Study on

The Industrial Marine Fisheries Sector in Bangladesh

from a Human Rights Perspective

March, 2021

BANGLADESH INSTITUTE OF LABOUR STUDIES-BILS
বাংলাদেশ ইনস্টিটিউট অব লেবার স্টাডিজ- বিল্‌স

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Research published:
March, 2021

Research Administered and published by:
Bangladesh Institute of Labour Studies-BILS

Design
AB Ratul

Printing
SARCO Media Aid Services
85/1 Fakirapool, Motijheel, Dhaka-100

Research Supported by:
Manusher Jonno Foundation-MJF

ISBN: 978-984-35-0747-1

CONTENTS

Executive Summary

BILS and COAST Trust, in close collaboration with MJF, have been implementing a project titled "Sustainable Oceans: Improving sustainable economic growth and development opportunities through efficient and sustainable use of human rights-centric aquaculture resources in Bangladesh". This project aims at pursuing strategic engagement of human rights actors at local, national, regional and global levels in policy and programming processes related to the fisheries and aquaculture sectors, and the implementation of SDG 14, by developing strong partnerships and generating knowledge and tools. The purpose of the study is to support the implementing organizations in understanding and exploring the industrial fishing sector and develop strategies for lobby and advocacy and follow-up initiatives in relation to the impacts of the fisheries sector in Bangladesh. The study analyzed the industrial fishing sector in Bangladesh, documented the existing status of industrial fishing (deep-sea marine fisheries with industrial-scale large vessels), with a particular focus on the full value chain and supply chain, analyzed through a human rights lens and also explored the impact of industrial fishing on artisanal fishing and ocean sustainability. The study design is qualitative. The qualitative approaches of data collection were applied with the concerned stakeholders.

The study suggested to develop viable strategies to create the necessary environment to encourage fishing operators to venture into deeper and open ocean areas with high-tonnage vessels and using alternate gear, such as tuna long-lines and hooks. It recommended sustainable fisheries production and management, maintaining river system and ecosystem health and Therefore, policies must contribute to climate change mitigation and adaptation strategies.

- √ To overcome the challenges of pollution, overfishing, and destructive fishing practices, Bangladesh needs to develop strategies of sustainable fishing and management. To achieve these the study suggest the following recommendations.
- √ All fishing vessels (non-mechanized and mechanized boats) must have registration, fitness certificate, fishing license and insurance coverage, radio, life buoys for the crews.
- √ All artisanal fishing boats will only be allowed to go for fishing within the 40 m depths (at distances as great as 96 km from the beach) if they are equipped with enough potable water, life buoys, life jackets, first aid box, fire extinguisher, magnetic compass, SSB Radio, VHF and GPS to take precautionary measures and avoid casualties.

- √ All industrial trawler fleets must fish at depths greater than 40 m, in no case they would be allowed to fish within 40 m depths, be it for harvesting mother-shrimp or any other cause. They should be strongly encouraged to go even beyond 200 m depths.
- √ Mother-shrimp harvesting be allowed only with the trammel nets, as these nets are quite species-specific and eco-friendlier.
- √ To protect the nursing and feeding grounds of all marine resources, as ensured by Thailand, the area of 0-5 km from the beach coast line can be declared as a complete no-fishing zone or 'no-take' zone throughout the year; no fishing of any sort, even with cast nets, beach seines, drag/push nets, current nets, mosquito nets etc. would be allowed.
- √ Ensure strong monitoring of fishing ban period of 15 January to 15 February for protecting shrimp mothers and ensure their natural spawning in the open sea.
- √ Introduce fin-fish fishing ban period for certain period of time depending on the spawning season of commercially important species (viz. hilsa, pomfrets, Bombay ducks, threadfins, croakers).
- √ Because of inexperience long-liner, purse seiner and squid jigger fishing are not practiced in Bangladesh territorial waters, though these are widely used in other country's marine fisheries. Without proper assessment of the present pelagic stocks no further license (so far 15 licenses issued but only a single squid jigger imported, later changed its fishing gears and converted to normal fishing trawler) should be issued for long-liner, purse seiner and squid jigger fishing.
- √ Strong vessel tracking and monitoring system (VTMS) should be introduced so that after importation of long-liner, purse seiner and squid jigger their fishing gears are not changed and converted to traditional fishing trawlers.

CHAPTER ONE

Introduction

1.1 Context and Background

Bangladesh Institute of Labour Studies (BILS) and COAST Trust in close collaboration with the Manusher Jonno Foundation (MJF) have been implementing a project titled "Sustainable Oceans: Improving sustainable economic growth and development opportunities through efficient and sustainable use of human rights-centric aquaculture resources in Bangladesh" aiming to pursue strategic engagement of human rights actors at local, national, regional and global levels in policy and programming processes related to the fisheries and aquaculture sectors, and the implementation of SDG 14, by developing strong partnerships and generating knowledge and tools.

This study report is on the Industrial Marine Fisheries Sector in Bangladesh from a Human Rights perspective under the project describes context, scope, objectives, and methodology in details.

1.2 Purpose, Scope and Objectives of The Study

Purpose the study

The purpose of the study is to support the implementing partners in understanding and exploring the industrial fishing sector as a contribution to the broader work under the project. The analyses and study findings will constitute a key output under the project and will feed into the final report, and will also be utilized for lobby and advocacy and follow-up initiatives in relation to the impacts of the fisheries sector in Bangladesh.

Scope of the Study

The scope of the study is to analyze the industrial fishing sector in Bangladesh, documenting the existing status of industrial fishing (deep-sea marine fisheries with industrial-scale large vessels), with a particular focus on the full value chain and supply chain, analyzed through a human rights lens. The study explores the impact of industrial fishing on artisanal fishing and ocean sustainability.

The scope of this analysis will essentially cover, but is not limited to:

a. Existing situation of Industrial marine fishing in Bangladesh
b. Value chain of industrial marine fishing in Bangladesh: The segments of the industrial fisheries value chain are as follows:

c. Production/Capture;
d. Collection (From First Producer Point);
e. Preparation of Value-Added products;
f. Distribution/Logistics; and
g. Sales.

Supply chain of Industrial marine fishing in Bangladesh: The supply chain of the industrial fisheries value chain is as follows:

- The key players in the industrial marine fisheries supply chain and its monitoring and enforcement mechanisms
- Supply and demand of the industrial marine fishing trade, including volume of collection, seasonality/banned period
- Profit analysis – understanding profit and its distribution among owners and workers, including how this profit-sharing mechanism impacts on other sectors including life and livelihood of workers
- The impacts of existing supply chain systems for oceans sustainability.

a) Mapping the institutions and stakeholders involved and their role in industrial fishing
b) Impact of industrial fishing on artisanal fishing and ocean sustainability
c) A series of recommendations targeting different stakeholders.

Objectives of The Study

The general objective of the study is to assess the industrial fishing sector in Bangladesh and understand how the sector negatively impacts the rights of workers and communities, including artisanal fishers, as well as the potential positive contributions of the sector. The study aims to support the implementing partners in understanding and exploring the industrial fishing sector in order to develop lobby and advocacy strategies and follow-up initiatives in relation to the impacts of the fisheries sector in Bangladesh.

Specific objectives of the study are:

1. To describe the value chain system of industrial marine fisheries
2. To document the supply chain system of Industrial fishing
3. To map the institutions and stakeholders involved in Industrial fishing
4. To identify human rights challenges in relation to the industrial marine fishing sector's contributions to achieving SDG 14

5. To identify the potential and actual positive contributions the industrial marine fishing sector has on the realization of human rights (i.e. direct and indirect job creation, tax revenues, etc.)
6. To formulate a set of recommendations targeting different stakeholders for future policy advocacy

1.3 Methodology

The study design is qualitative. The qualitative approaches of data collection were applied.

Primary and secondary sources of data were collected and used for analyses and report writing.

Secondary data were collected from desk review on published article, journal and newspaper report.

Area and Sampling

Workers of marine industrial and artisanal fisheries at Karnaphuli river under Chittagong city was the study area. Purposive and snowball sampling technique were applied.

Sources and techniques of data collection

Semi-structured interview, Focus Group Discussion (FGD) and in-depth interview were conducted. In order to collect critical evidences case story was collected. The sources of data were the stakeholders of marine fisheries of Bangladesh, the workers of industrial and artisanal and industrial marine fisheries, officials of Marine Fisheries Department, teachers of Marine Fisheries Academy and Institute of Marine Science. Interviews were also conducted with the organizers and trade union leaders of Industrial trawler and fish processing factories.

Structure of the Report

The report is divided into seven chapters.

In chapter one, the research design is introduced. Chapter two presents the status and challenges of industrial marine fisheries in Bangladesh including its contribution and policy directions. Chapter three deals with institutional mapping and governance and chapter four explains the impact of industrial fishing on artisanal and ocean sustainability. Chapter five reviews the status of SDG 14 in Bangladesh and chapter six presents supply chain and value addition, and finally chapter seven draws recommendations on analyses and findings of the study.

1.4 An overview of Industrial Marine Fisheries in Bangladesh

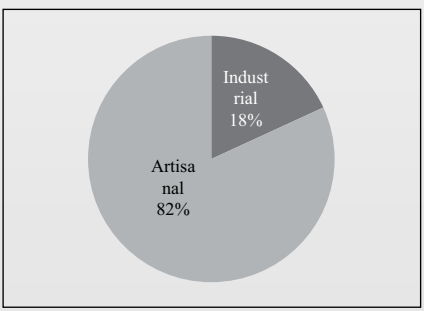
Bay of Bengal (BoB) is one of the world's 64 Large Marine Ecosystems (BOBLME, 2011) and defined as a moderately productive ecosystem (Madhupratapet et al., 2003) with great potential for fisheries because of the huge nutrient input from the rivers of the Ganges and Brahmaputra (ESCAP, 1988).[1]

In order to maintain the pace of development and industrialization, and in view of depleting land-based resources and population growth, Bangladesh has to look more towards the sea as a source of energy, food, medicine and other strategic minerals. Today, Bangladesh has very successfully resolved the delimitation issue and gained a total of 118,813 sq. km of territorial sea, 200 nautical miles of Exclusive Economic Zone (EEZ) and a substantial share of extended continental shelf in the Bay of Bengal. These have opened up opportunities for ocean-based economic growth and development for Bangladesh by the prudent use of marine resources. The harvest of marine capture fisheries in the coastal and marine waters of Bangladesh was 3.548 m MT (DoF 2016), which is about 16.78 percent of the total fish catch. More than 0.5 million people are in involved in marine fishery sector.[2]

At present total annual fish production is 4.276 million MT in 2017-18 of which inland culture 56.2%, inland capture 28.5% and marine fisheries occupies 15.3% ; among marine fisheries Artisanal is 82% and industrial is 18% in 2018.[3]

Figure 1.1: Artisanal and Industrial Fisheries Catch 2018

Source: Yearbook of Fisheries Statistics of Bangladesh 2017-18



A number of surveys examined the status of marine fisheries resources between 1970s and 1980s, but no recent and comprehensive knowledge is available on the fisheries, systematic, biological and ecological aspects of the coastal and marine fisheries of Bangladesh.

1. Capture Fisheries Scenario of the Bay of Bengal, Bangladesh in the last two decades through Industrial Freezer Trawler, Uttam Kumar, Md. SohelParvez, Jewel Das, Chowdhury Mohammad Nizamuddowla and Satya RanjanTarafdar Research in Agriculture, Livestock and Fisheries, Vol.3, number 1, April 2016
2. https://www.thedailystar.net/environment-and-climate-action/how-we-can-manage-our-marine-resources-better-1367104
3. Source: Yearbook of Fisheries Statistics of Bangladesh 2017-18

Hilsha is the largest and single most valuable species with an average annual catch of 340,000 MT, representing 50-60 percent of the global hilsha catch and generating employment and income for 2.5 million people (BOBLME, 2012). There are about 486 types of marine fish species and 36 types of marine shrimp in our sea area.[4] This huge catch is done by 2 ways called Artisanal and Industrial. The artisanal catch (both mechanized and non-mechanized boat) is 86% and industrial trawler is 14%.[5]

1.4.1 Trawlers and workers/fishermen

Artisanal fishing is done in near shore areas within 100 nautical miles at 10 meters to 40 meters depth by small wooden boat with a mechanical engine (no navigation device) and gear includes purse seine net, set bag net, gill net etc.

The industrial catch is done beyond 100 nautical miles at 40 to 70 meters depth by medium and large trawlers with storing capacity ranges from 70 ton to 450 ton. Two types of trawlers are operated fishing in BoB, Bangladesh. One type is a wooden or light steel body trawler where fish preservation is done by ice (ice trawler). Another type is a steel body trawler which preserves fish through the air blast freezer (freezer trawler).[6] At present, over 200 industrial trawlers and about 68000 artisanal vessels operate within a limited coastal waters belt, often using destructive gear/ net to exploit multiple species.[7]

1.4.2 Challenges of Marine Fisheries in Bangladesh

Marine fisheries of Bangladesh have been facing several problems and challenges, these are overfishing, destructive fishing practices leading cause of decline of species and some are near to extinct. Pollution is also a serious concern to the fisheries ecosystems and coastal communities of Bangladesh. Furthermore, the growing population in the coastal areas and weak common property management system will intensify the problems over the next decades.

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4. https://www.thedailystar.net/environment-and-climate-action/how-we-can-manage-our-marine-resources-better-1367104
5. Fisheries Statistics in Bangladesh: Issues, Challenges and Plans, Department of Fishing, Government of Bangladesh, Asia and Pacific Commission on Agricultural Statistics, Thimpu, Bhutan, 15-19 Feb.2016
6. Capture Fisheries Scenario of the Bay of Bengal, Bangladesh in the last two decades through Industrial Freezer Trawler, Uttam Kumar, Md. SohelParvez, Jewel Das, Chowdhury Mohammad Nizamuddowla and Satya Ranjan Tarafdar Research in Agriculture, Livestock and Fisheries, Vol.3, number 1, April 2016
7. Bangladesh Sustainable Coastal and Marine Fisheries, The World Bank, Sept. 2018

If overfishing continues at an alarming rate then a time will come when important fishery will reach a point of no return jeopardizing the whole industry. In order to establish a comprehensive plan for sustainable conservation, management and exploitation of resources from the sovereign marine waters the present status of fisheries resources and its future potential for the national economy needs to be framed out.[8]

8. 7th Five Year Plan, General Economic Division (GED) , Planning Commission, Government of the people's Republic of Bangladesh

CHAPTER TWO

Industrial Marine Fisheries in Bangladesh: Context, Potentials and Challenges

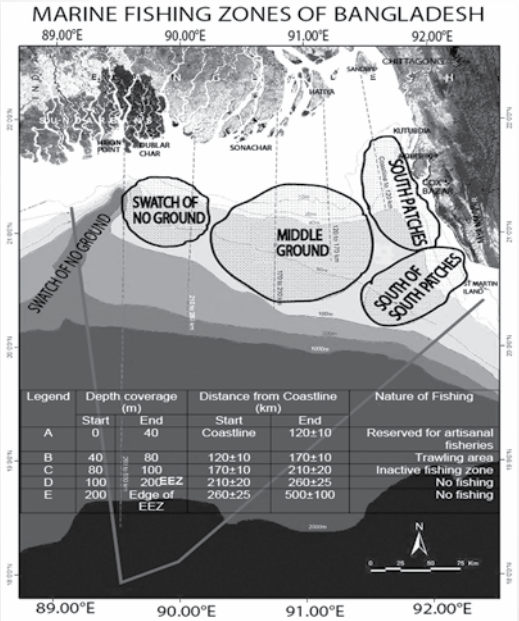
2.1 Status of Bangladesh's Marine Ecosystem

Bangladesh is very rich in marine waters. At the end of the final settlement of maritime border disputes with neighboring states Myanmar and India in 2012 and 2014 respectively, Bangladesh has received entitlement to 118,813 sq. km in the Bay of Bengal (BoB)-equivalent to more than 80 percent of the country's total land area comprising her territorial sea and Exclusive Economic Zone (EEZ) (MoFA, 2014).

