



Marine Resources: Highway to Economic Emancipation for Bangladesh



HERBS

133 Species of Seaweed Listed



MINERAL

13 Spots of Heavy Metals Detected



SALT

1.8 Million MT Annually Produced

FISH
511 Marine Species Identified



FUEL
17-103 TCF Gas Hydrates Estimated



ENERGY
Potential Sources: Wind, Wave, Tide and Current



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Editorial

Marine Resources: Highway to Economic Emancipation for Bangladesh

The COVID-19 pandemic has had an enormous impact on economies all over the world. Most of the countries were struggling, and only a few were creating an economic heading of slow recovery. Amid this situation, the Russia-Ukraine conflict has triggered turmoil around the globe and drastically increased uncertainty about the recovery of the global economy. Just as the global economy is bouncing back from the pandemic, financial markets worldwide fell sharply, and the prices of oil, natural gas, metals and food commodities surged. Beyond the humanitarian suffering and geopolitical crisis emanating from the Russo-Ukrainian conflict, the global economy will feel the effects of slower growth and faster inflation.

The South Asian region is also currently experiencing economic turmoil. The present classic twin deficits economy of Sri Lanka is a stark reminder for other developing nations. Bangladesh, one of the fastest-growing economies globally, is primarily driven by its exports of apparel products, accounting for 95.6% of the overall value of its global shipments. Remittances and domestic agriculture are also contributing. Besides, the geographical location and maritime demarcation have opened a booming economic gateway for Bangladesh. The ocean economy is a new economic frontier that can help developing countries boost employment, reduce poverty and enhance food security. Thereby, the sustainable use of marine resources is essential for economic diversification in the context of Bangladesh.

The theme of the present issue of PAAL is titled "Marine Resources: Highway to Economic Emancipation for Bangladesh". The vast water resources of the Bay of Bengal influenced by the Ganga, Brahmaputra and Meghna (GBM) river systems offer the best possibilities for food security and income sources for millions of people of Bangladesh. It is high time for this ancient maritime nation to grab the opportunity to go ahead toward economic viability using these natural god-gifted marine resources. Sustainable exploitation and exploration of marine resources significantly strengthen economic growth, ensuring livelihood security for Bangladeshi people. The current PAAL issue contains a couple of articles and viewpoints presenting the potential marine resources for the sustainable development of Bangladesh. Articles also focus on maritime cyber security, geopolitical concerns regarding the Russia-Ukraine war, Port and Shipping, etc. Regular sections like BIMRAD Feats, Marine News and Coastal Window are also included. Moreover, this issue of PAAL covers frequently told but consciously ignored stories shedding light on the benefits, drawbacks, and knowledge gaps associated with exploring and extracting these resources. In brief, the objective of the issue is to highlight the multi-dimensional maritime resources to attain the economic well-being of Bangladesh.

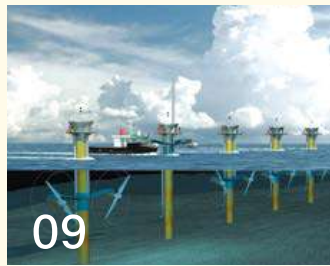
We are confident that this issue of PAAL would fulfil our objective to impart new knowledge and perspectives to our readers. We also wish our efforts will make the readers aware of the economic potential of Bangladesh's marine resources and their current status. Indeed, a better tomorrow awaits Bangladesh if we can materialize these opportunities.

Thanking you
Editorial Board

“We always want not only to protect sea areas, but also to use marine resources for our economic development. So, we have to work on it. Our only aim is to use the marine resources in the country's development and we are working on it”

- Hon'ble Prime Minister Sheikh Hasina

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Potential of Marine Resources for Sustainable Development of Bangladesh

Captain M Minarul Hoque, (H), BCGM, psc, BN



The seas and oceans are earth's greatest sources of biodiversity. Oceans cover 71% of the Earth's surface and 90% of the biosphere. Economic prosperity, society's well-being and quality of life at every level depend on the marine environment. Marine resources encompass valuable materials and attributes that are considered to have some economic significance. Marine resources are increasingly becoming the centre of the focus of every maritime nation as it facilitates the development of a nation. The land resources are depleting quickly. Technological advent is also alluring the nation to explore and exploit marine resources for economic benefit. Marine biotechnology and marine genetic resources, fisheries, renewable and non-renewable energy, sand and gravel, sea mining and minerals, tourism potential and unique ecosystems like coral reefs all are included in the categories of marine resources. Being vast reservoirs of biotic resources, oceans contain nearly 40,000 species of molluscs and 25,000 species of fishes. Along with mineral resources, several types of vitamins

and elements used in medicine are also in abundance in the marine environment, which are beneficial to mankind. These resources are of significant monetary value. Therefore, the sustainable use of these resources are of great importance.

One-fifth of the population i.e., about 30 million people of Bangladesh are dependent on marine resources for activities like fisheries, aquaculture, tourism, shipping, shipbuilding and ship decommissioning, salt production and offshore oil & gas production etc. Therefore, marine resources are essential for the national economy and overall social benefits. Bangladesh has a land territory of 1,47,570 sq km, which holds a limited number of various resources. With the increment of population and industrialization, the quantity of arable land is becoming limited day by day. Bangladesh also doesn't have an abundance of fossil fuels. Therefore, to sustain the development of Bangladesh, we need to shift our focus toward the marine resources, which by far and large, are yet to be tapped up to their full potential.

Broadly, marine resources are categorized into living and non-living resources. On the other hand, marine resources can also be divided into mineral resources, energy resources and food resources. In general, marine resources can be divided into the following categories:

According to experts, seaweed is one of the lucrative resources which is healthy for human bodies, skin and the environment. The economic value of seaweed is enormous. There is huge potential in Bangladesh to develop the commercial cultivation of seaweed. According to the Ministry

Living Resources	
Fisheries Resources	Animals: Fishes, Shrimps, Crabs, Lobsters, Mussels, Mammals etc.
	Plants: Algae, Seaweeds and other Medicinal plants
Non-living Resources	
Marine Renewable Energy	Tide, Current, Wave, Wind
Non-renewable Energy	Hydrocarbons (Oil, Natural Gas)
Mineral	Metal deposits, Salt etc.

Table: Types of Marine Resources

The fisheries resources are the most attractive exploitable marine resources as it is easy to acquire compared to other resources. It also plays a momentous role in fulfilling the demand for animal protein and the country's overall socio-economic development. Statistics say more than sixteen million people, which is almost 11% of the total population of Bangladesh, depend on the fisheries sector for their livelihood directly or indirectly. The coastal area populace is heavily engaged with this profession. The Bay of Bengal (BoB) is one of the 64 largest marine ecosystems globally. It is blessed with rich coastal and marine ecosystems, hosting a wide range of biodiversity, such as fishes, shrimps, molluscs, crabs, mammals, seaweeds, etc. Fisheries resources are crucial to meet the protein needs of the people in Bangladesh as they are intrinsically related to the traditional cuisine of this locality (Hossain, M. Shahadat 2014). However, the prospect of deep-sea fishing is unexplored to date. There is noticeable capacity lacking in terms of long-line fishing and catching demersal fishes in the deep waters of Bay of Bengal. Bangladesh was ranked 11th in marine fish production in 2018 (FAO, 2018). However, fisheries resources are in decline, and the discovery of dead zones in the Bay is a potential threat to this sector.

of Agriculture, seaweed production in Bangladesh has great potential and its multifarious use needs to be explored. It can support nutrition security, positively influence livelihoods, and meet global demands. However, due to the different food habits of our people across the country, seaweed is not popular or known food to us. Misconception and social stigma among the coastal communities also prevail in society. As of now, Bangladesh currently produces some 400 tons of seaweed, valued at Tk 55 million. However, according to a study titled "Seaweed for Blue Economy in Bangladesh", seaweed production in Bangladesh could be increased to 50 million tons from shallow coastal waters by 2050 (Hossain *et al*, 2020).



