobile marine species when ocean temperatures increase, and biological production is suppressed by oceanographic changes. For instance, during the 1997-98 El Niño when the ocean temperature heated up in the northern Pacific, the assemblage of cetaceans in the Monterey submarine canyon became more diverse (Benson et al., 2002).

The driving force for the enhanced productivity and biodiversity found in submarine canyons is the upwelling and mixing of cold, nutrient-rich waters (Harris et al. 2011). This implies that they may serve as important refuges for species that cannot adapt to warming temperatures and reduced productivity due to climate change, especially when poleward movements are prevented by land barriers.

The SoNG has been the focus of periodic line-transect surveys for a large diversity of cetaceans as well as fishing activity, and a citizen science network established among gillnet fishers operating in and around the submarine canyon who record information on their fishing effort, fish catches, and non-target catches of marine megafauna, including small cetaceans, sharks, rays, and marine turtles. These data provide a strong baseline for establishing a more robust long-term monitoring program to evaluate the role of the submarine canyon as an ecological refuge for marine biodiversity that cannot adapt to changing conditions in the northern Bay of Bengal due to the direct impacts of increasing ocean temperatures and potential declines in biological productivity predicted to accompany shifts in thermal regimes.

4. Key stakeholders

4.1 Government of Bangladesh

As detailed in the section on the national legal framework below, the GoB has a constitutional obligation to safeguard natural resources, biodiversity, and wildlife for present and future citizens. Details on the role of the government in leading the SoNG MPA management process are provided in the Administration section of the IMP-SoNG MPA below.

4.2 Fishing communities

The Wildlife (Conservation and Security) Act 2012 and the Marine Fisheries Act 2020 provide for community engagement in protected area management through co-management committees constituted from representatives of local communities, the Bangladesh Forest Department (BFD), and the Department of Fisheries (DoF).

Altogether, 142 villagers, including 96 fishers and 46 fish traders, day-wage fish landing site workers, boat owners and boat crew, from Parerhat (Pirojpur District), Pathorghata

(Barguna District), Bagerhat Sadar (Bagerhat District), and Alipur and Mohipur in the Kuakata (Pirojpur District), participated in five community consultations on conservation management in the SoNG MPA.

Participants stated that weather forecasts received over a transistor radio were insufficient due to the lack of accurate and timely updates and location-specific predictions. The lack of basic navigation aids such as a Global Positioning System (GPS), signal buoys or lighthouses, and no means to communicate via cell phone or VHF radio further added to the risks they face at sea from increasing extreme storms. Fishers mentioned being harassed by BFD and Bangladesh Coast Guard officers when seeking refuge from storms in the Sundarbans mangrove forest. They also thought that rescue procedures were not satisfactory.

Fishers emphasized industrial fishing vessels as a growing problem, reporting that domestic industrial bottom trawlers fish illegally in water less than 40 m deep and damage their gears. Participants mentioned that foreign vessels from India, Myanmar, and Thailand overexploit fish by using monofilament gillnets or bottom trawls, and that they often fish during the hilsa ban season.

The lack of monitoring and enforcement to stop illegal fishing was identified as a considerable challenge, along with mismanagement in the registration of fishers and the distribution of the Vulnerable Group Feeding (VGF) rice subsidy provided to fishers as an incentive for their compliance with the seasonal fishing ban imposed by the Government.

4.3 Transport vessel operators and port authorities

Bangladesh has two major international ports, Mongla and Chittagong, with two additional ports under development in Payra (inaugurated in 2016) and Matarbari (inaugurated in 2020). Commercial shipping vessels transit the SoNG MPA on the way to Mongla and Payra ports (Figure 5).

During 2016-2017, Mongla Port handled over 7.5 million metric tons of goods and serviced more than 1,700 vessels with a threefold increase over the last 15 years. Major developments have been undertaken in recent years to improve the capacity and connectivity of Mongla Port. Within the first three months after the opening in 2022 of the Padma Multipurpose Bridge connecting Mongla to Dhaka by road, Mongla Port handled over 4 million metric tons of commodities.⁷ Once the Padma bridge and Khulna-Mongla rail lines become fully operational, commercial shipments through the SoNG MPA are expected to further increase to 33 million tons per year in 2030 and 72.4 million tons in 2040.⁸

⁷ <https://thefinancialexpress.com.bd/economy/bangladesh/mongla-port-activities-see-sharp-rise-after-padma-bridge-opening-1666872573>

⁸ <https://www.dhakatribune.com/bangladesh/2022/10/26/mongla-port-on-verge-of-major-connectivity-upgrades>

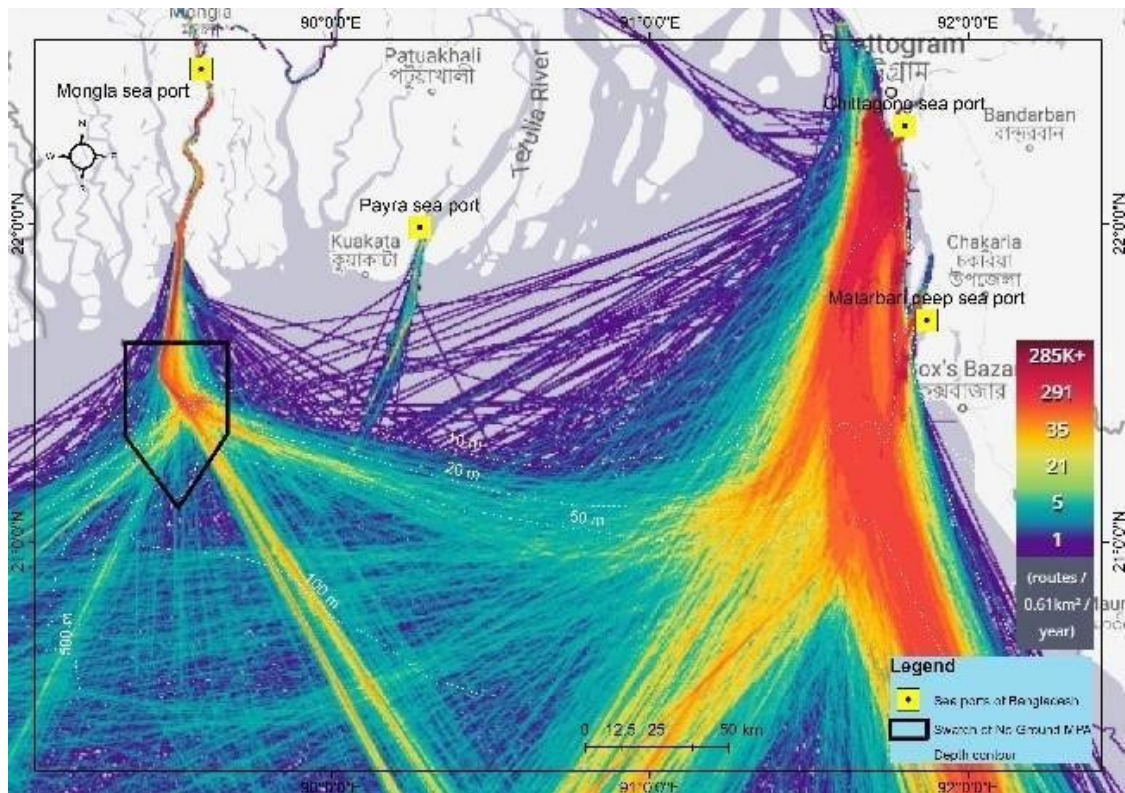


Figure 5. Commercial vessel traffic to and from the Mongla and Payra ports will likely increase and could impact the SoNG MPA. High (dark red), medium (yellow to lighter blue) and minimum (purple) density of commercial vessel traffic in 2019 was derived from <https://www.marinetraffic.com/en>.

4.4 Oil and gas developers

Offshore oil and gas are growth sectors in Bangladesh (MoFA 2014). To date, Bangladesh has approved 26 blocks for oil and gas exploration, of which 11 are shallow sea blocks and 15 are deep sea blocks in the EEZ of Bangladesh (Figure 6).

Oil and gas exploration block SS-01 covers the entire SoNG MPA area, with blocks SS-02 and SS-06 covering nearby waters and SS-05 in the newly settled maritime boundary adjacent to the SoNG MPA. To date no oil and gas exploration is known to occur inside SoNG MPA, but international bidding for exploring deep-sea blocks is being considered.

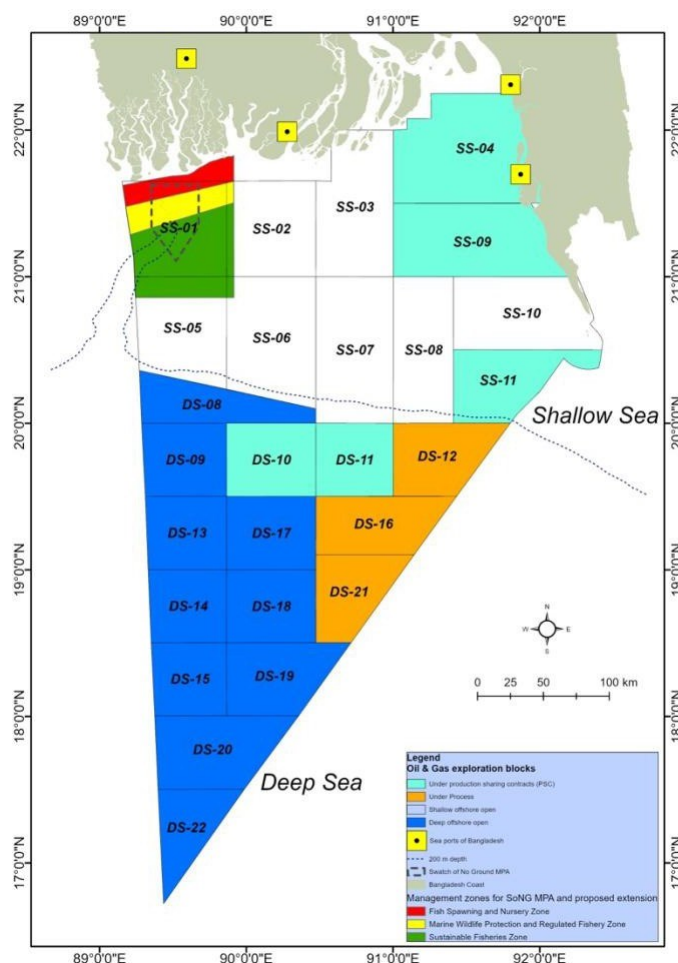


Figure 6. Oil and gas exploration blocks in the Bangladesh EEZ in relation to the SoNG MPA and its proposed extension, with shallow blocks (SS, white/green) <200 m deep and deep-sea blocks (DS, blue/green/orange) >200 m deep. Map reproduced from Hossain et al. 2014.

5. National and international legal framework

5.1 National laws and policies

5.1.1 Biodiversity

The Constitution of the People's Republic of Bangladesh directs the state to safeguard natural resources, biodiversity, and wildlife for present and future citizens. Bangladesh was the first South Asian country to adopt the Territorial Waters and Maritime Zones Act 1974, enabling the establishment of conservation zones to maintain the productivity of living marine resources with appropriate measures to prevent indiscriminate exploitation, depletion, or destruction. The maritime area of Bangladesh has increased through successful boundary negotiations with Myanmar in 2012 and India in 2014, resulting in an EEZ of 118,813 km².

The Wildlife (Conservation and Security) Act, 2012 provides the legal basis for the conservation and management of wildlife, biodiversity, and habitat. According to the act, the Chief Conservator of Forest (CCF) has the power to determine vulnerable, endangered, and critically endangered species and assign them to Schedule I, II, and III based on scientific data. Without special conditions, no one can remove these animals from their natural environment.

Chapter IV, 15(4), 16(4) and 20(4) of the Wildlife (Conservation and Security) Act 2012 provides guidelines for developing a management plan with specific areas for tourism development, and proper demarcation for protected areas. The act also provides regulations for improving habitat, protecting breeding grounds, and preventing disturbance during breeding for the protection of dolphins, whales, and porpoises through the control or prohibition of fishing activities or movement of watercrafts. After identifying detrimental activities, the act also empowers the BFD to prohibit activities within two km from the border of an MPA. Finally, the act empowers the Government, after receiving inputs from the local community, to declare any public or private area outside the boundaries of an official protected area as a landscape zone, buffer area, or corridor for the movement and safe breeding of wild animals.

The National Fisheries Policy 1998 aims to develop and increase production of fish resources and create self-employment to improve the socio-economic condition of the fishers. The policy emphasizes the nutritional value of fish and the importance of maintaining an ecological balance and biodiversity. The Marine Fisheries Act 2020 regulates permits for fishing and fishing vessels, research, and reporting requirements of catches. Section 29 of the act also enables the Government to declare areas where biodiversity is declining, or aquatic flora and fauna are threatened, as MPAs.

New Marine Fisheries Rules were issued by a gazette notification on March 13, 2023, without specifying fishing gear regulations, but with sections empowering the Director General (DG) of the DoF to issue additional regulations, including on fishing gear specifications, for example allowable materials, mesh-size, deployment depth or practice. Clear directives on fishing gear specifications in line with those from the Marine Fisheries Rules 1983 are anticipated.

The Biological Diversity Act 2017 defines activities negatively affecting threatened animals or biological resources as punishable offences. It differs from other legislation in that it promotes a multi-sectoral approach by mandating a multi-agency national committee rather than giving the mandate for biodiversity conservation to a single ministry or agency, and sustainable resource use. According to Article 33 of the act, the Government can declare any species as Vulnerable or Endangered and take measures to protect them.

5.1.2 Environment

According to the Bangladesh Environment Conservation Act 1995 and the Environment Conservation Rules 2023, red category industries/projects must get an environmental clearance certificate from the Department of Environment (DoE) on an approved Environmental Impact Assessment (EIA), and orange category industries must get an environmental clearance certificate on an approved Initial Environmental Impact Examination (IEE). Potential pollution mitigation measures like effluent treatment will be done according to the Environmental Management Plan (EMP).

The Maritime Affairs Unit under the Ministry of Foreign Affairs (MoFA) developed the Territorial Waters and Maritime Zones (Amendment) Act, 2021, in line with United Nations Convention on the Law of the Sea (UNCLOS - see 5.2.1 below).

5.1.3 Fisheries

The Ministry of Fisheries and Livestock (MoFL) through the DoF is primarily responsible for enforcing fishery laws and rules, except in the Sundarbans. Despite having the legal authority to monitor fishing activities and enforce fishery regulations, the BFD lacks the infrastructure and capacity for overseeing fisheries in the SoNG MPA.

The Marine Fisheries Act 2020 empowers the Government to regulate or prohibit fishing or fishing gear in specific fishing areas/grounds and to impose bans on catching all or any fish species. The currently valid Marine Fisheries Rules of 2023 do not regulate artisanal fishing gear, but the Technical Directives on Marine Fisheries Management and Harvest-2023 specify that the minimum mesh-size shall be: (a) 45 mm at the cod end of shrimp trawling nets, (b) 60 mm for fish trawling nets, (c) 200 mm for large-mesh drifting gillnets, (d) 100 mm for small-mesh drifting gillnets, and (e) 45 mm at the cod end of set-bag nets [Section 6]. Fisheries regulations issued through Statutory Regulatory Orders (SRO), for example SRO NO.93-Law-2013 banning ESNB up to a depth of 10 meters, remain valid.

Section 3a(iii) and (iv), 3(d), and 3(e) of the Protection and Conservation of Fish Act 1950 prohibit the manufacture, import, marketing, carrying, transporting, or processing of destructive fishing nets, traps, and gears. The act also allows the DoF to order seasonal prohibitions for any prescribed species as well as a minimum size below which no fish of any prescribed species shall be killed or sold. A 22-day ban on catching hilsa during their breeding season is implemented under the Protection and Conservation of Fish Act 1950, while the 65-day fishing ban (May - July) to protect fish stocks in the Bay of Bengal is imposed under the Marine Fisheries Act 2020 and the Marine Fisheries Rules, 2023, Section 3 (1) (Ka).

The DoF sometimes publishes separate rules to specify species and gear prohibitions under this act. For example, the Technical Directives on Marine Fisheries Management and Harvest-2023 specify that set-bag nets are allowed in 10-40 meters depths as per the fishing chart.

To protect fish breeding grounds and migration routes, the Marine Fisheries Sub-Strategy 2006 prohibits all fishing in waters less than five meters deep and within five km from the shore and allocates waters less than 40 m deep and within 10 km from the shore to small-scale mechanized boats operating drifting gillnets, marine set-bag nets, and longlines.

5.1.4 Poverty alleviation

The National Fisheries Policy 1998 provides guidelines for poverty alleviation through creating self-employment and improving socio-economic conditions of the fishers. The National Fisheries Strategy 2006 identifies and provides alternative income guidelines to give poor fishers the opportunity to diversify their livelihoods thus reducing the pressure on fishing resources.

5.1.5 National Environment Policy 2018

The National Environment Policy 2018 envisages environmental conservation, pollution control, biodiversity conservation, and mitigation of the adverse effect of climate change to ensure sustainable development. This policy is consistent with the establishment of MPAs, and implementation of the recommendations included in the IMP for the SoNG MPA.

5.2 International conventions and agreements

5.2.1 United Nation Convention on the Law of the Sea (UNCLOS)

The UNCLOS defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. UNCLOS supports MPA creation and signatory parties for conserving marine resources and cooperating with other neighboring states. As a signatory nation, Bangladesh is required to cooperate with other states through Regional Fisheries Management Organizations (RFMOs) and other international cooperation mechanisms such as the Indian Ocean Tuna Commission (IOTC).

5.2.2 The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) was established in 1992 to conserve biological diversity and ensure actions that lead to sustainable use and the equitable sharing of genetic resources. Bangladesh joined the Global High Ambition Coalition (HAC) and supported the CBD 30x30 commitment to bring 30% of the global land and sea area under protection by 2030. This commitment was approved at the 15th Conference of Parties CoP15 in Montreal. Target 1 of the Kunming-Montreal Global Biodiversity Framework (KM-GBF) relates to spatial planning, while Target 3 describes protection approaches, including PAs and OECMs. The CBD emphasizes implementation of conservation management in MPAs, and parties are required to prepare and update inventories of biological resources for planning, decision-making, and to ensure sustainability.

5.2.3 United Nations Sustainable Development Goals (SDGs)

SDGs identify a wide range of issues that need to be addressed to ensure the health, stability, and sustainability of ecosystems and species. According to SDG Goal 14 “Life Below Water”, countries should protect 10% of their coastal and marine waters as MPAs by 2030.

5.2.4 International Maritime Organization (IMO)

The IMO is a specialized agency of the United Nations founded in 1948 to regulate shipping. Its responsibilities include safety, environmental concerns, legal matters, technical cooperation, maritime security, and the efficiency of shipping. IMO designates specific areas as dumpsites for ballast water to ensure environmental protection. These are useful if integrated into national and international MPA creation processes. For example, if an area is listed as “particularly sensitive sea area” (PSSA), all vessels must undertake protective measures whenever they are in that area.

5.2.5 Convention on Migratory Species (CMS)

CMS, to which Bangladesh became a party in 2005, requires parties to take measures to protect, manage, and conserve the habitats of threatened species that cross national borders, including the integration of fisheries into coastal area management.

5.2.6 FAO Code of Conduct for Responsible Fisheries (CCRF)

Food and Agriculture Organization of the United Nations (FAO) CCRF was adopted in 2000 to ensure responsible and sustained fisheries. It outlines international standards of behavior for responsible practices to ensure the conservation, management, and development of living aquatic resources, ecosystems, and biodiversity. The code aims to strengthen institutional collaboration among states, regions, and sub-regional agencies in consideration of nutritional, economic, social, environmental, and cultural importance of fisheries and fishery sector stakeholders.

5.2.7 United Nations Environment Programme (UNEP)

UNEP Regional Seas Programme aims to sustainably manage coastal and marine degradation through a “shared seas” approach by engaging neighboring countries in protecting their common marine environment.

5.2.8 UN Framework Convention on Climate Change (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted, along with its sister convention the CBD, in May 1992, at the Earth Summit in Rio de Janeiro. The UNFCCC is an International environmental treaty, signed by Bangladesh in June 1992, which combats dangerous human interference with the climate system. It aims to develop synergies with its sister convention on biodiversity conservation. The potential role of the SoNG MPA as a refuge for marine biodiversity in the northern Indian Ocean in a warming ocean opens up potential opportunities for funding support under a system of grants and loans set up by the UNFCCC and managed by the Global Environment Facility.

5.2.9 South Asia Co-operative Environment Programme (SACEP)

The South Asia Co-operative Environment Programme (SACEP) is an intergovernmental organization created in 1981 to promote regional co-operation in supporting conservation and management of natural resources and working with national and international institutions, and governmental and non-government groups engaged in conservation efforts. Biodiversity conservation is one of the SACEP's priority programs and the Programme serves as secretariat of the South Asian Seas Programme. The SACEP could play a potential role in supporting efforts to match marine protection in the Bangladesh side of the SoNG submarine canyon and estuarine waters offshore the Sundarbans with establishing a similar MPA on the Indian side of these waters. Establishing transborder marine conservation with India is particularly important for protecting wide-ranging marine wildlife, including globally threatened cetaceans, sharks, rays and marine turtles, that move back and forth between the two countries.