Figure 2.1: Bay of Bengal

The BoB is one of the world's 64 largest Marine Ecosystems (LME). Several large rivers converge into the bay, such as the Ganges and three major rivers of Bangladesh the Jamuna, the Meghna, the Padma and other rivers including the Mahananadi, Godavari Bhramani, Irrawaddy, Baitarani, Kaveri and Krishna. Water discharges from these surrounding rivers, especially from Bangladesh, carry huge influx of sediments full of nutrients from the bays, particularly along the near shore region, which has turned the bay into a major fertile marine fishing ground of the region. These rivers have also been carrying vast tides of untreated sewage, plastic, industrial waste and effluents from the agriculture and aquaculture industries. The marine ecology of BoB is dependent on governance and sustainable management of these rivers.

There are eight countries surrounding the Bay in the north, east and west, namely Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand. The south of the BoB is connected to the India Ocean. The BoB countries are densely populated, relatively poor and significantly dependent on the Bay and its resources for their livelihoods.[9]



Taking into account major river inlets and estuaries, which are together a part of the marine ecosystem, the total marine waters of Bangladesh stand at 121,110 sq. kms of which coastal waters and the shallow shelf sea constitute about 20% and 35% respectively, the rest (45%) lying in deeper waters (Chowdhury 2014a).[10] The coastal zone of Bangladesh has been delineated administratively as considering 19 districts and 147 Upazillas (sub-district) and also the EEZ.[11]

Being an extension, BoB shares many oceanic characteristics of the Indian Ocean including cyclones and southwest monsoons, and has active connections to the Andaman Sea, Malacca Strait, Palk Strait, etc. The BoB is characterized by some unique features, notably:[12]

9. IUCN Bangladesh, 2015, National Framework for Establishing and Managing Marine Protected Areas (MPAs) on Bangladesh
10. Background paper for preparation of the 7th Five Year Plan, Planning Commission, Government of Bangladesh, "Opportunities and strategies for ocean and river resource management" 2014
11. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute
12. Background paper for preparation of the 7th Five Year Plan, Planning Commission, Government of Bangladesh, "Opportunities and strategies for ocean and river resource management" 2014&Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute

- It is a shallow oceanic arm, potential for sea-bottom activity relatively easier and less expensive than doing it on deeper ocean floor.
- Bangladesh ocean waters cover the widest continental shelf area in the Bay of Bengal. These highly productive ecosystems support a range of shallow water fisheries accessible to several types of gear (Hussain et al. 2017a, 2017b, Failler et al. 2017, and Shamsuzzaman et al. 2017).
- Almost all of Bangladesh's marine fishing is carried out in shallow and shelf waters, beyond which no fishing is being currently done due to lack of vessel capacity and appropriate fishing technologies.
- Almost all of the BoB's shallowest 100-200m of water is well-oxygenated whereas the water below this depth is seriously in short of oxygen supply, this suggests a mid-to-deep water unable to support large fishery at these depths.
- The rivers contributing to the coastal Bangladesh have deep sea connection through the 'Swatch of No ground' (a deep-sea canyon), located in the southern part of the Dublachar island in the Bay of Bengal, is a key breeding and spawning ground of dolphins, whales, sharks and turtles.

2.2 Features of Marine Fisheries In Bangladesh – Artisanal and Industrial

Harvesting marine fisheries – numbers and characteristics

There are two types of marine fisheries – artisanal and industrial. Industrial trawl fishing is carried out in offshore areas and artisanal fishing (or subsistence fishing) is limited to near shore zones. Artisanal fishing is done in near shore areas within 100 nautical miles at 10 meters to 40 meters depth by small wooden boat with a mechanical engine (no navigation device) and gear includes purse seine net, set bag net, gill net etc. The industrial catch is done beyond 100 nautical at 40 to 70 meters depth by medium and large trawler with storing capacity ranges from 70 ton to 450 ton. Two types of trawlers are operated for fishing in BoB of Bangladesh. One type is a wooden or light steel body trawler where fish preservation is done by ice (ice trawler). Another type of craft is a steel body trawler which preserves fish through the air blast freezer (freezer trawler).[13] At present, 253 industrial trawlers and about 67669 artisanal vessels are fishing within the limited coastal areas of Bangladesh. The operational no. of industrial trawlers is about 200.[14] Historically artisanal

13. Capture Fisheries Scenario of the Bay of Bengal, Bangladesh in the last two decades through Industrial Freezer Trawler, Uttam Kumar, Md. SohelParvez, Jewel Das, Chowdhury Mohammad Nizamuddowla and Satya Ranjan Tarafdar Research in Agriculture, Livestock and Fisheries, Vol.3, number 1, April 2016
14. Annual Report 2017, Department of Fisheries, Government of Bangladesh

fisheries are a major contributor of marine and coastal fisheries in Bangladesh; Roughly 90% serves domestic consumption (often salted and dried), with shrimp as the main export commodity (Table 2.1).

Table 2.1: Features of Marine Fisheries in Bangladesh

Type of Fishing	Character	No.	Catch			
			Shrimp	Hilsa	Other	Total
Industrial	Shrimp Trawler	37	2621	0	2749	5370
catch 40m depth>	Fish Trawler	216	1061	11060	102596	114717
	Total	253	3682	11060	105345	120087
Artisanal Small-scale vessels 12 m. long or less, roughly 50% motorized, e.g.: – Near-shore fry fishing with push and drag nets – Boats deploying set nets, gill nets, and longlines	Mechanized Boat	32859				
Semi-industrial wooden, mechanized vessels up to 20 m. long, fishing with gill nets- Small-scale and semi- industrial vessels produce 93% of catch	Non-Mechanized Boat	34810				
	Total	67669	45165	273440	215995	534600
Total		67922	3682	11060	105345	120087
Principal Markets	Roughly 90% serves domestic consumption (often salted and dried), with shrimp as the main export.					

Source: Yearbook of Fisheries Statistics of Bangladesh 2017-18

Artisanal fishing operations in the estuaries and coastal waters used to be carried out by traditional wooden non-mechanized crafts until the mid-1960s. After independence, the Bangladesh Fisheries Development Corporation (BFDC) and the *Bangladesh Jatio Matshyajibi Samobay Smity*[15] (BJMSS) started mechanization of fishing boats by importing and introducing marine engines (Khan 2010).

Overexploitation

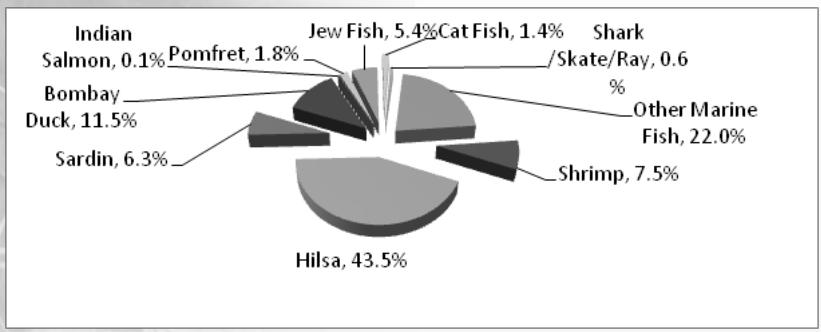
One of the problems facing the marine and coastal fishing communities of the region is the unsustainable harvesting of the resources. Many of the fishery resources in the regions have already been heavily exploited and if this continues unregulated, the situation will likely worsen with significant adverse impacts. Another problem is the continuous degradation of highly productive coastal and near-shore marine habitats such as coral reefs, mangroves, estuaries, sea-grass beds and other shallow spawning and nursery areas.There had been about 258% increase in fishing efforts since the start of mechanized fishing in 1975-76. Artisanal fishers complain about decline in catch per unit effort (CPUE) for mechanized and non-mechanized boats using medium to large-meshed gill nets and becoming non-remunerative. Shrimp trawlers as well are experiencing declining CPUE and are currently concentrating in shallow waters and often come in conflict with artisanal boats.[16]

Major catch include hilsa, tuna, sardine, seabass, snapper, pomfret, grouper, catfish, threadfin, bombay duck, hairtail, jewfish, and non-conventional fishery item consists of squid, octopus, lobster, oyster, mussel and seaweeds. Among the crustaceans, penaeid shrimps (brown shrimp, tiger shrimp, white shrimp) is the most dominant followed by some crab species (mud crab and swimming crab).[17]

The catch composition indicates the unsustainable overfishing in the marine fisheries sector in Bangladesh. Hilsa and shrimp accounts more than 50% of total catch and more than one fifth fish is unsorted 22% (Figure 2.2)

15. National Fishermen Cooperatives
16. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute
17. Hossain MS, Chowdhury SR, Sharifuzzaman SM. 2017. Blue Economic Development in Bangladesh: A policy guide for marine fisheries and aquaculture. Institute of Marine Sciences and Fisheries, University of Chittagong, Bangladesh

Figure 2.2: Species-wise Catch of Marine Fisheries in Bangladesh 2017-18



Source: Yearbook of Fisheries Statistics of Bangladesh 2017-18

2.3 Contributions of Marine Fisheries in Bangladesh

There is a steady growth in marine capture fisheries, within two decades from 1990 to 2010, the catch of marine fisheries increased more than double from 23063 MT to 517282 MT and then there is a steady growth averaging more than 600,000 MT per year (Figure 2.3). The actual figure will be higher as there is illegal and unreported fishing in the marine fisheries sector in Bangladesh. This relatively mature sector of the country's marine economy (including inland production systems) provides benefits that extend far beyond the economic measures mentioned above.

Figure 2.3: Trend of Bangladesh Marine Fisheries Production in MT from 1987 to 2018

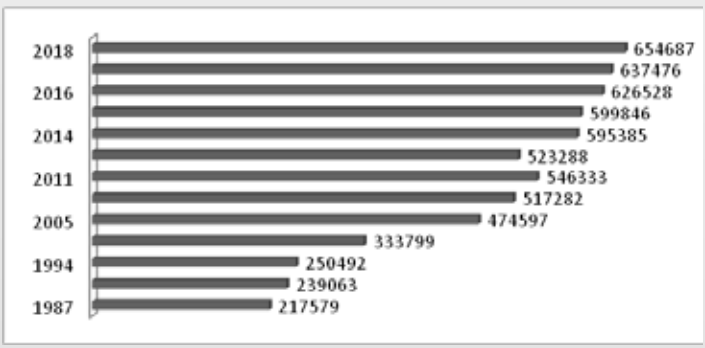


Figure 2: Source: Statistical Yearbook 2017 & FSYB 2017, 2018

Together with rice, fish is the backbone of the Bangladeshi diet, providing 60 percent of the animal protein intake in the country, as well as other essential vitamins and nutrients (DoF 2017). For poorer groups in Bangladesh, fish

is often the only source of protein. An estimated 70 percent of the rural population occasionally fishes for subsistence (FAO 2014).

At present total annual fish production is 4.276 million MT in 2017-18 (Table 2.1) of which inland culture 56.2%, inland capture 28.5% and marine fisheries occupies 15.3% (Figure 2.1).

Table 1.1: Sector wise Annual Fish Production 2017-18		
Sector of Fisheries	**Production (MT)**	**Percentage**
Inland Culture	2405415	56.2%
Inland Capture	1216539	28.5%
Marine Industrial	120087	2.8%
Marine Artisanal	534600	12.5%
Total	4276641	100.0%

Source: Yearbook of Fisheries Statistics of Bangladesh 2017-18

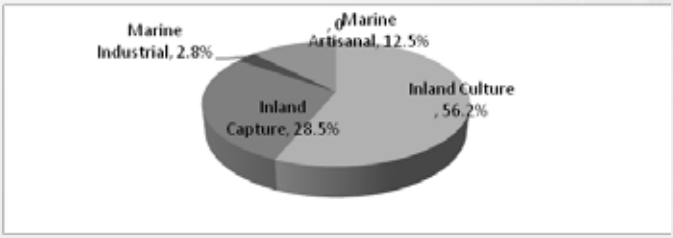


Figure2.4: Sector wise Annual Fish Production 2017-18

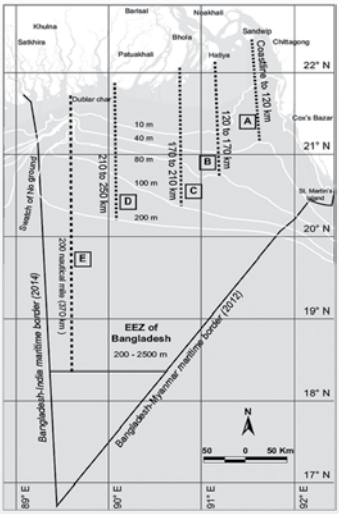
Source: Yearbook of Fisheries Statistics of Bangladesh 2017-18

The marine fisheries sector contributes significantly to the country's food and nutrition security as well as economy through direct income, employment and foreign exchange.Estimates suggest more than 17 million people work in fisheries and aquaculture (full and part-time, including inland production), of which some 1.35 million work in marine capture fisheries and aquaculture (Meisner et al. 2016).[18] The activity accounts for 4.4% of national GDP and supports ~22% to the agricultural GDP and <3% to the foreign exchange earnings through exports of fishery products.[19]

18. P.G. Patil, J. Virdin, C.S. Colgan, M.G. Hussain, P. Failler, and T. Vegh (2018). Toward a Blue Economy: A Pathway for Sustainable Growth in Bangladesh. Washington, DC: The World Bank Group.
19. Hossain MS, Chowdhury SR, Sharifuzzaman SM. 2017. Blue Economic Development in Bangladesh: A policy guide for marine fisheries and aquaculture. Institute of Marine Sciences and Fisheries, University of Chittagong, Bangladesh

2.4 Potentials of Industrial Marine Fisheries -Unexplored Fishing Zone at BoB

Figure 2.4: Fishing Zone in BoB



Marine fishing is effectively limited to continental shelf region, i.e. a depth <200 m, but the majority of fishing boats and vessels operate in the coastal areas within 40 m depth. The fishing grounds could be divided into five distinct zones (A-E), of which the nearest two zones (A and B) are subject to active fishing and the remaining zones (C, D and E) have the potential to provide new business opportunities (Figure 1.4). Starting from the coastline, up to a depth of 40 m and distance of 120 km is used by the artisanal fishers. The fishing zones extending up to 80 m depth and 170 km distance are for trawling. All other zones are either lightly fished or unexploited at present. Thus, there is scope of extending the fishing activities in deep waters and high seas, i.e. zones C, D, E and beyond.[20]

The unexplored fishing from deep-sea:

In April 2016, the government started giving licenses to firms / companies to bring vessels to catch tuna and pelagic fishes beyond the 200-metre depth of the Bay and in international waters.Until April last year, it awarded licenses to 17 firms for longline and purse seine fishing. None of the firms, some of which are connected to people of the ruling Awami League, has brought trawlers despite the passing of more than one and a half years since the last license was issued in April 2018, according to the Ministry of Fisheries and Livestock.