Marine Renewable Energy is known for its continuous renewability and inexhaustibility. Ocean energy resources are those that use the kinetic, potential, chemical or thermal properties of seawater. Ocean energy like waves, tidal currents, tidal range, ocean currents, ocean temperature and salinity gradients are all examples of this. This form of marine renewable energy is available on every coast. Bangladesh has about 710 km of coastline with the Bay of Bengal, and it is covered with many islands developed from river run-offs. These islands are locally called "chars", and they support a plethora of economic activities. Strong wind and tidal forces are experienced in these "chars". However, the ability to tap renewable energy is highly technical in nature. New technologies



are coming up to use marine renewable energy for commercial use. Of all marine renewable technologies, tidal energy is mostly usable. Generally, tidal power can be generated using two technologies – tidal stream and tidal barrage. Tidal stream power plants are being preferred because of their lower environmental disturbance, and it is considered as green energy. Wave energy also comes next to tidal in terms of technological readiness. In order to fulfil the targets of the Sustainable Development Goals (SDG) and the Nationally Determined Contributions under the Paris Agreement, a substantial increase in renewable energy is required. Marine renewable energy is considered one of the important elements for driving the Blue Economy for Bangladesh and the transition to green energy in the future.

Bangladesh is yet to assess the true potential of its offshore oil and gas prospects. According to a desktop study carried out by the Maritime Affairs Unit of MoFA, it is estimated that 0.11 to 0.63 TCF natural gas hydrates deposits are available within Bangladesh's EEZ only, which is equivalent to 17-103 TCF natural gas deposits. However, a correct estimation may be reached once a complete survey is conducted. Bangladesh needs to act faster than the neighbouring countries in this regard because of the transmitting characteristic of the gas. Fast exploration, drilling and extraction are especially crucial in the cases of gas reserves located across the maritime boundaries of adjacent littorals.

Several attempts with detailed investigations have been carried out on the sandy beaches of the coastal region of Bangladesh in search of heavy materials. Sands containing valuable

heavy minerals are found intermittently over the length of a 250 km coastal belt from Patenga to Teknaf. According to a report submitted to FAO in 2014, the entire coastal belt has been explored to discover 17 deposits of potentially valuable minerals such as Zircon, Rutile, Ilmenite, Leucosene, Kyan Garnet, Magnetite and Monazite. Proper extraction and commercialization of minerals from beach sand may enhance the growth of different industries such as welding electrodes, paper, glass, chemical and ceramic sectors in the country.

Bangladesh is a maritime nation, and the Bay of Bengal is an indispensable part of her geography, demography and culture. The sustainable use of marine resources in the Bay of Bengal has been prioritized by the Honorable Prime Minister Sheikh Hasina, as she has prudently labelled the Bay as our 'Third Neighbor.' Comprehensive planning and coordinated efforts are required to ensure sustainable use of marine resources. Marine resources have much potential to play a bigger part in contributing to the national GDP. For example, the fisheries sector contributed 3.69% to the GDP, which has seen an average growth of 5.43% in the last ten years. With more focus and maintaining good governance in this sector, it can contribute a lot more. Much scope of research and study is left unexplored to utilize the best marine resources of Bangladesh, which should get priority by educational and professional research institutions nationwide.

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Tuna Fisheries: Present Scenario of Bangladesh

Afifat Khanam Ritika



Tunas are among the largest, highly valued, most popular and commercially important fishes (Collette, 1983) in the international market, primarily found in temperate and tropical oceans around the world. Tuna accounts for one-third of the global marine fisheries exports (DoF). A significant proportion of the world's fishery products come from Tuna species. It has been found that 67% of the world's tuna catches are made in the Pacific Ocean by Japanese and American fleets, 12% in the Indian Ocean, and 12% in the Atlantic. The Tuna resources of the Indian Ocean are the 2nd largest globally and significantly contribute to food security throughout the region. Neighbouring countries like India and Sri Lanka have developed deep-sea fishing capacity and earned substantial foreign currencies from Tuna fisheries.

Tuna and Tuna-like other highly migratory deep pelagic sea species have become a high concern on the priority list of the government of Bangladesh for a few years, especially after the successful demarcation of maritime boundary with the neighbours.

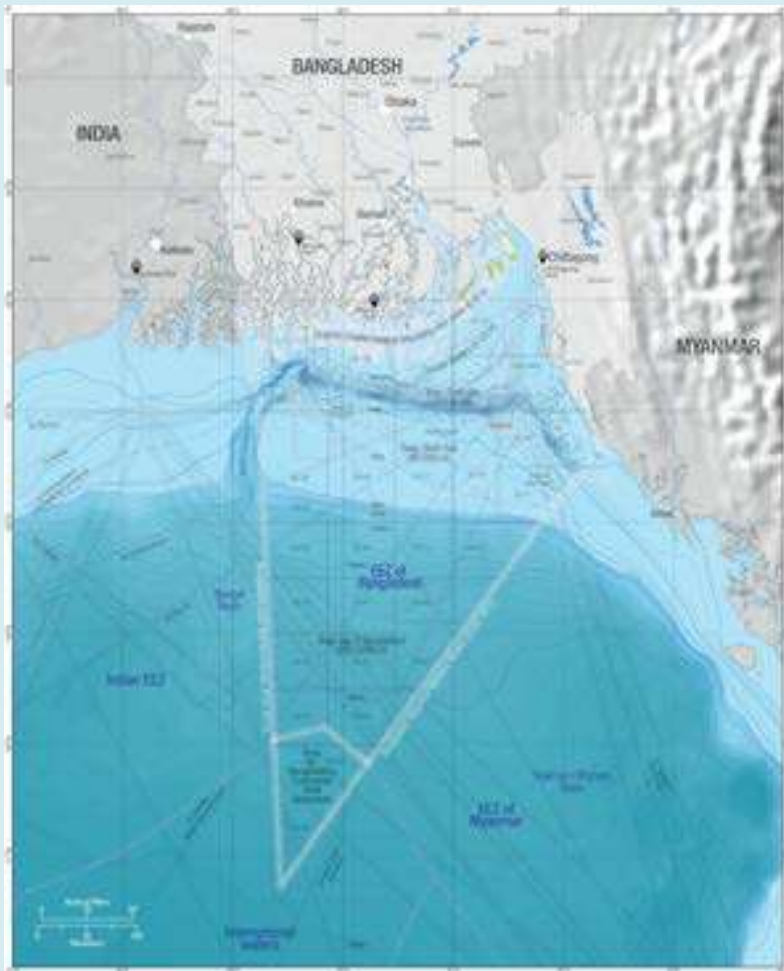
This leads to opening up the access of Bangladeshi fishers to the Area Beyond National Jurisdiction (ABNJ) of high seas. Many studies have ensured a vast prospect of Tuna fishery in Bangladesh. However, the Bangladesh-Thai joint venture surveys mentioned an excellent abundance of large pelagic, i.e. Tuna & Tuna-like fishes and sharks in Bangladesh marine water (Rahman, 1993). Not only that, Tuna is one of the dominant groups of migratory pelagic fishes in the EEZ of Bangladesh. Sometimes a minimal amount of Mackerel or Tuna family-like Eastern Little Tuna, locally known as 'Bom Maittya', 'Long Tail Tuna' known as 'Kawua' and 'Bullet Tuna', locally known as 'Bullet' are found in the marine water of Bangladesh jurisdiction (Marine Fisheries Department). The 'Eastern Little Tuna' with an average weight of 4-5kg, is more valuable than others in the local markets of the greater Chattogram region.

However, there is no specific Tuna fishery in Bangladesh. Tunas are bycatch of midwater industrial trawlers and artisanal gillnetters

primarily operated in South-Eastern & North-Western parts of the Bay of Bengal at Cox's Bazaar area. Statistically, in Bangladesh, gillnet and long lines fishing contribute 59.58% and 2.21% to our marine catch's total production. Tuna caught by long lines contributes less than 0.5%, and in gill nets fishing, less than 1.0% to the total catch value. In industrial production, tuna fish contributed only 2.22% (DoF, 2012-2013, Adhir et al, 2016). Bangladesh has a multi-trophic and multi-species fish capture trend, but no specific tuna fishery is solely involved. Simultaneously, few studies have been conducted on Tuna Fisheries in Bangladesh. No stock assessment data is available due to a lack of technological advancement.

The prospect of Tuna fishing in the Bay of Bengal is dangling in the balance owing to a lack of interest of licensee firms in bringing trawlers to catch the commercially important fish. According to the Ministry of Fisheries and Livestock, from April 2016, the government started giving licenses for exploring Tuna and other pelagic fishes beyond the 200-metre depth of the Bay and in international waters. It issued licenses to 17 firms for longline and purse seine fishing till April 2018. None of the firms had driven trawlers till the end of 2019, despite the passing of one and a half years. There is a massive gap in Tuna fishery outline in the Bay of Bengal that discourages going for Tuna fishing. The requirement for investing a large amount of capital, lack of data on Tuna stocks, data on available species and study on Tuna fishing grounds have kept licensee firms away from bringing the vessels blindly into the sea.