6. Conservation threats

6.1 Bycatch of cetaceans and marine turtles

Cetaceans and marine turtles are not targeted by fishers, have no or low economic value, and are strictly protected in Bangladesh. Both marine wildlife groups still occur in the northern Bay of Bengal in relatively large numbers but are threatened by accidental entanglement in fishing gear.

Cetaceans are mammals that die if they cannot surface to breathe. Small cetaceans, including finless porpoises and Irrawaddy, Indo-Pacific bottlenose, pantropical spotted, and spinner dolphins, have been recorded as entangled and killed in gillnets deployed inside and in nearby waters of the SoNG MPA. Fishers are willing to release entangled cetaceans, but entanglements are difficult to detect before they pull up their gear when the cetaceans are found already dead.

More than 28% of 1,144 Indo-Pacific bottlenose dolphin and 15% of 407 Indo-Pacific humpback dolphin individuals that were photo-identified during WCS studies conducted between 2005 and 2009 had marks that were almost certainly caused by entanglements in fishing gears (Mansur et al. 2012, WCS 2013). This implies a strong potential for fatal interactions that could jeopardize the conservation status of both populations which otherwise appear favorable.

Between February 2007 and July 2020, WCS recorded the deaths of 13 Irrawaddy dolphins, six finless porpoises, one Bryde's whale, one sperm whale, and one unidentified cetacean near the northern edge of the SoNG MPA. Fishing gear entanglement accounted for all of the seven of these mortalities that included information on the cause of death. From June 2015 through February 2019, WCS citizen scientists documented 42 cetacean mortalities in 4,247 gillnet sets of which five were recorded in the SoNG MPA (three in medium and two in large- mesh gillnets; Table 1).

Table 1. Cetacean mortalities recorded between June 2015 and February 2019 by citizen science fishers from entanglements in large and medium mesh-size gillnets.

Species	Total	Large mesh	Medium mesh	Inside SoNG MPA
Irrawaddy dolphin	15	7	8	1
Indo-Pacific humpback dolphin	6	1	5	0
Finless porpoise	8	3	5	1
Indo-Pacific bottlenose dolphin	9	2	7	2
Pan-tropical spotted dolphin	2	1	1	0
Spinner dolphin	2	1	1	1
TOTAL	42	15	27	5

Marine turtles are also accidentally caught in fishing gears. Like cetaceans, these reptiles also need to come to the surface to breathe. However, they can remain submerged for four to seven hours, which is much longer than cetaceans that drown after about 15 minutes. This means there is a strong potential for reducing turtle mortalities through rescue and release.

A tuna longline survey in the north-western Bay of Bengal near the SoNG MPA recorded 59 bycatches of marine turtles, almost all olive ridleys, with 0.30 catches per 1,000 hooks set, which is more than four times greater than the hooking rate of marine turtles in the Arabian Sea (Varghese et al. 2010). During five years in the late 1990s, more than 30,000 olive ridley turtles were reported to have died in industrial trawl nets along the nearby Orissa coast, with 14,000 turtles found dead in 1998 alone (Pandav et al. 1998).

Between June 2015 to February 2019, the *WCS Citizen Science Fishers Safety Network* reported accidental catches of 80 olive ridley turtles, three hawksbill turtles, and one green turtle in 4,247 gillnet sets, with 64% released alive. According to community consultations, marine turtles are also frequently entangled in set-bag nets.

6.2 Targeted and non-targeted catches of sharks and rays

According to consultations with 142 coastal community members, including 96 fishers and 46 fish traders, day-wage fish landing site workers, boat owners and boat crew, industrial trawling and set-bag nets were identified as the main threat to marine wildlife. They mentioned that sharks and rays are entangled as non-target catches in medium-mesh gillnets during winter months. Large-mesh gillnets deployed in deep waters of the SoNG MPA were mentioned as being particularly dangerous for entangling marine wildlife, especially sharks and rays.

According to these community consultations, there is no targeted shark fishery in the SoNG MPA, but rays are targeted using bottom-set long lines with thousands of un-baited hooks. They mentioned that the *Kamot jaal* or shark net, a large-mesh (30-50 cm) gillnet made from very thick twine or cord targeting sharks, was no longer in use since being reportedly banned in 2007.

Traders reported that shark and ray landings have declined while the prices paid for these animals has increased over the last ten years, and that they now rarely encounter full-grown hammerhead sharks, giant freshwater whiprays, or sawfishes.

Between June 2015 and February 2019, almost 9,000 shark individuals from eight species and 130 ray individuals from six species were recorded caught by the *WCS Citizen Science Fishers Safety Network* in 2,397 medium and large-mesh gillnet sets in the SoNG MPA. Among the species caught, catches of scalloped hammerhead sharks and sharpnose and Bengal guitarfish are particularly concerning due to their CR status in the Global IUCN Red List. The majority of scalloped hammerhead sharks (84% of 32 catches) were caught in large-mesh gillnets, while both sharpnose and Bengal guitarfishes were caught in a medium-mesh gillnet. Other globally threatened species recorded as caught in the SoNG MPA were EN giant freshwater whiprays, VU spinner, blacktip, bull, and pigeye sharks, whitespotted whiprays, and longtail butterfly rays, and NT spadenose, spottail, and tiger sharks.

6.3 Overexploitation of fisheries

Almost all major commercial finfish groups, including shad, pomfret, croaker, catfish, Indian salmon, sardine, and shrimp are overexploited. Without urgent management measures, many will become depleted beyond their capacity to recover. Conversely, small pelagic, non-targeted fish, such as sardines, are increasing (Fanning et al. 2019). Such shifts in fish catch composition indicate ecosystem changes that may be impossible to reverse with unknown impacts on threatened marine wildlife.

Catch per unit effort (CPUE) is declining in both small-scale and industrial fisheries in Bangladesh. Catch composition is also changing from large, slow-growing fish such as fourfinger threadfin, which is one of the target species of large-mesh gillnets operating in the SoNG MPA, to smaller, fast-growing species, such as sardines (Fanning et al. 2019).

Although bottom trawling has been illegal in Bangladesh since 2016, a large portion of the catch reported from industrial trawls in 2019 was bottom dwelling shrimp. This implies that industrial trawlers continue to trawl on the bottom despite fishery laws prohibiting this destructive fishing practice (Fanning et al. 2019).

While the number of both estuarine and marine set-bag nets has increased, catch rates of ESBNs have decreased from 18 kg/haul in 1987 to less than 10 kg/haul in 2007 (Huntington et al. 2007), while the catch rate of MSBNs also decreased from 85 kg/haul in 1985 to 24 kg/haul in 2002-2003 (Khan 2010). Non-selective ESBNs and MSBNs are one of the critical threats facing estuarine and marine biodiversity, including economically valuable finfishes, and globally threatened marine wildlife.

6.4 Oil and gas exploration and development

Seismic surveys are used to determine the location and size of oil and gas reservoirs. Intense broadband pulses produced by seismic air guns can cause hearing impairment and physiological and behavioral changes in cetaceans (Gordon et al. 2004). Oil exploration and recovery may exclude cetaceans from valuable habitat and disturb feeding, resting, and breeding behavior. Pollutants released during offshore drilling are also a health risk to cetaceans and surface oil can impair their respiratory system through inhalation of toxic petroleum vapors (Helm et al. 2015).

6.5 Vessel traffic

Large transport vessels discharge hazardous oil and increase the risk of bio-invasions through ballast water discharges (Seebens et al. 2013). Ship strikes can kill highly mobile, surface-active marine megafauna (Van Waerebeek et al. 2007), especially large whales (Wilcock et al. 2014).

6.6 Climate change

The world's climate is changing due to greenhouse gas emissions that are warming the world's ocean. Sea surface temperature in the Bay of Bengal is predicted to increase by 2.0–3.5° C by the end of the century (Vivekanandan et al. 2009). Ocean warming affects the exchange of gases between the ocean surface and the atmosphere, and it can lead to reduced mixing between nutrient-rich deep waters and relatively nutrient-poor surface waters. Major changes to ocean circulation will impact the dispersal of larval fish, particularly pelagic species.

The biological features of the SoNG reflect the spatial complexity and temporal dynamism of freshwater discharge, a basin-scale current gyre, and upwelling at the head of the submarine canyon. These features occur in an ecological “cul-de sac” or dead end at the head of the Bay of Bengal. This feature of the bay has important implications for the ecological value of the SoNG submarine canyon as a thermal refuge for mobile marine wildlife, such as cetaceans, sharks, and rays, from warming temperatures in the northern Indian Ocean. The consequences of habitat loss in this ecological dead end, which prevents pole-ward range shifts of mobile species that are possible in most other ocean basins (e.g., Atlantic and Pacific Oceans), could be catastrophic for species populations that cannot adapt to changing ocean conditions.

B. PROPOSED MANAGEMENT

1. Vision

Optimize the protection of globally unique habitat and significant biodiversity with local resources needs to ensure a healthy ocean for healthy people.

2. Mission statement

Save among the world's most endangered marine wildlife while sustaining productive fisheries and other environmentally friendly uses of marine resources.

The Ministry of Environment, Forest and Climate Change (MoEFCC) will lead the multi-agency effort for marine protected area management and engaging coastal communities as ocean guardians with the aim of balancing the biodiversity protection with marine resource use.

3. Goals and objectives

The goal of the SoNG MPA is to conserve threatened marine wildlife and other biodiversity and sustain productive marine fisheries.

Objectives are to:

- I. Protect globally threatened marine wildlife, including dolphins, porpoises, whales, sharks, rays, and marine turtles, and their habitat through marine spatial planning, engagement of coastal communities, and multi-agency enforcement and monitoring.
- II. Sustain productive marine fisheries and coastal fishing livelihoods that provide economic benefits for local communities.
- III. Support a sustainable blue economy for the benefit of the nation.

4. Methodology for the development of the IMP-SoNG MPA

The Ministry of Environment, Forest and Climate Change requested WCS to develop a management plan for SoNG MPA in March 2018. WCS then conducted an extensive literature review and compiled and analyzed information collected from the SoNG MPA during dedicated surveys and fisheries investigations, and by Citizen Science Fishers. Community consultations were convened in Parerhat, Pathorghata, Bagerhat Sadar, Alipur and Mohipur/Kuakata on conservation management in, and the potential ecological and human benefits of, the SoNG MPA.

Based on the literature review, surveys, investigations and consultations described above, a background document for developing an IMP for the SoNG MPA was developed and submitted to the Bangladesh Forest Department in February 2021. Informed by the

background document, a draft IMP for the SoNG MPA was submitted to the BFD on 3 January 2022. The plan was discussed during a meeting on 7 March 2023 chaired by the CCF with physical and virtual participation of relevant officers.

Based on a recommendation from the BFD, a follow-up meeting was held to discuss the IMP-SoNG MPA with the MoEFCC on May 30, 2023, convened by Additional Secretary (Admin) followed by another meeting with the Secretary on July 6, 2023, decision taken to form an interministerial committee, headed by Additional Secretary (Development), with relevant ministries and agencies. The 1st meeting of the interministerial committee was held on August 20, 2023, and the 2nd meeting of the same committee was held on December 20, 2023. Comments received from the agencies and ministries of the 1st meeting were incorporated into IMP-SoNG MPA and presented at the 2nd meeting of the committee and after a rigorous discussion, further comments from participants were solicited for inclusion. MoEFCC received detailed comments from all the relevant agencies /ministries by February 2024 and necessary changes were made in the draft IMP-SoNG MPA incorporating the comments from members and participants, and the final meeting for approval of the Integrated Management Plan for the SoNG MPA along with proposed extension of MPA, was held on July 7, 2024, chaired by the Secretary, MoEFCC, Dr. Farhina Ahmed. The Integrated Management Plan for the SoNG MPA was recommended for approval after incorporating the suggested changes as per the decisions made in the meeting of July 7, 2024, held in MoEFCC (Appendix 7).

5. Management strategy

The SoNG MPA will be managed as an IUCN Category VI Protected Area designed to conserve ecosystems and habitats, together with cultural values and traditional natural resource management systems. This category is for protected areas (PAs) that are “generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.”

This category of PAs is not designed to accommodate large-scale industrial fisheries, and IUCN recommends that a portion be designated as a no-take management zone. No-take management zones can be justified for achieving productive, sustainable fisheries due to spillover effects. This means that increased fish reproduction and growth in areas where no fishing is allowed can result in increased fish availability in areas where fishing is allowed.

The SoNG MPA was declared by the MoEFCC with the BFD as the lead agency for implementation. However, interagency cooperation will be crucial for achieving MPA objectives. The DoF is needed to ensure sustainable fisheries together with the Bangladesh Coast Guard (BCG) and Bangladesh Navy (BN) who have the at-sea capacity for enforcement and monitoring. Effective collaboration among these four agencies, as well as with local stakeholders, should be coordinated by a SoNG MPA Management Committee accountable for management decisions informed by results from enforcement and monitoring patrols, transparent assessments, and stakeholder engagement (see below).

6. Management recommendations

Detailed management recommendations are provided below with a summary included in Section D that includes information on the timeline, responsible agencies.

6.1 Marine spatial or zoning plans

6.1.1 *Predictive mapping to inform marine spatial planning*

Data on the distribution of marine wildlife in the SoNG MPA and surrounding waters were compiled from a citizen science network of gillnet fishers (2015-2019) and at-sea surveys for marine wildlife and investigations of fisheries (2017-19) organized and conducted by WCS to generate a predicted map of priority habitat (Figure 7 - top left).

Estuarine waters near the Sundarbans mangrove forest provide essential spawning and nursing habitat for numerous marine species, including sharks and rays. Considering the importance of mangroves for supporting biodiversity in adjacent open estuarine waters, the highest priority areas for biological importance were mapped according to distance from the edge of the mangrove forest: high priority <15 km, medium priority 15-25 km, and low priority >25 km (Figure 7 - top right).

As part of the habitat prioritization process, the importance of estuarine habitat for hilsa fisheries was also considered in terms of protecting areas that are especially important for juvenile growth. Kernel density estimates of juvenile hilsa or *jatka* (< 25 cm long) catches were mapped from data collected by 19 gillnet fishing vessels during 106 net sets made between 2015 and 2016 (Figure 7 - bottom left). Finally, a primary productivity map of the area was generated using remote sensing data on chlorophyll levels from Assis et al. (2017) (Figure 7 - bottom right).

Fishing intensity was mapped according to the kernel density of 3,791 gillnet sets recorded by the same citizen science fishers safety network from 2015-2019 and categorized as high > 3 net sets per km², medium 1-3 net sets per 10 km², and low fishing intensity <1 net set per 10 km² (Figure 8 - left).

Areas affected by vessel shipping routes⁹ were also mapped according to the distance from the main route with high impact <5 km, medium impact 5-15 km, and low impact >15 km (Figure 8 - right).

Maps of priority habitat for marine biodiversity and threats indicated that the nearshore waters close to the mangrove forest in the northern portion of the MPA are particularly important for biological productivity, as nursery grounds for numerous species, including economically valuable hilsa fish, and for supporting high densities of marine wildlife, including particularly large numbers of Irrawaddy and Indo-Pacific humpback dolphins and finless porpoises.

⁹ Shipping route data were reproduced from the map of Maritime Provinces of Bangladesh in <https://i.pinimg.com/originals/45/00/a9/4500a9c47e2829230c57c49697cd0fa1.png>.

This zone is also affected by high fishing intensity and a shipping route through the middle of the area. This area was prioritized as a Fish Spawning and Nursery Zone (Figure 9 -red area).

The density of marine wildlife, including Irrawaddy and Indo-Pacific humpback dolphins and finless porpoises, is also particularly high in the middle of the MPA, which is similarly affected by high fishing intensity and located at the junction of multiple shipping routes. This area was prioritized as a Marine Wildlife Protection and Regulated Fishery Zone (Figure 9 - yellow area).

The southern portion of the MPA also supports high marine wildlife density as well as high fishing intensity. However, this area is of lesser importance as a nursery ground for marine species, including hilsa fish, and for biological productivity. Also, the marine wildlife occurring in this area, such as pantropical spotted and spinner dolphins and Bryde's whales, are not globally threatened. Therefore, to balance the protection of marine wildlife and other biodiversity with fisheries essential for coastal communities, this area was prioritized as the Sustainable Fishery Zone (Figure 9 - green area).

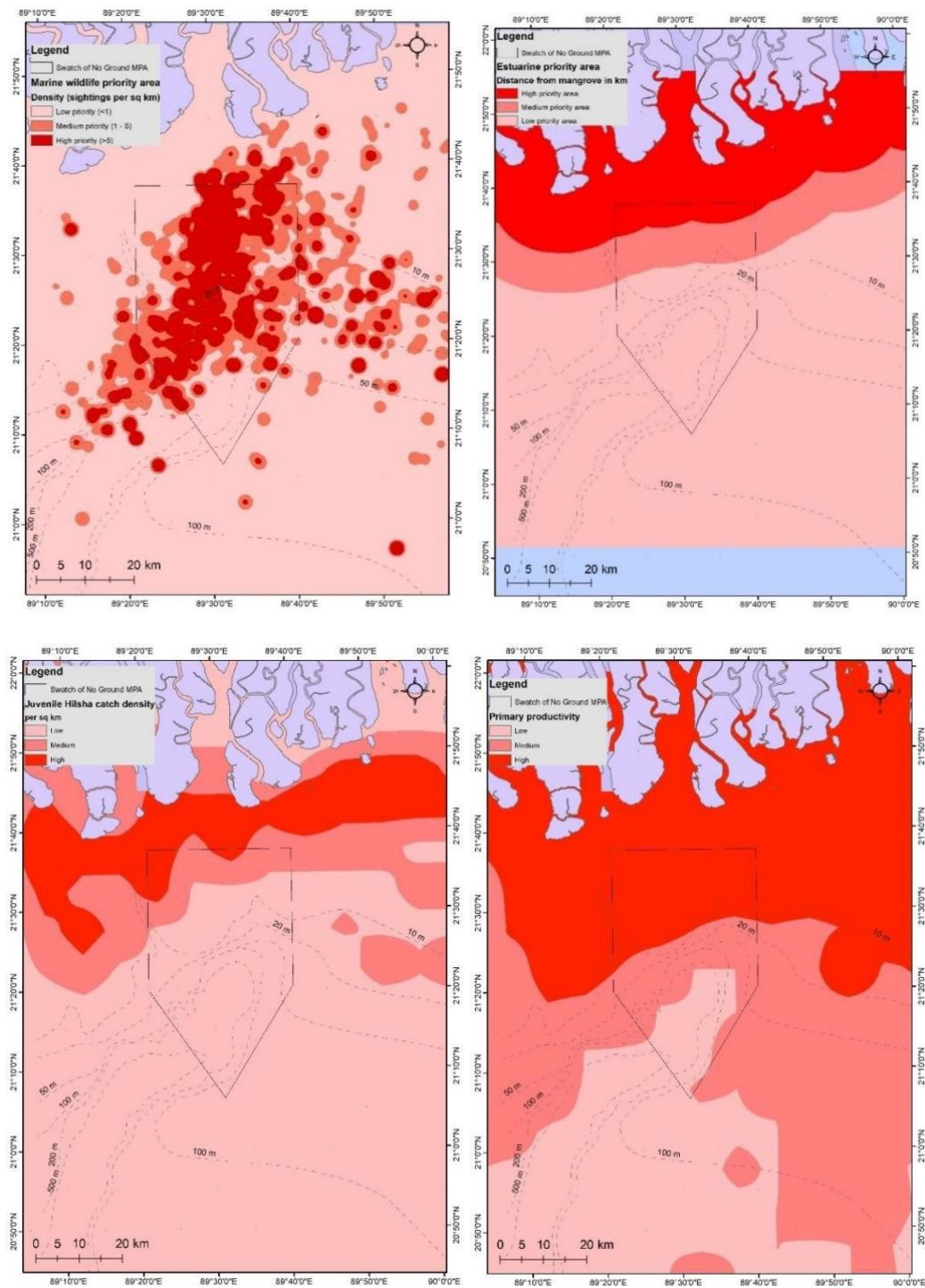


Figure 7. Maps showing priority habitat for marine wildlife (cetaceans, sharks, rays, marine turtles) (top left), importance of adjacent mangrove-associated shallow estuarine waters for marine biodiversity according to distance from shore (top right), importance of open estuarine waters for hilsa productivity according catch density of juvenile hilsa or *jatka* (bottom left) and primary productivity according to chlorophyll levels (bottom right).