2.5 Human Drivers of Change in the Status of Bangladesh's Ocean Ecosystems

Manmade and natural changes in marine ecosystems will affect output from Bangladesh's future ocean resources and sustainability. Seasonal variation in precipitation, and in the intensity and amount of discharge influence the marine ecology in Bangladesh; furthermore, the diversion of water in India by Farakka barrage has significant impact on coastal mangrove area Sundarban--the planet's

20. Hossain MS, Chowdhury SR, Sharifuzzaman SM. 2017. Blue Economic Development in Bangladesh: A policy guide for marine fisheries and aquaculture. Institute of Marine Sciences and Fisheries, University of Chittagong, Bangladesh

largest contiguous mangrove area located in the west of the Brahmaputra-Meghna river delta; support a rich and diverse fish fauna, and are an important staging and wintering area for migratory birds. Decreased river flow effects the marine ecology, particularly the Sundarbans mangrove forest.[21] One of the evidences, of these changes are the reduction of Hilsa and its route changes caused by dam.[22]

According to a recent assessment by the Bay of Bengal Large Marine Ecosystem Project (BOBLME 2012), at least three significant and mutually reinforcing local human drivers are altering the status of Bangladesh's natural capital:[23]

I. Increasing fishing capacity and effort, including ecologically damaging fishing practices and illegal fishing,

II. Coastal development, including the alteration of some natural habitats for aquaculture, and

III. Pollution, notably land-based sources of pollution from urban centers.

Increasing fishing capacity and effort, including ecologically damaging fishing practices and illegal fishing

The fishing capacity (e.g. the number of fishing vessels operating) and overall fishing efforts have grown significantly in recent years, often causing biological overfishing. At present, over 200 industrial trawlers and about 68000 artisanal vessels operate within a limited coastal waters belt, often using destructive gear to exploit multiple species, even though trawling at depths less than 40 meters is prohibited by the 1983 Marine Fisheries Ordinance which is being violated frequently. The number of total industrial trawl vessels nearly tripled between the years 2001 and 2016 (Islam et al. 2017). About 100 vessels continue to bottom trawl despite a government ban. This increase has led to reports of conflicts with small-scale fishers and concerns for the physical alteration of the seabed in ways that affect habitats (Islam et al. 2017). The growth in trawl capacity and operations, as well as non-compliance with fishing regulations are the key driver of the status of the country's fish stocks and wider ocean ecosystem processes.

21. https://www.researchgate.net/publication/318756475_Impacts_of_Farakka_barrage_on_hydrological_flow_of_Ganges_river_and_environment_in_Bangladesh

22. https://timesofindia.indiatimes.com/city/kolkata/hilsa-changes-route-swims-bangla-waters/articleshow/71250754.cms

23. P.G. Patil, J. Virdin, C.S. Colgan, M.G. Hussain, P. Failler, and T. Vegh (2018). Toward a Blue Economy: A Pathway for Sustainable Growth in Bangladesh. Washington, DC: The World Bank Group.

i. Coastal development, including the alteration of some natural habitats for aquaculture

The expansion of coastal urban areas has significant impact on marine ecosystems and biodiversity. Since the 1980s, coastal development, economic growth, and other factors have degraded coastal protection, water availability and quality, and land stability (Hossain et al. 2016). One impact of coastal development has been changes in mangrove ecosystems in some areas. For example, old-growth mangrove forests known as the Chakaria Sundarbans, once located near Cox's Bazar, were lost completely due to clearing for multiple uses (Hossain et al. 2001).

ii. Pollution, especially the land-based sources of pollution from urban centers

There are two sources of marine pollution: sea and land. Pollution, notably land-based sources of pollution from urban centers. The sea-based sources include merchant ships, ferries and cruise liners, fishing vessels, offshore oil and gas platforms, and fish farming installations.

While the land-based ones include sewage, municipal and industrial wastes; which is around 80%. Most of the industries in Bangladesh are situated near the major river systems such as the Buriganga, Shitalakkhya, Balu, Turag, Karnaphuli, Rupsa, and Meghna – all of which end up in the Bay of Bengal. The pollution from ship breaking industry, pesticides and fertilizers used in agricultural land, textile industry, untreated urban sewage, plastic and micro plastic poses significant threats to marine fisheries and ecology.

According to a study[24] conducted by the Department of Environment, marine litter reaches the ocean from the land through river runoff, drainage system, wind action and intentional or unintentional discharge of materials in the sea due to human activities. A total of 6,705 pieces of waste products were found on 18.5km stretch of the four sea beaches – Laboni and Inani in Cox's Bazar, and Ananda Bazar and Patenga in Chittagong – in Bangladesh during the survey. Among the litter, 63% were found to be plastic, 13% foamed plastic, 2% cloth, 1% glass and ceramic, 1% metal, 9% paper and cardboard, 3% rubber, 1% wood, and 7% other materials. Plastic bags were found to be the most common type of litter: at least 2,182 pieces of plastic bags were found on the beaches. The survey also found 589 pieces of insulation and packaging foam, 470 pieces of cigarette butts and filters, and 300 bottles. The survey also found bottle caps and lids, drums, jerry cans, buckets, disposable

24. https://www.dhakatribune.com/bangladesh/environment/2018/12/17/reckless-plastic-waste-dumping-greatly-endangering-bay-of-bengal?fbclid=IwAR0M7VmoCo_QHgl2Fu8fCwZ4TGGsHxgn6JRsxPwdg9kPNO_DgTsW71ak-ZM

utensils, straws, stirrers, drink packaging, food containers, bags, gloves, cigarette lighters, syringes, baskets, crates and trays, mesh bags, fishing gear, and many other kinds of plastic waste on the four beaches.

Ship breaking industry

From ship breaking industry, scrapping old vessels can release toxic materials that harm marine taxonomic groups such as fish, mammals, birds, reptiles, plants, phytoplankton, zooplankton, and benthic invertebrates (Abdullah et al. 2013 and Sarraf et al. 2010). For example, in the area from Foujderhat to Kumira at Sitakunda in the Chittagong district, ship-breaking activities were found to discharge a number of refuse materials and metal fragments into the coastal environment, resulting in ammonia concentrations at toxic levels for marine organisms, an increase in the pH of coastal waters, and an abundance of floatable materials (grease balls and oil films), and other ecological impacts (Islam and Hossein 1986).

Pollutants carried in by rivers and streams

In addition, coastal waters suffer due to pollutants carried in by rivers and streams from far inland, such as the estimated 9,000 metric tons of pesticides and more than 2 million tons of fertilizers used in Bangladesh (Islam and Tanaka 2004). Recent estimates have suggested that nitrogen and phosphorus inputs into coastal waters as a result of untreated sewage are currently one to two orders of magnitude higher than previously thought and increasing, which could contribute to coastal eutrophication (e.g. creation of "dead zones" in the water) as well as health issues with consumption of fish caught near urban areas (Amin et al. 2017). Much of the worst pollution of the country's waterways originates from the growing urban centers. For example, the textile industry alone is estimated to discharge 140 million tons of effluents into Dhaka's rivers annually (World Bank 2018a).

Plastic waste and micro plastic (MP)

Plastic waste constitutes more than 60% of the litter found in the beaches of Bangladesh.Lastly, Bangladesh ranked tenth in the world in 2010 for mismanaged plastic waste, with 787,327 metric tons of plastic entering the ocean each year, or 2.5 percent of the global total (Jambeck et al. 2015). Projections show this volume increasing almost three-fold to 2,210,230 metric tons annually (3.2 percent of the global total) by 2025, the seventh-highest level in the world, as shown in Figure 17 (Jambeck et al. 2015).[25]

25. P.G. Patil, J. Virdin, C.S. Colgan, M.G. Hussain, P. Failler, and T. Vegh (2018). Toward a Blue Economy: A Pathway for Sustainable Growth in Bangladesh. Washington, DC: The World Bank Group.

Pollution of the marine ecosystems by micro-plastics (MP) is widespread and diverse. MP particles tend to be easily uptaken by aquatic organisms, for example shrimps can ingest micro plastics. Therefore, presence of MPs in the gastrointestinal tract of marine organisms has raised concern worldwide as seafood could be a significant source of MPs in humans. In the BoB, 500-20,000 items /km2 of MPs are recorded in surface waters and higher abundance observed near the Nicobar Islands, exceeding 100,000 items/km2. A study conducted by Institute of Marine Science, University of Chittagong, found that shrimps either inhabiting in the shallow coastal water (i.e. M.monocerous) or in the offshore water (i.e. P. monodon) had particles of MPs in their gastrointestinal tract. Shrimps are typically eaten without removal of the gastrointestinal tract, and thus MPs therein could be transferred to humans via food chain.[26]

These human drivers of changes affect the size and economic value of the ocean resources in general and particularly the fisheries and will reduce the sustainability of annual output from the country's ocean economy.

2.6 Challenges of industrial marine fisheries in Bangladesh

Industrial marine fisheries in Bangladesh have been facing a no. of challenges mentioned below.

- Overcapacity of fishing effort;
- Infringement of rules and regulations;
- Entry of illegal fishing vessels and pouching in the Bangladesh EEZ (up to 200 nautical miles from the baseline comprising 118,813 sq. km of maritime waters);
- Long gap exploratory survey on stocks assessment;
- Intense and overfishing deploying destructive and illegal gears;
- Shift in climate change paradigm;
- IUU (illegal, unreported and unregulated) fishing;
- Destructive fishing; and
- Pollution.

These challenges will be discussed widely in the following chapters.

26. Microplastic contaminations in Penaeid Shrimp from the Northern Bay of Bengal, M. Shahadat Hossain et al. 2019, Institute of Marine Science, University of Chittagong, https://www.journals.elsevier.com/chemosphere

CHAPTER THREE

Institutional Mapping and Governance of Industrial Marine Fisheries in Bangladesh

The institutional context of marine fisheries is characterized by multiple agencies with often overlapping mandates.[27] The marine fisheries sub-strategy 2006 has yet not been implemented (Box 3.1)

The Department of Fisheries (DOF) is the principle agency responsible for managing Bangladesh fisheries resources. The Department of Fisheries (DOF) DOF's Marine Fisheries Wing, Marine Fisheries Department (MFD) based in Chattagram, has regulatory responsibility for marine fisheries.

The MOFL oversees the activities of the DOF and its sister agencies, such as the Bangladesh Fisheries Development Cooperation (BFDC) and the Bangladesh Fisheries Research Institute (BFRI). In addition to managing sites, the sites, the BFDC is also responsible for processing and marketing of fish in large urban centers.

The BFRI is responsible for scientific research and training in both capture and culture fisheries.

Its capacity, however, is concentrated largely on culture and inland fisheries, with very little attention to marine capture outside Bangladesh's iconicHilsa fishery. Bangladesh Marine Fisheries Academy (MFA) trains future industrial fishermen and vessel officers. Other agencies that exercise various levels of fishery management- related responsibilities include the Department of Land, the Department of Forest, the Department of Environment, the Department of Agriculture, and Bangladesh Water Development Board, as well as the Marine Mercantile Department (MMD), the Navy and the Coast Guard.[28]

Department of Fisheries (DOF)

The DoF is primarily responsible for managing marine fisheries resources. Marine fisheries management is based around the 'Marine Fisheries Ordinance 1983'. This is implemented by the Director, Marine Fisheries Wing (MFW) of the DoF, empowering MFW to make rules covering licensing, catch reporting and declaration of marine reserves. This is supported by a series of rules (Marine Fisheries Rules, 1983) and supplemented periodically, may cover anything from changes in licensing fees to new technical instruments

27. Bangladesh Sustainable Coastal and Marine Fisheries, World Bank, Sept. 2018
28. Bangladesh Sustainable Coastal and Marine Fisheries, World Bank, Sept. 2018

such as minimum gear specifications or change of fishing practices, by further legal rulings that are published in the Bangladesh Gazette. However, a few management rules, such as Hilsa nursery ground and spawning ground protection is regulated by the Fish Protection Conservation Rules amended in 2011. They generally issue fishing licenses to those boats/trawlers having registration certificates from the Mercantile Marine Department (MMD).

BOX: 1: Management Plan
Marine Fisheries Sector Sub-Strategy 2006

- For effective management of marine and coastal fisheries the management regimes are required to be divided into three principal categories, i. Artisanal Fisheries Management, ii. Mechanised Commercial Boat Fisheries Management and III) Industrial Trawl Sector Management.
- A Marine Fisheries Management Plan will be prepared based on existing information as a precautionary measure and updated as more information becomes available
- To carry out the job of management and monitoring of marine resources, management responsibility currently vested with the marine wing of DoF in Chittagong shall be decentralized and allocated to coastal districts and Upazilas. For this there is need for institutional strengthening and a Human Resource Development (HRD)
- A Monitoring, Control and Surveillance system needs to be implemented initially using the existing staff. Staff will be deployed throughout the coastal zone to improve the flow and quality of information and simultaneously capacity need to be build to provide technical support for the Monitoring, Control and Surveillance. As resources and staff become available this should be strengthened to ensure a robust supply of information on which a revised management plan can be based. This information would include assessment of the fish stocks, determination of the maximum sustainable yield (MSY) and the maximum economic yield (MEY) and develop biological information on the important fish and shellfish species. For this surveys and research on marine fisheries would be undertaken by DoF with participation of the BFRI, concerned universities and private /NGO sector institutions. This will also utilize the indigenous knowledge of the communities for an effective and rational development and management plan.

- For effective regulatory and enforcement activities cooperation and support of Local Government Institutions are to be sought and established at Upazila and district levels.
- Communities´ and fishermen's involvement must be ensured at all levels of planning and management, including MCS.
- Management regimes for the non-mechanized artisanal sector, mechanized boat sector and trawler sector shall be re-organized by specifying their fishing gear and area of operation. A new zonation will be made to demarcate operations of different types of fishing fleet, including the provision for protection of the nursery grounds within 5 meter depth of water or 5 km distance from the shore line.
- Marine Ordinance and Rules shall be revised to accommodate provisions and updated to resolve conflicts among stake-holders on exploitation of limited resources.
- Appropriate programs to identify and develop new fisheries based on the new or under-utilized fishery resources.
- Improved marketing and quality control should be promoted to maximise the benefit from the sector.
- The institutions given the responsibility should be strengthened in line with the importance of this function
- Increased co-ordination and linkages between the different institutions in the sector within the country, the region and internationally.
- Management plans must include specific advice on the management of particular species. A start has been made with the development of a management plan for hilsha. However, although hilsha is the most important species in the marine sector, specific management plans need to be developed also for other commercially important species.

The 'Marine Fisheries Ordinance 1983' defines depth zones, mesh sizes of nets, fish sizes to be harvested, fishing seasons and areas for different fisheries. However, there are limited interventions on industrial trawler operations and to some extent on the hilsa fisheries. This could have been at least a proper management, in the absence of updated stock status, if followed logically.

The freezer trawlers are permitted to fish for 30 days, while non-freezer trawlers are permitted to sail for up to 15 days. Shrimp trawlers must have at least 30% fin-fish in the total catch. This measure was enforced in order to limit the discard of by-catch. Govt. has imposed restriction on throwing any catch of fish or aquatic resources, except sea turtles, in the sea.