In an interview, Planning Minister MA Mannan (New Age, 2020) stated that the Department of Fisheries (DoF) had made at least half a dozen attempts to send private sector fishers to the deep sea, where only Tuna and other pelagic fish are available. But the attempts come fruitless in the end. Many reasons have been identified, including the vessel size and structure. The vessels used for Tuna fishing are wholly different and more prominent in size from the wooden trawlers used by the fishers in Bangladesh. Those wooden boats with shallow capacity can mainly go within 80-100 kilometres of the sea and are engaged primarily in catching Hilsa. Besides this, training facilities and experts are rare among the fisher community for deep-sea fishing practice in Bangladesh. Bangladesh has signed an agreement with the European Union (EU) for sustainable Tuna fishing in Bangladesh water for the sustainable management of marine living resources in the EEZ, valid for 5 years starting from 1st January 2020 to 31st December 2025. In 2015, Bangladesh was awarded membership by the Indian Ocean Tuna Commission (IOTC), an intergovernmental organization responsible for managing Tuna and Tuna-like species in the Indian Ocean. As a member of the Indian Ocean Tuna Commission, the country has to provide information on Tuna stocks in its water boundary. Without catching capacity, it is impossible to know about the



Tuna stock. So, whatever or wherever we would like to engage ourselves for the sustainable catch or management data is necessary.

However, failing to run after the private sectors and prioritizing the Tuna fishery as a top economic sector, the government of Bangladesh has solely taken a pilot project to catch commercially important Tuna fish. The expected value is worth Tk 61.06 crore, which is planned to end in 2023, aiming to build expertise with the aid of overseas training in Tuna fishing and encouraging the possible private sectors to get involved in the much-needed venture. Under this project, three fishing vessels with long liner technology and modern features like satellite connection are being procured.

Proper attention is needed in every aspect of exploitation, handling and processing, export and marketing, and biological and institutional management strategies for the flourishing Tuna fishery in Bangladesh. Bangladesh could extend her capacity and capability for Tuna fishery through regional cooperation regarding information and technological knowledge sharing. A standard fishing policy for shared resources should develop regionally. There should be a clear and transparent licensing system as well. No fishing vessels

with poor capacity and over-aged should be allowed for deep-sea fishing. There should be some clear criteria for fishing vessels to be allowed fishing in the deep sea. Promoting the Tuna fisheries through sustainable blue funds should be kept under consideration.

Deep-sea fishing is mainly a sector of enormous collaboration, financial involvement and the use of proper data with advanced fishing technology. Bangladesh has a huge prospect with lots of improvement in the overall marine fisheries sectors. The SDG 14-life underwater and its targets for sustainable fishery cannot have any prospect of success without harnessing

the deep-sea resources, especially the highly valued Tuna fishes. Marine Fisheries are one of the utmost priorities for "Vision 2041" for its high prospect and less effort with a high return nature. Bangladesh is still lagging behind in harnessing marine fish. International cooperation along with national coordination among the concerned organizations, authorities, universities, and think tanks are essential. Fruitful steps should be taken in a combined approach to go for a developed country with the successful utilization of a considerable marine sector.

Writer: Afifat Khanam Ritika is a Research Officer, BIMRAD.

TUNA FISHING METHODS



Pole & Line

Pole & Line is a fishing method that uses a single pole, line and barbless hook to catch one fish at a time.



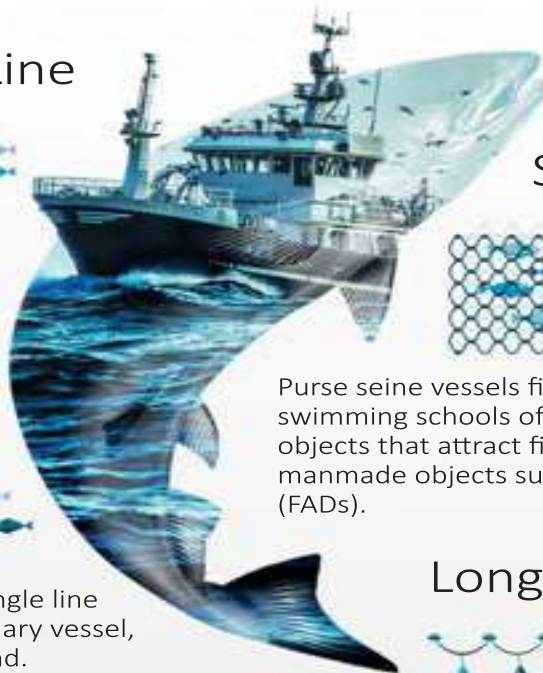
Handline

The handline method utilizes a single line and hook deployed from a stationary vessel, and the fish is then hauled by hand.



Troll

Troll fishing vessels use multiple fishing lines drawn through the water behind a moving vessel. Once tuna are hooked, the lines are pulled in to unhook the catch.



Purse Seine

Purse seine vessels fish either by spotting free-swimming schools of tuna or by utilizing floating objects that attract fish, either with natural or manmade objects such as fish aggregating devices (FADs).

Long Line



Long line is a fishing method making use of lines with baited hooks as fishing gear.

RENEWABLE ENERGY



The energy contained in the ground



Rotation of windmill blades



Biofuels from biogas and liquid biofuels from various sources



Electromagnetic radiation from the sun



The energy of the tides



The energy of the waves on the ocean surface



The energy of the tides rotation of the turbine tidal



Ocean-Based Renewable Energy Resources: Sustainable Solution to Growing Energy Demands

Nur Ahmed



Ocean-based renewable energy resources are considered the cornerstone for achieving sustainable blue growth because of their renewability and inexhaustibility. In the context of the growing demand for depleting and environmentally damaging fossil fuels, renewable energy resources provide sustainable solutions to ensure the energy security of a country. Marine Renewable Energy (MRE) resources are often used interchangeably to denote ocean-based resources. However, there are conceptual differences as MRE resources imply seawater's kinetic, potential, chemical or thermal properties. In this regard, the offshore wind falls under wind energy technology as a particular application, and biofuels from marine biomass are regarded as a type of bioenergy. In line with this definition, ocean waves, tidal currents, tidal range, ocean currents, ocean temperature, and salinity gradients fall

under the rubric of MRE resources. Nevertheless, considering the more significant advantages, the potentials of all ocean-based renewable energy resources should be focused more than the conceptual symmetries and asymmetries.

The conventional utility of the ocean-based renewable energy resources lies in power generation, e.g., electricity through conversion technology. And these alternative sources of energy can contribute significantly to offset the traditional practices of greenhouse gas (GHG)-intensive electricity generation. Therefore, it is recognised as an important means to mitigate the adverse impacts of climate change by the Intergovernmental Panel on Climate Change (IPCC). The High-Level Panel for a Sustainable Ocean Economy (Ocean Panel) estimated that ocean-based energy solutions have the

potential to reduce GHG emissions by nearly four billion tons of CO₂ equivalent per annum in 2030. Power generation through these resources has the enormous theoretical potential to produce a surplus after meeting the global energy demands. According to a 2020 International Renewable Energy Agency (IRENA) report, the estimated volume of global electricity production from all marine renewable technologies stands in the range of 45,000 to 130,000 terawatt-hours (TWh) per year, whereas the annual demand is 25,814 TWh. The ground-level reality is entirely different, as the cumulative global capacity to produce electricity through MRE resources in 2020 was only 535 megawatts (MW). The challenges to realising the true potential of ocean-based renewable energy resources are manifold. They stem from diverse areas of concern like technology, infrastructure, finance, policy, market, environment etc. Apart from the technological and financial inequality among the nation-states, the spatial distribution of the energy resources is also uneven across the globe. For example, waves are generally high at higher latitudes, while ocean thermal energy is mainly concentrated in the tropics. However, some general energy resources are available on every coast having utilitarian value to meet the local power demands.