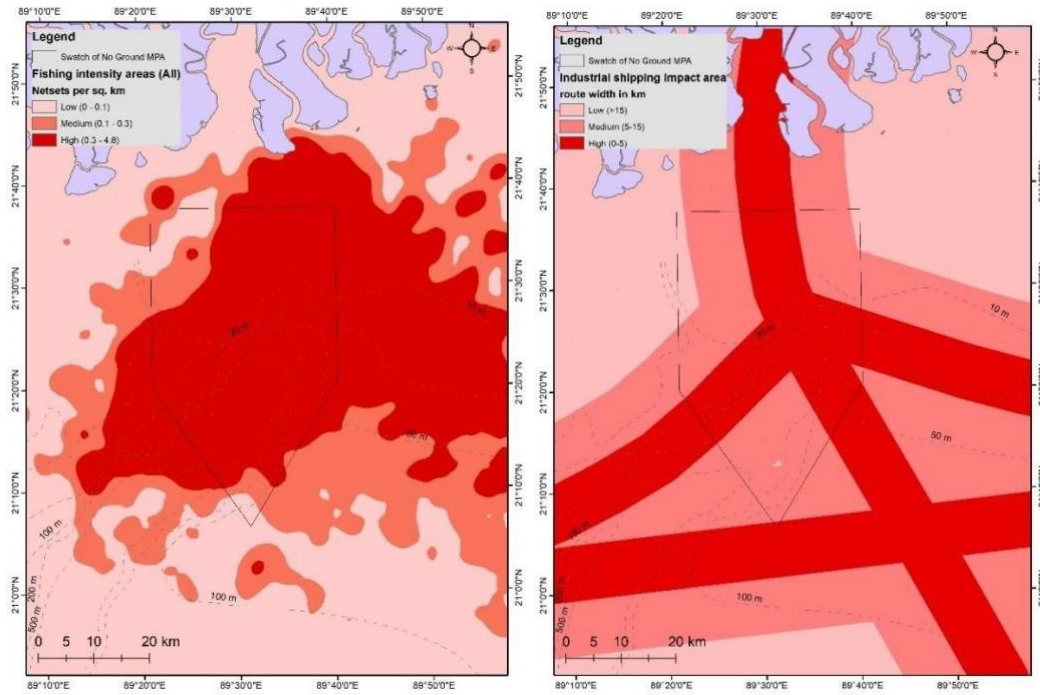


Figure 8. High risk areas for threatened marine wildlife in and around the SoNG MPA according to gillnet fishing intensity (left) and distance from shipping routes (right).

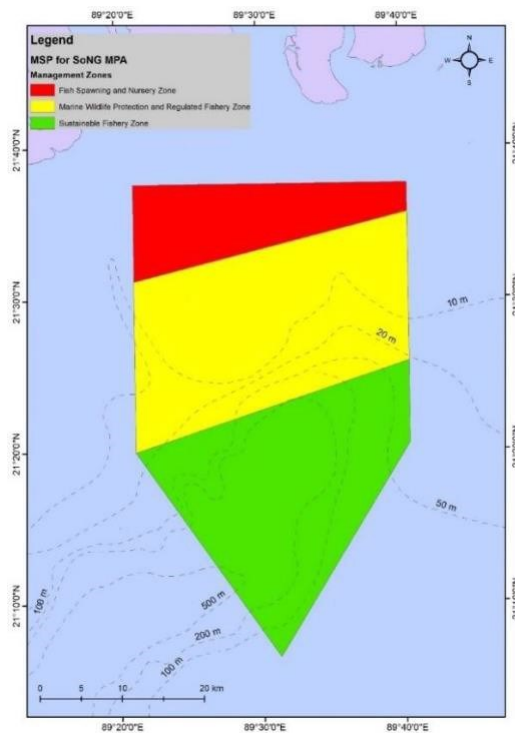


Figure 9. Marine spatial plan for the SoNG MPA with three management zones: Fish Spawning and Nursery Zone (red), Marine Wildlife Protection and Regulated Fishery Zone (yellow), and Sustainable Fishery Zone (green).

6.1.2 Recommendations for management zones

For optimizing the protection of threatened marine wildlife and other biodiversity with sustaining productive fisheries, marine spatial planning should be implemented including a Fish Spawning and Nursery Zone, Marine Wildlife Protection and Regulated Fishery Zone, and Sustainable Fishery Zone.

(i) Fish Spawning and Nursery Zone

The Fish Spawning and Nursery Zone is a no-take zone protecting priority fish spawning and grow out habitat for improving fisheries outside of the zone with the added benefit of eliminating the potential for entanglement in fishing gear of marine wildlife protected under the Wildlife (Conservation and Security) Act, 2012.

Specific rules recommended for this zone include:

- a) All fishing should be prohibited.
- b) Extraction of natural resources, including oil, gas, and minerals, should be prohibited.

(ii) Marine Wildlife Protection and Regulated Fishery Zone

The Marine Wildlife Protection and Regulated Fishery Zone focusses on protecting threatened marine wildlife and ensuring that fisheries are sustainable. Rules recommended for this zone include:

- a) Non-selective fishing gears, including gillnets, set-bag nets, trawling and purse-seine nets, and unbaited bottom-set longlines should be prohibited.
- b) Only selective fishing techniques such as baited longlines should be allowed, with incidental catches of legally protected marine wildlife released at sea.
- c) Extraction of natural resources, including oil, gas, and minerals, should only proceed after a rigorous EIA, with specific measures included to protect threatened wildlife and fisheries that has been rigorously reviewed, and approved by the MoEFCC.

(iii) Sustainable Fishery Zone

The Sustainable Fisheries Zone focusses on reducing the unselective capture of undersized fish and marine wildlife for safeguarding healthy coastal and marine ecosystems and fishery dependent livelihoods.

Rules recommended for this zone include:

- a) No trawl fisheries or set-bag nets should be permitted.
- b) Extraction of natural resources, including oil, gas, and minerals, should only proceed after a rigorous EIA with specific measures included to protect threatened wildlife and sustainable fisheries is reviewed, and approved by the MoEFCC under a “no net loss” framework.

6.2 Fisheries

Destructive fishing practices are the highest priority threat to marine wildlife and sustainable fisheries in the SoNG MPA. The zone-wise rules detailed above aim to balance the protection of threatened species and their priority habitats with sustaining fisheries and livelihood needs.

Throughout the MPA, management recommendations for fisheries include that:

- a. Existing fishing laws and rules should be strictly enforced and monitored, including:
 - i. Sub-Section 3(1) of the Protection and Conservation of Fish (Amendment) Act 1995 that prohibits the manufacture, import, marketing, carrying, transporting, or possessing of destructive fishing nets, traps, and gears, specified under the Protection and Conservation of Fish (Amendment) Act 2002, Section 4 (44A) as *current jaal* or monofilament gillnet, and under the S.R.O No. 197-Ain-2020 by the MoFL as all types of gillnets below 6.5 cm (2.6 inches) mesh size,
 - ii. The 22-day ban on catching hilsa during their breeding season, and the 65-day fishing ban (May to July) to protect fish stocks in the Bay of Bengal as authorized by the Marine Fisheries Rules, Section 3 (1) (Ka),
 - iii. Technical Directives on Marine Fisheries Management and Harvest-2023, Section 6, which specifies that industrial trawlers can only operate in waters more than 40 m deep, and the S.R.O. No 93-Ain-2013 that prohibits the use of estuarine set-bag nets in waters less than 10 m deep during high tide, and
 - iv. All fishing vessels operating in the MPA should hold a valid license issued by the DoF as per Marine Fisheries Act 2020 (Section 30) that requires them to agree to follow laws and rules in the MPA.
 - v. Technical Directives on Marine Fisheries Management and Harvest-2023, Section 6 (2) (Ka) (i to iv), which specified that the minimum mesh-size shall be (a) 45 mm at the cod end of shrimp trawling nets, (b) 60 mm for fish trawling nets, (c) 200 mm for large-mesh drifting gillnets, (d) 100 mm for small-mesh drifting gillnets, and (e) 45 mm at the cod end of set-bag nets.
- b. All fishing vessels operating in the MPA should be required to possess a GPS that includes a digitized map of the MPA with the boundaries of the different zones detailed in the section on MSP above.
- c. Catching, killing, and landing of marine wildlife and fishes listed under Schedule I of the Wildlife (Conservation and Security) Act, 2012, is strictly prohibited, and accidentally caught specimens must be released at sea as per Technical Directives on Marine Fisheries Management and Harvest-2023, Section 10 (18) and Section 10 (23).
- d. Catching, killing, and landing of marine wildlife and fishes listed under Schedule II of the Wildlife (Conservation and Security) Act, 2012, is only allowed with prior permission from the BFD.

- e. Accidentally caught marine wildlife and fishes listed under Schedule II of the Wildlife (Conservation and Security) Act, 2012, must be released at sea unless fishers have permission from the BFD to catch them.
- f. Strong efforts should be made by the Bangladesh Navy and Bangladesh Coast Guard to ensure that foreign vessels do not enter or fish in the MPA.

6.3 Vessel traffic and pollution

Shifting depth and proximity to ecologically sensitive mangrove habitat makes the northern waters of the SoNG MPA a high-risk area for shipping, including spillage of oil or other hazardous cargo. Meanwhile, the high density of commercial vessel traffic at the head of the submarine canyon, where marine wildlife, including large whales and marine turtles, spend extended time on the surface, increases the potential for ship collisions to affect protected marine wildlife.

To minimize threats from vessel traffic and pollution in the SoNG MPA, it is recommended that:

- a) Existing pollution laws and rules, which apply to marine shipping vessels, including the Environmental Conservation Act 1995 and the Environmental Conservation Rules 2023, which mandate that industries must carry out an EIA and put in place effluent treatment, report accidents or discharges of pollutants, and take remedial measures, should be strictly enforced by the Mongla and Payra Port Authorities.
- b) Provisions under the Territorial Waters and Maritime Zones Act 1974 (Act No. XXVI of 1974), Water Act 2013, for preventing and controlling marine pollution and preserving the quality and ecological balance in the marine environment, including prohibiting the disposal of bilge water, and, in case of any accidental discharge, holding the responsible party liable for all expenses of control and mitigation activities, in compliance with the International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL 73/78), should be enacted and enforced.
- c) Anchorage of commercial shipping vessels should be prohibited in the SoNG MPA except in the designated anchorage areas or in an emergency.
- d) No military firing practice should be conducted in the SoNG MPA.
- e) Operational and piloting guidelines for vessels, including for pollution prevention, waste treatment and disposal, oil spill, and avoidance of environmentally sensitive areas (e.g., Fish Spawning and Nursery Zone) should be enforced by the Mongla and Payra Port Authorities to minimize risks of collisions, accidents, and oil spills to marine wildlife and fisheries in the SoNG MPA.

- f) The Bangladesh Navy should provide up-to-date digital maps of the Bangladesh coast indicating depth contours, the SoNG MPA boundary and management zones, and the maritime border with India, free of charge to support safe navigation to commercial vessels.
- g) All vessels should reduce their speed to maximum 10 knots (18.5 km/hour) while in the MPA in order to prevent, control, and manage oil and chemical spillage emergencies in a coordinated way, the National Oil and Chemical Spill Contingency Plan (NOSCOPE) of Bangladesh will be strictly followed here.

6.4 Dredging and oil and gas exploration and development

Regardless of precautions taken, oil and gas exploration and development entail unavoidable risks to MPAs. Oil and gas exploration use high decibel air guns that can have lethal impacts on dolphins, porpoises, and whales, as well as on zooplankton that support all fishes and crustaceans that either eat zooplankton or feed on marine organisms whose diet depends on zooplankton. Oil and gas development also requires extensive offshore infrastructure, which means increased vessel traffic for construction and maintenance. Also, there is always a potential for oil spills and spills of chemicals used when drilling for oil and gas, which may have devastating consequences for ocean life.

Dredging also affects the seabed and surrounding waters. Noise and pollution from dredging operations impact marine wildlife and fish that depend on the shallow nearshore habitats.

Recommendations for dredging and oil and gas exploration and development include:

- a) Dredging should be prohibited in the entire SoNG MPA.
- b) All oil and gas exploration should be prohibited in the *Fish Spawning and Nursery Zone*.
- c) Any seismic surveys should be considered in consultation with the SoNG MPA Management Committee (see below) and conducted according to international standards for protected/sensitive areas.¹⁰ These include:
 - i. Implementing a soft start approach which involves activating the smallest volume element in the seismic array with subsequent stages, of roughly equal duration, doubling the number of active elements lasting at least 20 minutes and no longer than 40 minutes,
 - ii. Implementing an exclusion zone of at least 500 m horizontal radius from the center of the sound source,

¹⁰ The recommendations below are adapted from <https://www.iogp.org/bookstore/product/recommended-monitoring-and-mitigation-measures-for-cetaceans-during-marine-seismic-survey-geophysical-operations/> and Nowacek, D.P., Bröker, K., Donovan, G., Gailey, G., Racca, R., Reeves, R.R., Vedenev, A.I., Weller, D.W. and Southall, B.L. (2013). Responsible practices for minimizing and monitoring environmental impacts of marine seismic surveys with an emphasis on marine mammals. *Aquatic Mammals*, 39(4), p. 356.

- iii. Visually observe the exclusion zone for at least 30 minutes prior to the seismic survey sounds being activated,
 - iv. Observer(s) should be trained to an acceptable standard and have no other duties or distractions while serving as cetacean observers,
 - v. If cetaceans are present within the 500 m exclusion zone, initiation of soft-start procedures should be delayed until at least 20 minutes after the last sighting of a cetacean,
 - vi. All visual observations and operations should be electronically documented, and
 - vii. During periods of poor visibility and darkness, passive acoustic monitoring (PAM) should be used prior to initiation of soft-start procedures.
- d) Oil and gas drilling and production should only proceed in the *Marine Wildlife Protection and Regulated Fishery Zone* and *Sustainable Fisheries Zone* after a rigorous EIA has been approved by the SoNG MPA Management Committee with specific measures taken to protect threatened marine wildlife and sustainable fisheries,¹¹ including:
- i. Minimize the placement of operational structures, pipelines, and associated infrastructure in sensitive marine habitat,
 - ii. Undertake construction activities outside of sensitive lifecycle periods for relevant species, such as migration, breeding and spawning of hilsa,
 - iii. Develop and implement a hazardous materials management plan to minimize impacts of each type of hazardous waste,¹²
 - iv. Do not dispose of waste chemicals overboard, instead dispose at port by reputable/licensed waste management contractor,
 - v. Use environmentally sensitive alternatives to harmful chemical agents when cleaning vessels or infrastructure,
 - vi. Store all hazardous materials in suitably contained areas, in accordance with their Material Safety Data Sheet (MSDS),
 - vii. Use of best practices in construction materials and maintenance of facilities to minimize disturbance from noise, light, temperature, chemicals, and vibration, and
 - viii. Meet with fishing communities to assess potential impacts for fisheries and develop plans for mitigation that are appropriate to the local context.

¹¹ The recommendations below are adapted from https://cms.fauna-flora.org/wp-content/uploads/2017/12/FFI_Good-Practice-Guidance-for-oil-gas-operations-marine-environments-.pdf

¹² https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

- e) According to Bangladesh Environment Conservation Act 1995, prior to conducting dredging and oil and gas exploration and development, an Environmental Clearance Certificate must be obtained from the DoE pending approval of an environmental impact assessment (EIA) for adopting appropriate mitigation measures.

6.5 Tourism

Interest in tourism at the SoNG MPA is growing, primarily due to the attraction of dolphin and whale watching and the potential for developing sportfishing tourism. Although these activities are limited to the winter months, due to rough seas during other months of the year, they are unlikely be a major source of government and community revenue, if well managed, both activities could provide alternative income and employment in coastal communities. Mass tourism should be discouraged and an assessment of tourism carrying capacity be conducted.

Recommendations for managing tourism in the MPA include:

- a) All tourism vessels should maintain a speed below 10 knots (18.5 km/hour) while inside the MPA.
- b) Unless they approach the vessel, dolphins and porpoises should be observed from a safe distance of at least 50 m and large whales from at least 100 m.
- c) Viewing time of dolphin, porpoise, and whale groups or individuals should be limited to no more than 30 minutes.
- d) Tourism vessels must avoid circling or entrapping dolphins, porpoises, and whales, making abrupt movements or loud noises, and separating mother/calf pairs.
- e) Attempting to feed dolphins, porpoises, and whales is prohibited.
- f) Tourism vessels must avoid circling marine turtles and separating mating pairs.
- g) All sportfishing must be caught and release using circle hooks, barbless hooks, or hooks with crimped barbs, to increase fish survival and make hook removal easier.
- h) Sport fishers should use non-stainless-steel hooks which will corrode and fall out over time if marine wildlife is accidentally hooked and cannot be dehooked.
- i) Handling of fish caught should be minimized, and, if possible, the fish should be released without removing it from the water.
- j) Sport fishers should use a wet, knotless mesh landing net which causes less damage to eyes, fins, and scales.
- k) Sport fishers are prohibited from gaffing fish, including sharks and rays, and they should be dehooked as soon as possible.
- l) If a fish caught by a sport fisher cannot be dehooked, the line should be cut as close as possible to the hook.

- m) Vessels engaged in tourism in the SoNG MPA should be certified and registered with the Bangladesh Inland Water Transport Authority (BIWTA) under the Department of Shipping and registered with the BFD following the same practice as in the Sundarbans Reserved Forest.
- n) Before the onset of the trip, the tour operator should inform the BFD, Bangladesh Coast Guard, Bangladesh Navy, Tourism Board, and Mongla Port Authority about tour plans and provide vessel details and a list of all persons on board.
- o) For safe navigation and emergency preparedness, all tourist vessels must be equipped with a Global Positioning System (GPS), depth sounder, licensed VHF radio, Bangladesh Coast Guard approved life vests for all passengers and crew, at least two life rings with one each mounted for easy access on both sides of the vessel, and at least two up-to-date certified fire extinguishers.
- p) Tourists and vessels engaged for tourism should be charged an entry fee to access the SoNG MPA as per current practice by the BFD for most protected areas in Bangladesh. This revenue could contribute to offset operational costs of SoNG MPA management (see below).
- q) Tourists and operators must not dispose of solid or liquid waste at sea. Waste can be disposed of in Mongla Port Reception Facility, or the designated areas as specified by the Tourism Board.

6.6 Enforcement and monitoring

Equitable and systematic enforcement of laws and rules in the MPA is critical for achieving its goal and objectives. This can be accomplished through interagency government law enforcement and monitoring patrols and community monitoring patrols using SMART.¹³ SMART patrols have been successfully implemented by the BFD for enforcement and monitoring in the Sundarbans Reserved Forest with Government endorsed Standard Operating Procedures (SOPs). Results from SMART patrols should be used to prioritize the timing and locations of future patrols and inform MPA management. Systematic enforcement and monitoring efforts in the SoNG MPA should be well coordinated with the Joint Monitoring Cell (JMC) designated by the MoFL as per the Marine Fisheries Act 2020 Section 5 (1) with combatting Illegal, Unreported and Unregulated (IUU) Fishing and Section 5(2) for Monitoring, Controlling, and Surveillance (MCS) across Bangladesh's EEZ, to optimize the allocation, use, and sharing of government resources.

¹³ SMART stands for a Spatial Monitoring and Reporting Tool and is a suite of best practices that uses a free, user-friendly software program (<https://smartconservationtools.org/>) employed to document, adaptively manage, and evaluate the performance of enforcement and monitoring patrols.

6.6.1 Interagency government SMART patrols

The Spatial Monitoring and Reporting Tool (SMART) is the world's leading tool for conservation law enforcement monitoring and protected and conserved area management. Developed by the SMART Partnership, a consortium of NGOs, SMART is accessible on mobile app, desktop software and cloud-based platforms and is used to measure, evaluate and improve the effectiveness of law enforcement monitoring.

For conducting interagency SMART patrols in the SoNG MPA, it is recommended that:

- a) A draft SOP for conducting collaborative SMART patrols in the SoNG MPA has been developed that is to be reviewed and finalized through workshops convened with field-level officers and high-level officials from the BFD, DoF, Bangladesh Navy, and Bangladesh Coast Guard.
- b) A *Handbook for SMART Patrols in the SoNG MPA* and marine SMART model should be developed with support from national and international SMART experts.
- c) Intensive field-level trainings should be conducted for officers from the BFD, DoF, Bangladesh Navy, and Bangladesh Coast Guard who will conduct and record data on SMART patrols.
- d) Trainings and technical support should be provided for SMART data managers to enter SMART data into a centralized database and generate SMART maps and reports to be used for adaptive management and refining patrols so that they focus on where and when laws and rules are being violated in the MPA.

6.6.2 Community monitoring patrols

Community members should be actively engaged as Ocean Guardians for monitoring marine wildlife and threats in the SoNG MPA. For conducting community-led SMART patrols, recommendations include:

- a) Small-scale fishers operating in the MPA should be equipped, trained, and mentored to collect geo-referenced, photo-verified data on their fishing effort and catches, sightings, and releases of protected marine wildlife, and observed violations of laws and rules.
- b) A data management system should be established to compile, enter, analyze, and generate reports on information collected by community monitoring patrols.
- c) SMART data recorded by fishers should be included in a centralized database and the resulting SMART reports used for adaptive management and refining Government law enforcement patrols so that they focus on where and when laws and rules are being violated.
- d) Results from SMART patrols should be shared with coastal communities at the home ports of fishers operating in the SoNG MPA.
- e) Incentives should be identified, such as the provision of a smartphone, GPS, binoculars, or other lifesaving equipment for fishers participating in community-led SMART patrols.

6.7 Community engagement

The willingness of stakeholders to engage in MPA management should be encouraged through educational outreach on its ecological importance and the impacts of human activities. Local communities in Bagerhat, Pirojpur, Barguna, and Patuakhali should be prioritized because vessels operating in the SoNG MPA primarily come from these districts.