Cod end mesh of shrimp trawl nets are mandatory to be 45 mm and cod end mesh of finfish trawl nets are mandatory to be 60 mm to facilitate escape of small-sized fish, shrimp and juveniles of larger fishes. Since 2003, high profile drive by Coast Guards is ongoing in the coastal areas during February-May of every year against catching of jatka by finemeshed monofilament nets (Current jals). Mesh size of large meshed gill nets should be 200 mm and that of small meshed gill nets should be 100 mm. Cod end mesh of set bag nets are mandataory to be 30 mm.

Evidence suggests that there is significant under reporting of fisheries catches by Bangladesh's commercial fisheries, despite requirements for licensed vessels to maintain detailed catch records and to submit them at regular intervals. Previous studies have estimated that approximately 50% of Bangladeshi trawlers are under-reporting or fail to report their catch.[29]

Mercantile Marine Department (MMD)

In terms of managing the coastal fishing fleet, a further complication is that the capacity of the MMD is poor– this has hindered the registration of fishing vessels and their subsequent licensing for fisheries purposes. At present, only half the commercial fleet and under ten percent of the entire fishing fleet is registered and licensed. Again a recent proposal to provide a 'one stop service' where prospective applicants can both register vessels and obtain fishing licenses at a single point at district level has yet to start. Without the ability to understand the nature and capacity of the different fishing elements, it will be impossible to strategize, target and control fishing efforts.

Institutional management conflicts: Mercantile Marine Department (MMD), Ministry of Shipping, with limited operational bases in Chittagong and Khulna, has the sole mandate to register and provide fitness certificates to fishing boats. As a result they are unable to register vast majority of fishing boats that operates all over the coast from south-east to south-west and in open sea. Hence the DoF is no capacity to bring all the boats under licensing and fitness systems for allocation and administering sustainable harvest limits of the resources.

There are no set rules for practical linkage and coordination between the DoF and the Bangladesh Coast Guard (BCG) for the use of manpower and logistics for enforcing various regulatory measures in the coastal waters and the sea.[30]

29. BOBLME (2015) Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia. BOBLME-2015-Governance-15
30. Interview with Sr. officer of MFD

Marine Fisheries Resource Survey Unit

Marine Fisheries Resource Survey Unit of DoF based at Chittagong records and monitors marine fish catch, especially the trawl catch. At the moment, the catch is estimated mainly as group/species, e.g. hilsa, Bombay duck, pomfrets, Indian salmon, jew fishes, cat fishes, shrimps, elasmobranchs, others, etc.

Fisheries Resource Survey System (FRSS)

Fisheries Resource Survey System (FRSS) of the DoF records and monitor coastal and inland fisheries catch throughout the country. The FRSS produces Fisheries Statistical Yearbook of Bangladesh (FSYB) annually based on the annual catch monitoring. However, FRSS sometimes take estimates from the marine fisheries resource survey unit and publish it through the FRSS within the FSYB. Lack of comprehensive and reliable scientific data, especially for marine fisheries is a serious handicap for future development and sustainable management of Bangladesh's marine fishery. Among large number of marine species, species-wise catch and effort statistics are roughly available only for hilsa. For other species, gross catch statistics are available for different groups (croakers, pomphrets, mackerels, herrings, shrimps, sharks, etc.). Data collection and acquisition system is also unreliable and most data are not suited for use in scientific management purposes. Therefore, more reliable, more stratified data collection need to be ensured for each of the commercially important species.[31]

Monitoring, control and surveillance (MCS)

Enforcement of monitoring, control and surveillance (MCS) operations are very poor. MCS in the coastal fisheries is concentrated only in the surveillance of the industrial trawler fishery which contributes only about 6.88% of the catch and the artisanal fishery that contributes 93.12% are still beyond the MCS management.[32]

There is a single marine surveillance check post at Patenga, Chittagong, from where MCS activities are implemented. The Marine Fisheries Wing of the DoF has taken a plan to increase coastal/marine surveillance check posts. Besides, the BMFCB project of DoF is going to procure VTMS (vessel tracking monitoring system) for effective MCS implementation.

Under the present level of exploitation, it is felt that small-meshed ESBN, MSBN, trawl nets are detrimental for the growth, regeneration and maintenance of balance of the biological cycle and leading to decreased CPUE of unsustainable overexploitation year after year.[33]

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31. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute
32. Interview with academics
33. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute

Fishing capacity controls and Harvest Limits

While there are some broad technical instruments governing mesh sizes and minimum size restrictions, the absence of fishing capacity controls, harvest limits (e.g. total allowable catch, TAC) and by-catch controls have contributed to the difficulty in managing our coastal/marine fisheries and controlling the evident slide into the overfishing of key stocks. It is urgently needed that after proper stock survey of the marine fishes the extent of fishing pressure and level of exploitation both by artisanal and industrial fisheries be adjusted for achieving MSY. This has been clearly spelled out in the 'National Fisheries Policy 1998'. In the light of the 'National Fisheries Policy 1998', a pathway to achieve the objectives of the policy, several strategies for every sub-sector were formulated in 2006 by the DoF. It just needs proper action and implementation, sooner the better. Govt. has decided to encourage industrial fishing fleet to fish outside 500 m isobaths within EEZ in order to reduce fishing pressure in the coastal area and tapping virgin resources within the EEZ. However, no catch limit is applied to any vessel. There are some restrictions about species composition, discard proportion and area of fishing. In future, after proper assessment of the stock status, allocation of annual catch for important species like shrimp, hilsa, pomfrets, Bombay duck, croakers, threadfins, Indian salmon, jew fishes, grunters, anchovies, cat fishes, jacks/scads, elasmobranchs, etc. might be applied in terms of TAC (total allowable catch) for sustainable management of their stocks.[34]

Academic & Research Institute

It has been observed that there is lack of exchange, sharing, and coordination among the academic and research institutes of marine fisheries in Bangladesh.[35]

Stakeholders & Coordination

Marine fisheries management is a top down approach in Bangladesh without or poor involvement of the concerned stakeholders. Association for the marine fisheries include the Mechanized Boat Owners Association, the non-mechanized boat owners' association, the Fish Trawlers Owners Association, the Bangladesh Frozen Food Export Association, the Fish and Shrimp Processors Association and the Shrimp Hatcheries Association, among others. Similarly, thinktanks, such as the Bangladesh Shrimp and Fisheries Foundation are actively engaged in developing policy and industry recommendations. for improving aquaculture productivity and competitiveness.[36] In addition, trade union bodies of industrial trawler "

34. Interview with Sr. officer of MFD
35. Interview with academics
36. Bangladesh Sustainable Coastal and Marine Fisheries, World Bank, Sept. 2018

Samudrik Matsha Sikary Jahaj Sramik Union under Bangladesh Naojan Sramik Federation and coastal NGOs are also active in influencing policy and practice changes in the industrial marine sector of Bangladesh.There should have at least two (02) meetings in a year with the all stakeholders involved with the industrial marine fisheries in Bangladesh under the coordination of Director of MFD.

As advocated in the National Fisheries Strategy, a separate 'Marine Fisheries Directorate' is to be established and empowered with the responsibility to implement the Marine Fisheries Sector Sub-strategy. Officers of the Marine Fisheries Directorate will be trained and empowered to initiate and participate in appropriate co-management and/or community-based fisheries management initiatives. The nature and responsibilities of this new Directorate should be reflected in an updated marine fisheries ordinance. As advocated by the Marine Fisheries Sector Sub-strategy, posts of Marine Fisheries Officers need to be created and posted to each coastal Upazila, with development of district level marine capture fisheries management skills.[37] The 'Marine Fisheries Ordinance 1983' is applied between the baseline (10 fathoms or 18.29 m) and 40 m depth contour for artisanal fishery and beyond the 40 m depth contour for industrial fisheries. All artisanal gears ought to operate <40 m depth and industrial trawlers must operate beyond the 40 m depth contour. In practical situation both industrial and artisanal fisheries are competing and indiscriminately over-exploiting coastal and marine fishes, only from a limited area of within 0-80 m depths leaving the deeper area of the open sea, without any level of management for regeneration and maintenance of balance to the biological cycle of the marine population. This is mainly due to lack of updated recent data on stock status, severe competition within shallow water regions, inexperience of fishing practices in deeper zones and of the pelagic stocks. Fish harvest is increasing every year at the expense of over exploitation of stocks from a very limited area of the open sea due to ever increasing industrial and artisanal efforts, as a result CPUE is declining, species biodiversity is threatening and fishery becoming nonremunerative both for industrial and artisanal.

While unfortunately vast area of the open sea under Bangladesh's maritime is remaining unexploited, a situation no country can think of spoiling her valuable resources at the present time.[38]

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37. Interview, Faculty, Marine Fisheries Academy, Chittagong
38. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute

CHAPTER FOUR

Impact of industrial fishing on artisanal fisherfolk and ocean sustainability

In 2015, the sector employed 18.20 million people, or 11 percent of the population, including 1.4 million women, mostly in the artisanal sector.[39] The total no. of employment in industrial marine sector is insignificant around six thousand people are employed in industrial marine fishing. Traditionally this sector was dominated by low caste Hindu fishers (viz. koybarta, jalodas, das, rajbangshi, sutrodhar, malo, barman, majhi, etc.). But in recent times more and more landless and unemployed Muslims' have taken up fishing as an occupation. Males are the principal work force in this sector, be it fishing, gear and craft mending or transporting, icing, selling, etc. Females are engaged in sorting, de-heading shrimps and in the processing plants. Industrial trawlers are owned and managed by urban-based super rich people of the society outside of fishing community from Chittagong, Dhaka or elsewhere who hire captain, engineer, and crew on contractual basis. The total trawler fleets is a capital-intensive commercial industry. While most artisanal boats are owned as well by local money lenders from non-fishing community.[40] The sector affects hardly the poor fisherfolk community engaged in the artisanal fisheries. From management aspects greater emphasis, institutional support and surveillance is exerted for industrial fisheries which at present contribute only 18.3% of the harvestable amount. But the sector– the artisanal fishery, contributing 81.7% of the harvestable amount are given lesser emphasis, no institutional support and under no or very poor surveillance.

The sheer size of the fishing fleet consisting of more than 60,000 boats and some 247 industrial trawlers, is possibly contributing to the long-term overfishing in Bangladeshi waters. The fisheries resources in the Bay of Bengal have long been showing several indications of decline for lack of effective fisheries management in the past decades, particularly resulting in overfishing.[41]

Like other sectors, there exists activity conflict largely between the industrial and artisanal fishery. There are provisions for restricting the industrial trawlers for trawling within a 40 m depth zone to protect the nursery grounds of marine

39. Bangladesh Sustainable Coastal and Marine Fisheries, The World Bank, Sept. 2018
40. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute
41. http://www.ipsnews.net/2019/02/bangladesh-needs-intensive-surveys-gauge-potential-blue-economy/

fish and shrimp and preserve the interest of artisanal fishers. Often industrial trawlers operate in inshore waters defying operations in beyond 40 m depths in competition with artisanal fishers which are restricted with 40 m depth zones and the artisanal fishing boats go beyond 40 m depths for fishing.[42]

At present, over 200 industrial trawlers and about 68,000 artisanal vessels operate within a limited coastal waters belt, often using destructive gear to exploit multiple species.

Impact of industrial fishing on artisanal fishing and ocean sustainability

Continuously increasing fishing efforts in the coastal/marine fisheries has led to artisanal fisheries being too non-remunerative to survive. The destructive overfishing by industrial trawler affects the artisanal fishing and sustainability of BoB fishing resources.

i. Overfishing by the surplus number industrial trawlers approved by government without survey
ii. Unsustainable fishing with the illegal mesh size
iii. Destructive bottom trawling; and
iv. Damaging the net of artisanal fishers.

4.1 Overfishing by the surplus number industrial trawlers without proper survey

The development of the private sector for the off-shore trawl fishery commenced only after the confirmation of the presence of commercially exploitable shrimp resources. The number of privately-owned trawlers increased rapidly from only 4 trawlers operating in 1978 to about 100 by early 1985 and subsequently a total of 274 trawlers in 2017 were permitted to harvest off-shore marine fishery resources without any appropriate sustainable management planning.

Based on preservation capacities, industrial trawlers are of two kinds; trawlers having freezer and wooden body trawlers without freezers inside are non-freezer trawlers. Based on fishing mode they are also different types like bottom fishing trawlers, mid-water trawlers and shrimp trawlers. Gross tonnage capacity of industrial fishing fleet ranged between 56 to 148 mt for wooden body and 251 to 668 mt for steel hulled freezer trawlers.[43] At present 200 trawlers are operating in the BoB with modern 104 mid water trawler.[44]

42. Annual Report 2017, Department of Fisheries, Ministry of Fisheries and Livestock, http://fisheries.gov.bd/
43. Hossain MS, Chowdhury SR, Sharifuzzaman SM. 2017. Blue Economic Development in Bangladesh: A policy
44. Interview with MFD Officer

Industrial trawl fishery developed in Bangladesh, with the assistance of Russia, just after independence. As per Zaman Committee's Report of 1985 a total of 114 trawlers were imported up to December 1985. Later as per Task force's recommendation the MoFL freshly categorized those mixed trawlers as shrimp trawlers and non-shrimp trawlers (as fish trawlers) in March 1988. Following the increasing of trawler fleets, it was felt by the scientists and the policy makers that the number of trawlers should be reduced to encourage sustainable exploitation of the resources and trawler fleets were reduced to 72.[45]

In 1997 a government committee was formed led by Mahmudul Karim and suggested conducting a survey of the existing marine reserve before awarding any more licenses for fishing in the sea. In 1998 committee led by D.K. Chowdhury of MoFL also recommended not to issue new licenses for industrial fishing without survey.

Table 4.1: No. of Operating Industrial Trawler

Source: Interview with MFD Officer, Chottogram

Category /Type	**No.**
Shrimp trawler	35
Fish trawler (old)	36
Fish trawler approved during 2001-06	50
Fish trawler approved after 2008	34
Trial	45
Total	200

The BNP-led government had overlooked the recommendation first in 2002, and issued 50 licenses for marine fishing, including 10 for mid-water fishing. Most of them later had changed hands several times for huge sums of money before landing with genuine fishing companies. Following Awami League led government issued 34 more licenses violating the recommendations of the expert committee.