The Bay of Bengal is considered as the lifeline of Bangladesh as it provides her only access point to the sea. It features a coastline of about 710 km extending from St Martin's in the south-east to the Sundarbans in the south-west. The long coastline and many small islands provide suitable locations for power generation due to the continuous presence of tides, wind and waves. In line with the global challenges, Bangladesh also faces similar obstacles due to the shortcomings in technological readiness. Of all the MRE technologies, tidal technologies feature the highest level of readiness and greater prospect for commercialisation. However, in the context of Bangladesh, the progress is minimal despite having geographical suitability for power generation. Selecting a suitable

spot is the first step in constructing a tidal power generation plant. The availability of high tide waves (>5m) and suitable embankment are two of the essential criteria in this regard. The other factors include considerable stability, locating away from the locality, transformation systems etc. Bangladesh has such coastal areas in Hiron Points, Sundarikota, Mongla, Char Changa, Cox's Bazar, Golachipa, Patuakhali, Sandwip, Barishal etc. Those spots are potentially suitable for constructing a large tidal power plant as well as producing enough electricity from tidal waves. Being situated at the estuary of the Meghna river on the Bay of Bengal and having a tidal variation of 5-6m, Sandwip is the best spot for tidal power generation.

Name of the Station	Tidal Range (m)	Output Power (MW)
Sandwip	5.53	28.83
Cox's Bazar	3.54	11.82
Hiron Points	2.90	7.93
Golachipa	3.55	11.88
Patuakhali	3.54	11.82
Barishal	3.9	14.34
Sundarikota	4.78	21.54
Mongla	4.8	21.72
Char Changa	5.6	29.57
Total		176.64

[Source: Roy, 2015]

Table 1: Probable Tidal Power Generation Stations and Estimated Output

Wave is regarded as the secondary source of solar energy, which is abundant, accessible and sustainable. The kinetic energy contained in the wave energy is around 1000 times more than the wind. The available technological gateways of Wave Energy Converters (WEC) are broadly classified into three: Oscillating Water Column (OWC), Oscillating Bodies (OB) and Overtopping. Considering Bangladesh's geographical and socio-economic context, OWC and Pelamis devices are the most suitable wave energy devices. The annual average of the wave power density is about 8-15 KWm⁻¹ in the Bay of Bengal, which is considered a low concentration of energy (Boyle, 2012). Saint Martin, Kutubdia and Sandwip Islands can be considered the potential places where OWC's could be installed, and power density would be optimal for cost-effective operation. The average wave height in Bangladesh's coastal area is about 1 to 2 metres, varying across the seasons. Based on everyday data on wave height, the average wave energy concentration is high between May and October in Bangladesh's coastal areas.

Wind energy has recently been popularised among the available avenues of renewable energy resources, and the global scenario is moving fast in this regard. Bangladesh's long coastline provides a unique opportunity for wind turbines' electrification, and more techno-economic assessments should be conducted as early as possible. There are two wind battery hybrid power plants in Kutubdia, while another one in Chakaria of Cox's Bazar is being built. Several important plants are being planned in the coastal areas in order to tap the ocean-based wind energy, e.g, Matarbari 100 MW Wind Power

Plant Project, Mongla 55 MW Wind Power Plant, Cox's Bazar 50 MW Grid-tied Wind Power Plant, Patuakhali 10 MW Wind Power Plant etc.

Location	Reference Height (m)	Annual-Average Wind Speed (m/s)
Cox's Bazar	10	2.42
Sandwip Island	5	2.16
Teknaf	5	2.16
Patenga Airport	5	2.45
Cumilla Airport	6	2.21
Khepupara	10	2.36
Kutubdia Island	6	2.09
Bhola Island	7	2.44
Hatia Island	6	2.08

[Source: Uddin et al., 2019]

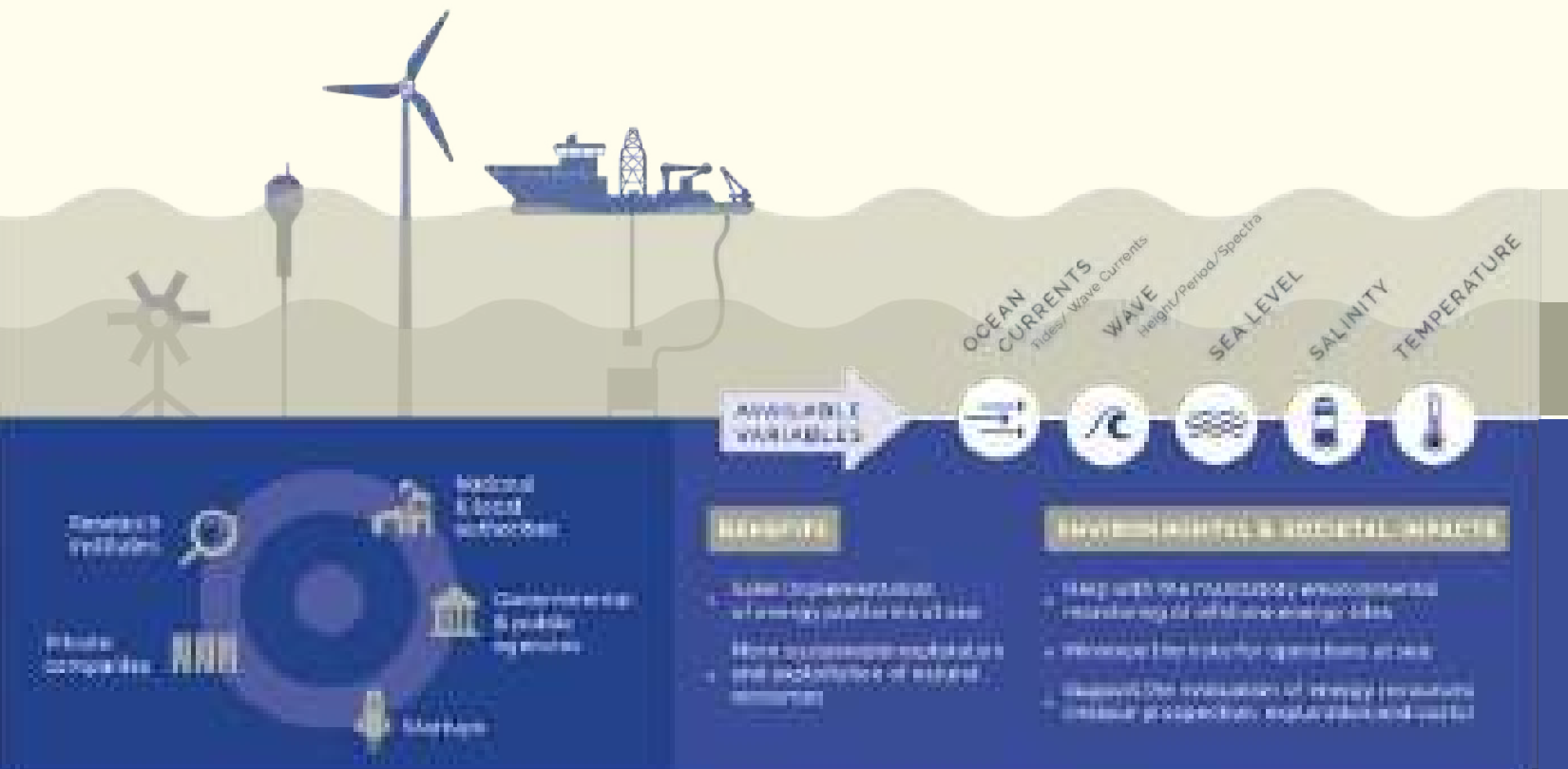
Table 2: Feasibility of Wind Condition for Generation of Electricity at Different Places in Bangladesh

Harnessing the renewable and inexhaustible local resources to

the fullest extent is key to ensuring the energy security of Bangladesh. The terrestrial energy resources are deemed limited due to the growing population. The ocean-based renewable energy resources are fundamental to achieving the Sustainable Development Goals (SDGs) and the National Determined Contributions (NDC) to tackle the adversities of climate change. In this regard, the Government of Bangladesh (GoB) has established a dedicated authority – Sustainable Energy Development Authority' (SREDA), under the jurisdiction of the Power Division of the Ministry of Power, Energy and Mineral Resources. However, there should be a strong collaborative framework between SREDA and the maritime stakeholders like the Blue Economy Cell of the same ministry and other related authorities under different ministries. The coordination must be framed comprehensively to address issues like technological readiness, infrastructural development, developing commercially viable distributive mechanisms, etc.