Recommendations for engaging coastal communities include:

- a) Informative, weather resistant signs about the objectives, location, management zones, rules, and benefits to coastal communities of the SoNG MPA should be installed at homeports and fish landing sites frequented by fishers active in the SoNG MPA.
- b) Educational outreach programs, including interactive community events and community radio programs, should be initiated to inform community members about the location and management of the SoNG MPA, including the boundaries of and rules in different management zones, their benefits, and how fishers can participate in community-led monitoring patrols.
- c) Practical communication tools should be provided to community members about SoNG MPA rules, including identification guides and instructions for safely handling and releasing protected marine wildlife, plastic rulers showing permitted mesh sizes for different nets, and a digitized base map that can be uploaded into a smartphone showing the location, boundaries, and depth contours of the SoNG MPA as well as the three different management zones.
- d) Frequent consultative meetings should be convened by the SoNG MPA Community Engagement Unit for stakeholders to express their concerns, contribute to MPA management, and evaluate the results of research and monitoring in the SoNG MPA.
- e) The Bangladesh Meteorological Department should be engaged to improve access to daily Fishers Forecasts, currently only accessible via their website, by broadcasting weather forecasts and storm warnings on national and community radio channels as well as over VHF radio that can be received at sea.
- f) Mobile phone network range should be extended to 30 km offshore to enable fishers to access up-to-date weather maps and navigation aids, request emergency assistance from other vessels or the Bangladesh Navy or Bangladesh Coast Guard, report illegal activities, and receive messages about SoNG MPA laws and rules.
- g) Training programs should be developed and implemented to enable fishers to access, understand, and use available tools, applications, and services, including a GPS or GPS-enabled smartphone equipped with a map of the MPA with the three management zones, weather predictions and storm warnings, depth charts, and species identification guides for protected marine wildlife, that aim to increase compliance with SoNG MPA regulations and reduce risks to the lives and livelihoods of small-scale fishers.

6.8 Livelihoods

Enhancing livelihood opportunities for small-scale fishers is aligned with the objectives of the SoNG MPA for supporting a sustainable blue economy. Alternative income generating opportunities should be directly linked to biodiversity conservation objectives, designed at an appropriate scale to benefit stakeholders, and target individuals engaged in unsustainable fishing practices.

Recommendations for enhancing livelihood opportunities include:

- a) Post-harvest facilities, such as cold storage, ice plants, solar fish dryers, transportation and market access, and quality control for export products, should be improved to increase the value and diversify fishery products.
- b) The engagement of women should be strengthened through training on hygienic fish handling and value enhancement, financial management, processing low-value catches as a nutritional supplement, and improved access to support services from the Government and non-government organizations (NGOs).
- c) Fishing vessel owners who currently provide illegal fishing gears should be required to switch to legal gears in cooperation with fishing vessel owner associations.
- d) Fishers currently working on vessels using illegal fishing gears should be provided with information and opportunities to adopt alternative livelihoods such as boat renovation, engine repair, or value-enhancing post-harvest processing of legally caught fish and shrimp.
- e) Fishers should be informed about labor laws, finance and insurance schemes, and vocational training programs to reduce their dependency on money lenders.
- f) Public-private partnerships should be initiated for community-based, environmentally responsible tourism, such as dolphin or whale watching tours or sportfishing.
- g) Quota-based employment in emerging industries should be initiated for local community members to reduce their dependency on fisheries and fishing pressure in the SoNG MPA.
- h) Collaborations should be made with NGOs to develop and implement an interactive training program at early entry points in a fishery-based economy on laws and rules in the SoNG MPA and safe navigation using a GPS where, after passing a practical exam, trainees will be awarded an *Ocean Guardian Certificate* that gives them an advantage for being hired as skilled crew on fishing or tourist vessels.

6.9 Climate adaptation

As discussed in the background section, the SoNG submarine canyon may serve as a critical ecological refuge for mobile marine species that cannot adapt to warming ocean temperatures and changes in productivity due to shifting currents predicted to occur as a result of global climate change. To monitor and evaluate potential climate change impacts and incorporate the results into an adaptive management framework, recommendations include:

- a) A cost-effective, robust, ecological and biodiversity monitoring approach should be formulated for the SoNG MPA that combines technical methods (e.g., passive acoustical monitoring, sonar-satellite buoys, and underwater camera traps), dedicated sighting surveys, citizen science networks, government-led SMART patrols, and remote sensing to understand potential changes in the occupancy of mobile marine species over time.
- b) A decision-making framework should be designed for providing science-based guidance to ocean stakeholders, including managers, fishers, and women engaged in fish processing and marketing, on how potential changes in marine fish and marine megafauna species distribution and density can be used for adaptively managing the SoNG MPA to protect marine biodiversity and sustain productive fisheries.

6.10 Assessment and monitoring

Transparent assessments and evaluations are required on the effectiveness of management interventions in the SoNG MPA to protect globally threatened marine wildlife, sustain productive fisheries and fishing livelihoods, and support a national blue economy. An overview of biophysical, socioeconomic, and governance indicators to evaluate effectiveness of SoNG MPA management is provided in Appendix 5.

Recommendations for assessment and monitoring of MPA effectiveness include:

- a) Biological and threat indicators, including trends in the occurrence of marine wildlife, and observations of illegal fishing, and infractions of laws and rules related to vessel traffic, pollution, and tourism should be used as a measure of MPA success.
- b) Long-term changes in the socio-economic conditions of fishery-dependent communities resulting from the SoNG MPA should be measured according to changes in financial liquidity, buying power, dependency on money lenders, nutritional status, and health condition of community members.
- c) Decision making among MPA managers should be assessed in terms of inclusiveness and transparency through yearly consultations and interviews, and results used to modify the management processes as needed.

- d) Collaborating with social service providers should be considered as a cost-effective approach for monitoring the economic, social, and governance impacts of the SoNG MPA in coastal communities.
- e) A rigorous assessment of the effectiveness of management efforts in the SoNG MPA should be conducted every five years, and the results used to modify the management plan as needed.

C. ADMINISTRATION

1. Management structure and responsibilities

Management of the SoNG MPA will be coordinated through the SoNG MPA Management Committee led by the MoEFCC, as authorized under the Biodiversity Act, 2017, and implemented through Research, Community Engagement, and Monitoring and Evaluation units (Figure 10).

To ensure interministerial coordination and multisectoral support, and to avoid any administrative difficulties, nominations for designated committee members should be issued by the respective ministries in close consultation with department or agency heads.

1.1 MPA Management Committee

Recommendations for the Management Committee are:

- a) Management will be coordinated through the SoNG MPA Management Committee led by the MoEFCC, as authorized under the Biodiversity Act, 2017, and implemented through Research, Community Engagement, and Monitoring and Evaluation units (Figure 10).
- b) The MPA Management Committee should be chaired by the Secretary of the MoEFCC or an appointed representative. Members should include representatives from the MoEFCC (BFD, DoE), MoFL (DoF, Marine Fisheries Office Chattogram, Joint Monitoring Cell (JMC)), Bangladesh Coast Guard under the Public Security Division (PSD) of the Ministry of Home Affairs (MoHA), Bangladesh Navy, Mongla and Payra Port Authorities, Tourism Board, Bangladesh Fisheries Research Institute (BFRI), Bangladesh Forest Research Institute (BFRI), Deputy Commissioners and fishery associations from Bagerhat, Pirojpur, Barguna, and Patuakhali (which are the home ports for fishers who operate in the SoNG), government research institutions, and conservation NGOs, with the total not exceeding 25 members. The MPA Management Committee will meet every six months (in person or virtually) with the proceedings documented in published meeting minutes.
- c) Responsibilities of the MPA Management Committee should be to:
 - i. Produce a publicly available annual report, including financial information, based on results provided by the research, community engagement, and monitoring and evaluation units,
 - ii. Review and update the IMP-SoNG MPA every five years to reflect up-to-date scientific evidence ecological, socio-economic and governance changes,
 - iii. Secure sustainable funding for implementing the IMP-SoNG MPA by liaising with relevant trust funds, government ministries, donor agencies, and NGOs,

- iv. Facilitate and coordinate engagement of government agencies, community associations, research institutions, and NGOs for implementing the IMP-SoNG MPA, and
- v. Coordinate activities of the Research, Community Engagement, and Monitoring and Evaluation units through annual workplans.

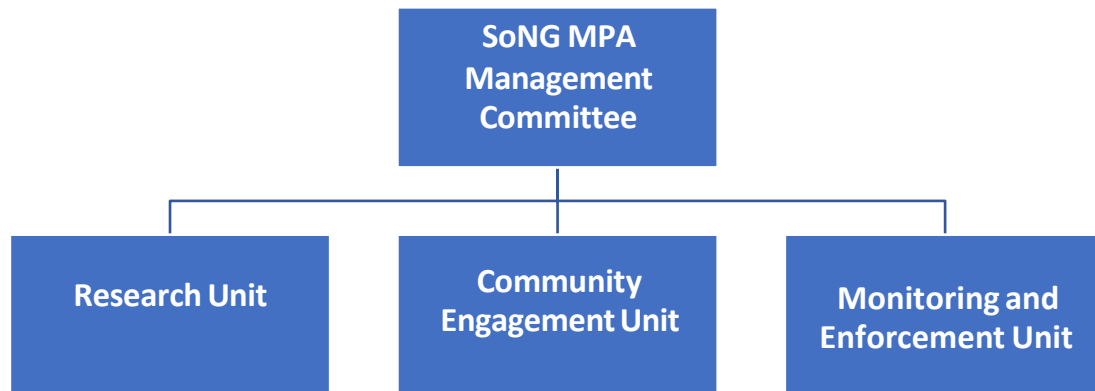


Figure 10. Organogram for SoNG MPA management.

1.2 MPA Research Unit

Recommendations for the SoNG MPA Research Unit are:

- a) The SoNG MPA Research Unit should be chaired by the Bangladesh Fisheries Research Institute (BFRI) with members not exceeding ten individuals representing the BFD, DoF Marine Fisheries Office, Bangladesh Forest Research Institute (BFRI), conservation NGOs, and researchers selected for their relevant expertise.
- b) Members of the SoNG MPA Research Unit should maintain regular communications and meet in person or virtually at least every four months.
- c) Responsibilities of the SoNG MPA Research Unit should be to:
 - i. Coordinate research on the effectiveness of MPA regulations and management interventions according to biological, threat, and socioeconomic indicators,
 - ii. Coordinate annual at-sea fisheries investigations and biannual visual surveys for marine wildlife,
 - iii. Review research and monitoring results from the Community Engagement and Monitoring and Enforcement units to formulate science-based, community-informed recommendations for adaptive management,
 - iv. Share research findings with the Community Engagement and Monitoring and Enforcement units to inform educational outreach, trainings, and consultations,

- v. Advise the SoNG MPA Management Committee on the results of government and community led SMART patrols, marine development projects, including dredging, oil and gas exploration and drilling, and tourism activities that could potentially affect the SoNG MPA, and
- vi. Summarize key research findings and contribute science-based recommendations to support the SoNG MPA Management Committee in preparing an annual report.

1.3 MPA Community Engagement Unit

Recommendations for the SoNG MPA Community Engagement Unit are:

- a) The Community Engagement Unit should be chaired by a senior official from Bangladesh Forest Department with members not exceeding 15 representing the BFD, DoF Marine Fisheries Wing, Bangladesh Coast Guard, Bangladesh Navy, and District Commissioners or Upazila Nirbahi officers from Bagerhat, Pirojpur, Barguna, and Patuakhali districts.
- b) Members of the SoNG MPA Community Engagement Unit should maintain regular communications and meet in person or virtually at least every four months.
- c) Responsibilities of the Community Engagement Unit should be to:
 - i. Coordinate and promote training programs for enabling fishers to conduct monitoring patrols, safely release protected marine wildlife caught in fishing gears, collect data on their fishing practices and catches, and improve their navigation and at-sea safety skills.
 - ii. Promote and coordinate educational outreach initiatives and tools aiming to inform stakeholders (including local fishing communities, industrial fisheries, shipping companies, and relevant government agencies and institutions) about the location, different management zones, laws and rules, and benefits of the SoNG MPA.
 - iii. Share information from research and monitoring activities and annual reports with local communities and provide stakeholders an opportunity to express their concerns and contribute to adaptive management during frequent consultative meetings.
 - iv. Support the Monitoring and Enforcement Unit by identifying and motivating local fishers to engage in community-led SMART patrols.
 - v. Coordinate biannual land-based socio-economic and knowledge, attitude, and practice (KAP) surveys among fishery stakeholders in MPA dependent communities.
 - vi. Ensure that livelihood enhancement or alternative income generating opportunities include women and men from communities that are dependent on fisheries in the SoNG MPA.

- vii. Support the DoF with the registration of fishers and fishing vessels, and the distribution of Vulnerable Group Feeding (VGF) rice subsidies during fishing ban periods.

1.4 MPA Enforcement and Monitoring Unit

Recommendations for the SoNG MPA Enforcement and Monitoring Unit are:

- a) The unit should be chaired by a senior officer from the DoF, with a maximum of 12 members from the BFD, Bangladesh Coast Guard, Bangladesh Navy, Mongla and Payra Port Authorities, Tourism Board, and the DoF Marine Fisheries Office and/or JMC.
- b) Members should maintain strong communication and convene monthly meetings (in person or virtually) to discuss patrol plans and results and ensure that SMART patrols are following the SMART SOPs.
- c) For optimizing SoNG MPA enforcement and monitoring, including SMART patrols, across government agencies and institutions to implement the IMP-SoNG MPA and minimizing operational costs, aligning or combining efforts of the MPA Enforcement and Monitoring Unit with the JMC of the MoFL should be considered, along with the inclusion of a nominated representative from the MoEFCC in the JMC.
- d) Responsibilities of the SoNG MPA Enforcement and Monitoring Unit are to:
 - i. Coordinate and ensure the implementation of interagency SMART patrols with appointed patrol team leaders.
 - ii. Ensure that SMART patrol teams have a safe, well-maintained vessel and are equipped, trained, motivated, and supported by on-board mentors to carry out their duties according to the SMART SOP.
 - iii. Coordinate with the Community Engagement Unit on enabling and motivating local fishers to engage in community-led SMART patrols through trainings, mentoring, and recognition of their contributions.
 - iv. Coordinate data management of interagency and community-led SMART patrols and generate SMART law enforcement and monitoring reports to help decide where and when subsequent SMART patrols should be conducted.
 - v. Support the SoNG MPA Management Committee in preparing an annual report by summarizing key results and achievements from SMART monitoring and enforcement efforts.

2. Infrastructure

Essential infrastructure, equipment, and resources needed for implementing the IMP-SoNG MPA include:

2.1 Land-based infrastructure

- a) Office space and internet connectivity to support management in the SoNG MPA, including for the central SMART data base managers, as well as a meeting room for the SoNG Management Committee and the Research, Community Engagement, and Enforcement and Monitoring Units. Opportunities for sharing existing infrastructure should be explored, for example with the DoF Monitoring, Control, and Surveillance (MCS) Unit and the MoFL Joint Monitoring Cell (JMC).
- b) A central VHF radio station and mobile phone hotline and staff to respond to distress calls, possibly incorporated in existing Bangladesh Navy, Bangladesh Coast Guard, or Port Authority offices.
- c) Mobile phone tower to extend the mobile network range to 30 km offshore for communication with government and community-led SMART patrols and for increased at-sea safety of small-scale fishing operations.
- d) Signs that communicate the location, three management zones, and fishing laws and rules in the SoNG MPA posted at the home ports of fishing, tourism, and shipping vessels entering the SoNG MPA.

2.2 Sea-based infrastructure

- a) Vessel support for government-led enforcement and monitoring patrols and emergency response to be provided by Bangladesh Navy and/or Bangladesh Coast Guard.

3. Equipment and resources

- a) Base map for mobile phones and GPS devices with updated depth contours, shipping routes, MPA boundaries, management zones, and international border demarcation, prepared and made electronically available free of charge by the Bangladesh Navy Hydrographic and Oceanographic Centre to fishing, commercial shipping, and tourism vessels operating in or transiting through the SoNG MPA.
- b) Rugged GPS-enabled smartphone devices provided to both government-led (at least four) and community-led (at least ten) SMART patrols.
- c) Educational materials and compliance tools, including informative signs (see above), training handbooks, plastic rulers with fishing net mesh size regulations, plastic laminated maps with the MPA and management zones clearly demarcated, marine wildlife identification guides, and instructions for the safe handling and release of protected marine wildlife, should be developed and made available to small-scale fishers.
- d) At least five computers or laptops necessary for SMART data processing and reporting, and administrating SoNG MPA management.

4. Estimated costs for IMP-SoNG MPA operations and functioning

Estimated costs for the smooth operations and functioning of the IMP_SoNG_MPA would be developed by BFD in consultation with concerned government agencies after approval on the Integrated Management Plan for the SoNG MPA

5. Sustainable financing

Stable long-term funding is essential to achieve protected area objectives. Recommendations for sustainable financing of conservation management in the SoNG MPA adapted from Iyer et al. (2019) include:

- a) Potential funding from the private sector through offset financing by industries adversely impacting the environment, or innovative private-public partnerships including potential vessel transit or offshore anchorage fees should be explored.
- b) Tourism and permit fees could be earmarked from potential dolphin and whale watching or sport fishing tours.
- c) Investing funds into an existing or new trust fund should be considered for ensuring sustainable support for SoNG MPA management.

D. PROPOSED ACTIONS FOR IMPLEMENTING THE IMP-SoNG MPA

Table 2. Summary table of proposed actions for implementing the *Integrated Management Plan for the Swatch of No-Ground Marine Protected Area 2024-2033* (IMP-SoNG MPA) with information on responsible agencies and timeline.

[BFD – Bangladesh Forest Department, BFRI – Bangladesh Fisheries Research Institute, BN – Bangladesh Navy, BCG – Bangladesh Coast Guard, BIWTA – Bangladesh Inland Water Transport Authority, DC - District Commissioner, DCCF - Deputy Chief Conservator of Forest, DoF – Department of Fisheries, GoB – Government of the People’s Republic of Bangladesh, MoCAT - Ministry of Civil Aviation and Tourism, MoEFCC – Ministry of Environment, Forest and Climate Change, MoFL – Ministry of Fisheries and Livestock, MPEMR – Ministry of Power, Energy and Mineral Resources, NGO – Non-Governmental Organization.]

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
MPA MANAGEMENT			
Management recommendations			
Marine spatial or zoning plan			
Implement marine spatial plan, including a Fish Spawning and Nursery Zone, Marine Wildlife Protection and Regulated Fishery Zone, and Sustainable Fishery Zone, for optimizing the protection of threatened marine wildlife and other biodiversity with sustaining productive fisheries in the SoNG MPA.	November 2024, onward	BFD	DoF, BN, BCG, Technical Experts from NGOs
Fisheries			
i. Strictly enforce and monitor existing fishing laws and rules throughout the MPA. ii. Check that all fishing vessels operating in the MPA hold a valid license issued by the DoF as per Marine Fisheries Act 2020 (Section 30) that requires them to agree to follow laws and rules in the MPA. iii. Mandate all fishing vessels operating in the MPA possess a GPS that includes a digitized map of the MPA with the boundaries of the different zones detailed in the section on MSP above. iv. Enforce strict prohibition on catching, killing, and landing of marine wildlife and fishes listed under Schedule I of the Wildlife (Conservation and Security) Act, 2012, and the release of accidentally caught specimens at sea.	Initiate after IMP-SoNG MPA endorsement, to be continued	BCG	DoF, BFD, BN

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
v. Ensure that prior permission from the BFD is obtained for catching, killing, and landing of marine wildlife and fishes listed under Schedule II of the Wildlife (Conservation and Security) Act, 2012. vi. Enforce release of accidentally caught marine wildlife and fishes listed under Schedule II of the Wildlife (Conservation and Security) Act, 2012, unless fishers have permission from the BFD to catch them. vii. Ensure that foreign vessels do not enter or fish in the MPA.			
Vessel traffic and pollution			
i. Strictly enforce existing pollution laws and rules which apply to marine shipping vessels. ii. Enact and enforce provisions for preventing and controlling marine pollution and preserving the quality and ecological balance in the marine environment. iii. Prohibit anchorage of commercial shipping vessels in the SoNG MPA except in an emergency. iv. Prohibit military firing practice in the SoNG MPA. v. Enforce operational and piloting guidelines for vessels, including from the National Oil and Chemical Spill Contingency Plan (NOSCOP), to minimize risks to marine wildlife and fisheries in the SoNG MPA and prevent, control, and manage collisions, accidents, and oil and chemical spills. vi. Provide up-to-date digital maps prepared by the Bangladesh Navy of the Bangladesh coast, free of charge to support safe navigation to commercial vessels. vii. Ensure that all vessels reduce their speed to maximum 10 knots (18.5km/h) while in the MPA. viii. In order to prevent, control, and manage oil and chemical spillage emergencies the National Oil and Chemical Spill Contingency Plan (NOSCOP) of Bangladesh will be strictly followed here in a coordinated way managed by the National Oil and Chemical Spill Control (NOCS) committee.	Initiate after IMP-SoNG MPA endorsement, to be continued	Mongla and Payra Port Authorities	BFD, DoF, BCG, BN, DoE