Furthermore,the court issued them temporary permits for three months and asks the government to show why the trawlers should not be allowed to fish all the time. Industry sources say the government never takes these notices seriously so renewed temporary permits last for years; which creates overfishing in the BoB. According to an expert "Fish living at the bottom of

45. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute

the sea, or demersal stock, is deteriorating." Experts fear this over-fishing by about 50 percent will be "disastrous" for fish stocks. Fishermen and trawling companies agree that their catches are declining.[46]

The stock assessment of fishery resources was carried out in 1973, 1981 and 1983, and the current survey (DoF-FAO, 2016-17) is ongoing with the research vessel RV Meen Sandhani (Table 3.2). However, recent declining trends of the catch-per-unit-effort (CPUE) by commercial trawlers indicate an alarmingly dwindling stocks, despite the overall total (catch) seems to be increasing in the short run that might be correlated to increased number of vessels in operation and use of underwater fish finder technology.[47]

Table 4.2: Standing Stock (tonnes) of Marine Fisheries in Bangladesh

Demersal Fish	Pelagic	Shrimp	Reference
264000-373000	-	9000	West
160,000	90,000-160,000	-	Saetre (1981)
200,000-250,000	160,000-200,000	4000-6000	Penn (1983)
Ongoing	Ongoing	Ongoing	DoF-FAO (2016-17)

Source: Hossain MS, Chowdhury SR, Sharifuzzaman SM. 2017. Blue Economic Development in Bangladesh: A policy guide for marine fisheries and aquaculture. Institute of Marine Sciences and Fisheries, University of Chittagong, Bangladesh

The no. of licenses has increased more than three times. Annual marine catches have increased in Bangladesh due to a rise in the number of nets and boats and overfishing with modern technology. But catch per net has dropped, indicating that marine stock is decreasing. The results of over-exploitation may be disastrous from the resource sustainability point of view. From 1987 to 2018, the catch of marine fish has increased around 10 times (Figure 3.1) despite having decrease of catch per net, which indicates destructive overfishing in the area allocated

46. Interview with the expert and The Daily Star, August 7, 2010, https://www.thedailystar.net/news-detail-149731

47. Hossain MS, Chowdhury SR, Sharifuzzaman SM. 2017. Blue Economic Development in Bangladesh: A policy guide for marine fisheries and aquaculture. Institute of Marine Sciences and Fisheries, University of Chittagong, Bangladesh

for artisanal fishing within 40 m depth. During the field visits for this study the crew of the industrial trawlers admitted that industrial trawlers fish within 40 m depth at night generally and fish within 10 m depth area during the winter season particularly. As their gear is non-selective, they harvest sizes of fish and shrimp, which fall under the post-juvenile and pre-adult categories, thereby restricting adult recruitment of a part of the population.[48]

Both artisanal and industrial fishing has been competing to catch the alreadydeclining marine fish within the same area in the BoB. This happened due to lack of marine fisheries governance which led to a harvesting boom in the 1990s, followed by depletion of traditional stocks and structural changes of the sector's labor force. Available landing data, albeit limited, suggest that the demersal fishery is at near collapse, fishing is moving down the ecosystem ladder to lower-valued species, and overharvesting by industrial and semi- industrial/artisanal fleets is causing stock depletion. In the process, the economic profile of fishers in the industrial and motorized artisanal fleets has also changed. Control of productive assets has moved largely away from professional fishers into the hands of investors and middlemen, de facto converting traditional fisheries into hired labor. Both small- and large-scale fishing operations are now linked to Bangladesh's national and international trade in seafood, operated through a complex system of multiple merchants and middlemen that brings little added value and comes at excessive cost for fishers and consumers alike.[49]

4.2 Unsustainable fishing using illegal mesh size

Catch composition of industrial trawlers indicates unsustainable overfishing utilizing illegal mesh size. The fisheries of the Bay of Bengal have been under pressure for decades and are now severely depleted. Many once-abundant species have all but disappeared. Particularly badly affected are the species at the top of the food chain. The bay was once feared by sailors for its man-eating sharks; they are now rare in these waters. Other apex predators like grouper, croaker and rays have also been badly hit. Catches now consist mainly of species like sardines, which are at the bottom of the marine food web.[50]

Furthermore, the important commercial spices of fish that comprises 75% of the catch in the 80-90s (Table 4.3) has almost been disappeared.

48. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute
49. Bangladesh Sustainable Coastal and Marine Fisheries, The World Bank, Sept. 2018
50. https://www.theguardian.com/environment/2017/jan/31/bay-bengal-depleted-fish-stocks-pollution-climate-change-migration

The people engaged with the industrial fishing confirmed during interview and FGD.

Table 4.3 Important species that contribute about 75% of the catch (Lamboeuf 1987)

Scientific Name	English/common name	Local/Bangla name
Pampus argentius	Silver pomfret	Foli chanda
P. chinensis	Chinese pomfret	Rup chanda
Pomadasys hasta	White grunter	Datina
Lutjanus johni	Red snapper	Ranga koi
Polynemus indicus	Indian salmon	Lakkha
Lepturacantus savala	Ribbon fish/hair tail	Churi
Arius spp.	Cat fish	Aeir/Kata mach
Johnius belangerii	Croaker	Rupali poa
Otolithoides argentius	Croaker	Poa
Namipterus japonicus	Japanese threadfin bream	Rupban
Upenus sulphurus	Goat fish	Sonali bata
Saurida tumbil	Lizard fish	Choukkha, Barochoukkha
Ilisha filigera	Big eye ilisha	Choukkha pasa
Sphyraena barracuda	Great barracuda	Darkuta
Muraenesox telabonoides	Indian pike conger	Kamila

Source: Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute

Table 4.4 During FGD, the workers identified and ranked the following fish as available

Name of the fish (local Bangla name)	Ranking in terms of availability
Aila	1
Illis	1
Chapila	2
Loitta	2
Churi	3
Kolombo	2
Lalmach	3

Source: FGD with the workers of Industrial Trawler at Karnaphuli River

The DoF published statistics also reflects the changes of catch composition and overfishing.

The fisheries resources in the Bay of Bengal have long been showing several indications of decline for lack of effective fisheries management in the past decades, particularly resulting in overfishing. Different data indicate that many large fish species like Lakkha (Indian Salmon) and Coral fish, which were available in past years, are hardly found in the country's waters now. "If this trend continues, the marine areas are likely to be turned into an almost barren zone for fish within 10 years or so. So, immediate measures are required for effective fisheries management, the Gulf of Thailand had lost all its fish in the space of just 40 years". [51]

Datina, Bara kata, Koi, Lakkha has been identified as almost disappeared fish by the workers in the industrial trawlers.

Catch of unsorted other fishincreased from 68% to 86% during 2006 to 2011 (Figure 3.2 & 3.3). As the statistics show total industrial catch gradually increased form 34,084 t in 2005-06 to 41,665 t in 2010-11 (Figure 3.1), it seems that decreased percentages of cat fish, jew fish and shrimps during these six years are simply due to statistical changes of unsorted other fishes (Fig. 3.2). This obviously reflects problems in identification of small-sized fishes (as more and more juvenile, immature fishes are being harvested), hence clumped into unsorted other fishes. Bulk harvesting of juveniles and immature fishes also reflect overfishing condition.

Figure 4.2 : Catch Composition 2005-06

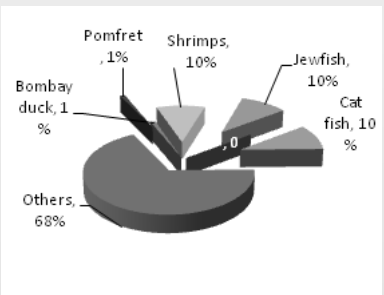
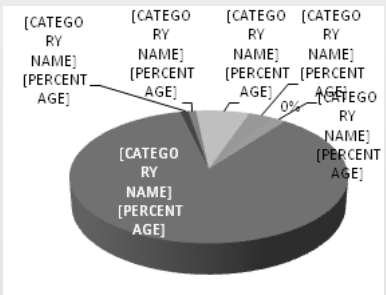


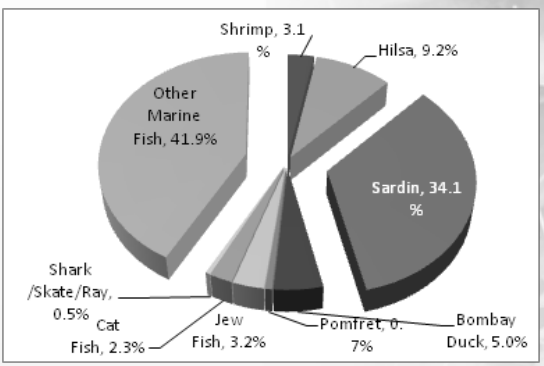
Figure 4.3 : Catch Composition 2010-11



Source: Source: Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute

51. Sayedur Rahman Chowdhury of the Institute of Marine Sciences and Fisheries at Chittagong University, http://www.ipsnews.net/2019/02/bangladesh-needs-intensive-surveys-gauge-potential-blue-economy/

Figure 4.4: Figure: Species-wise Catch of Industrial Marine Fisheries 2017-18



Source: Yearbook of Fisheries Statistics of Bangladesh 2017-19

At present (2018) this trend of depletion and overfishing is severe; the total amount of industrial marine catch increased at 120087 mt in 2018 (Figure 3.1) comprising significant portion is Sardin, is more than 34% (Figure 3.4). According to the insiders, the ban contributed increased catch from BOB.[52] However, the catch increase of Sardin is bad news as it indicates depletion and overfishing; the fishes which survive eating Sardin have been depleted or decreased.[53]

According to marine fisheries ordinance 1983, it is mandatory to use 45 mm and 60 mm mesh size at the cod end for the shrimp and fish trawl nets, respectively to facilitate the escape of small sized fish, shrimp and the juveniles of larger fish species. The workers of the trawlers and experts said during interviews that this rule is being violated; and workers have to work at least 4 more hours per day when using this net.[54]

The expert opinion about the mesh size is that, rather frontal (mouth part of the net) mesh size is more important than cod end mesh size. If the mesh size of the bottom trawl nets are either 300 mm or bigger at the entrance part and gradually lowered downed to 25-45 mm in the cod ends then small fish would get easy chances to escape. Most fish die once they reach up to the cod end, increasing the mesh size of the cod end would simply mean dumping of dead fish in the sea.[55]

52. FGD & Interview
53. https://www.bd-pratidin.com/last-page/2019/01/12/391203?fbclid=IwAR2QWZ73zWYhmwRHq_pfOz0OpvvhUHf8lFR0mi0zbneYr5sZrjG1jxretcE
54. FGD with the workers of industrial trawler & interview with an expert at Institute of Marine Science, University of Chittagong
55. Interview with an expert of Marine Fisheries Academy, Chittagong

4.3 Destructive Bottom Trawling

Bottom-trawling is regarded as one of the most unsustainable and environmentally destructive fishing methods around the globe. The bottom trawls are damaging benthic habitats and shrimp grounds and has very high discard rates of around 70-80% of the total shrimp trawler catch– this amounts to approximately 30,000-35,000 MT fin-fish discarded per annum (Huntington et al. 2008).[56] During field visit it has been observed that a good marketing system has been developed on "trash" selling (Photo 3.1).

(DoF) is successfully negotiating with the owners of 'bottom-trawling only' marine fishing vessels to convert all bottom-trawlers into 'eco-friendly mid-water' trawlers. According to DoF, to date total 63 bottom-trawlers have been converted to modern trawling vessels for mid-water trawling. According to official statistics, this means still 97 'bottom-trawling only' vessels remain in operation. DoF hopes the rest of the bottom-trawlers will be converted too. Traditional small trawlers (wooden or steel-made) based in Chittagong Fish Harbor are purpose-built for bottom-trawling, to operate trawl nets onto the relatively shallow sea-bed. They need minimum structural capacity and engine power to operate trawl in shallow depth for demersal fish species. What barred them to operate in deeper sea and in mid-water is their small size, structural and engine power limitations.

Figure 4: Trash (bycatch) from bottom trawling

The new 104 heavily-built modern ships have the generic identity 'mid-water trawler' attached with them, with almost 3 times more engine power-8 times more vertical opening of the trawl (net) and modern gears they can easily operate in far and deeper sea for school of pelagic fish species. And most importantly they have more capacity to operate bottom trawl in greater depth for demersal species too. With emergence of improved fishing gear technologies, one can now use the same trawl net in the surface, into mid-water, and onto the bottom. With modernizing of the vessels, what actually happening is, the number of

56. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute

deep sea fishing vessels with capacity of simultaneously bottom, mid and surface trawling is increasing. To operate a bottom-trawl haul, a 'mid-water trawler' needs to just lower down its trawl nets onto the sea bed. And the haul will end up with 'higher catch efficiency than traditional Thai nets' used by the small bottom trawlers, with more destruction of the sea-bed ecosystem, benthic community, and with more discarded-by catch.[57]

"We don't discard now anything which was a practice of earlier; even we collect trashes from the seabed; the wholesale price of per kg trash is TK. 14; this trash is being used for poultry feed".[58]

Figure 5: Trash from bottom trawling

These trash collections were once called bycatch and were largely discarded. Today the collateral damage of the trawling industry is processed and sold to the fast-growing poultry and aquaculture industries of the region. In effect, the processes that sustain the Bay of Bengal's fisheries are being destroyed in order to produce dirt-cheap chicken feed and fish feed. The bottom trawling practices also scooped up whole seafloor ecosystems as well as vulnerable species like turtles, dolphins, sea snakes, rays and sharks.[59]

The artisanal fishermen informed that the industrial trawlers damages their nets; and they are helpless to redress the problem.

Despite the slowness of the rate of implementation of the rules and regulations to manage the marine fishery, some important management tools are in

57. https://www.daily-sun.com/post/148058/2016/06/29/How-to-stop-bulldozing-the-Bay-of-Bengal
58. Interview with a officer at industrial trawler
59. https://www.theguardian.com/environment/2017/jan/31/bay-bengal-depleted-fish-stocks-pollution-climate-change-migration

practice such as, mesh size control, control of monofilament net (current jal), reduction of juvenile hilsa (jatka) catch, control of illegal, unreported and unregulated (IUU) fishing.

Figure 6: Artisanal Fishermen at Fishery Ghat, Chittagong

4.4 ILLEGAL UNREGULATED AND UNPROTECTED (IUU) FISHING

The marine fishery sector is largely unregulated and open access to the common fisheries resources. Existing fisheries governance and management regimes, which are unable to curb domestic illegal unregulated and unprotected (IUU) fishing, have led to unsustainable fishing levels and sector underperformance.[60] This failure has been affecting the sector in general and specially the poor and weak artisanal fishers.

The legal framework by which the DoF manages Bangladesh's fisheries is contained within The Marine Fisheries Ordinance (1983)6, as implemented by the Marine Fisheries Rules (1983). This regulation stipulates specific fisheries management tools to be utilised by the DoF, such as vessels licences, gear restrictions, and provisions for demarcating marine reserves. Fines and penalties associated with violations of fisheries laws are also clearly stated. However, this legislation is acknowledged to be out dated and in need of revision. [61]

60. Bangladesh Sustainable Coastal and Marine Fisheries, The World Bank, Sept. 2018
61. http://iwlearn.net/iw-projects/1252/reports/IWS-09%20Country%20Report%20-%20Bangladesh.pdf

Catch reconstructions for Bangladesh are presented in the Sea Around Us database which account for illegal, unregulated and unreported (IUU) catch in the form of under-reported commercial catch, discarded by-catch and subsistence catches (Ullah et al., 2014). Bangladesh's catch records are poorly defined as a substantial quantity of catches are not reported to species level.[62]

IUU and Fleet breakdown

It is simple breakdown of the fleets operating (up to a maximum of 5-6) by flag State (and nationalities of owners and other legal personalities), gear types, target species, modus operandi, drivers of IUU activity, trade routes).