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Ocean-Based Renewable Energy Resources



Seaweed: An Option for Mariculture Expansion in the Coastal Region of Bangladesh

Asst. Prof. Md. Masud Rana



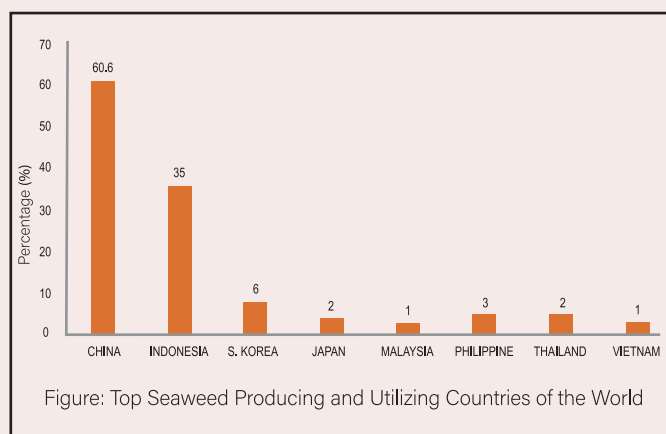
The Oceans are the most essential resources on the planet. The total maritime area of Bangladesh is approximately 1,18,813 square kilometres which is about 80% of our total land area. Seaweeds are one of the most commercially important non-conventional fisheries of this vast ocean. The diverse and large group of organisms that develop in the marine environments to convert minerals and carbon-di-oxide to biomass photosynthetically by using energy provided by the sun are known as seaweed. Seaweeds are one type of autotrophic organism which grows through the photosynthesis process as plants do. Macroalgae and microalgae are two primary forms of seaweed; microalgae differ from macroalgae by their morphology, pigments, cell wall, reserve substances, and cellular division characteristics. Macroalgae can be divided into red, green, and brown algae-based on primary pigments. It is a type of marine vegetable with medicinal properties; it is possible to strengthen the wheels of the country's finances by earning a large amount of foreign exchange by exporting these algae.



Seaweed, A-Green, B-Red



A total of 221 species of seaweeds having commercial importance are found in South-East Asia, of which 110 are fit for consumption. St. Martin's surroundings and coastal areas of Bangladesh are suitable for cultivating these algae. So far, 215 species of seaweeds of 102 groups have been found along the coast of St. Martin's. Bangladesh Fisheries Research Institute (BFRI), in their study, confirmed the presence of 116 species of seaweeds in coastal areas, among them *Caulerpa racemosa*, *Enteromorpha* sp., *Gelidiella tenuissima*, *G. pusillum*, *Hypnea pannosa* are commercially important. Around the world, food patterns are constantly changing; new items are being added to the menu, and as a result, the demand for seaweed is increasing among tourists. The demand and trend for seaweed and seaweed-based food is also increasing day by day in the tourist areas of Bangladesh, including five-star hotels-motels, Cox's Bazar and Kuakata.



Seaweed has a considerable demand in the global market, amounting to 16 million metric tons/year. China alone produces 55-58% of its current demand. Like any other country in the world, Bangladesh has a vast potential for cultivating this green asset. Bangladesh Fisheries Research Institute (BFRI), Bangladesh Agricultural Research Institute (BARI), WorldFish, and Food and Agriculture Organization (FAO) are working extensively on the production, processing, and marketing of seaweed. As many climate threats are arising, options should be opened for more income-generating options with economic sustainability. Researchers have shown that the weather in the sub-coastal region of Bangladesh is very suitable for seaweed cultivation. Seaweed is the best produced *Hypnea* sp. in Bangladesh and has the potential to cultivate *Eucheuma* sp. These are used to prepare carrageenan, widely used in the food processing industry. In today's world, marine algae are one of the most important aquatic resources that contain edible protein, carbohydrates, minerals, and fats, like other plants. Studies have shown that marine algae contain high protein, fibre, vitamins (A, D, K, E), calcium, and potassium, which are essential and vital ingredients for the human body.

Besides, seaweed contains high-quality amino acids and is a good source of unsaturated fatty acids. Scientists say that this vegetable is an effective antidote to heart disease, diabetes, high

blood pressure, and iodine-related gallstone diseases, which also play a role in lowering cholesterol in the blood. Due to its high nutritional value, it has been used directly as salads, spices, vegetables, etc. in developed countries. Since seaweed is full of nutrients, it can be used to produce different types of products. Seaweed soups, pizzas, noodles, biscuits, bleach, and pickles are some of the most edible products prepared from seaweed. From seaweed, carrageenan, agar powder, essential medicines, preservative food additives, toothpaste, various types of cosmetics and cloth colors can be prepared. Likewise, in different countries of the world, paper, cloth, gel, emulsifier, glue, packet coating, glaze of ceramics, skin polishing material, and alginate are made from seaweed. Seaweed is widely used as an organic fertilizer and as a binder for fish and animal feed. Since there are different types of bioactive ingredients present in seaweed, it is considered to be a high-quality functional food. It is possible to earn a virtuous currency by making various value-added products using seaweed and exporting them abroad to meet our nutritional needs. Already seaweed-based various value-added products in coastal areas have gained massive popularity in the local market.



China, Japan, Korea and other seaweed producing countries mainly follow the long line or rope, floating rack, hanging net, permanent and temporary rack system for seaweed cultivation. A temperature of 25-30°C, solid rocky bottom, saline semi-transparent water, and suitable water circulation are very important for growing seaweed that meets with our marine environment. Cultivating seaweed as seriously as any other crop can make it a highly profitable crop because it is a fast-growing plant, and the cost of production is very low. Seaweed farming does not require fertilizer, insecticides or soil preparation like any other crop, and it does not require a very skilled person. The biggest thing is that it is not possible to grow any vegetable in the hidden water of the sea if there is a crop to be done there, then it is a pleasing thing. The average cost of seaweed production per square meter is BDT 200-250, and the price of the produced crop is BDT 700-800. The price of seaweed is BDT 1500-2000 per 40 kg in raw condition and

BDT 3500-4000 in dry condition. Due to the high salinity in the coastal areas, it is impossible to cultivate other crops, so economic revolution is possible by cultivating these green algae at a low cost. Seaweed cultivation has excellent potential in the 710 km coastal areas of Bangladesh; in these areas, if the seaweed cultivation is intensified, it is possible to make good use of our coastal water as well as to achieve foreign currency after meeting the nutritional demand of our country. Expanding seaweed cultivation, processing, and marketing in Bangladesh will create employment opportunities for a large population in the coastal area and play a vital role in alleviating poverty.

In order to expand the cultivation of this potential plant and make this unconventional fishery resource profitable, we have

to face many challenges. If the government of Bangladesh prepares some policies to increase the cultivation and utilization of this resource, it will be easier to solve the challenges. Apart from this, if various entrepreneurs and traders of the fisheries sector take the initiative to make seaweed processing industries for valuable natural sources of food, cosmetics, and various medicines, then it will be a new step for further enriching the economy of Bangladesh.

Writer: Asst. Prof. Md. Masud Rana is the Chairman, Department of Fishing and Post Harvest Technology, Sher-e-Bangla Agricultural University.

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Hydrocarbon Potential in Offshore Bangladesh: Current Status and Future Prospects