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
Dredging and oil and gas exploration and development			
i. Prohibit dredging in the entire SoNG MPA. ii. Prohibit all oil and gas exploration in the Fish Spawning and Nursery Zone. iii. Consult with the SoNG MPA Management Committee on any planned seismic surveys and ensure they are conducted according to international standards for protected/sensitive areas. iv. Ensure rigorous EIA cleared by DoE with appropriate mitigation measures to protect threatened marine wildlife and sustainable fisheries is approved by SoNG MPA Management Committee before permitting oil and gas drilling and production in the Marine Wildlife Protection and Regulated Fishery Zone and Sustainable Fisheries Zone.	Initiate after IMP-SoNG MPA endorsement, to be continued	MPEMR	DoE, BFD, DoF, and Mongla and Payra Port Authorities
Tourism			
i. Ensure that tour operators are informed and comply with regulations pertaining to vessel speed, wildlife interactions, and sport fishing. ii. Vessels engaged in tourism in the SoNG MPA should be certified and registered with the Bangladesh Inland Water Transport Authority (BIWTA) under the Department of Shipping and registered with the BFD following the same practice as in the Sundarbans Reserved Forest. iii. Before the onset of the trip, the tour operator should inform the BFD, Bangladesh Coast Guard, Bangladesh Navy, and Mongla Port Authority about tour plans and provide vessel details and a list of all persons on board. iv. For safe navigation and emergency preparedness, all tourist vessels must be equipped with a Global Positioning System (GPS), depth sounder, licensed VHF radio, Bangladesh Coast Guard approved life vests for all passengers and crew, at least two life rings with one each mounted for easy access on both sides of the vessel, and at least two up-to-date certified fire extinguishers. v. Tourists and tourism operators should not dispose of solid or liquid waste at sea. vi. Tourists and vessels engaged for tourism should be charged an entry fee to access the SoNG MPA as per current practice of BFD for most protected areas.	Initiate after IMP-SoNG MPA endorsement, to be continued	Bangladesh Tourism Board	BFD, BIWTA, Mongla Port Authority, MoCAT, BN, BCG, DoE

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
Enforcement and monitoring			
i. Operationalize interagency SMART patrols following jointly developed Standard Operating Procedures (SOPs) through training of field-level patrols teams. ii. Operationalize community-led SMART patrols by equipping, training, incentivizing, and mentoring small-scale fishers operating in the MPA to collect geo-referenced, photo-verified data on their fishing effort and catches, sightings, and releases of protected marine wildlife, and observed violations of laws and rules. iii. Establish a centralized data management system and database with trained data managers to compile, enter, analyze, and generate maps and reports on information collected by interagency and community SMART patrols. iv. Ensure that resulting SMART reports are used for adaptive management and refining Government law enforcement patrols so that they focus on where and when laws and rules are being violated. v. Share results from SMART patrols with coastal communities at the home ports of fishers operating in the SoNG MPA. vi. Coordinate operations with JMC to optimize enforcement and monitoring efforts.	November 2024, onward, to be continued	DoF	BFD, BCG, BN, /JMC units, Technical Experts from relevant NGOs

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
Community engagement			
i. Install informative, weather resistant signs about the objectives, location, management zones, rules, and benefits to coastal communities of the SoNG MPA at homeports and fish landing sites frequented by fishers active in the SoNG MPA. ii. Initiate educational outreach programs, including interactive community events and community radio programs, to inform community members. iii. Provide practical communication tools to community members about SoNG MPA rules. iv. Convene frequent consultative meetings by the SoNG MPA Community Engagement Unit for stakeholders to express their concerns, contribute to MPA management, and evaluate the results of research and monitoring in the SoNG MPA. v. Engage the Bangladesh Meteorological Department to improve access to daily Fishers Forecasts. vi. Promote the extension of mobile phone network range to 30 km offshore to enable fishers to access up-to-date weather maps and navigation aids, request emergency assistance from other vessels or the Bangladesh Navy or Bangladesh Coast Guard, report illegal activities, and receive messages about SoNG MPA laws and rules. vii. Develop and implement training programs to enable fishers to access, understand, and use available tools, applications, and services.	Initiate after IMP-SoNG MPA endorsement, to be continued	BFD	DoF, NGOs
Livelihoods			
i. Improve post-fish-harvest facilities to increase the value and diversify fishery products. ii. Strengthen engagement of women through training on hygienic fish handling and value enhancement, financial management, processing low-value catches as a nutritional supplement, and improved access to support services from NGOs and the Government. iii. Cooperate with fishing vessel owner associations to require fishing vessel owners who currently provide illegal fishing gear to switch to legal gears. iv. Provide fishers currently working on vessels using illegal fishing gears with information and opportunities to adopt alternative livelihoods. v. Inform fishers about labour laws, finance, and insurance schemes, and vocational training programs to reduce their dependency on money lenders. vi. Initiate public-private partnerships for community-based, environmentally responsible tourism, such as dolphin or whale watching tours or sport fishing. vii. Initiate quota-based employment in emerging industries for local community members to reduce their dependency on fisheries and fishing pressure in the SoNG MPA.	November 2024, onward	DoF	BFD, NGOs

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
viii. Develop and implement an interactive training program at early entry points in a fishery-based economy on laws and rules in the SoNG MPA and safe navigation using a GPS where, after passing a practical exam, trainees will be awarded an Ocean Guardian Certificate that gives them an advantage for being hired as skilled crew on fishing or tourist vessels.			
Climate adaptation			
i. Formulate a cost-effective, robust, ecological and biodiversity monitoring approach for the SoNG MPA that combines technical methods (e.g., passive acoustical monitoring, sonar-satellite buoys, and underwater camera traps), dedicated sighting surveys, citizen science networks, government-led SMART patrols, and remote sensing to understand potential changes in the occupancy of mobile marine species over time. ii. Design a decision-making framework for providing science-based guidance to ocean stakeholders, including managers, fishers, and women engaged in fish processing and marketing, on how potential changes in marine fish and marine megafauna species distribution and density can be used for adaptively managing the SoNG MPA to protect marine biodiversity and sustain productive fisheries.	2024-2025	BFD	DoE, DoF, NGOs
Assessment and monitoring			
ADMINISTRATION			
Management structure and responsibilities			
MPA Management Committee			
SoNG MPA Management Committee led by the MoEFCC, as authorized under the Biodiversity Act, 2017, to coordinate management and implementation through Research, Community Engagement, and Monitoring and Evaluation units with representatives nominated by respective ministries and agencies for ensuring interministerial, multisectoral collaborations.	Establish after IMP-SoNG MPA endorsement, to be continued	Chaired by Secretary MoEFCC	Members from MoFL, BFD, DoF, DoE, BCG, BN, Mongla and Payra Port Authorities, Tourism Board, Bangladesh Fisheries Research Institute (BFRI), Bangladesh Forest Research Institute (BFRI), DCs, fishery associations

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
MPA Research Unit			
i. Coordinate research on the effectiveness of MPA regulations and management interventions according to biological, threat, and socioeconomic indicators, ii. Coordinate annual at-sea fisheries investigations and biannual visual surveys for marine wildlife, iii. Review research and monitoring results from the Community Engagement and Monitoring and Enforcement units to formulate science-based, community-informed recommendations for adaptive management, iv. Share research findings with the Community Engagement and Monitoring and Enforcement units to inform educational outreach, training, and consultations, v. Advise the SoNG MPA Management Committee on the results of government and community led SMART patrols, marine development projects, including dredging, oil and gas exploration and drilling, and tourism activities that could potentially affect the SoNG MPA, and vi. Summarize key research findings and contribute science-based recommendations to support the SoNG MPA Management Committee in preparing an annual report.	Establish after IMP-SoNG MPA endorsement, to be continued	Chaired by the Bangladesh Fisheries Research Institute (BFRI)	Members from DoF, BFD, Bangladesh Forest Research Institute (BFRI), conservation NGOs and marine researchers

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
MPA Community Engagement Unit			
i. Coordinate and promote training programs for enabling fishers to conduct monitoring patrols, safely release protected marine wildlife caught in fishing gears, collect data on their fishing practices and catches, and improve their navigation and at-sea safety skills. ii. Promote and coordinate educational outreach initiatives and tools aiming to inform stakeholders about the location, different management zones, laws and rules, and benefits of the SoNG MPA. iii. Share information from research and monitoring activities and annual reports with local communities and provide stakeholders an opportunity to express their concerns and contribute to adaptive management during frequent consultative meetings. iv. Support the Monitoring and Enforcement Unit by identifying and motivating local fishers to engage in community-led SMART patrols. v. Coordinate biannual land-based socio-economic and knowledge, attitude, and practice (KAP) survey among fishery stakeholders in MPA dependent communities. vi. Ensure that livelihood enhancement or alternative income generating opportunities include women and men from communities that are dependent on fisheries in the SoNG MPA. vii. Support the DoF with the registration of fishers and fishing vessels, and the distribution of Vulnerable Group Feeding (VGF) rice subsidies during fishing ban periods.	Establish after IMP SoNG MPA endorsement, to be continued	Chaired by a GoB official ranked not less than DCCF from the BFD	Members from the BFD, DoF, BCG, BN, and Deputy Commissioners or Upazila Nirbahi officers
MPA Enforcement and Monitoring Unit			
i. Coordinate and ensure the implementation of interagency SMART patrols with appointed patrol team leaders. ii. Ensure that SMART patrol teams have a safe, well-maintained vessel and are equipped, trained, motivated, and supported by on-board mentors to carry out their duties according to the SMART SOP. iii. Coordinate with the Community Engagement Unit on enabling and motivating local fishers to engage in community-led SMART patrols through trainings, mentoring, and recognition of their contributions. iv. Coordinate data management of interagency and community-led SMART patrols and generate SMART law enforcement and monitoring reports to help decide where and when subsequent SMART patrols should be conducted.	Establish after IMP-SoNG MPA endorsement, to be continued	Chaired by a senior ranking officer from the DoF	Members from the BFD, BCG, BN, Mongla and Payra Port Authorities, and DoF Marine Fisheries Office (Chattogram) and JMC

Actions	Timeframe	Lead Agency	Supporting Agencies or Institutions
v. Support the SoNG MPA Management Committee in preparing an annual report by summarizing key results and achievements from SMART monitoring and enforcement efforts. vi. Coordinate efforts with JMC of the MoFL for optimizing resources and impact.			
Infrastructure, equipment, and resources			
Land-based infrastructure			
Office space and internet connectivity, central VHF radio station and mobile phone hotline and staff to respond to distress calls, mobile phone tower to extend the mobile network range to 30 km offshore, signs that communicate the location, three management zones, and fishing laws and rules in the SoNG MPA.	Establish after IMP-SoNG MPA endorsement, to be continued	BFD	DoF, BN, BCG
Sea-based infrastructure			
Vessel support for government-led enforcement and monitoring patrols and emergency response to be provided by Bangladesh Navy and/or Bangladesh Coast Guard. A list of necessary logistics, including the number of vessels and estimated costs for the smooth operation and implementation of the IMP-SoNG MPA, will be developed by BFD in consultation with concerned government agencies after the approval of the IMP-SoNG MPA.	November 2024, onward	BCG	BFD, DoF, BN
Equipment and resources			
Base map for mobile phones and GPS devices with updated depth contours, shipping routes, MPA boundaries, management zones, and international border demarcation; 15 rugged GPS-enabled smartphone devices; educational materials and compliance tools; and at least five computers or laptops for SMART data processing and reporting, and administering SoNG MPA management.	November 2024, onward	BFD	DoF, BN, BCG, NGOs
PROPOSED SONG MPA EXTENSION			
Proposed extension aligns with the EEZ boundary in the west, covers the entire nearshore habitat adjacent to the Sundarbans mangrove forest in the north, and ends in a perpendicular line to the eastern edge of the Sundarbans Reserved Forest at the Baleshwar/Haringhata River in the east. This enlarged area encompasses shallow productive coastal waters, high priority areas for marine wildlife, and has a strong potential to sustain vital fisheries in adjacent waters.	January 31, 2025 onward	MoEFCC /BFD	DoF, BFRI, NGOs

E. PROPOSED SONG MPA EXTENSION

As mentioned in the management approach section above, IUCN Category VI Protected Areas are generally large with most of the area in a natural condition. The existing SoNG MPA is relatively small, while the marine wildlife it aims to protect is wide ranging with many species commonly found outside of the MPA. Furthermore, the value of the existing MPA for sustaining productive fisheries is limited due to its relatively small size.

It is therefore recommended that a major extension of the MPA be established by end of 2025 from its current size of 1,738 km² to a much larger area covering 6,866 km². Using science-based, community-informed MSP, the proposed extension could be used as an effective strategy for sustaining productive marine fisheries and contributing to a thriving Blue Economy.

The proposed extension aligns with the EEZ boundary in the west, covers the entire nearshore habitat adjacent to the Sundarbans mangrove forest in the north, and ends in a perpendicular line to the eastern edge of the Sundarbans Reserved Forest at the Baleshwar/Haringhata River in the east. This enlarged area encompasses shallow productive coastal waters, high priority areas for marine wildlife, and has a strong potential to sustain vital fisheries in adjacent waters. Based on the spatial analyses and management considerations described in the subsection above on *Predictive mapping to inform marine spatial planning*, the Fish Spawning and Nursery, Marine Wildlife Protection, and Regulated Fishery Zones were extended from west to east in the SoNG MPA expansion (Figure 11).

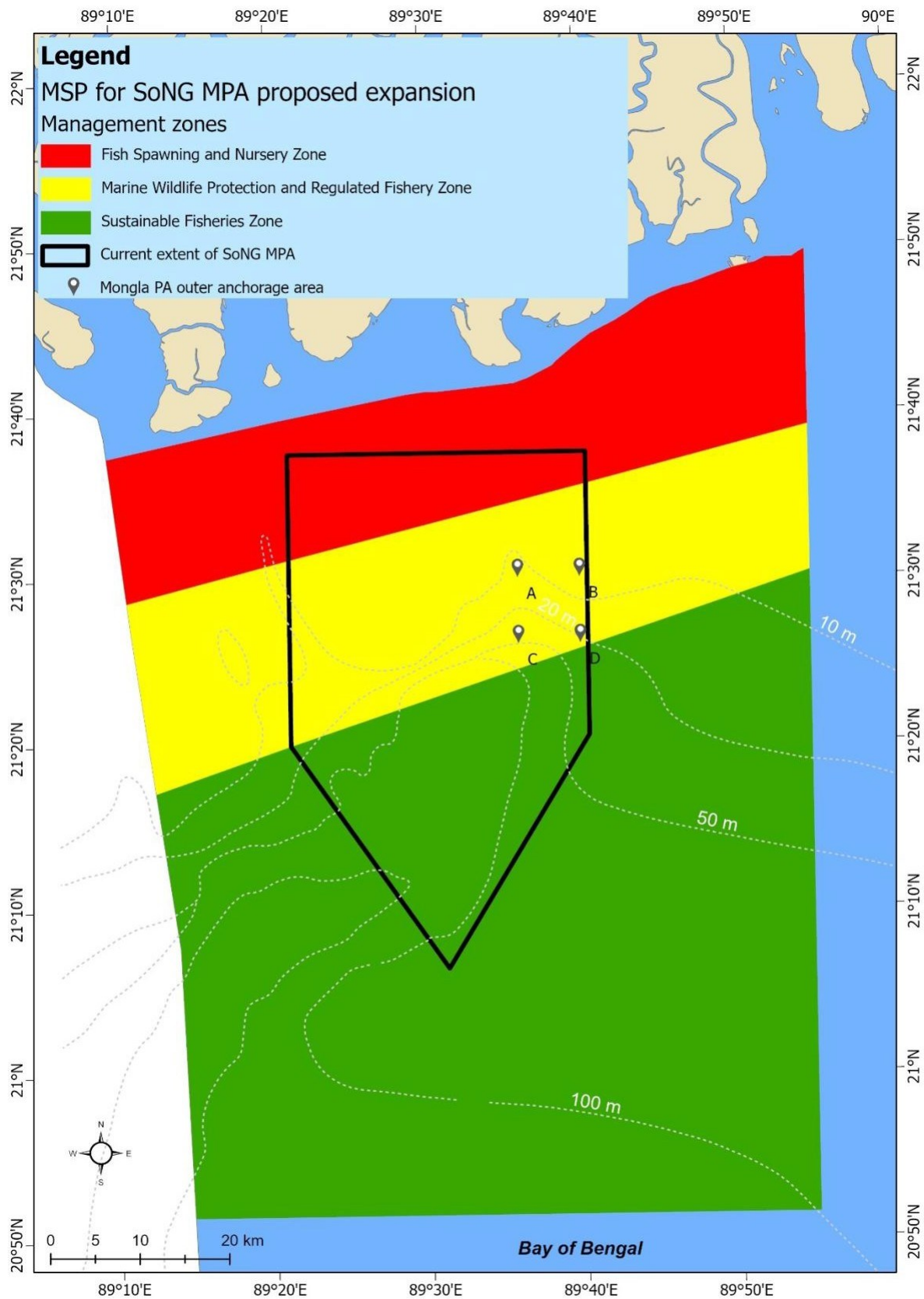


Figure 11. Marine spatial plan for the extended SoNG MPA indicating the *Fish Spawning and Nursery Zone* in red, *Marine Wildlife Protection and Regulated Fishery Zone* in yellow, and the *Sustainable Fishery Zone* in green.

REFERENCES

- Assis, J., Tyberghein, L., Bosh, S., Verbruggen, H., Serrão, E. A., De Clerck, O. (2017). Bio- ORACLE v2.0: Extending marine data layers for bioclimatic modelling. *Global Ecology and Biogeography*.
- Aziz, A. and Paul, A.R. (2015). Bangladesh Sundarbans: Present status of the environment and biota. *Diversity*, 7(3), pp. 242-269.
- Benson, S.R., Croll, D.A., Baldo, B., Marinovic, B., Francisco, P., Chavez, C., James, T. and Harvey, A. (2002). Changes in the cetacean assemblage of a coastal upwelling ecosystem during El Niño 1997-98 and La Niña 1999. *Prog. Oceanogr.* 54: 279-91.
- DoF (2016). Yearbook of Fisheries Statistics of Bangladesh 2014-15 (32). Fisheries Resources Survey System, Department of Fisheries, Government of Bangladesh.
- DoF (2020). Yearbook of Fisheries Statistics of Bangladesh, 2019-20 (37). Fisheries Resources Survey System, Department of Fisheries. Bangladesh: Ministry of Fisheries and Livestock.
- Fanning, L.P., Chowdhury, S.R., Uddin, M.S. and Al-Mamun, M.A. (2019). Marine fisheries survey reports and stock assessment 2019. Department of Fisheries, Government of Bangladesh.
- Fernandez-Arcaya, U., Ramirez-Llodra, E., Aguzzi, J., Allcock, A.L., Davies, J.S., Dissanayake, A., Harris, P., Howell, K., Huvenne, V.A., Macmillan-Lawler, M. and Martín, J., (2017). Ecological role of submarine canyons and need for canyon conservation: a review. *Frontiers in Marine Science*, 4, p. 5.
- Gordon, J., Gillespie, D., Potter, J., Frantzis, A., Simmonds, M.P., Swift, R. and Thompson, D. (2004). A review of the effects of seismic surveys on marine mammals. *Marine Technology Society Journal*, 37(4), pp. 16-34.
- Helm, R.C., Costa, D.P., DeBruyn, T.D., O'Shea, T.J., Wells, R.S. and Williams, T.M. (2015). Overview of effects of oil spills on marine mammals. In Fingas, M. (eds) *Handbook of Oil Spill Science and Technology*, pp. 455-475.
- Hoq, M.E. (2008). Sundarbans Mangrove: Fish & Fisheries - Ecology, Resources, Productivity and Management Perspectives. Dhaka, Bangladesh.
- Hossain, M.S., Chowdhury, S.R., Navera, U.K., Hossain, M.A.R., Imam, B. and Sharifuzzaman, S.M. (2014). Opportunities and strategies for ocean and river resources management. Background paper for preparation of the 7th Five Year Plan. FAO, Dhaka, Bangladesh.
- Huntington, T., Khan, G., Islam, S., Brakel, M.V. and Miller, A. (2007). Towards sustainable coastal and marine fisheries in Bangladesh: initiating a precautionary approach. WorldFish Center, Dhaka, Bangladesh.