Table 4.5 The fleet breakdown for Bangladesh

SL No.	Description	Gear	Flags	Target Species	Comment
1	**Coastal Artisan**	Set bag nets	Bangladesh	Mixed	Majority of the nation's marine wild capture production
2	**Shrimp fry fishing**	Drag and Push Nets	Bangladesh	Shrimp fry	Illegal fishery
3	**Semi-industrial gill net**	Gill net	Bangladesh	Mixed	Operate in water deeper than 10m
4	**Industrial Domestic**	Double rigged shrimp trawl and stern trawl	Bangladesh	Shrimp Finfish	
5	**Indian Trawl**	Trawl	India	Shrimp	Illegal Fleet
6	**Foreign Industrial from other regional states**	Trawl	Thailand India Myanmar Sri Lanka	Mixed	Illegal Fleet

Source: BOBLME (2015) Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia. BOBLME-2015-Governance-1

62. BOBLME (2015) Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia. BOBLME-2015-Governance-1

Coastal Artisan

IUU fishing activities associated with Bangladesh's domestic artisanal fleet includes, fishing without licenses, poaching in protected areas and violating spatio-temporal

Table 4.6 The fleet breakdown for Bangladesh

SL No.	Description	Gear	Flags	Target Species	Comment
1	Coastal Artisan	Set bag nets	Bangladesh	Mixed	Majority of the nation's marine wild capture production
2	Shrimp fry fishing	Drag and Push Nets	Bangladesh	Shrimp fry	Illegal fishery
3	Semi-industrial gill net	Gill net	Bangladesh	Mixed	Operate in water deeper than 10m
4	Industrial Domestic	Double rigged shrimp trawl and stern trawl	Bangladesh	Shrimp Finfish	
5	Indian Trawl	Trawl	India	Shrimp	Illegal Fleet
6	Foreign Industrial from other regional states	Trawl	Thailand India Myanmar Sri Lanka	Mixed	Illegal Fleet

Source: BOBLME (2015) Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia. BOBLME-2015-Governance-1

Coastal Artisan

IUU fishing activities associated with Bangladesh's domestic artisanal fleet includes, fishing without licenses, poaching in protected areas and violating spatio-temporal fishing bans.[63] All trawl vessels are mandated to obtain a fishing license for a year which grants them permission to fish within the EEZ. Since the adoption of the Marine Fisheries Ordinance, licensing requirements have been extended to all mechanised and non-mechanised boats: Mechanised vessels were brought under a licensing system in 1992, whereas non-mechanized boats were included under the licensing system in January 2001.[64]

63. BOBLME (2015) Review of impacts of Illegal, Unreported and Unregulated fishing on developing countries in Asia. BOBLME-2015-Governance-1
64. The Marine Fisheries Rules (Amendment), 1992 (No. S.R.O. 275 - Rule/92, December 1992 of the Ministry of Fisheries and Livestock).

At present, over 200 industrial trawlers and about 68,000 artisanal vessels operate within a limited coastal waters belt, often using destructive gear to exploit multiple species. Both industrial

and artisanal fleets are treated as a single multispecies fishery, but only the former is subjected to some measure of practical monitoring. Licensing and monitoring is severely inadequate due to limited institutional capacity, with less than 3 percent of the artisanal fleet currently holding valid licenses and only about 50% of the industrial fleet subject to partial monitoring, control and surveillance (MCS) coverage.[65]

Mercantile Marine Department (MMD), Ministry of Shipping, with limited operational bases in Chittagong and Khulna, has the sole mandate to register and provide fitness certificates to fishing boats. As a result, they are unable to register vast majority of fishing boats that operates all over the coast from south-east to south-west and in open sea. Hence the DoF is no capacity to bring all the boats under licensing and fitness systems for allocation and administering sustainable harvest limits of the resources.[66]

Marine Fisheries Office (MFO) under DoF provides license for mechanized fishing vessels but the licensing required prior Certificate of Inspection (COI) from MFO and vessel registration from the Marine Mercantile Office (MMO). At present combined camps are being operated by MFO and MMO at different fishing sites to provide the same through one stop service.[67]

Table 4.7: Licensing activities of mechanized fishing boats

Year	License Issues (No.)		
	New	Renew	Total
2013-14	614	1226	1840
2014-15	319	1167	1486
2015-16	273	1269	1542
2016-2017	313	1255	1568

Source: Annual Report 2017, Department of Fisheries, Ministry of Fisheries and Livestock, http://fisheries.gov.bd/

65. Bangladesh Sustainable Coastal and Marine Fisheries, The World Bank, Sept. 2018
66. Marine Fisheries Bangladesh: Prospect and Potentialities, 2013, BOBLME Project, Bangladesh Fisheries Research Institute
67. Annual Report 2017, Department of Fisheries, Ministry of Fisheries and Livestock, http://fisheries.gov.bd/

The small-scale fishers of Bangladesh are reported to fish illegally within the nation's inland and marine protected areas.

- People are fishing and poaching in no-take-areas in the Sundarbans. Rampant fishing takes place throughout the Sundarban Reserved Forest (SRF) despite fishing activity being banned;
- Fishing methods practiced in the Teknaf Game Reserve are often against regulations;
- Fishing by poison in canals inside the Sundarbans to catch fish easily;
- Fishing some of the sharks and ray species that are globally 'Threatened, Vulnerable or Endangered'[68] ; and
- Fishermen have also been implicated in violating temporal fishing bans designed to protect populations of hilsa. According to a newspaper report, on 18 March 2019 a mobile court sentenced four fishermen to one-year jail each and fined 14 other fishermen for catching fish in the Meghna river for violating the ongoing two-month ban on catching of all sorts of fish in the Padma and the Meghna rivers in 100-km area from Laxmipur to Chandpur from March 1 to April 30 to protect jatka (hilsa fry less than nine inches long). A joint team of coast guards, Department of Fisheries and River Police conducted drives in the river from 12pm to 10:30pm and arrested the fishermen along with six engine-run boats and 30,000 metres current net. The seized net was burnt. Later they were produced before the mobile court led by assistant commissioner (land) and acting upazila nirbahi officer Fahmida Mostafa which sentenced four fishermen to one-month jail and fined 14 fishermen Tk 3,042 each.[69] Similarly, on 14 Oct. 2019, at least 128 people were arreste in connection to illegally nettinghilsa, despite the government's ongoing 22-days ban on netting mother hilsa in the Padma, Jamuna, Meghna Rivers crossing six districts.[70]

68. https://www.thedailystar.net/star-weekend/environment/fighting-save-the-giants-the-seas-1581055
69. https://www.daily-sun.com/post/378805/2019/03/19/Four-fisherman-jailed-fourteen-fined-for-violating-ban-in-Laxmipur--
70. https://www.dhakatribune.com/bangladesh/nation/2019/10/15/128-buyers-fishermen-held-for-netting-ilish-defying-ban

THE IMPACTS OF IUU FISHING

There are clear impacts of unlicensed fishing by national and foreign vessels in Bangladesh's EEZ. For example, the management of stocks will be negatively affected due to the consequential unknowns relating to harvest rates and stock status. There will also be direct losses to the Bangladeshi economy through the loss of licensing revenues from national and foreign boats, and indirect losses associated with the depletion of commercially exploited stocks. Furthermore, illegal fish caught by foreign vessels are unlikely to be landed in Bangladesh, and it is more likely they will be landed in ports in India, Thailand, Myanmar and Sri Lanka. This will result in a loss of national revenue in the form of potential taxation and other potential benefits to local industry.

Death by poison: A constant threat for Sundarbans crustaceans and fish

A few drops of poison are all it takes to decimate fish and crustacean stocks in a Sundarbans canal. The poachers who cruise the waterways of the world's largest mangrove forest in search of valuable shrimp and crabs regularly use poison. Crustaceans clamber ashore within minutes to escape the toxin and are easily collected. Fish die en-masse, carcasses left to float away on current and tide. "Some locals from Marapasur, Dangmari, Jhapshi and Jongra villages in the Sundarbans area are known to persistently fish using poison," says the divisional forest officer of Sundarbans East Division, Mahamadul Hasan. "It's not only the canals they fish that are affected. The toxic water flows into the larger rivers, damaging the aquatic ecosystem there as well." He says stern measures are taken against poachers who are caught.

"We have eighteen canals across the Sundarbans where all fishing is banned, because they are important spawning grounds," says Bashirul Al Mamun, the divisional forest officer in Sundarbans West Division. "Yet fishing with poison has never ceased. In the last five years 37 poachers have been sent to jail for the crime; to protect fish breeding cycles, law enforcement agencies must continue to take stern action against any who violate the fishing prohibition."

Source:https://www.thedailystar.net/country/death-poison-constant-threat-sundarbans-crustaceans-and-fish-1462498

Table 4.8: IUU Fishing Risk Identification

Risk Category	Specific Risk
Unlicensed/unauthorised fishing within territorial sea, contiguous zone or exclusive economic zone	Unlicensed fishing in EEZs by national boat
	Unlicensed fishing in EEZs by boats from regional States (India, Thailand, Sri Lanka, Myanmar)
Non-compliance with reporting obligations by licensed/authorised vessel	Under-or non-reporting target species (artisanal and industrial domestic fleets)
	Misreporting of bycatch species
Non-compliance with other licence conditions and/or legislation	Illegal fishing related to spatio-temporal closures (depth zone restrictions, hilsa shad closed seasons)
	Violation of rules on discards (30% of Catch must be finfish)
	Use of prohibited/destructive gear
Other offence	Illegal harvest/possession of vulnerable species (shrimp fry)
	Illegal fishing related to spatio-temporal closures (protected areas)
	Bribery/obstruction/mistreating of observers or fisheries officers

Under- or non-reporting target species by the artisanal and industrial domestic fleets, misreporting of bycatch species, and non- or delayed submission of logbooks will have similar impacts as previously mentioned, in terms of unknown harvests and stocks. Again, there is the potential loss of national revenue from potential taxation on landings. Significant under- or non-reporting target species (artisanal and industrial domestic fleets) is reported to occur in Bangladesh. For example, it has been reported that for the industrial trawl fisheries that 50% of the fleet under- or non-report their catch. Furthermore, unreported artisanal catch has been considered a significant proportion of previous catch reconstructions (Ullah et al., 2014) for Bangladesh. Given the high rates of non-reporting coupled with the weakness of the deterrents in place it is estimated that an additional 20-40% of the national reported catch is unreported. Misreporting of bycatch species by the domestic fleets is estimated to contribute significantly to the unreported catch.

Illegal fishing related to spatio-temporal closures (depth zone restrictions, hilsa shad closed seasons) is reported to extensively occur in Bangladesh and is estimated to contribute to the national illegal catch. Specifically, the hilsa shad fishery closed seasons are acknowledged to be regularly violated. Illegal fishing related to spatio-temporal closures of depth zone restrictions and hilsa shad closed seasons is likely to have profound impacts. The use of trawl gear in the inshore zone may damage sensitive habitats and may result in conflict between artisanal and industrial fishers. The violation of the hilsa shad closed season, a temporal fishing ban designed to conserve an important fisheries species, will contribute to the further exploitation of an extensively exploited species.

Similarly, Illegal fishing related to spatio-temporal closures (protected areas) is likely to significantly impact highly vulnerable species. Given the high

519 Indian fishermen in Bangladesh safe custody

At least 519 fishermen along with 32 Indian fishing trawlers were taken into safe custody by the Coast Guard at Paira seaport in Kalapara of Patuakhali district yesterday afternoon. As the sea was turbulent on account of inclement weather, the Coast Guard personnel took the fishermen to Paira seaport from the deep sea area where they had been catching fish after crossing the border into Bangladeshi waters on Sunday noon. The Coast Guard later kept them in custody. The Commander of the Paira Seaport Coast Guard contingent, Rezaul Karim, said, "The names of the trawlers and fishermen are being listed. As there are many trawlers, it is time-consuming," he said. "The Coast Guard is also investigating whether there are any illegal items in the trawlers."The assistant commissioner (land) of Kalapara, Anup Kumar Das, said, "The fishermen are inhabitants of West Bengal of India. All of them speak Bangla.'Kalaparaupazilanirbahi officer (UNO) Munibar Rahman said because of adverse weather conditions, the Indian fishermen had crossed the Bangladeshi water borderline seeking safety. But several sources at Mahipur fish port alleged that because of the restrictions on fishing in the sea, the Bangladeshi fishermen did not go to sea to catch fish, but Indian fishermen did not stop there. Indian trawlers roam around the Bangladeshi water borderline everyday, netting fish. "If the Bangladeshi fishermen violate the waters of India, they have to return to the country after months in jail. But for the Indian fishermen, there is no punishment for illegal infiltration into our country."

Source: The Daily Independent, 8 July 2019, http://www.theindependentbd.com/post/206407

incentives, high catch volumes, and frequently reported violations it is estimated that an additional 10-50% of the reported hilsa shad catch is taken illegally.

Unlicensed fishing in Bangladesh's EEZ by boats from regional States (India, Thailand, Sri Lanka, and Myanmar) is widely acknowledged to occur in the Bangladeshi waters, with shrimp trawlers from India regarded as the most common offender. Catches from these vessels are hard to estimate. Given the high frequency of the offence, nature of fishing practice (trawling for shrimp by Indian vessels is likely to have significant discard rates) and the relatively weak deterrents in place, it is estimated that an additional 5-20% over the total national reported catch is taken.

Violation of rules on discards (30% of trawler catch must be finfish) is acknowledged to occur in Bangladesh and is likely to have serious impacts on marine ecosystems as substantial quantities of bycatch will be discarded at sea. The use of prohibited gear and the illegal harvest/possession of shrimp fry in Bangladesh are considered to have significant negative impacts on shrimp, finfish and other marine populations where prohibited gears are used. The extent of extraction of shrimp fry conducted with small mesh size nets is thought to remove significant proportions of shrimp and other species groups before spawning age. Bribery/obstruction/mistreating of observers or fisheries officers is another factor which may have significant impacts on fish stocks and the marine environment.

Foreign Industrial trawlers

India is regarded as the foreign nation which most frequently violates Bangladesh's maritime sovereignty, and numerous arrests of Indian nationals for such offences are published in the media. The exact scale of illegal fishing by Indian vessels is unknown; however, it was recently stated by the former major, Zia Uddin (Chairman of Dubla Fisherman Group, the country's largest marine fishing organization), that between 30 and 100 fishing boats from India venture into Bangladesh waters and flee with hundreds of tonnes of marine fish daily. Additionally, illegal fishers from India are thought to use gears which are prohibited in Bangladesh. Other nations have also been implicated in fishing illegally in Bangladeshi waters, including Thailand, Myanmar and Sri Lanka.

Industrial domestic trawlers

Bangladesh's industrial fisheries are reported to undertake a variety of activities which violate national fisheries law, such as misreporting, discarding and fishing within/during spatio/temporal closures. Previous studies indicate

that significant under-reporting occurs in Bangladesh's commercial fisheries. For example, Ullah et al. (2014) estimate that a substantial proportion (50%) of Bangladeshi industrial trawlers under-report or completely fail to report their catch (Ullah, H. World Fish Center. pers. obs. as presented in Ullah et al., 2014), and this is somewhat corroborated by Rahman (2001) who states that shrimp trawlers provide little information pertaining to their landings. This is in contradiction of Regulation 14 of the Marine Fisheries Ordinance of 1983, which stipulates that licensed vessels must keep detailed records of catches and report them to the Fisheries Director at monthly intervals or when requested. Bangladesh's domestic trawlers are also considered to regularly violate the depth restrictions imposed on them: Trawling is meant to be limited to waters deeper than 40m, however Islam (2003) reports that trawlers regularly fish in shallower waters up to 20 m depth.