Prof. Dr. Md. Sakawat Hossain



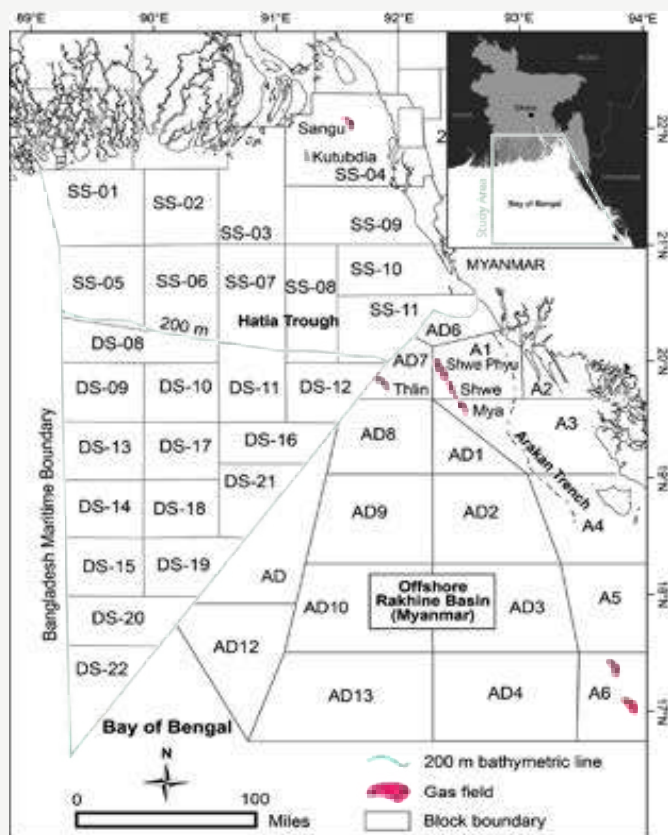
Introduction

The Bay of Bengal, one of the largest bays in the world is surrounded by several petroliferous basins in India to the west, Myanmar to the east, and Bangladesh to the north. Among these petroliferous basins, the Krishna-Godavari and Mahanadi offshore basins are located along the eastern coast of India, the Rakhine offshore basin on the western coast of Myanmar, and the Bangladesh offshore basin along the southern coast of Bangladesh. Although the Krishna-Godavari Basin in India and the Rakhine offshore basin in Myanmar have been extensively explored and are well known for their prolific hydrocarbon (i.e., oil and gas) reserves, Bangladesh offshore basin has been little explored and yet discovered its full petroleum potential (Shamsuddin, 2022). Exploration drilling in offshore Bangladesh is almost nonexistent and the exploration data is not sufficient to analyze the hydrocarbon reserve. However, from the similar deltaic nature, depositional history and close vicinity of Indian and Myanmar's offshore basins, it seems that Bangladesh's offshore areas might be rich in hydrocarbon. Nevertheless, as the sole national exploration company – Bangladesh Petroleum Exploration and Production Company Limited (BAPEX) cannot explore hydrocarbon offshore, Bangladesh entirely relies on the international oil companies (IOC). The efforts to attract IOC companies for offshore (i.e., shallow and deepwater) explorations in Bangladesh part were not fully materialized for two important reasons. One is the low hydrocarbon price in the international market in the last few years discouraged IOC companies from expanding exploration in Bangladesh's offshore territories. The second important issue is the maritime boundary dispute between Bangladesh and Myanmar in the east and between Bangladesh and India in the west deterred the IOC companies from carrying out full-scale exploration near the disputed water

previously. As the maritime boundary disputes were settled through the International Tribunal for the Law of the Sea (ITLOS) in 2012 and 2014 with Myanmar and India, respectively, Bangladesh now has undisputed rights to the natural resources beneath the seabed out to 200 nm and beyond. Within its maritime boundary (118,813 sq. km) in the Bay of Bengal, Bangladesh divided the area into 26 blocks (Figure 1). Among these offshore blocks, 11 are in shallow water with a water depth up to 200 m, and 15 are in deepwater with a water depth of more than 200 m to a maximum water depth of about 2500 m (Chowdhury et al., 2022).

Current State of Offshore Hydrocarbon Exploration

In terms of the petroleum system, the northern offshore part of the Bay of Bengal within the Bangladesh territory is mostly covered by the Hatia Trough, which is a proven petroleum province (Hossain et al., 2019). Not all the anticlinal and stratigraphic traps of the offshore part of the Hatia petroleum system have been explored yet, and the western part of the system is completely unexplored. In the Bangladesh offshore part, the first exploration project was launched in early 1974 and several IOCs were engaged in exploration in the offshore blocks. In 1978, the IOCs abandoned the blocks and left after only a very small gas field discovery (i.e., Kutubdia), and returned after decades. So far, two offshore gas fields have been discovered in the eastern offshore part of Bangladesh and these are the Kutubdia (1976) and Sangu (1996) gas fields. A total of 21 exploratory wells were drilled in the offshore area of Bangladesh by the end of 2020, and all these wells were drilled by the IOC in the shallow water (Imam, 2022).



The Kutubdia gas field is located in the offshore shallow water block SS-04. The gas field is estimated to have recoverable gas reserves of around 45.50 BCF, but an inadequate gas demand at the time of discovery might have prompted the IOC to leave the field undeveloped, which is yet to be developed. The Sangu gas field located in block SS-04 was the first offshore and is the only offshore gas field in the country which has been produced, and had a calculated initial confirmed GIIP of 1612 BCF (Shahriar et al., 2020). This gas field is a large-scale anticline trap cut by numerous channels and canyons. After having produced about 487 BCF of gas, the field was shut down in 2013 due to unexpected low reservoir pressure. However, recently the exploration data has been re-evaluated and re-interpreted to assess the total number of reservoir horizons and the hydrocarbon volumes remains, and to decide whether it is possible to further production from this field in the future (Shahriar et al., 2020). The results suggest that the recoverable reserves remain about 358 BCF and could be produced by employing advanced hydrocarbon production techniques. The results also indicate that the reservoirs in this field may be compartmentalized by channels or faulting, thus limiting the drainage areas. Hence, a 3D seismic survey is necessary to accurately map this gas field and locate the future development/production wells. Recently, the government of Bangladesh is planning to convert this offshore gas field (i.e., Sangu) into an underground storage area for the imported liquid natural gas (LNG), where 487.91 billion cubic feet of gas can be stored (Khan, 2022).

Prospects in Deepwater Blocks

As of today, 15 deepwater blocks are covered by very limited 2D seismic surveys without any exploratory drilling. On the other hand, exploration activities in the adjacent deepwater areas of the Rakhine Basin of Myanmar, and the Krishna Godavari Basin of India, started quite a long ago and have significant success with oil and gas discoveries (Shamsuddin, 2022). The northern part of the Bay of Bengal is home to the largest fluvio-deltaic-slope fan complex in the world known as the Bengal Fan. Bangladesh's 15 deepwater blocks covered the north-central part of the Bengal Fan. The Rakhine Basin of Myanmar and Krishna Godavari Basin of India are located on the eastern and western peripheries of the Bengal Fan, respectively. Several major discoveries have been made in the Rakhine Offshore Basin. Among them, Shwe Phyu, Shwe and Mya (shallow water), and Thlin (deepwater) gas discoveries are prominent. All these gas fields are adjacent to Bangladesh deepwater block DS-12. Though separated by the international boundary, the geology of the most offshore blocks of the Rakhine Basin is genetically similar to the southeastern offshore blocks of Bangladesh (Bowles et al., 2019). Similar play fairway trends and deepwater architectural elements are most likely to be present in adjacent Bangladesh's deepwater blocks. These deepwater architectural elements include submarine canyons, confined slope channel complex systems, isolated channels, aggradational channel-levee complexes, frontal splays, and mass-transport complexes (Ma et al., 2020). All such similarities and available geological evidence suggest that Bangladesh shallow and deepwater blocks have a good to excellent potential of being gas-rich, particularly in the area adjacent to the Rakhine Basin of Myanmar.

Both thermogenic and biogenic gas is present in the offshore area of Bangladesh. Naturally occurring oil seeps have been identified on St. Martin's Island, and multiple gas chimneys have been recognized in seismic surveys in the offshore area as indicative of an active petroleum system (Shamsuddin, 2022). Furthermore, the initial results of a recent study suggest evidence of gas hydrate occurrence in offshore Bangladesh at depths 250–440 m below the seafloor where water depths ranges from 1300–1900 m (Monteleone et al., 2022). Further research and exploration initiatives need to be taken to identify new gas hydrate reservoirs, their spatial distribution, and the quantity of the total reserves within the Bangladesh maritime boundary. Against the backdrop of depleting gas reserves, hardly any new discoveries, and ever-increasing energy demand, gas hydrates represent a potential prospects for the future energy security of Bangladesh. Now, the time has come to focus on hydrocarbon exploration in the vast offshore area, and accordingly, the government is awarding deepwater blocks to IOC to boost hydrocarbon exploration and production.

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Aquatic (Blue) Food Systems and Blue Economy of Bangladesh: WorldFish Initiatives

Md. Abdul Wahab, PhD



Approach for Healthy People and Planet

Aquatic foods, often called blue foods, whether caught in oceans, lakes, and rivers or sustainably farmed, release less carbon than land-based crops and livestock. They are packed with vitamins, minerals, and healthy fats. Aquatic foods are healthy for people and the planet. It has been a time-demanding approach to turning attention towards the sustainable use of vast aquatic systems for harvesting (capture) and growing (culture) the various types of aquatic foods, both from animal and plant origin.

The victorious wins with having entitlement of sovereignty over 118,813 sq. km of the Bay of Bengal have opened up a new opportunity for Bangladesh to achieve sustainable economic growth through resources exploitation and ocean-based activities. The declaration of “Blue Economy” has become a national dream of the people of Bangladesh. There are two major sectors in the new concept (i) Established sector-comprised of Fisheries both (artisanal and industrial), Aquaculture (coastal & mariculture), Fish processing (mainly of

shrimp), Ports and warehousing, Marine transport, Shipbuilding and repair, Coastal tourism, Oil and gas, and Salt production; and (ii) Emerging sector - Coastal and environmental protection, Off-shore wind energy, Ocean energy, Desalination, Biotechnology, and Carbon sequestration.