- Harris, P.T. and Whiteway, T., (2011). Global distribution of large submarine canyons: Geomorphic differences between active and passive continental margins. *Marine Geology*, 285(1-4), pp. 69-86.
- Islam, M.M., Mohammed, E.Y. and Ali, L. (2016). Economic incentives for sustainable hilsa fishing in Bangladesh: An analysis of the legal and institutional framework. *Marine Policy*, (68), pp. 8-22.
- Iyer, V., Shamsunnahar, S. and Smith, B.D. (2019). Sustainable Conservation Finance for Three Wildlife Sanctuaries for Freshwater Dolphins and the Swatch-Of-No-Ground Marine Protected Area in Bangladesh. Wildlife Conservation Society, Bangladesh.
- Kader, A., Chowdhury, M.Z.R., Uddin, M.M., Hoque, M.E. and Basak, S.C. (2013). Bathymetric study of the Bay of Bengal based on open-source satellite and sounding data. *International Journal of Geomatics and Geosciences*, 4(1), p. 116.
- Khan, M.G. (2010). Bangladesh coastal and marine fisheries, and environment. In Hussain, M.G. and Hoq, M.E. (eds.), *Sustainable Management of Fisheries Resources of the Bay of Bengal: Compilation of national and regional workshop reports*. BOBLME Project, Bangladesh Fisheries Research Institute, pp. 1-35.
- Kottke, B., Schwenk, T., Breitzke, M., Wiedicke, M., Kudrass, H.R. and Spiess, V. (2003). Acoustic facies and depositional processes in the upper submarine canyon Swatch of No Ground (Bay of Bengal). *Deep Sea Research Part II: Topical Studies in Oceanography*, 50(5), pp. 979-1001.
- Kudrass, H.R., Michels, K.H., Wiedicke, M. and Suckow, A. (1998). Cyclones and tides as feeders of a submarine canyon off Bangladesh. *Geology*, 26(8), pp. 715-718.
- Kuehl, S.A., Levy, B.M., Moore, W.S., Mead, A. A. (1997). Subaqueous delta of the Ganges-Brahmaputra river system, *Marine Geology*, Volume 144, Issues 1–3, 1997, pp. 81-96.
- Kumar, S. and Stohlgren, T.J. (2009). Maxent modeling for predicting suitable habitat for threatened and endangered tree *Canacomyrica monticola* in New Caledonia. *Journal of Ecology and the Natural Environment*, 1(4), pp. 094-098.
- Mansur, R.M., Strindberg, S. and Smith, B.D. (2012). Mark-resight abundance and survival estimation of Indo-Pacific bottlenose dolphins, *Tursiops aduncus*, in the Swatch-of-No-Ground, Bangladesh. *Marine Mammal Science*, 28(3), pp. 561-578.
- Michels, K.H., Suckow, A., Breitzke, M., Kudrass, H.R. and Kottke, B. (2003). Sediment transport in the shelf canyon “Swatch of No Ground” (Bay of Bengal). *Deep Sea Research Part II: Topical Studies in Oceanography*, 50(5), pp. 1003-1022.
- Milliman, J.D. and Syvitski, J.P. (1992). Geomorphic/tectonic control of sediment discharge to the ocean: the importance of small mountainous rivers. *The Journal of Geology*, 100(5), pp. 525-544.

- MoFA (2014). Press Release: Press statement of the Hon'ble Foreign Minister on the verdict of the Arbitral Tribunal/PCA. Dhaka: Ministry of Foreign Affairs. Available at: <http://www.mofa.gov.bd/PressRelease/PRDetails.php?txtUserId=&PRid=854> (Accessed: 27January 2021)
- Nabi M.R.U. and Ullah M.H. (2012). Effects of Set Bagnet fisheries on the shallow coastal ecosystem of the Bay of Bengal. *Ocean and Coastal Management*, 67, pp. 75-86.
- Palanques, A., Guillén, J. and Puig, P. (2001). Impact of bottom trawling on water turbidity and muddy sediment of an unfished continental shelf. *Limnology and Oceanography*, 46(5), pp. 1100-1110.
- Pandav, B., Choudhury, B.C. and Shanker, K. (1998). The Olive Ridley sea turtle (*Lepidochelys olivacea*) in Orissa: an urgent call for an intensive and integrated conservation programme. *Current Science*, 75(12), pp. 1323-1328.
- Phillips, S.J., Anderson, R.P. and Schapire, R.E. (2006). Maximum entropy modeling of species geographic distributions. *Ecological Modelling*, 190(3-4), pp. 231-259.
- Seebens, H., Gastner, M.T., Blasius, B. and Courchamp, F. (2013). The risk of marine bioinvasion caused by global shipping. *Ecology Letters*, 16(6), pp. 782-790.
- Sengupta, R., Basu, P.C., Bandyopadhyay, R.R., Bandyopadhyay, A. and Rakshit, S. (1992). Sediments in the continental shelf in and arounds the Swatch of No Ground. *Visesa Prakasana-Bharatiya Bhuvaijñanika Sarveksana*, (29), pp. 201-207.
- Shiklomanov, I.A. (1993). World Freshwater Resources. In *Water in Crisis: A Guide to World's Freshwater Resources*, Oxford University Press, pp. 13-24.
- Smith, B.D., Ahmed, B., Mowgli, R., and Strindberg, S. (2008). Species occurrence and distributional ecology of nearshore cetaceans in the Bay of Bengal, Bangladesh, with abundance estimates for Irrawaddy dolphins *Orcaella brevirostris* and finless porpoises *Neophocaena phocaenoides*. *Journal of Cetacean Research and Management*, 10(1), pp. 45-58.
- Subrahmanyam, V., Krishna, K.S., Ramana, M.V. and Murthy, K.S.R. (2008). Marine geophysical investigations across the submarine canyon (Swatch-of-No-Ground), northern Bay of Bengal. *Current Science*, 94(4), pp. 507-513.
- Van Waerebeek, K., Baker, A.N., Félix F., Gedamke, J., Iñiguez, M., Sanino, G.P., Secchi, E.R., Sutaria, D., Helden, A.V. and Wang, Y. (2007). Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, an initial assessment. *Latin American Journal of Aquatic Mammals*, (6), pp. 43-69.
- Varghese, S.P., Varghese, S. and Somvanshi, V.S. (2010). Impact of tuna long line fishery on the sea turtles of Indian seas. *Current Science*, 98(10), pp. 1378-1384.

- Vetter, E.W., Smith, C.R. and De Leo, F.C., (2010). Hawaiian hotspots: enhanced megafaunal abundance and diversity in submarine canyons on the oceanic islands of Hawaii. *Marine Ecology*, 31(1), pp. 183-199.
- Vivekanandan, E., Rajagopalan, M. and Pillai, N.G.K. (2009). Recent trends in sea surface temperature and its impact on oil sardine. *Global Climate Change and Indian Agriculture*, Indian Council of Agricultural Research, New Delhi, India, pp. 89-92.
- WCS (2013). Final report to the Indo-Pacific Cetacean Research and Conservation Fund on the abundance, ranging patterns, habitat selection, and fisheries interactions of Indo-Pacific humpback *Sousa chinensis* and Indo-Pacific bottlenose *Tursiops aduncus* dolphins in coastal waters of the Bay of Bengal, Bangladesh. Wildlife Conservation Society, Bangladesh.
- WCS (2014). Proposal to establish a marine protected area in the Swatch-of-No-Ground submarine canyon and surrounding coastal waters in the Bay of Bengal. Wildlife Conservation Society's Bangladesh Cetacean Diversity Project, Khulna, Bangladesh.
- Whitehead, H., McGill, B. and Worm, B. (2008). Diversity of deep-water cetaceans in relation to temperature: implications for ocean warming. *Ecology Letters* 11: 1198-207.
- Wilcock, W.S.D., Stafford, K.M., Andrew, R.K. and Odom, R.I. (2014). Sounds in the Ocean at 1–100 Hz. *Annual Review of Marine Science*, 6, pp. 117-140.
- Gallacher, J., Simmonds, N., Fellowes, H., Brown, N., Gill, N., Clark, W., Biggs, C. and Rodwell, L.D., (2016). Evaluating the success of a marine protected area: a systematic review approach. *Journal of environmental management*, 183, pp.280-293.
- Hockings, M., (2006). *Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas*. IUCN.
- Pomeroy, R.S., Watson, L.M., Parks, J.E. and Cid, G.A., (2005). How is your MPA doing? A methodology for evaluating the management effectiveness of marine protected areas. *Ocean & Coastal Management*, 48(7-8), pp.485-5.

রেজিস্টার্ড নং ডি এ-১



অতিরিক্ত সংখ্যা
কর্তৃপক্ষ কর্তৃক প্রকাশিত

সোমবার, নভেম্বর ৩, ২০১৪

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

পরিবেশ ও বন মন্ত্রণালয়

বন শাখা-২

প্রজ্ঞাপন

তারিখ : ১২ কার্তিক ১৪২১/২৭ অক্টোবর ২০১৪

নং পবম/বঃ শাঃ-২/০২/বন্যপ্রাণী অভয়ারণ্য/১২/২০১০/১৫৫—বন্যপ্রাণী (সংরক্ষণ ও নিরাপত্তা) আইন, ২০১২ এর ধারা ১৩(১) এবং ১৩(২) এর ক্ষমতাবলে দক্ষিণ বঙ্গোপসাগরে অবস্থিত সোয়াচ অব নো-গ্রাউন্ড এর নিম্নতফসিল বর্ণিত ১৭৩৮ বর্গ কি. মি. অংশকে পাঁচ প্রজাতির বিপন্ন সামুদ্রিক ডলফিন (ইরাবতী ডলফিন, গোলাপি ডলফিন, বোতলনাক ডলফিন, চিত্রা ডলফিন, ঘুনি ডলফিন); পাখনাহীন পরপয়েস/শুগুক, কয়েক প্রজাতির তিমি (ব্রাইডস তিমি, ফিন তিমি, কুঁজো তিমি, কমন স্পার্ম তিমি, খাটো স্পার্ম তিমি, ঘাতক তিমি, চন্দ্রঘাতক তিমি ইত্যাদি); এবং হাঙ্গর (হাতুরী হাঙ্গর, বাঘা হাঙ্গর, বিলাই হাঙ্গর, মুইচিয়া হাঙ্গর, কানি হাঙ্গর, চোখা হাঙ্গর, কালা হাঙ্গর, নীল হাঙ্গর, থুটি হাঙ্গর, ফৌরি হাঙ্গর, করাতি হাঙ্গর) সংরক্ষণ ও বংশবৃদ্ধির লক্ষ্যে বাংলাদেশ গেজেটে প্রকাশের তারিখ হতে “সোয়াচ অব নো-গ্রাউন্ড মেরিন প্রোটেক্টেড এরিয়া” হিসেবে ঘোষণা করা হলো :

তফসিল

স্থানের নাম	প্রস্তাবিত সংরক্ষিত এলাকার নাম	সংরক্ষিত এলাকার পরিমাণ	সংরক্ষিত এলাকার গভীরতা	মন্তব্য
দক্ষিণ বঙ্গোপসাগর	“সোয়াচ অব নো-গ্রাউন্ড মেরিন প্রোটেক্টেড এরিয়া”	১৭৩৮ বর্গ কি. মি.	৯০০ + মি.	

(১৯৩৭১)

মূল্য : টাকা ৪.০০

চৌহদ্দি

উত্তর	ঃ	বঙ্গোপসাগর সুন্দরবন পর্যন্ত বিস্তৃত
দক্ষিণ পূর্ব	ঃ	বঙ্গোপসাগর
দক্ষিণ পশ্চিম	ঃ	বঙ্গোপসাগরের ভারতীয় জলসীমা
পূর্ব	ঃ	বঙ্গোপসাগর
পশ্চিম	ঃ	বঙ্গোপসাগরের ভারতীয় জলসীমা পর্যন্ত বিস্তৃত
অবস্থান	ঃ	জিপিএস অনুসারে “সোয়াচ অব নো-থ্রাউন্ড মেরিন প্রোটেক্টেড এরিয়া”র অক্ষাংশ ও দ্রাঘিমাংশ নিম্নরূপ ঃ

অবস্থান	অক্ষাংশ	দ্রাঘিমাংশ
উত্তর	২১°৩৭'৩৫"	৮৯°৩০'২২"
উত্তর পশ্চিম	২১°৩৭'৩৫"	৮৯°২১'১৩"
উত্তর পূর্ব	২১°৩৭'৩৫"	৮৯°৪০'৩০"
দক্ষিণ পশ্চিম	২১°১৯'৫৭"	৮৯°২১'১৩"
দক্ষিণ পূর্ব	২১°২০'২৮"	৮৯°৪০'৩০"
দক্ষিণ	২১°০৬'২৫"	৮৯°৩১'১৪"

রাষ্ট্রপতির আদেশক্রমে

মোঃ নজিবুর রহমান
সচিব।

মোঃ নজরুল ইসলাম (উপসচিব), উপপরিচালক, বাংলাদেশ সরকারি মুদ্রণালয়, তেজগাঁও, ঢাকা কর্তৃক মুদ্রিত।
আবদুর রশিদ (উপসচিব), উপপরিচালক, বাংলাদেশ ফরম ও প্রকাশনা অফিস,
তেজগাঁও, ঢাকা কর্তৃক প্রকাশিত। website : www.bgpress.gov.bd

Appendix 2. Images of marine wildlife occurring in the SoNG MPA.

Cetaceans



Irrawaddy dolphins
Orcaella brevirostris (EN)



Finless porpoise
Neophocaena phocaenoides (VU)



Indo-Pacific humpback dolphins
Sousa chinensis (VU)



Indo-Pacific bottlenose dolphins
Tursiops aduncus (NT)



Pantropical spotted dolphin
Stenella attenuata (LC)



Spinner dolphin
Stenella longirostris (LC)



Bryde's whale
Balaenoptera edeni (LC)



False killer whales
Pseudorca crassidens (NT)

Elasmobranchs



Scalloped hammerhead
Sphyrna lewini (CR)



Largetooth sawfish
Pristis pristis (CR)



Sharpnose guitarfish
Glaucostegus granulatus (CR)



Bengal guitarfish
Rhinobatos annandalei (CR)



Whale shark
Rhincodon typus (EN)



Whitespotted whipray
Maculabatis gerrardi (EN)

Marine turtles



Hawksbill turtle
Eretmochelys imbricate (CR)



Green turtle
Chelonia mydas (EN)



Olive ridley turtles
Lepidochelys olivacea (VU)

Appendix 3. List of confirmed and suspected shark species in the SoNG MPA with their Global IUCN Red List status. CR=Critically Endangered, EN=Endangered, VU=Vulnerable, NT=Near Threatened, LC=Least Concerned, DD=Data Deficient and NA= Not Assessed.

Common Name	Local Name/ Bengali name	Scientific Name	Global Red List Status
Confirmed			
Scalloped hammerhead	তাম্রমাথা হাতুড়ি হাঙ্গর/জুলিয়া মাগর/কাইন্যা/কাউন্যা	<i>Sphyrna lewini</i>	CR
Whale shark	তিমি হাঙ্গর	<i>Rhincodon typus</i>	EN
Spinner shark	ঘূর্ণি হাঙ্গর/কালো লতা বলি হাঙ্গর	<i>Carcharhinus brevipinna</i>	VU
Blacktip shark	ইলিশা বলি/কালো হাঙ্গর/লতা বলি হাঙ্গর	<i>Carcharhinus limbatus</i>	VU
Bull shark	ঘ-বলি হাঙ্গর	<i>Carcharhinus leucas</i>	VU
Pigeye shark	ভোঁতা বলি হাঙ্গর	<i>Carcharhinus amboinensis</i>	VU
Spottail shark	ফোঁটালেজী/কালো লতা বলি হাঙ্গর	<i>Carcharhinus sorrah</i>	NT
Spadenose shark	ছুরি/কোদালনাক/থুড়ি হাঙ্গর	<i>Scoliodon laticaudus</i>	NT
Tiger shark	বাঘা হাঙ্গর	<i>Galeocerdo cuvier</i>	NT
Bigeye hound shark	গুলে হাঙ্গর	<i>Iago omanensis</i>	LC
Sharpnose shark	বলি হাঙ্গর	<i>Rhizoprionodon sp</i>	NA
Suspected			
Oceanic whitetip shark	সাদাটুপি হাঙ্গর	<i>Carcharhinus longimanus</i>	CR
Pondicherry shark	পন্ডিচেরি হাঙ্গর	<i>Carcharhinus hemiodon</i>	CR
Great hammerhead	বড় হাতুড়ি হাঙ্গর/জুলিয়া মাগর/কাইন্যা/কাউন্যা	<i>Sphyrna mokarran</i>	CR
Winghead shark	পাখমাথা হাতুড়ি হাঙ্গর/জুলিয়া মাগর/কাইন্যা/কাউন্যা	<i>Eusphyra blochii</i>	EN
Longfin mako	বড়পাখ ম্যাকো হাঙ্গর	<i>Isurus paucus</i>	EN
Shortfin mako	ছোটপাখ ম্যাকো হাঙ্গর	<i>Isurus oxyrinchus</i>	EN
Broadfin shark	বড়পাখ চিনারি হাঙ্গর	<i>Lamiopsis temminckii</i>	EN
Whitecheek shark	সাদাগাল হাঙ্গর/কামোট	<i>Carcharhinus dussumieri</i>	EN
Pelagic thresher	পেলাজিক কাস্তে হাঙ্গর	<i>Alopias pelagicus</i>	EN
Bigeye thresher	বড়চোখা কাস্তে হাঙ্গর	<i>Alopias superciliosus</i>	VU
Common thresher	পাতি কাস্তে হাঙ্গর/সাদাপাখ কাস্তে হাঙ্গর	<i>Alopias vulpinus</i>	VU

Silky shark	পাতি কাস্তে হাঙ্গর/সাদাপাখ কাস্তে হাঙ্গর	<i>Carcharhinus falciformis</i>	VU
Blackspot shark	পাতি কাস্তে হাঙ্গর/সাদাপাখ কাস্তে হাঙ্গর	<i>Carcharhinus sealei</i>	VU
(Great) White shark	সাদা হাঙ্গর	<i>Carcharodon carcharias</i>	VU
Snaggletooth shark	শাঁখাদাঁতী/শিয়াল-বলি হাঙ্গর	<i>Hemipristis elongata</i>	VU
Smooth hammerhead	জোয়াল হাতুড়ি হাঙ্গর/মাঝারি জুলিয়া মাগর	<i>Sphyrna zygaena</i>	VU
Hooktooth shark	বড়শিদাঁতী হাঙ্গর	<i>Chaenogaleus macrostoma</i>	VU
Milk shark	দুধরাজ/চোখা/সাদা বলি হাঙ্গর/কামোট	<i>Rhizoprionodon acutus</i>	VU
Slender bambooshark	সরু টুট্যাং/গুইলা	<i>Chiloscyllium indicum</i>	VU
Brownbandedbamboo shark	বাদামিডোরা/কালাপাখ টুট্যাং/গুইলা/বিলাই হাঙ্গর	<i>Chiloscyllium punctatum</i>	NT
Blue shark	নীল হাঙ্গর	<i>Prionace glauca</i>	NT
Grey sharpnose shark	আটাইল্যা/সোনা বলি হাঙ্গর	<i>Rhizoprionodon oligolinx</i>	NT
Pygmy ribbontail catshark	ফিতালেজী বামন হাঙ্গর	<i>Eridacnis radcliffei</i>	LC
Crocodile shark	কুমির টুট্যাং/গুইলা	<i>Pseudocarcharias kamoharai</i>	LC
Pygmy shark	বামন হাঙ্গর	<i>Euprotomicrus bispinatus</i>	LC
Megamouth shark	মেগামাউথ হাঙ্গর	<i>Megachasma pelagios</i>	LC
Ornate dogfish	কমলা হাঙ্গর	<i>Centroscyllium ornatum</i>	LC

Appendix 4. List of confirmed and suspected ray species in the SoNG MPA with their Global IUCN Red List status. CR=Critically Endangered, EN=Endangered, VU=Vulnerable, NT=Near Threatened, LC=Least Concerned, DD=Data Deficient and NA=Not assessed.