CHAPTER FIVE

Sustainable Development Goal (SDG) and Marine Resources in Bangladesh

SDG 14 is "Life below water" looks to "conserve and sustainably use the oceans, seas and marine resources" and articulates ten targets and their corresponding indicators to help countries and agencies achieve this goal. Most of the indicators for the SDG 14 targets are classified as tier 3; this is the lowest-ranking SDG indicator, which illustrates that "no internationally established methodology or standards are yet available for the indicator". [71]

SDG 14 Targets

Target 14.1: *By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.*	**Target 14.6:** *By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation.*
Target 14.2: *By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.*	**Target 14.7:** *By 2030, increase the economic benefits to small island developing states and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.*

71. United Nations Statistical Division 2018, tier classification for global SDG indicators. http://tinyurl.com/y4ls2vj8

Target 14.3: *Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels.*	**Target 14.A:** *Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries.*
Target 14.4: *By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.*	**Target 14.B:** *Provide access for small-scale artisanal fishers to marine resources and markets.*
Target 14.5: *By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information.*	**Target 14.C:** *Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources.*

The complicated nature of social and economic systems related to the oceans and the complex ecosystems related with SDG 14 is critical for several reasons.

Oceans cover 71% of the earth's surface and are home to up to 2.2 million species. They regulate global climate, mediating temperature, driving weather

systems and determining rainfall, droughts and floods: 83% of the world's carbon cycle is circulated through the ocean, which absorbs around 30% of the annual anthropogenic carbon emissions released to the atmosphere.[72] Globally over 3 billion people depend on marine and coastal biodiversity for their livelihoods. Increasing levels of debris in the world's oceans are having a major environmental and economic impact.

Furthermore, improper marine management results in overfishing. The lost economic benefits from the fisheries sector are estimated to be around US$50 billion annually. The UN Environment Programme (UNEP) estimates the cumulative economic impact of poor ocean management practices is at least US$200 billion per year.[73]

SDG 14 AND BANGLADESH

The Bay of Bengal and the coastal regions are the backbone of national economy of Bangladesh. It has potentials of generating jobs for millions living along the coastline, in islands and across Bangladesh protecting biodiversity, conservation through community led sustainable management approach. In comparison to total fisheries and particularly the marine fisheries, the contribution of industrial marine fisheries meagre because almost all of Bangladesh's marine fishing is carried out in shallow and shelf waters, beyond which no fishing is being currently done due to lack of vessel capacity and appropriate fishing technologies. Furthermore, the ocean ecology in Bangladesh has been facing the challenges of overfishing, and pollution described in section ???. There are10 indicators and 9 data providers for the 10 targets of SDG 14.

Target	Indicator	Data Providers
14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	14.1.1: Index of coastal eutrophication and floating plastic debris density	(1) DoE, MoEF (2) MoS (3) BN, MoD

72. MEL Handbook for SDG 14, IIED, London, March 2019, http://pubs.iied.org/16644IIED
73. https://www.un.org/sustainabledevelopment/wp-content/uploads/2018/09/14.pdf

14.2 - By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans	14.2.1 : Proportion of national exclusive economic zones managed using ecosystem-based approaches	(1) DoE, MoEF (2) Bangladesh Forest Department (BFD), MoEF
14.3 - Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels	14.3.1 : Average marine acidity (pH) measured at agreed suite of representative sampling stations	DoE, MoEF
14.4 - By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	14.4.1 : Proportion of fish stocks within biologically sustainable levels	(1) BBS, SID (2) DoF, MoFL
14.5 - By 2020, conserve at least 10 per cent of coastal and marine are as, consistent with national and international law and based on the best available scientific information	14.5.1 : Coverage of protected areas in relation to marine areas	(1) DoE, MoEF (2) Bangladesh Forest Department (BFD), MoEF (3) DoF, MoFL Triennial (2016-17, 2019-20, 2022-23)

14.6 - By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and over fishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation, the DOHA Development Agenda and the Hong Kong ministerial mandate.)	14.6.1 : Progress by countries in the degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing	(1) DoF, MoFL (2) BN, MoD
14.7 - By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism	14.7.1 : Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries	(1) DoF, MoFL (2) NAW, BBS, SID

14.a - Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries	14.a.1 : Proportion of total research budget allocated to research in the field of marine technology	FD
14.b - Provide access for small-scale artisanal fishers to marine resources and markets	14.b.1 : Progress by countries in the degree of application of a legal/regulatory/policy/ institutional framework which recognizes and protects access rights for small-scale fisheries	DoF, MoFL
14.c - Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of "The future we want"	14.c.1 : Number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the United Nations Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources	MOFA

Source: SDG Tracker, Bangladesh Mirror, http://www.sdg.gov.bd/page/indicator-wise/1/186/3/0#1

Prioritized indicators of SDGs in Bangladesh[74]

To ensure Sustainable Development Goals in Bangladesh by leaving no one behind in most possible short time, a set of 39 indicators has been selected under the instructions of SDG Working Committee of The Prime Minister's Office. Under this indicators, some of the indicators are selected from the global Sustainable Development Goals and some of the indicators are selected after modification on Bangladesh perspective. All relevant ministries are connected with this process.Government of Bangladesh identified 14.5.1 as priority indicator under the target 14.5 of SDG 14. The status of the progress of 14.5.1 indicator as mentioned the Table 1.3.

To achieve the goal of conservation, and sustainable use and development of marine seas and resources, The Government has established the country's first marine protected area 'the Swatch of No GroundMarine Protected Area' on 27 October 2014 that may safeguard whales, dolphins, sea turtles, sharks, and other oceanic species. The two Marine Protected Areas (MPAs) as shown in Figure 14.1, one in 'Swatch of No-ground' of Bay of Bengal, declared under Bangladesh Wildlife (Conservation and Security) Act, 2012 and another in 'Middle Ground and South Patches' of Bay of Bengal, declared under the Marine Fisheries Ordinance 1983 together comprise 243,600 hectares (2436 sq. km) constituting 2.05% of the total marine area 11,881,300 hectares (118,813 sq. km) of Bangladesh. If the area protected during the spawning season of Hilsa is included then the protected area rises to 7.94%.

Table 1.3 : At a Glance SDGs Progress in Bangladesh

Goal	Target	Indicator	Base Year	Current Status	Milestone 2020	Remarks
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Target 14.5: By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information	14.5.1 Coverage of protected areas in relation to marine areas		7.94% (DoF, 2016-17)	10.0%	On track

Source: Sustainable Development Goals: Bangladesh Progress Report 2018, GED, Government of Bangladesh, Dec.2018

74. http://www.sdg.gov.bd/#1

Swatch of No Ground (SONG) is a ravine, which engraves the Ganges delta near the Sundarbans area, and cuts the seabed of the subaqueous shallow shelf and acts as dead center between river mouth and Bengal fan. It is a world-famous breeding and spawning ground for various aquatic fauna including whales, dolphins, sharks, and porpoises. The depth of SONG is approximately 1200 m and the width is 7km (Hossain et al., 2014).

The southwest coastal area of Bangladesh has been blessed by the world's largest single-track Mangrove forest- Sundarbans (see Figure 12), which is a UNESCO world heritage site providing huge marine and terrestrial biodiversity (Al Mohit et al., 2018). The Bangladesh government has taken initiatives for protecting this ecologically sensitive area (ESA). In addition, a Coral Island, Saint Martin Island (see Figure 12) in the southern tip of Bangladesh, is a vulnerable place for marine ecosystem providing hiding and breeding.[75]

Increase of hilsa benefitted mostly the industrial trawlers, not artisanal fishermen

Bangladesh government has also taken various legislative measures to protect, conserve and enhance the ecological sustainability of fish and other marine resources. These measures include a 65-day fishing ban for all types of fish, an 8-month fishing ban for juvenile Hilsa fish of less than 25 cm, 22 days ban on catching broad Hilsa and a total ban on destructive fishing practices in the maritime area of Bangladesh (Islam & Shamsuddoha, 2018). These measures helped to increase stock of the hilsa and has been showing some signs of recovery.

As compensation, the government gives artisanal fishermen a subsidy of around 44 pounds of rice per household not to fish. But many say they struggle to feed their families and face financial ruin during this time. The increase of hilsa benefited mostly the industrial trawlers, not poor artisanal fishermen.

"Although hilsa conservation affects millions of poor fishers, a large proportion of the benefit is going towards the industrial trawl operators who are catching thousands of tonnes of hilsa without providing much social benefit or revenue to the government, the hilsa recovery has also begun attracting "super-trawlers" from abroad that are fitted with equipment to track and target the hilsa schools."

PROBLEMS AND CHALLENGES OF MPAS IN BANGLADESH

There are some problems and challenges on management of MPAs in Bangladesh; these are related with demarcation or areas, drilling by oil

75. Dr. Dilruba Chowdhury & Mohammad Rokanuzzaman " Blue Economy, Prospect & Challenges of Marine Fisheries of Bangladesh, April 2018, Academic Press and Publishers Library, Dhaka

companies in the sea, shipbreaking industry and pollution, monitoring and also the socio-economic impact on coastal poor communities

Demarcation of areas

Demarcation of areas is a big challenge. Industrial fishing trawlers violate the rules of MPAs. In 2015, IUCN developed and published a framework for establishing MPA in Bangladesh, which suggested a total of 67 sites for declaring MPA including St. Martin Island and Nijhum Dip (see Figure 24) (Karim & Uddin, 2019). The Ministry of environment has declared Sundarbans a Ecologically Critical Area (ECA) in 1999. However, no policy has been made to manage all these MPAs and ECAs.

Drilling in the shallow shelf sea

Drilling in the shallow shelf sea area will be harmful for marine ecology and potential oil spill near the coast, may have a far-reaching impact on fishery, fishing grounds, fish breeding and nursery heavens, salt-marsh ecosystems, coral reef, mangrove ecosystems, coastal tourism, salt industry, peoples' livelihood and health, which would reduce the benefits of the exploitation of fossil fuels (FAO, 2014).

Shipbreaking industry and pollution

Moreover, shipbreaking and recycling industry has serious impact on marine environment. The fisheries in and around the industries have been seriously depleted. Furthermore, marine biodiversity has declined sharply due to environmental degradation and numerous anthropogenic activities such as over-fishing of inshore fisheries, indiscriminate catching of juveniles, construction of barrages and dams, siltation, and extensive use of pesticides, pollution. Increase in the human population and consequent increases in the demand for fish and fishing pressure is intensifying every year. This is believed to have caused overfishing of all stocks and populations of fishes and prawns by the use of even banned gears and methods.

Lack of monitoring

There is lack of monitoring from government agencies on MPAs and there is also lack of institutional capacity of the government. Industrial fishing trawlers violates the rules of MPAs. Furthermore, there is lack of awareness of the community about conservation and protection of the areas.

Socio-economic challenges

However, the establishment of sanctuaries led to some negative socio-economic consequences such as loss of income, seasonal unemployment, increased poverty, and de-creased food security. Non-compliance of conservation rules is common in the protected areas. Poverty, insufficient incentives for compliance, political interference, mismanagement and

corruption, limited capacity of the government often makes it difficult for law enforcement towards conservation.[76]

The impact of these conservation initiatives is mixed. It contributed increase of hilsa production in Bangladesh. The country's hilsa production has increased by around 150% in last 15 years – thanks to the government's different conservation initiatives which include a temporal ban on fishing and livelihood support for the fisher-folk. As a result, hilsa production increased from 199,032 tons in 2002-03 to 496,417 tons in 2016-17. According to the Fisheries Statistical Report of Bangladesh 2016-17, the country's total hilsa production is 496,417 tons-217,469 tons (43.81%) from inland and 278,948 tons (56.19%) from marine catches.[77]

A balance strategy needs to be maintained between protection of marine biodiversity and industrial activities in and around the coast. Sustainable management of fisheries requires keeping the fish catch within sustainable yield. At the same time, a management or strategic plan on how to manage the marine stock for sustainable use will also needs to be prepared.[78]

For the sustainable management of MPAs in Bangladesh Marine Spatial Planning (MSP) is needs to be developed. In recent years, marine spatial planning (MSP) has become a popular tool for managing ocean uses and resolving conflicts among ocean users (Douvere, 2008).To date, 20 countries have implemented MSP and by 2030 at least one-third of the surface area of the world's EEZ will have government-approved MSP (Hassan & Alam, 2019). Being a coastal country, Bangladesh is still in the primary stage to manage its maritime resources (Hussain, Failler, Karim, & Alam, 2018).

SDG 14 AND BANGLADESH

To achieve the targets under SDG 14 mentioned above Bangladesh needs to address the following critical issues.[79]

a. Addressing marine pollution (target 14.1)

b. Managing, protecting, conserving and restoring marine and coastal ecosystems (target 14.2) and Marine Protected Areas-MPA (target 14.5)

76 https://www.sciencedirect.com/science/article/abs/pii/S1462901117310080

77 https://www.dhakatribune.com/bangladesh/2018/07/24/national-fisheries-week-2018-ilish-production-up-by-150?_

78 Sustainable Development Goals: Bangladesh Progress Report 2018, GED, Government of Bangladesh, Dec.2018

79 Bangladesh Interfaces with the ocean (SDG 14) concept paper for the ocean conference 2017 https://www.google.com/search?q=Bangladesh+Interfaces+with+the+Ocean+(SDG+14)+Concept+paper+for+the+Ocean+Conference%2C+5-9+June+2017&oq=Bangladesh+Interfaces+with+the+Ocean+(SDG+14)+Concept+paper+for+the+Ocean+Conference%2C+5-9+June+2017&aqs=chrome..69i57.1788j0j7&sourceid=chrome&ie=UTF-8

c. Minimizing and addressing ocean acidification / blue carbon (target 14.3)

d. Making fisheries sustainable (targets 14.4 and 14.6)

e. Increasing economic benefits to SIDS & LDCs (target 14.7) and providing access to small scale artisanal fisheries to marine resources and markets (target 14.b)

f. Increasing scientific knowledge, developing research capacity and transfer of marine technology (14.a)

g. Enhance the conservation and sustainable use of oceans and their resources by implementing international law (target 14.c)

Theses issues are mutually inclusive and overlapping were discussed in previous chapters. The problems related with marine pollution and MPA were discussed in previous sections, ? and ? respectively.

Minimizing and addressing ocean acidification / blue carbon (target 14.3): Increasing atmospheric CO2 is changing the global ocean's chemistry, as one-fourth of the anthropogenic CO2 is absorbed by the ocean. In addition, ocean absorbs CO2 from the respiration and breakdown of dead organic matter. When CO2 dissolves in seawater, it forms carbonic acid, decreasing both ocean pH and the concentration of the carbonate ion. Ocean acidification could affect marine food chain and substantially change the marine biota which is huge threat to global protein supply and food security for millions of people, including the multi-billion dollar fishing industry. Acidification can affect marine organisms, especially to those that build their shells and skeletons materials from calcium carbonate, such as species of corals, oysters, clams, mussels, and snails. The molluscs and crustaceans support valuable commercial and recreational fisheries, where the coral reef ecosystems support a variety of subsistence, recreational, and commercial fisheries worldwide.