About 68,000 artisanal fishing boats of different capacities and sizes are involved in fishing in the earmarked 40m depth zones in the coastal waters and significantly contribute to the total marine catch. Around 255 industrial trawlers are supposed to fish in the waters beyond 40m. A vast area of the deeper ocean remains untapped due to the lack of capacity. Marine catch contributes only 15% of the total fish production, where 85% of the total marine catch comes from the artisanal fisheries and the rest from the commercial fleets. It is high time for Bangladesh to pursue growth by capturing fisheries through science-based management and to rebuild depleted stocks.

The coastal aquaculture of Bangladesh is mainly comprised of tiger shrimp farming. This farming system grew unplanned and

the farming practices, mostly traditional extensive seriously hit by environmental deterioration and the onset of various viral diseases. The mud crab (*Scylla Serrata*) farming in saline-affected rice fields in the Southwest region has been successful and extended to 27,000ha with a production of 13,000 metric tons.

In the true sense, mariculture has not yet started in this country and is still in its infancy. There are opportunities for mariculture of nontraditional marine animals like various types of shellfish (edible oysters, pearl oysters, green mussel, clam, abalone, and sea snails), sea snails urchin, and sea cucumber.

Economic Values

The market price of marine fish varies widely from BDT 100/kg (US\$ 1.2/kg) to BDT 1000/kg (US\$ 11.6/kg), depending on species and size. The average price could be BDT 500/kg (US\$ 5.8/kg), so the approximate economic value of 671,104 tons of marine fish would be about BDT 33,555 Crores (US\$ 3.9 billion) per annum (Exchange rate, US\$ 1 = BDT 86).

The retail market price of Hilsa largely varies from BDT 400/kg (US\$ 4.7/kg) to BDT 1,200/kg (US\$ 14/kg) with an average of BDT 800/kg (US\$ 9.3/kg) of fresh fish. Based on that, the direct economic value of 0.55 million metric tons of Hilsa is worth about BDT 44,000 Crores (US\$ 5.2 billion) per annum.

Shrimp is an essential export-oriented marine resource, and its annual production reached 42,816 tons from marine sources. The annual export value from shrimp and shrimp products is about BDT 2,949 Crores (US\$ 3.4 million) through exporting 30,036 tons of shrimp commodities (including cultured shrimp and prawns). Besides, Bangladesh exported about 12,686 metric tons of mud crab and earned 25.37 million USD in 2017.

WorldFish's Blue Economy Initiative

The USAID funded Enhanced Coastal Fisheries (ECOFISH Activity) of WorldFish Bangladesh has taken following comprehensive actions towards biodiversity conservation and producing aquatic foods, including fish and other food organisms, popularly called blue foods, through the improvement of artisanal fisheries and coastal mariculture:

i) Blue Guards for Cleaner Environment & Healthier Ocean

ECOFISH II activity involved youth fishers as "Blue Guards" to keep the coastal waters clean. ECOFISH II has trained and inspired youths to get voluntarily involved in collecting plastics, abandoned nets and garbage from the beaches, coastal waters, and fishing boats to reduce pollution and make the marine environment habitat healthier for the beach users and biodiversity.

ii) Boat Skippers as Citizen Scientists

The boat skippers (Majhee) are responsible for the fishing boats' safe and efficient operation, including its safety and security, navigation, team management, and legal compliance. Aiming to sensitize the boat skippers, ECOFISH has started

countrywide training on various aspects of biodiversity conservation and responsible fishing. These specially trained boat skippers equipped with mobile phones act as "Citizen Scientists". Half of them work in the coastal rivers to cover only the hilsa fishery, and the other half covers the marine artisanal fisheries.

iii) Marine Protected Area (MPA) & Hilsa Sanctuary

Marine Protected Area (MPA) can enhance ecosystem resilience, conserve biodiversity, enhance fisheries, and secure human well-being, thus contributing to the blue economy. ECOFISH and the Department of Fisheries, in collaboration with IUCN and WCS, delineated a total of 3,188 sq. km area of Nijhum Dwip seascape for declaring an MPA. The Ministry of Fisheries and Livestock declared the MPA under the Marine Fisheries Ordinance, 1983, in 2019.

The ECOFISH activity, in collaboration with the Department of Fisheries (DoF) and Bangladesh Fisheries Research Institute (BFRI), delineated and declared the sixth Hilsa sanctuary (82 km) in an important hilsa nursery grounds in Hizla and Mehendiganj in Barishal. The compliance of both brood hilsa fishing and Jatka fishing bans is implemented in this sanctuary, contributing to the higher recruitment of juveniles and higher production of Hilsa.

iv) Hilsa Fishery Revival through Co-management

ECOFISH introduced adaptive co-management in 2016. Co-management is an approach where government and stakeholders jointly prepare action plans and implement them for better compliance. ECOFISH with DoF created a revolving fund "Hilsa Conservation and Development Fund (HCDF)" amounting to US\$ 0.43 billion as seed money to use the interest for the co-management committees.

As a synergistic impact of the general management activities and science-based co-management through the ECOFISH project, the Hilsa catch increased from 5% to 11%. The fish size has also improved. The success of the Hilsa fishery management approach in Bangladesh has been adopted in the neighbouring countries and has become a role model for the small-scale capture fisheries.

v) Stock Assessment of Major Marine Fish

Since 2020, the ECOFISH project has focused on stock assessment of 10 major commercial species (Hilsa shad, Mackerel tuna, Indo-pacific king mackerel, Silver Pomfret, Black Pomfret, Threadfin, Indian salmon and Reeve's croaker) chosen from the artisanal fish catches. As part of the biodiversity conservation and assessment, the ECOFISH team also monitors the catch of megafauna.

vi) Assessment of the IUU Fishing at the Artisanal Fisheries Level

WorldFish/ ECOFISH assessed the status of IUU fishing by the artisanal fishers in the major coastal regions of the country. The IUU survey revealed that industrial trawlers caught 37,532 tons

of marine fish illegally in waters below 40-metre depth and inside marine protected areas. Interviews with fisheries officers revealed that, on average, 24% of the landed fish are of illegal origin and caught through fishing operations contravening fisheries regulations in Bangladesh.

vii) Seaweeds Farming for Alternative Livelihood & Reducing Fishing Pressure

Aiming to create a new opportunity for an alternative livelihood and economic empowerment of fishers' women of Cox's Bazaar, ECOFISH has taken initiatives to promote environmentally friendly mariculture of seaweeds along the coastal inshore marine waters. Seaweeds farming could create numerous employment opportunities, especially to support the fishing households during 65 days of the marine fishing ban period, which will reduce illegal fishing and help conserve biodiversity. Seaweed farming requires no significant investment or expensive infrastructure. It does not require additional feed and still can convey lucrative returns within a short period. Seaweed farming is a climate-friendly production system that sequesters 'blue carbon' and thus reduces carbon footprints.

viii) Green Mussel Farming – A Potential Door to Blue Economy

The coastal waters of Cox's Bazar are ideal sites for green mussel farming because of the favourable environmental conditions, nutrient-rich waters, and the natural abundance of green mussel spats. WorldFish Bangladesh has been promoting green mussel farming for the economic empowerment of 200 fishing families, particularly fisherwomen and youths. Green mussel farming is a low investment activity; it requires only a few infrastructures and does not require additional feed inputs. This new mariculture dimension will provide a viable alternative livelihood approach for small-scale coastal fisherfolks during the fishing ban.

ix) Women-led Safe and Hygienic Dried Fish & Fish Powder Production

ECOFISH activity has taken the initiative to produce safe and hygienic dried fish and fish powder from the nutrient-rich marine pelagic small fish to revert the consumers' suspicion of taking dried fish into their daily diet. Until now, 1000 fisherwomen have already received the complete package of training, low-cost infrastructures, and necessary raw materials, including a regular supply of fresh marine fish. They follow the standard protocols of safe post-harvest handling from boat to drying platform.