Common Name	Local Name	Scientific Name	IUCN status
Confirmed			
Sharpnose guitarfish	সরুনাক পিতাম্বর/নাঙলা	<i>Glaucostegus granulatus</i>	CR
Largetooth sawfish	বড়দাঁত করাত মাছ/খান্দা	<i>Pristis pristis</i>	CR
	মাগর/খটক/করাতি		
Bengal guitarfish	হাঙ্গর/আইশা	<i>Rhinobatos annandalei</i>	CR
	বাংলা পিতাম্বর/নাঙলা		
Giant freshwater whipray	মিঠাপানির	<i>Urogymnus polylepis</i>	EN
	শাপলাপাতা/পাইন্যা/বাইল্যা		
Whitespotted whipray	ফুল শাপলাপাতা/জাতি	<i>Maculabatis gerrardi</i>	EN
	শাপলাপাতা		
Longtail butterfly ray	চাবুকলেজী প্রজাপতি/বাদুড়/	<i>Gymnura poecilura</i>	VU
	পদুনি/পদ্মামনি		
Bengal whipray	বাংলা ফাইস্যা/পাইসি	<i>Brevitrygon imbricata</i>	VU
Suspected			
Giant guitarfish	বড় কোদালনাক পিতাম্বর/নাঙলা	<i>Glaucostegus typus</i>	CR
Widenose guitarfish	চ্যাপ্টানাক পিতাম্বর/নাঙলা	<i>Glaucostegus obtusus</i>	CR
Clubnose guitarfish	গদানাক পিতাম্বর/নাঙলা	<i>Glaucostegus thouin</i>	CR
Bowmouth guitarfish	ধনুকমুখী পিতাম্বর/ব্যাঙ	<i>Rhina ancylostoma</i>	CR
	হাঙর		
Smoothback guitarfish	তেলাপিঠ পিতাম্বর/নাঙলা	<i>Rhinobatos lionotus</i>	CR
Smoothnose wedgefish	মসৃণনাক নাঙলা/পিতাম্বর	<i>Rhynchobatus laevis</i>	CR
Bottlenose wedgefish	বোতলনাক নাঙলা/পিতাম্বর	<i>Rhynchobatus australiae</i>	CR
Tentacle butterfly ray	টেন্টাকল প্রজাপতি/বাদুড়/	<i>Gymnura tentaculata</i>	CR
	পদুনি/পদ্মামনি		
Green sawfish	সবুজ করাত মাছ/খান্দা	<i>Pristis zijsron</i>	CR
	মাগর/খটক//করাতি		
	হাঙ্গর/আইশা		
Pointed/Narrow sawfish	ছুরি করাত মাছ/খান্দা	<i>Anoxypristis cuspidata</i>	EN
	মাগর/খটক/করাতি		

হাঙ্গর/আইশা

Spinetail/Giant devil ray	বড় শিংচোয়াইন/লেজকাঁটা বাদুর/দেউমাছ বাদুর/ভদউমাছ	<i>Mobula mobular</i>	EN
Longhorned pygmy devil ray	লম্বাকাইন্যা বামন শিংচোয়াইন/দেউমাছ	<i>Mobula eregoodoo</i>	EN
Shortfin pygmy devil ray	কুহলির শিংচোয়াইন/দেউমাছ	<i>Mobula kuhlii</i>	EN
Sicklefin devil ray	চিলি শিংচোয়াইন/দেউমাছ	<i>Mobula tarapacana</i>	EN
Bentfin devil ray	বাঁকাপাখ শিংচোয়াইন/দেউমাছ	<i>Mobula thurstoni</i>	EN
Giant manta ray	দেউ শিংচোয়াইন/দেউমাছ/লুইমনি	<i>Mobula birostris</i>	EN
Longhead eagle ray	বড়মাথা ঠোঁট্যা/টুইটা ঘাপরি	<i>Aetobatus flagellum</i>	EN
Whitespotted eagle ray	সাদাফোঁটা ঠোঁট্যা/ফুল টুইটা ঘাপরি/শঙ্খচিল	<i>Aetobatus narinari</i>	EN
Mottled eagle ray	নকশি ঠোঁট্যা/ফুল টুইটা ঘাপরি	<i>Aetomylaeus maculatus</i>	EN
Ocellate eagle ray	ফুল ঠোঁট্যা/টুইটা ঘাপরি	<i>Aetomylaeus milvus</i>	EN
Roughnose cowtail ray	থ্যাবড়ানাক থাইন/হাঙরাইল	<i>Pastinachus solocirostris</i>	EN
Javan cownose ray	জাভান ভোঁতা ঘাপরি	<i>Rhinoptera javanica</i>	EN
Honeycomb whipray	বাঘা/হরিণা শাপলাপাতা	<i>Himantura undulata</i>	EN
Coach (Reticulated) whipray	জালি/বাঘা/চিতা শাপলাপাতা	<i>Himantura uarnak</i>	EN
Round whipray	গোল শাপলাপাতা/ফাইস্যা/পাইসি	<i>Maculabatis pastinacoides</i>	EN
Tubemouth whipray	চোঙামুখ শাপলাপাতা	<i>Urogymnus lobistomus</i>	EN
Whitenose whipray	সাদানাক শাপলাপাতা/হাউশ	<i>Pateobatis uarnacoides</i>	EN
Bleeker's whipray	রাম্মি/চুনি শাপলাপাতা	<i>Pateobatis bleekeri</i>	EN
Zonetail butterfly ray	জোনটেইল প্রজাপতি/বাদুড়/পদুনি/পদ্মমা মনি	<i>Gymnura zonura</i>	EN
Tonkin numbfish	টঙ্কিন কারেন্ট মাছ	<i>Narcine prodorsalis</i>	EN
Spotted eagle ray	চিত্রা ঠোঁট্যা/ফুল টুইটা ঘাপরি	<i>Aetobatus ocellatus</i>	VU
Banded eagle ray	ডোরাকাটা ঠোঁট্যা/টুইটা ঘাপরি/শঙ্খচিল	<i>Aetomylaeus nichofii</i>	VU
Mangrove whipray	বাদা শাপলাপাতা	<i>Urogymnus granulatus</i>	VU
Leopard whipray	বাঘা/চিতা শাপলাপাতা	<i>Himantura leoparda</i>	VU

Jenkin's whipray	জাকিনের ঘণ্টি/ঘুড়ি শাপলাপাতা	<i>Pateobatis jenkinsii</i>	VU
Sharpnose stingray	সরুনাক শাপলাপাতা	<i>Telatrygon zugei</i>	VU
Shortlip numbfish	ভোঁতামুখ কারেন্ট মাছ	<i>Narcine brevlabiata</i>	VU
Smallspot numbfish	ফুটকি/ছোটফোঁটা কারেন্ট মাছ	<i>Narcine maculate</i>	VU
Chinese numbfish	চীনা কারেন্ট মাছ	<i>Narcine lingula</i>	VU
Brown numbfish	বাদামি কারেন্ট মাছ	<i>Narcine timlei</i>	VU
Spot-tail sleeper ray	চিত্রালেজী কারেন্ট মাছ	<i>Narke dipterygia</i>	VU
Jenkin's whipray	জাকিনের ঘণ্টি/ঘুড়ি শাপলাপাতা	<i>Pateobatis jenkinsii</i>	VU
Sharpnose stingray	সরুনাক শাপলাপাতা	<i>Telatrygon zugei</i>	VU
Shortlip numbfish	ভোঁতামুখ কারেন্ট মাছ	<i>Narcine brevlabiata</i>	VU
Smallspot numbfish	ফুটকি/ছোটফোঁটা কারেন্ট মাছ	<i>Narcine maculate</i>	VU
Chinese numbfish	চীনা কারেন্ট মাছ	<i>Narcine lingula</i>	VU
Brown numbfish	বাদামি কারেন্ট মাছ	<i>Narcine timlei</i>	VU
Spot-tail sleeper ray	চিত্রালেজী কারেন্ট মাছ	<i>Narke dipterygia</i>	VU
Cowtail ray	পাতি থাইন/হাঙরাইল	<i>Pastinachus sephen</i>	NT
Ganges stingray	গাঙ্গেয় শাপলাপাতা	<i>Himantura fluviatilis</i>	NT
Scaly whipray	চিত্রা ফাইস্যা/পাইসি	<i>Brevitrygon walga</i>	NT
Pelagic stingray	বেগুনী/কালো শাপলাপাতা	<i>Pteroplatytrygon violacea</i>	LC
Bluespotted maskray	নীলফোঁটা/ফুল শাপলাপাতা/ নপরা	<i>Neotrygon caeruleopunctata</i>	LC
Smalleye stingray	ক্ষুদেচোখা শাপলাপাতা	<i>Megatrygon microps</i>	DD
Fine-spotted leopard whipray	বাঘা শাপলাপাতা	<i>Himantura tutul</i>	NA

Appendix 5. Biophysical, socioeconomic and governance indicators with metrics and methods to evaluate the effectiveness of SoNG MPA management actions. CS – citizen scientists; OO – onboard observer; RIO – Research institute/organization; CR – Critically Endangered; EN – Endangered; and VU – Vulnerable.

MPA Objective	Indicator of Success	Threat Metrics	Method	Intervals	Evaluators
Biophysical Indicators					
Protect globally threatened marine wildlife	Risk to threatened marine wildlife reduced against 2019 baseline Marine wildlife populations stabilized or increasing against 2019 baseline	• Mortalities of CR/EN/VU dolphins, porpoises, whales, sharks, rays, and marine turtles in MPA reduced. • Number of non-selective and illegal fishing gears in MPA reduced • Cetacean abundance/population estimates in MPA stable/increased • Number of live releases of CR/EN/VU dolphins, porpoises, whales, sharks, rays, and marine turtles in MPA increased	• Wildlife and fishing vessel encounters reported from SMART patrols • Visual marine wildlife and fisheries surveys in and around MPA • Reports from citizen science fisheries monitoring networks among fishers	• Annual SMART/CS reports • Biannual marine wildlife survey	FD, DoF, Bangladesh Navy/CG, CS, RIO
Protect marine habitat	Marine spatial plans regulating access and human activities in MPA and buffer areas adopted and enforced Reduced or no human impacts on priority habitats for threatened marine wildlife	• Twice monthly SMART patrols in MPA and buffer zone • Number of non-compliant fishing vessels entering or operating in MPA reduced • Number of non-compliant shipping vessels transiting or anchoring in MPA reduced • Catches of gravid/immature sharks and rays in MPA reduced	• SMART patrolling coverage in SMART reports • Infraction detections from SMART patrols • Reports from CS network • Visual marine wildlife and fisheries surveys in and around MPA • OO reports from commercial fishing vessels	• Annual SMART/CS/OO reports • Biannual marine wildlife survey • Annual at-sea fisheries investigation	FD, DoF, Bangladesh Navy/CG, CS, RIO

Sustain productive fisheries	Abundance of key marine fish species stabilized/increased	• Catch per unit effort of legal fisheries increased against 2021 baseline • Size distribution of economically important species (e.g., hilsa) remains stable	• Reports from CS networks • Fishery surveys in and around MPA	• Annual at-sea fisheries investigation	DoF/ BFR, CS, RIO
Socio-Economic Indicators					
Sustain fishing livelihoods	Risks to fishing livelihoods reduced through improved at-sea safety Food security of coastal communities enhanced Access to livelihood support and social services for small-scale fishers enhanced Compliance among resource users strengthened	• Number of lives lost at at-sea reduced • Number of small-scale fishing vessels equipped with and trained in the use of basic navigation and lifesaving tools increased • Levels of nutritional deficiency in communities dependent on fisheries in MPA reduced • Social service providers and government/non-government support accessed by fishery stakeholders (e.g., insurance, loan schemes, health care, formal education, skill development) increased • Levels of local understanding of and compliance with MPA/fisheries/wildlife rules and regulations (e.g., seasonal bans or landing/trade/consumption of legally protected sharks and rays) increased	• Media reports of lives lost and saved. • Standardized interviews in fishing communities • Post-training evaluation on the effectiveness of at-sea safety trainings for small-scale fishers • Socio-economic survey among fishery stakeholders • Changes measured by social service providers (e.g., completion of formal education, increased employment opportunities) • Positive changes in knowledge, attitudes, and practices (KAP) from standardized interviews	• Annual SMART/ CS reports • Biannual socio-economic and KAP survey among fishery stakeholders in MPA dependent communities	DoF, Bangladesh Navy/ CG, BFD, RIO

Provide economic benefits for fishing communities with fishers that operate in the MPA	Local stakeholders view MPA as economically beneficial Community and infrastructure support for local fishery businesses Dependency on marine fishery resources reduced through diversified livelihoods	• Availability increased and conditions improved of post-harvest processing facilities • Increase in non-fishing employment and income for stakeholders economically dependent on MPA	• Standardized interviews on socio-economic conditions • Direct observations of conditions in communities with fishers that operate in the MPA	• Community meeting reports • Biannual socio-economic survey among fishery stakeholders	BFDC, DoF, BFD, RIO
Governance Indicators					
Support a sustainable blue economy	Marine spatial planning in place Adaptive management and effective decision-making maintained Effective stakeholder participation and representation ensured Legal enforcement and monitoring of MPA regulations established	• Adoption of a management plan and structure for MPA • MPA regulations informed by research findings • Level of stakeholder participation and satisfaction in MPA management increased • Quality of human health, household income distribution improved in coastal communities that depend on the MPA • Administrative and financial resources for MPA management sustained and sufficient for infrastructure and	• Interviews with MPA managers • Consultative meetings between managers and stakeholders. • Socio-economic survey among fishery stakeholders that includes assessing (a) training provided; (b) participation and satisfaction with management process and activities; and (c) stakeholder involvement in MPA monitoring and enforcement	• Annual financial reporting • Community consultation reports • Biannual socio-economic and KAP surveys	MPA mgmt comm, MoEFCC RIO

	Benefits of MPA equitably distributed Resource use conflicts managed and reduced Financial and infrastructure resources and personnel available to enable long-term MPA management	equipment requirements • At least 20 trained citizen scientists providing data on fishing practices and catches • Recommendations from scientific or socio-economic research shared and incorporated into MPA management • Clearly defined and applied enforcement procedures • Educational outreach to encourage stakeholder compliance.	• Number of active trained citizen scientists and participation in community-led SMART patrols		
--	---	---	--	--	--

REFERENCES

Gallacher, J., Simmonds, N., Fellowes, H., Brown, N., Gill, N., Clark, W., Biggs, C. and Rodwell, L.D., (2016). Evaluating the success of a marine protected area: a systematic review approach. *Journal of environmental management*, 183, pp.280-293.

Hockings, M., (2006). *Evaluating Effectiveness: A framework for assessing management effectiveness of protected areas*. IUCN.

Pomeroy, R.S., Watson, L.M., Parks, J.E. and Cid, G.A., (2005). How is your MPA doing? A methodology for evaluating the management effectiveness of marine protected areas. *Ocean & Coastal Management*, 48(7-8), pp.485-5.

Appendix 6. Consultations to inform the Integrated Management Plan for the Swatch of No-Ground Marine Protected Area 2024-2033 (IMP-SoNG MPA) with information on actions, participants, remarks and decisions.

<i>Date</i>	<i>Participants</i>	<i>Decisions</i>
Oct 2017	CF Khulna (BFD), WCS	In a discussion on the need to conserve biodiversity in the SoNG MPA, WCS offered to assist in preparing an IMP-SoNG MPA.
Dec 2017	CCF (BFD), WCS	WCS is officially requested to develop the IMP-SoNG MPA
Mar 2019	Honorable Minister, Secretary (MoEFCC), CCF (BFD), WCS	Informal request to WCS for the development of the SoNG MPA management plan by the Honorable Minister during a visit to the WCS exhibition on World Wildlife Day at Ban Bhaban
Mar 2019	Parerhat, 16 community members	Five community consultations on conservation management in the SoNG MPA facilitated by WCS in locations from where fishers access the SoNG area.
	Pathorghata, 25 community members	
	Bagerhat Sadar, 32 community members	
	Alipur, 31 community members	
	Mohipur/Kuakata, 31 community members	
28 Feb 2021	WCS	Background document to inform IMP-SoNG MPA submitted to BFD by WCS
3 Jan 2022	WCS	First draft of IMP-SoNG MPA prepared by WCS submitted to BFD
28 Mar 2022	CCF (Chair) and senior officers (BFD), WCS	Draft IMP-SoNG MPA presented to senior BFD officers, responded to comments.
19 Nov 2022	WCS	IMP-SoNG MPA revised based on comments from BFD and resubmitted to BFD.
June - Sep 2022	Senior officers (BFD), WCS	Consultative meetings for planning consultations with other government agencies
Oct - Jan 2022	Consultation with international experts	Incorporation of expert comments
19 Nov 2022	Submission of revised IMP-SoNG MPA to BFD	Revised draft of IMP SoNG MPA to BFD Focal Point DCCF Jahidul Kabir
Jan - Feb 2023	Discussions with community members visiting WCS exhibition in Alipur, Kuakata, Patuakhali, Khulna, Bagerhat, Pathorghata, Borguna, Saint Martin, Teknaf, Cox's Bazar, Chattogram, Char Fashion, Char Kukri Mukri, Char Montaz, Nijhum Dwip, Monpura, Hatia	Proposed zone-wise regulations discussed with coastal fishing community members and local government officers visiting exhibitions conducted by WCS at 14 coastal fish landing sites for strengthening marine stewardship.
24 Jan 2023	BFD Focal Point DCCF Jahidul Kabir, WCS	Meeting to discuss suggestions for revisions on the IMP-SoNG MPA and preparation of short clip to introduce SoNG MPA seascape & wildlife.
31 Jan 2023	WCS	Proposed script for short film submitted for comments to BFD by WCS

<i>Date</i>	<i>Participants</i>	<i>Decisions</i>
24 Feb 2023	BFD, WCS	Revised IMP-SoNG MPA with proposed timeline for next steps and meeting request sent to CCF/BFD by WCS
7 Mar 2023	CCF (Chair), 19 BFD officers, WCS	Second consultative meeting (hybrid) with senior BFD officers. Decisions (signed by CCF on 3/4/23): - BFD officers to submit comments to Focal point DCCF Jahidul Kabir - CCF to share draft with MoEFCC for review - Address comments from MoEFCC and send revised draft to other agencies for review - Incorporate all comments and finalize the IMP-SoNG MPA for interministerial meeting to be called by MoEFCC
21 Mar 2023	WCS, BFD Email and letter sent by Elisabeth of WCS to Mr. Jahidul Kabir, FD	WCS proposed consultative meetings with Bangladesh Coast Guard, Bangladesh Navy, and the Authorities from both Mongla and Payra ports, and DoF, separately, in April.
30 May 2023	MoEFCC, BFD, DoE, WCS	Inhouse meeting on IMP-SoNG MPA chaired by Additional Secretary MoEFCC Iqbal Abdullah Harun. It was decided that the document was to be thoroughly reviewed by the relevant MoEFCC and DoE officers with comments provided within 8 June. Findings to be presented in a meeting with MoEFCC Secretary.
6 Jul 2023	Additional Secretaries, Joint Secretary and Deputy Secretary, MoEFCC, BFD	Second internal MoEFCC meeting with decisions communicated to WCS verbally: - Add chapter on 'Methodology of preparing the IMP-SoNG MPA' with specifics on parties consulted and processes used for formulating the content. - A committee to be formed by MoEFCC for planning and leading inter-governmental consultations and finalization of IMP-SoNG MPA. - Additional Secretary (Development) Dr. Fahmida Khanom appointed as lead.
10 Jul 2023	WCS	List of relevant government entities to consult prepared and submitted
3 Aug 2023	MoEFCC (Additional Secretary), WCS	Planning meeting on strategic approach for securing broad support for approval and implementation of IMP-SoNG MPA across government sectors. Decision to conduct joint briefing for all relevant agencies with designated committee members before the official interministerial consultation.
20 Aug 2023	Interministerial Committee Members	A detailed presentation on the IMP-SoNG MPA held with Dr Fahmida as Chair in the 1 st meeting of the committee, addressing all member's concerns and inviting their written feedback on the proposed management plan.

20 Dec 2023	Interministerial Committee Members	Comments received from agencies incorporated into the IMP-SoNG MPA and presented at the 2 nd meeting of the committee and further comments from participants were solicited for inclusion.
07 Jul 2024	Interministerial Committee Members	Necessary changes made in the IMP-SoNG MPA incorporating the comments from members and participants, the changes discussed in the 3 rd interministerial meeting chaired by Secretary, Dr. Farhina Ahmed, and with some suggested changes, the IMP-SoNG MPA was recommended for approval after incorporating the suggested changes as per the decisions made.