Due to the effect of ocean acidification, an estimated 19% of the world's coral reefs have been damaged and a further 35% are seriously threatened. As a result, one-third of all reef-building corals are at risk of extinction. The Saint Martin's Island is the only coral bearing island of Bangladesh located in the Bay of Bengal. Among the 66 coral species in 1997, only 40 species were recorded in 2008 and the remaining 26 coral species may be lost in the next 11 years, posing serious threat to the coral biodiversity in Bangladesh.[80]

80. Hossain, M.S., Chowdhury, S.R., Sharifuzzaman, S.M. and Sarker, S. (2015). Vulnerability of the Bay of Bengal to Ocean Acidification. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh

The Ministry of Environment and Forests and its agencies in collaboration with some other Ministries/Departments are responsible to develop the policy documents addressing climate change challenges, including ocean acidification. Each of the Ministry or Department has specific roles and responsibilities on mitigation and adaptation practices to enhance resilience of the community in the face of extreme natural events. Moreover, these wings are involved in advocacy, governance and negotiation in home and abroad. In addition, academic and research institutions work on climate change challenges, ocean acidification, carbon sequential, and aquatic food production issues to develop knowledgeable and skilled human recourses. Given the economic and social importance of the oceans to human societies, government at the local, national, and international levels must begin to assess and implement adaptive approaches to acidification.

Making fisheries sustainable (targets 14.4 and 14.6): In order to restore fish stock and maintain sustainable yield government needs to effectively regulate harvesting, end overfishing and destructive fishing practices. Overfishing has been creating fishless zone in the BoB; hundreds of industrial trawlers are overfishing at an unstainable rate, the biggest of which can catch up to 400tonnes of fish each trip, 20 times the amount of the largest artisanal vessel. The monitoring from government is almost absent.[81] This were discussed in the section 4.1 and 4.2.

Hundreds of large vessels are overfishing at an unsustainable rate, monitors suggest. Local fishermen say the government is turning a blind eye as the trawlers target key fish species they rely on.The ongoing study on fish stock (2016-17) commissioned by the government shows the largest and most valuable species, like tiger prawns and Indian salmon, are almost completely gone. The scientist conducting the study are worried about unsustainability of the fishing effort and says *" "We are truly worried that if the fishing effort is not substantially reduced, we may lose this resource for generations to come,"...."Some seas in the world, like the Gulf of Thailand, have run out of fish," "We don't want our Bay of Bengal to end up like that."*[82]

There should have strong monitoring from government agencies on industrial trawlers. The fishing efforts and no. of industrial trawlers need to reduced. The destructive practices should be ended immediately.

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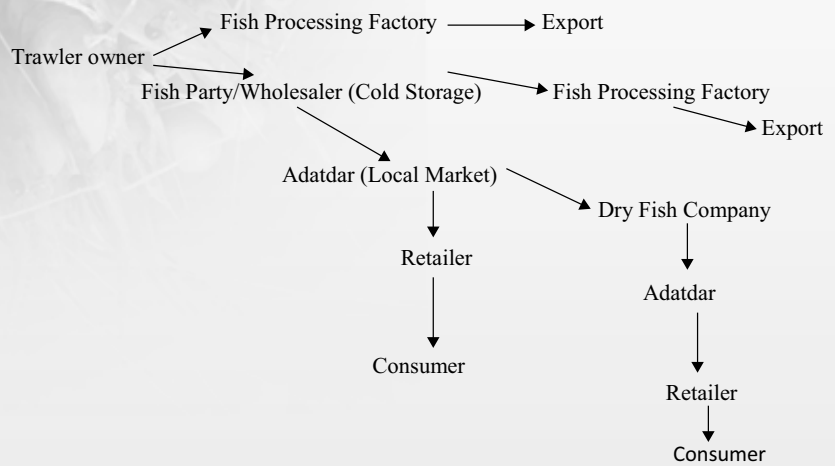
81. https://www.bbc.com/news/world-asia-52227735?fbclid=IwAR3fNVIf1pbXa667h6389p3R3CSpRzn60gVUVI9Q8OSIsglffov5pytJ1Zo
82. https://www.bbc.com/news/world-asia-52227735?fbclid=IwAR3fNVIf1pbXa667h6389p3R3CSpRzn60gVUVI9Q8OSIsglffov5pytJ1Zo

CHAPTER SIX

Supply Chain and Value Addition in Industrial Marine Fisheries in Bangladesh

There are two big players/actors in the industrial marine supply chain; companies or trawler owners and wholesalers /fish party (wholesale buyers from trawlers through auction).

6.1 Supply Chain in Industrial Marine Fisheries in Bangladesh



In every stage of the supply chain there is at least 10% profit; says a fish processing owner. According to expertsin the sector from trawler owner to Adatdar and fish processing factory the profit margin is more than 10% in every stage and sometimes it goes up to 50%.

6.2 WORKERS IN GLOBAL SUPPLY CHAIN UNDER INDUSTRIAL MARINE FISHERIES IN BANGLADESH

6.2.1 Industrial Trawler Workers

The age of majority of the workers are below the 30 years and they have migrated from rural to urban areas mostly from coastal districts of Bangladesh, pushed by river erosion and poverty. They are mostly drop outs from school and have studied only up to class five due to economic hardship in the family. There are no female workers in this sector. Most of the workers are married and the majority of them are the primary earner of their family. The workers enter the job throughtheir network and change the job within 2-3 years for better wages and benefits.

The working condition in industrial marine fisheries are precarious. Most of the workers are contractual / temporary and are denied government declared minimum wages.

The workers have no appointment card, service book and ID card from company. They have only the Marine Fisheries Department Card; the majority of them received this card recently introduced by the DoF. Workers are denied of minimum wage declared by the government.Majority of the workers donot get any promotion in the job and there is no system of in-job formal training in this sector for development of skills and capacity. They also lack occupational safety and health management systems and practices.In the workplace there is a risk of accidents and physical hazards, and they don't get adequate emergency medicines and personal protective equipment.

The workers of deep-sea fishing trawler industries have to work for 24 hours in a dusty environment when trawlers remain in the sea; workers cannot sleep adequately.They also cannot bath regularly due to shortage of fresh water. Workersdo not enjoy the provisional leave and holidays due to lack of required manpower in the trawlers. Theyalso do not have any social protection and social security provisions.

Furthermore, the workers of industrial trawlers have been facing two major problems – retrenchment during ban period and catch target.

Trawlers remain idle about half of the year due to fishing ban, bad weather and other problems; at that time most of the workers are being retrenched and have to leave the trawler. At that time workers remain employed in different informal sector, some of them pulling rickshaws and work as day laborer in agriculture sector. Company again recruit the workers contractually with fixed amount of salary after the ban season without considering the previous experience sometime with the low wage than previous term. The workers have no choice as they have little option of employment opportunities in the informal sector. The workers union is not strong enough to negotiate with the owners in order to make the workers permanent and the MFD is in favor of safety-net program for the workers during the ban period. The workers told that ban is good for the ocean sustainability as they are getting more fish in the last two years due to the ban.

A second major problem is target system of catch; if the workers fail to fulfil the catch target, they are deprived of their bonus andjob loss which pushes them to violate the law using illegal nets, catching within 40 m and destructive bottom trawling.

The destructive bottom trawling is dangerous for the ocean sustainability, and the workers are aware of the consequences.There is no study about the impactsof trawling of trash on ocean sustainability and livelihoods of fisherfolk communities. However, they feel powerless against the mighty economy of the industry. During FGD and interview, workers said *" to fulfill targets we collect everything including the mud from sea-bed; we call it "tuch" (trash); there is a huge demand of trash to the poultry-feed companies; we know it is destructive, it leads to decline of fish stock"*.

Photo: Juvenile fish harvested as trash by industrial trawler

Photo: Invisible workers in GSC; load-unload workers in industrial marine fishery (Trawler to fish party cold storage)

6.2.2 Workers in Fish Processing Factories

Two types of workers are employed in fish processing factories; contractual workers (60%) and permanent workers (40%). The dominant trend is contractual workers. The working conditions are precarious and hazardous. It has been observed that the minimum personal protective equipment like hand-gloves are not being supplied to the workers by the company.

There is discrimination among Bengali and Adivasi workers. For example, it hasbeen observed that the young girls from the Adivasi community working in the fish processing factory supplied by contractorsreceivea lower remuneration compared to the Bengali community; though the difference was not determined.

Among the workers, the contract workers are more vulnerable; whether they have work or not depends on the availability of fish stock. They can work 7-8 months in a year in the sector. Contractual workers are denied minimum wage; they receive TK. 4500-7000 per month. The contractor provides accommodation 5-7 person in a room with one shared toilet and kitchen.

Photo: Adivasi contractual women worker in fish processing factory.

Fundamental workers' rights like working hours, minimum wages, and occupational health and safety conditions are being denied. There is no fixed

working hours in the processing plants; during peak season workers have to remain in the factory 14-16 hours per day. Women workers have to perform night shift duties.

Cold-related fever and pain was reported as a common physical problem workers suffer in the fish processing factory.

Photo: Sick worker of processing factory in the room provided by contractor.

6.3 Value addition and reduce post-harvest losses

Value addition and reduce post-harvest losses By-catch or non-conventional species (such as sole, ray, squid, cuttlefish, small pelagic species) remain unused due to unattractive appearance, color, texture, bones and small size. Although some species are used industrially for fishmeal manufacturing, utilization of other species for human consumption is essential to prevent post-harvest fishery losses.

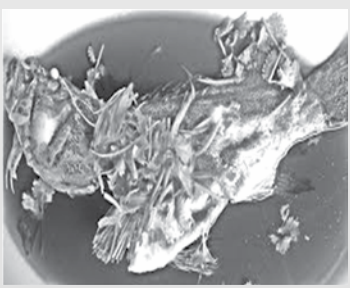


Photo: Value added shrimp and marine fish product (Source: Online)

The possible means of using low-cost fishery resources include preparations of fish cutlets, fish fingers, canning of fish and fish products, dried and salted fish/shrimp, breaded prawns and fish sticks, fish cakes, shrimp skewer, coated squid rings, coated fish balls, fish oils, liver oils, fish sauces, surimi and surimi-based products, sausages, fermented products, and protein concentrates (Figure 10). Besides, seafood processing discards (20–80% depending upon the level of processing and type of fish/shellfish) is a rich source of proteins and xanthophylls, but these valuable components in discards remain a neglected issue. This waste can be used for production of fishmeal, silage and compost, including various value- added products such as proteins, oil, amino acids, minerals, enzymes, bioactive peptides, collagen and gelatin.[83]

Bangladesh can explore the potentiality of value addition in industrial marine fisheries.

83. Hossain MS, Chowdhury SR, Sharifuzzaman SM. 2017. Blue Economic Development in Bangladesh: A policy guide for marine fisheries and aquaculture. Institute of Marine Sciences and Fisheries, University of Chittagong, Bangladesh

CHAPTER SEVEN

The Way Forward

RECOMMENDATIONS

Industrial marine fisheries are being operated in Bangladesh to the continental shelf only; the implication of this limited fishing zone are threefold, firstly, fishing effort is intense on a smaller space and volume of water putting excess pressure on the stock therein; secondly, some open ocean high value fishes (only rarely appear in Bangladeshi fish catch despite their availability in deeper areas; and finally, the large area within the EEZ and beyond has tremendous untapped potential.It is, therefore, imperative for Bangladesh to create the necessary environment to encourage fishing operators to venture into deeper and open ocean areas with high-tonnage vessels and using alternate gear, such as tuna long-lines and hooks.

Sustainable fisheries production and management

- Highest priority should be given to sustainable fisheries resource management considering the importance of this resource for sustaining livelihood of millions of poor people, as a source of protein and export earnings, and its potential to replenish itself (sustainability) if properly taken care of. To this end, stock and maximum sustainable yield/total allowable catch (quota) must be determined by thorough assessments on a regular basis. Therefore, capacity building and proper actions in the marine fisheries sector should be brought to immediate focus.
- Conservation of fish biodiversity and healthy stock will remain keys to the success in this sector in the long run. Suitable areas in the EEZ and coastal waters should be declared as Marine Protected Areas (MPA) of appropriate kind to facilitate conservation and protection of fish diversity, and also protection of breeding, nursing, growth, migration, habitats, etc. (C) Land based pollution consisting primarily of solid wastes (e.g. plastics, polythene, toxic substances) and untreated industrial effluents must be banned from entering into the sea, and be enforced with rigor and determination, if the habitats and the lives of fishes are to be protected. Shore-based and ship-borne pollution should also receive due importance. (D) No industrial practices should be allowed on the continental shelf and onshore areas which may cause destruction and degradation of fish habitats and decline of fish stocks. Such activity may include irresponsible and destructive means of oil and gas explorations/ exploitation. All hydrocarbon exploration on the shelf and coastal waters should be carried out using internationally accepted practices.

Maintaining river system and ecosystem health

River systems and inland water resources should be maintained and managed in a way to support fish populations, navigability and sediment transport to the coastal areas. Freshwater fishes should be given natural corridors by maintaining links among water bodies and/or periodic controlled flooding of suitable areas, which would also be beneficial for soil fertility. Dams and barrages are extremely damaging to river ecosystems, sediment movement and navigation, and also detrimental to downstream coastal ecosystems and remains a dominant cause of coastal erosion. Blocking of stream flow of any kind should not dominate the irrigation agenda. Ecosystem management should be a goal of both integrated water resources management and marine and coastal zone management.

Climate change mitigation and adaptation

Climate change and associated phenomena such as sea-level rise, weather and climatic shift, changing rainfall (precipitation) patterns, depression, extreme climate events (intensification of tropical cyclones), ocean acidification and hypoxia are now visible and established facts through scientific investigations. These anomalies may directly or indirectly affect production from fisheries and aquaculture. For example, recent changes in the distribution and productivity of a number of fish species can be ascribed to regional climate variability, such as the El Niño-Southern Oscillation. Such a phenomenon can affect our multi-billion-dollar hilsa fishery negatively. Therefore, blue economy policies must contribute to climate change mitigation and adaptation strategies.

- √ All fishing vessels (non-mechanized and mechanized boats) must have registration, fitness certificate, fishing license and insurance coverage, radio, life buoys for the crews.
- √ All artisanal fishing boats will only be allowed to go for fishing within the 40 m depths (at distances as great as 96 km from the beach) if they are equipped with enough potable water, life buoys, life jackets, first aid box, fire extinguisher, magnetic compass, SSB Radio, VHF and GPS to take precautionary measures and avoid casualties.
- √ All industrial trawler fleets must fish at depths greater than 40 m, in no case they would be allowed to fish within 40 m depths, be it for harvesting mother-shrimp or any other cause. They should be strongly encouraged to go even beyond 200 m depths.
- √ Mother-shrimp harvesting be allowed only with the trammel nets, as these nets are quite species-specific and eco-friendlier.

- √ To protect the nursing and feeding grounds of all marine resources, as ensured by Thailand, the area of 0-5 km from the beach coast line can be declared as a complete no-fishing zone or 'no-take' zone throughout the year; no fishing of any sort, even with cast nets, beach seines, drag/push nets, current nets, mosquito nets etc. would be allowed.
- √ Ensure strong monitoring of fishing ban period of 15 January to 15 February for protecting shrimp mothers and ensure their natural spawning in the open sea.
- √ Introduce fin-fish fishing ban period for certain period of time depending on the spawning season of commercially important species (viz. hilsa, pomfrets, Bombay ducks, threadfins, croakers).
- √ Because of inexperience long-liner, purse seiner and squid jigger fishing are not practiced in Bangladesh territorial waters, though these are widely used in other country's marine fisheries. Without proper assessment of the present pelagic stocks no further license (so far 15 licenses issued but only a single squid jigger imported, later changed its fishing gears and converted to normal fishing trawler) should be issued for long-liner, purse seiner and squid jigger fishing.
- √ Strong vessel tracking and monitoring system (VTMS) should be introduced so that after importation of long-liner, purse seiner and squid jigger their fishing gears are not changed and converted to traditional fishing trawlers.