Appendix 7. Minutes of the meeting regarding the finalization of Integrated Management Plan for the Swatch of No-Ground Marine Protected Area (IMP-SoNG MPA) held on 07 July 2024

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয়
বন শাখা-২
www.moef.gov.bd

“Integrated Management Plan for the Swatch-of-no-ground Marine Protected area (SoNG) (2023-2032)” শীর্ষক ব্যবস্থাপনা পরিকল্পনা চূড়ান্তকরণ সংক্রান্ত সভার কার্যবিবরণী:

সভাপতি : ড. ফারহিনা আহমেদ
: সচিব, পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয়।
স্থান : পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয়ের সম্মেলন কক্ষ
তারিখ : ০৭.০৭.২০২৪ খ্রিঃ
সময় : দুপুর ২:৩০ ঘটিকা
হাজিরা : পরিশিষ্ট “ক” তে প্রদর্শিত

সভাপতি উপস্থিত সকলকে স্বাগত জানিয়ে সভার কার্যক্রম শুরু করেন। তিনি বলেন যে, জীববৈচিত্র্য সম্পর্কিত আন্তর্জাতিক ও দেশীয় বিভিন্ন চুক্তি ও পলিসি ফ্রেমওয়ার্ক অনুসরণে বিশাল সমুদ্রের অত্যন্ত সমৃদ্ধ প্রাকৃতিক সম্পদ ও জীববৈচিত্র্যের সুষ্ঠু সংরক্ষণ ও ব্যবস্থাপনার লক্ষ্যে সংশ্লিষ্ট সকল সংস্থাকে অন্তর্ভুক্ত করে Integrated Management Plan for the Swatch-of-No Ground Marine Protected Area (2023-2032) শীর্ষক ব্যবস্থাপনা পরিকল্পনা এর চূড়ান্ত খসড়া প্রস্তুত করা হয়েছে। অতঃপর সভাপতি ব্যবস্থাপনা পরিকল্পনার খসড়া উপস্থাপনের অনুরোধ করেন। সভাপতির অনুমতিক্রমে এ মন্ত্রণালয়ের উপসচিব (বন-২) খসড়া ব্যবস্থাপনা পরিকল্পনা প্রণয়নের পটভূমি, যৌক্তিকতা ও কার্যপদ্ধতি উপস্থাপন করেন। তিনি সভাকে অবহিত করেন যে, বন্যপ্রাণী (সংরক্ষণ ও নিরাপত্তা) আইন, ২০১২ এর ধারা ১৩(১) এবং ১৩(২) এর ক্ষমতাবলে দক্ষিণ বঙ্গোপসাগরে অবস্থিত সোয়াচ অব নো-গ্রাউন্ড ১৭৩৮ বর্গ কি:মি: গভীরতা ৯০০মি. অংশকে পাঁচ প্রজাতির বিপন্ন সামুদ্রিক ডলফিন (ইরাবতী ডলফিন, গোলাপি ডলফিন, বোতলনাক ডলফিন, চিত্রা ডলফিন, ঘুনি ডলফিন); পাখনাহীন পরপুষ্প/শুশুক, কয়েক প্রজাতির তিমি, (রাইডস তিমি, ফিন তিমি, কুঁজো তিমি, কমন স্পার্ম তিমি, খাটো স্পার্ম তিমি, ঘাতক তিমি, চন্দ্রঘাতক তিমি ইত্যাদি); এবং হাঙ্গার (হাতুরী হাঙ্গার, বাঘা হাঙ্গার, করাতি হাঙ্গার) সংরক্ষণ ও বংশবৃদ্ধির লক্ষ্যে ২০১৪ সালে “সোয়াচ অব নো-গ্রাউন্ড মেরিন প্রোটেক্টেড এরিয়া” হিসেবে ঘোষণা করা হয়।

সভায় জানানো হয় যে, বন্যপ্রাণী (সংরক্ষণ ও নিরাপত্তা) আইন ২০১২ এর ধারা ১৬ দ্বারা প্রদত্ত ক্ষমতাবলে বন অধিদপ্তর কর্তৃক আলোচ্য ম্যানেজমেন্ট প্ল্যান প্রণয়ন করা হয়েছে। আলোচ্য ম্যানেজমেন্ট প্ল্যান প্রণয়নের পদ্ধতিগত বিষয় সম্পর্কে উপসচিব বলেন যে, মন্ত্রণালয় ও বন অধিদপ্তরের নির্দেশনার প্রেক্ষিতে ওয়াইল্ড লাইফ কনজারভেশন সোসাইটি (WCS) কর্তৃক ২০১৮-২০২২ সময়ব্যাপী জীববৈচিত্র্য ও প্রাকৃতিক সম্পদ সুষ্ঠু সংরক্ষণের বিষয়টিকে প্রাধান্য দিয়ে ব্যাপক গবেষণা, মৎস্য সম্পদ পর্যবেক্ষণ, তথ্য উপাত্ত সংগ্রহ, সোয়াচ অব নো-গ্রাউন্ড পার্শ্ববর্তী এলাকাস্থ সাগরে জরিপ পরিচালনার মাধ্যমে প্রাপ্ত ফলাফলসমূহ সংকলন ও বিশ্লেষণ করে এবং এমপিএ ব্যবস্থাপনার প্রয়োজনীয়তা বিষয়ে স্থানীয় পর্যায়ে বাগেরহাট, বরগুনা, পিরোজপুর, পটুয়াখালী জেলার পারেরহাট, পাথরঘাটা, বাগেরহাট, আলিপুর, মহিপুর এলাকার মৎস্যজীবীদের সাথে পরামর্শ সভা করে। সভায় টেকসই মৎস্য আহরণ, জেলেদের অর্থনৈতিক উন্নয়ন, সামুদ্রিক পরিবেশ সুরক্ষার মাধ্যমে বাড়তি মৎস্য উৎপাদন এবং সামুদ্রিক বন্যপ্রাণী সংরক্ষণের উপায় নিয়ে আলোচনা হয়। সরকারের সাংবিধানিক ও আন্তর্জাতিক প্রতিশ্রুতির সাথে সামঞ্জস্য রেখে সমুদ্র, উৎপাদনশীল মৎস্য ও অন্যান্য সামুদ্রিক সম্পদের টেকসই ও পরিবেশবান্ধব ব্যবহার বজায় রেখে বিশ্বের সংকটাপন্ন সামুদ্রিক বন্যপ্রাণী সংরক্ষণ করার লক্ষ্যে উপরিউক্ত প্রক্রিয়ায় প্রাপ্ত তথ্য-উপাত্ত, মতামত, সুপারিশের ভিত্তিতে সোয়াচ অব নো-গ্রাউন্ড এমপিএ-এর একটি খসড়া সমন্বিত ব্যবস্থাপনা পরিকল্পনা (Integrated Management Plan for the Swatch of No-Ground Marine Protected Area; সংক্ষেপে IMP-SoNG-MPA)- প্রণয়ন করা হয়।

পরবর্তীতে প্রণয়নকৃত পরিকল্পনাটি অনুমোদনের জন্য মন্ত্রণালয়ে দাখিল করা হয়। প্রস্তাবিত পরিকল্পনাটি পর্যালোচনার লক্ষ্যে মন্ত্রণালয় পর্যায়ে অতিরিক্ত সচিব (প্রশাসন) ও সচিব মহোদয়ের সভাপতিত্বে ২টি ইন-হাউজ সভা অনুষ্ঠিত হয়। অধিকন্তু এ মন্ত্রণালয়ের অতিরিক্ত সচিব ড. ফাহিমদা খানম, এর সভাপতিত্বে সংশ্লিষ্ট সকল মন্ত্রণালয়/বিভাগ/সংস্থা সমন্বয়ে একটি আন্তঃমন্ত্রণালয় কমিটি গঠন করা হয়।

আলোচ্য পরিকল্পনার ওপর সংশ্লিষ্ট সেক্টর যেমন: মৎস্য, নৌপরিবহন, বাংলাদেশ নেভি, কোস্ট গার্ড, পরিবেশ, পর্যটন, জ্বালানী ও খনিজ সম্পদ, ম্যারিটাইম এ্যাফেয়ার্স ইউনিট, মোংলা বন্দর এবং পায়রা বন্দর কর্তৃপক্ষ থেকে মতামত সংগ্রহ করা হয়। অতঃপর গঠিত আন্তঃমন্ত্রণালয় কমিটি কর্তৃক পরিকল্পনাটি বিস্তারিত পর্যালোচনা করা হয় এবং বিভিন্ন সংস্থা থেকে প্রাপ্ত মতামত পর্যালোচনাপূর্বক ব্যবস্থাপনা পরিকল্পনার খসড়া চূড়ান্ত করা হয়। সর্বশেষ চূড়ান্ত খসড়া অনুমোদনের সুপারিশ প্রদানের জন্য আলোচ্য আন্তঃমন্ত্রণালয় সভা আহ্বান করা হয়েছে।

সভায় ব্যবস্থাপনা পরিকল্পনাটির ওপর একটি উপস্থাপনা প্রদান করা হয়। জানানো হয় যে, প্রস্তাবিত সোয়াচ অব নো-গ্রাউন্ড এমপিএ ব্যবস্থাপনার উদ্দেশ্য হলো (১) সামুদ্রিক স্থানিক পরিকল্পনা, উপকূলীয় সম্প্রদায়ের অন্তর্ভুক্তি এবং বিভিন্ন সংস্থার আইন প্রয়োগ ও পর্যবেক্ষণের মাধ্যমে ডলফিন, পরপয়েস, তিমি, হাঙ্গার, শাপলাপাতা মাছ এবং সামুদ্রিক কাছিমসহ বৈশ্বিকভাবে হুমকির সম্মুখীন সামুদ্রিক বন্যপ্রাণী এবং এদের আবাসস্থল সংরক্ষণ; (২) উৎপাদনশীল সামুদ্রিক মৎস্যসম্পদ ও উপকূলীয় মৎস্য ব্যবস্থাপনার মাধ্যমে স্থানীয় জনগোষ্ঠীর অর্থনৈতিক সুবিধা টেকসইকরণ; (৩) জাতীয় স্বার্থে একটি টেকসই ব্লু ইকোনোমি গঠনে সহায়তা প্রদান। অতঃপর সভায় ব্যবস্থাপনা পরিকল্পনায় উল্লিখিত জীববৈচিত্র্য ব্যবস্থাপনা পদ্ধতি, বিভিন্ন সেক্টরের দায়িত্ব-কর্তব্য, ব্যবস্থাপনা প্রশাসন সম্বলিত বিভিন্ন কমিটির কার্যক্রম ও সমন্বয় ইত্যাদি বিষয় বিস্তারিত উপস্থাপন ও আলোচনা করা হয়।

আলোচনা:

১। আলোচনায় অংশগ্রহণ করে প্রধান বন সংরক্ষক সভাকে অবহিত করেন যে, জীববৈচিত্র্য সংরক্ষণ সম্পর্কিত বিদ্যমান আইন ও নীতিমালা অনুসরণ করে এ মন্ত্রণালয়ের ম্যান্ডেট অনুযায়ী অত্যন্ত সমৃদ্ধ প্রাকৃতিক সম্পদ ও জীববৈচিত্র্যের সূচু সংরক্ষণের লক্ষ্যে, সংশ্লিষ্ট সকল সংস্থাকে অন্তর্ভুক্ত করে সোয়াচ অব নো-গ্রাউন্ড মেরিন প্রোটেক্টেড এরিয়া সমন্বিত ব্যবস্থাপনা পরিকল্পনা প্রণয়ন করা হয়েছে। এটি অনুমোদিত হলে কুনমিং মন্ট্রিল গ্লোবাল বায়োডাইভারসিটি ফ্রেমওয়ার্কের অভিস্ট-৩ এবং জাতিসংঘের টেকসই উন্নয়ন অভিস্ট-১৪ অনুযায়ী সাগর সামুদ্রিক সম্পদ সংরক্ষণ ও টেকসই ব্যবহার করার জন্য বাংলাদেশের প্রতিশ্রুতির সাথে সামঞ্জস্যপূর্ণ কার্যক্রম গ্রহণ করা সম্ভবপর হবে। তিনি আরও জানান যে, সোয়াচ অব নো-গ্রাউন্ড মেরিন প্রোটেক্টেড এরিয়া সম্পর্কিত ব্যবস্থাপনা কোন একক সংস্থার পক্ষে বাস্তবায়ন করা সম্ভবপর নয় বিধায় সংশ্লিষ্ট সকল মন্ত্রণালয় ও সংস্থার সাথে আলোচনা করে/মতামত নিয়ে এবং পরিকল্পনা বাস্তবায়নে অংশগ্রহণের সুযোগ রেখে একটি সমন্বিত ব্যবস্থাপনা পরিকল্পনা প্রস্তাব করা হয়েছে।

২। সভায় মৎস্য অধিদপ্তরের প্রতিনিধি উল্লেখ করেন যে, দেশের মৎস্য সম্পদের ব্যবস্থাপনার জন্য মৎস্য ও প্রাণিসম্পদ মন্ত্রণালয় দায়িত্বপ্রাপ্ত হওয়ায় সোয়াচ-অব-নো-গ্রাউন্ড এলাকায় এমন কোন কার্যক্রম গ্রহণ করা সমীচীন হবে না যা উক্ত মন্ত্রণালয়ের মৎস্য ব্যবস্থাপনার সাথে সাংঘর্ষিক হয়। জবাবে অতিরিক্ত সচিব (পরিবেশ) উল্লেখ করেন যে, মৎস্য সেক্টরের বিদ্যমান সকল আইন ও বিধি যেমন: Technical Directives on Marine Fisheries Management and Harvest-2023, Marine Fisheries Rules-2023, Marine Fisheries Act-2020 ইত্যাদির সাথে সংগতি রেখে ব্যবস্থাপনা প্রশাসনের বিভিন্ন কমিটি যেমন: মনিটরিং ও এনফোর্সমেন্ট, গবেষণা, ভেসেল ব্যবস্থাপনা ইত্যাদিতে মৎস্য প্রশাসনের মূখ্য ভূমিকা পালন করার সংস্থান রেখে আলোচ্য পরিকল্পনা প্রণয়ন করা হয়েছে। এছাড়া, সংশ্লিষ্ট সকল সংস্থা থেকে প্রাপ্ত লিখিত মতামত প্রস্তাবনায় অন্তর্ভুক্ত করে পরিকল্পনা চূড়ান্ত করা হয়েছে। সভাপতি গভীর সমুদ্রের জীববৈচিত্র্য রক্ষা ও টেকসই ব্যবস্থাপনার বৃহত্তর স্বার্থে আলোচ্য ব্যবস্থাপনা পরিকল্পনা বাস্তবায়নে সংশ্লিষ্ট সকল স্টেকহোল্ডার স্ব-স্ব অবস্থান থেকে প্রয়োজনীয় সমন্বয় করে গুরুত্বপূর্ণ ভূমিকা পালন করতে পারেন মর্মে মতামত ব্যক্ত করেন।

৩। সভায় কোস্ট গার্ডের প্রতিনিধি বলেন যে, আলোচ্য পরিকল্পনাটি মাল্টিসেক্টোরাল এ্যাপ্রোচ-এ বাস্তবায়ন করা প্রয়োজন বিধায় সংশ্লিষ্ট স্টেকহোল্ডারগণের ভূমিকা যথাযথ প্রতিফলন করা প্রয়োজন। তিনি আরও বলেন যে, “SMART PATROLLING” মনিটরিং এর জন্য একটি গুরুত্বপূর্ণ টুল বিধায় বিষয়টি বাস্তবায়নের কার্যপদ্ধতি প্রস্তাবনায় অন্তর্ভুক্ত করা যেতে পারে। সভাপতি এ বিষয়ে প্রয়োজনীয় ব্যবস্থা গ্রহণ করা যেতে পারে মর্মে অভিমত ব্যক্ত করেন। সভাপতি ইন্টিগ্রেটেড ম্যানেজমেন্ট প্ল্যান এ প্রস্তাবিত কার্যক্রমসমূহ বাস্তবায়নের জন্য বিভিন্ন সংস্থাসমূহ এর মাঝে বন্টনকৃত দায়িত্ব ও সময়সীমার বিবরণ ছক আকারে appendix এর পরিবর্তে মূল পরিকল্পনাতে লিপিবদ্ধ করার পরামর্শ প্রদান করেন। এছাড়া তিনি ব্যবস্থাপনা পরিকল্পনার ২৯ পৃষ্ঠা এর “ii (c)” থেকে accepted at public hearings” লেখাটি বাদ দেয়া যেতে পারে মর্মে মতামত ব্যক্ত করেন।

৪। বাংলাদেশ কোস্ট গার্ড-এর প্রতিনিধি কর্তৃক পরিকল্পনায় ট্যুরিজম কার্যক্রমের লিড এজেন্সি হিসেবে কোস্ট গার্ড-এর পরিবর্তে বাংলাদেশ ট্যুরিজম বোর্ডের নাম প্রস্তাব করা হয়। বাংলাদেশ ট্যুরিজম বোর্ডের প্রতিনিধি এ প্রস্তাবে সম্মতি জ্ঞাপন করেন। তবে পর্যটকগণ যাতে মংলা ছাড়াও অন্যান্য এলাকা যেমন কক্সবাজার থেকেও সোয়াচ-অব-নো-গ্রাউন্ড রক্ষিত এলাকায় ভ্রমণ করতে পারেন তার সংস্থান রাখার এবং ব্যয়বহুল এ ভ্রমণে পর্যটকগণের জন্য সোয়াচ-অব-নো-গ্রাউন্ড রক্ষিত এলাকায় অবস্থানের ক্ষেত্রে সময়ের সীমাবদ্ধতা শিথিলের তিনি সুপারিশ করেন। সভাপতি বিশ্বের অন্যান্য দেশের সামুদ্রিক রক্ষিত এলাকায় বিদ্যমান ব্যবস্থা অনুসরণের পরামর্শ প্রদান করেন এবং এই সমন্বিত ব্যবস্থাপনা পরিকল্পনা বাস্তবায়নের জন্য কিছু গুরুত্বপূর্ণ বিষয় যেমন: টহল পরিচালনার বিস্তারিত, পর্যটকদের জন্য নিয়ম-কানুন সম্পর্কে পরবর্তীতে বাস্তবায়ন পর্যায়ে স্ট্যান্ডার্ড অপারেটিং প্রোসিডিউর বা এসওপি তৈরি করা যেতে পারে মর্মে মতামত ব্যক্ত করেন।

৫। সভায় বাংলাদেশ নৌবাহিনী ও কোস্ট গার্ডের প্রতিনিধি গভীর সমুদ্র এলাকায় মনিটরিং এবং অন্যান্য কার্যক্রম বাস্তবায়নে লজিস্টিকসহ বিভিন্ন সীমাবদ্ধতার বিষয়ে উল্লেখ করেন। সভাপতি বলেন যে, বাংলাদেশ নৌবাহিনী ও কোস্টগার্ডকে ব্যবস্থাপনা পরিকল্পনায় অন্তর্ভুক্ত কার্যক্রমকে নিয়মিত কার্যক্রমের অংশ হিসেবে পরিগণিত করে ব্যবস্থাপনায় সম্পৃক্ত হতে হবে। তিনি ডেসেলসহ প্রয়োজনীয় লজিস্টিকস এর চাহিদা আলোচ্য ব্যবস্থাপনা পরিকল্পনাতে অন্তর্ভুক্তির সুপারিশ প্রদান করেন। সর্বোপরি, সভাপতি দেশের সেন্টোরাল পলিসি এবং আন্তর্জাতিক চুক্তির নিয়ম কানুন প্রতিপালন সাপেক্ষে গভীর সমুদ্র এলাকায় (সোয়াচ-অব-নো-গ্রাউন্ড এর) অত্যন্ত গুরুত্বপূর্ণ জীববৈচিত্র্য সংরক্ষণকে যথাযথ গুরুত্ব দিয়ে টেকসই উন্নয়ন ও পরিকল্পনার অংশ হিসেবে প্রস্তাবিত সংশোধন সাপেক্ষে আলোচ্য ব্যবস্থাপনা পরিকল্পনা অনুমোদনের সুপারিশ করেন।

সিদ্ধান্ত: বিস্তারিত আলোচনা শেষে সভায় নিম্নলিখিত সিদ্ধান্তসমূহ গৃহীত হয়:

- ক) দেশের সেন্টোরাল পলিসি এবং আন্তর্জাতিক চুক্তির নিয়ম কানুন প্রতিপালন সাপেক্ষে গভীর সমুদ্র এলাকায় (সোয়াচ-অব-নো-গ্রাউন্ড এর) অত্যন্ত গুরুত্বপূর্ণ জীববৈচিত্র্য সংরক্ষণকে যথাযথ গুরুত্ব দিয়ে টেকসই উন্নয়ন ও পরিকল্পনার অংশ হিসেবে প্রস্তাবিত সংশোধন সাপেক্ষে আলোচ্য ব্যবস্থাপনা পরিকল্পনা অনুমোদনের সুপারিশ করা হলো;
- খ) আলোচ্য পরিকল্পনাটি মাল্টিসেন্টোরাল এ্যাপ্রোচ-এ বাস্তবায়ন করা প্রয়োজন বিধায় সংশ্লিষ্ট স্টেকহোল্ডারগণের ভূমিকা ব্যবস্থাপনা পরিকল্পনাতে যথাযথ প্রতিফলন করতে হবে;
- গ) “SMART PATROLLING” একটি গুরুত্বপূর্ণ মনিটরিং উপায়/ টুল বিধায় বিষয়টি বাস্তবায়নের কার্যপদ্ধতি ব্যবস্থাপনা পরিকল্পনায় অন্তর্ভুক্ত করতে হবে;
- ঘ) গভীর সমুদ্রের জীববৈচিত্র্য রক্ষা ও টেকসই ব্যবস্থাপনার বৃহত্তর স্বার্থে আলোচ্য ব্যবস্থাপনা পরিকল্পনা বাস্তবায়নে সংশ্লিষ্ট সকল স্টেকহোল্ডার স্ব-স্ব অবস্থান থেকে প্রয়োজনীয় সমন্বয়পূর্বক কার্যকর ভূমিকা পালন করবে;
- ঙ) ব্যবস্থাপনা পরিকল্পনায় অন্তর্ভুক্ত কার্যক্রম বাস্তবায়নে ডেসেলসহ প্রয়োজনীয় লজিস্টিকস এর চাহিদা আলোচ্য ব্যবস্থাপনা পরিকল্পনাতে অন্তর্ভুক্ত করতে হবে;
- চ) ইন্টিগ্রেটেড ম্যানেজমেন্ট প্ল্যান এ প্রস্তাবিত কার্যক্রম সমূহ বাস্তবায়নের জন্য বিভিন্ন সংস্থা সমূহ এর মাঝে বন্টনকৃত দায়িত্ব ও সময়সীমার বিবরণ ছক আকারে appendix এর পরিবর্তে মূল পরিকল্পনাতে লিপিবদ্ধ করতে হবে;
- ছ) ব্যবস্থাপনা পরিকল্পনার ২৯ পৃষ্ঠা এর “ii (c)” থেকে accepted at public hearings” লেখাটি বাদ দিতে হবে;
- জ) সমন্বিত ব্যবস্থাপনা পরিকল্পনা বাস্তবায়নের জন্য কিছু গুরুত্বপূর্ণ বিষয় যেমন: টহল পরিচালনার বিস্তারিত, পর্যটকদের জন্য নিয়ম-কানুন সম্পর্কে পরবর্তীতে বাস্তবায়ন পর্যায়ে স্ট্যান্ডার্ড অপারেটিং প্রোসিডিউর বা এসওপি তৈরি করতে পারে;
- ঝ) উপরোক্ত সুপারিশের আলোকে চূড়ান্ত খসড়া ব্যবস্থাপনা পরিকল্পনা পুনর্গঠন করে আগামী ১০ (দশ) কর্ম দিবসের মধ্যে মন্ত্রণালয়ে প্রেরণ করতে হবে।

৬। সভায় আর কোন আলোচ্য বিষয় না থাকায় সভাপতি সকলকে ধন্যবাদ জানিয়ে সভার সমাপ্তি ঘোষণা করেন।

স্বাক্ষরিত

১৮/০৭/২০২৪

(ড. ফারহিনা আহমেদ)

সচিব

পরিবেশ, বন ও জলবায়ু পরিবর্তন মন্ত্রণালয়।