Way Forward

The following actions are recommended for achieving Blue economic growth and for the marine resource conservation:

- > Need adoption of new legislation on "ecosystem-based fisheries management"
- > Introduce MCS as a tool for the management and conservation of marine resources
- > Assess the MSY of major commercial fish species and stock status of demersal and pelagic fishes and Tuna stock
- > Modernize the major fish landing centres and improve cold chain and post-harvest value chains
- > Introduce mariculture of high-value fishes, seaweeds, and mollusks
- > Develop value-added products from marine bycatch and small pelagic fish
- > Derive pharma and nutraceuticals from marine algae and seaweeds to contribute to economic prosperity

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Promotion of Local Shipping Industry is Crucial for Survival in Thriving Global Market

R Adm A S M Abdul Baten, (E), BSP, ndc, psc, BN (retd)



Shipping has always been an efficient and economic driving force for prosperity; thus, it remains at the heart of the global economy. Some 11 billion tons of goods are globally transported by ship each year. Nevertheless, operating ocean-going vessels has never been without challenge; investment in shipping demands handsome capital, prudence, knowledge and courage to take a calculated risk. There have been ups and downs in the shipping industry worldwide. Intelligent players with essential knowledge of the field generally survive well in adverse conditions. Successful governments also promote the new entrepreneurs for better performance.

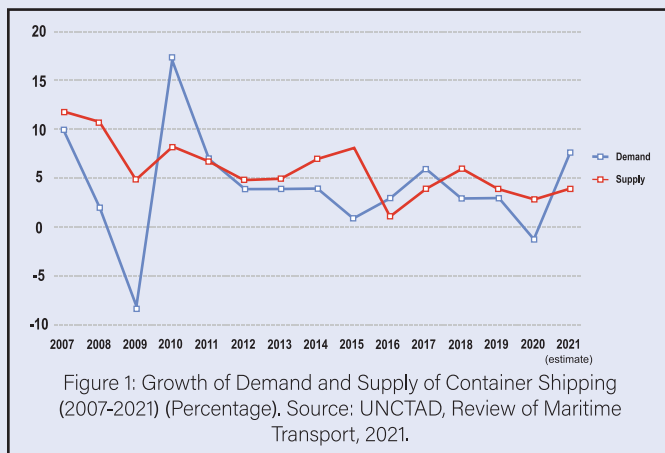
As an emerging littoral maritime nation, Bangladesh is striving to attain excellence in the blue economy with many new agendas, where shipping is one of the front line industries. Over the last four decades, there has been an upswing in this sector. Alongside shipping, shipbuilding is a thrust sector and can influence shipping directly once the builders can deliver ocean-going vessels. But unfortunately, there is hardly any remarkable achievement in the shipbuilding sector (in terms of building ocean-going vessels), which would introduce Bangladesh

as a shipbuilding country in line with other Asian countries that are leading from the front. Opportunities available have not been adequately exploited to attain brilliance. The major issue lies at the expert level as there is a shortage of skilled human resources. Moreover, there is a shortage of strong entrepreneurs supported by pragmatic policy packages.

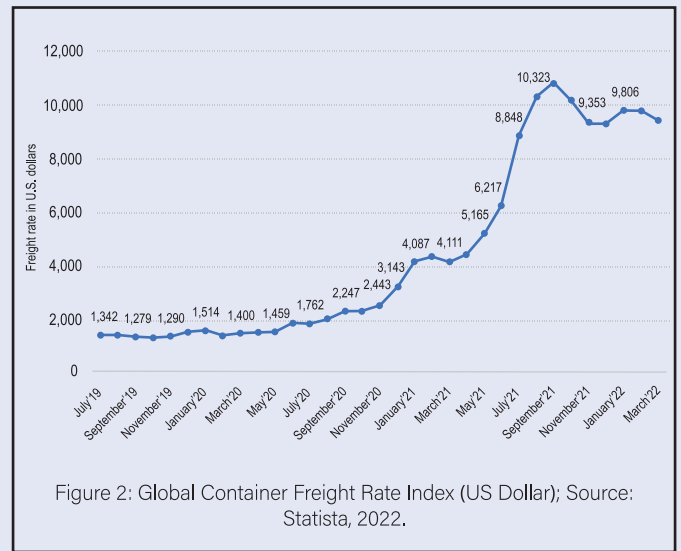
In Bangladesh, a shipping company was first established in the public sector by the Father of the Nation Bangabandhu Sheikh Mujibur Rahman in 1972 and was named Bangladesh Shipping Corporation (BSC). In the late eighties, private entrepreneurs started investing in the shipping trade. Bangladesh Ocean Going Ship Owners Association (BOGSOA) was formed in 1989 to represent private and public enterprises. At one stage, the public sector had developed uncertainties in managing the assets, and the number of ships began to decline. Presently, almost 90% of the flag carriers at sea are owned by the private sector. One positive news is that when there were shrinkages during the pandemic, the number of ocean-going vessels touched a new record within the country with 2.22 million GRT (80 vessels). Again, this number is not enough as it is less than

10% of total shipping loads taken by foreign ships (import and export together) at three national ports of Bangladesh.

The shipping business is one of the fastest-growing businesses of today's time because it helps generate good revenue, and the need for shipping companies is on a constant rise. Over 55,000 merchant ships are plying global trade around the world. These ships include General Cargo, Bulk and Break Bulk ships, Container ships, Chemical, Oil and LNG Tankers, Passenger and various other types of ships. Out of all, containerisation has increased the efficiency of moving traditional break-bulk cargoes significantly, reducing shipping time by 84% and costs by 35%. Today, about 90% of non-bulk cargo worldwide is transported by container ships. Since 1980, there has been a significant evolution in this category. Early container vessels of the 1950s had a carrying capacity of 500-800 TEU only. The recent vessels like Megamax-24 (MGX 24) of 21,000 to 25,000 TEUs are phenomenal. Leading Container companies MSC – Mediterranean Shipping Company (4.28m TEUs) and APM-Maersk (4.27m TEUs) are world leaders (Marine Insight, 2022).



In Bangladesh, container ships entered at the beginning of this century for a brief period by HRC Shipping Ltd, and it could not



continue due to multiple reasons. The recent inclusion of six container ships by HR Lines Ltd, an affiliate of the Karnaphuli Group with a 100% Bangladeshi crew, has brought a change to the local scene. The company deserves immense appreciation from the maritime community for taking such a major decision at the right time. They have a further scope of enhancing business in the coming days through new routes.

Under the Bangladesh flag, almost all categories of vessels are now operating. With the occurrence of the Russian-Ukrainian war amid the pandemic, the shipping business has become expensive at this time. These charter and freight rates will not last long, so the new entrepreneurs must plan accordingly. Congestion at ports, lockdown, shortage of vessels and empty containers have driven prices exceedingly high. However, maritime experts have different opinions about it. When the boom cycle will end, the drop may not be as big as it used to be, and the benchmark for charter and freight rates will be elevated compared to the pre-pandemic crisis.



The shipping sector has some peculiarities in its area of operation, which may result in uncertainties and new challenges. This entails a detailed understanding of the field before any kind of investment. New entrepreneurs need to have a fair understanding of the 'shipping cycle' at the planning stage. This business plan should talk about facts, figures, and strategies that would be depending on. This business plan needs to include target market, skills, price, cost, financial plans, core competencies, etc. A simple guideline is shown in Figure -3.

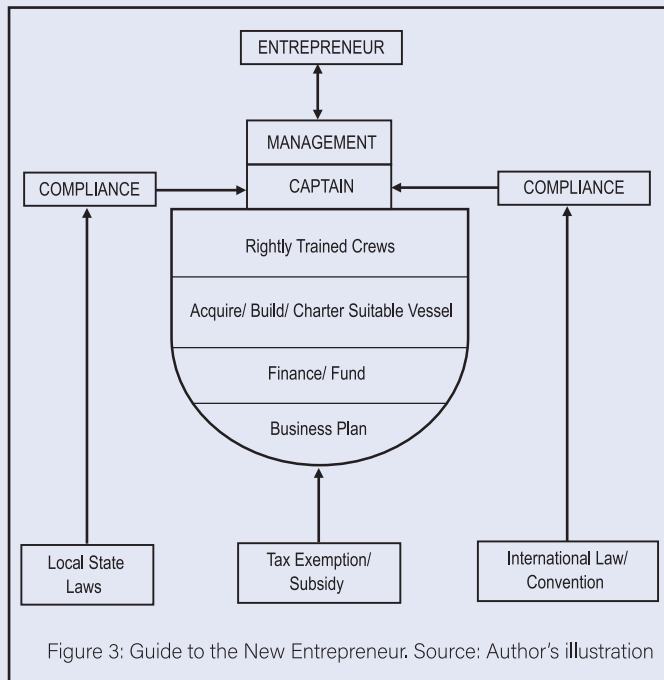


Figure 3: Guide to the New Entrepreneur. Source: Author's illustration

A market should be selected where there is demand but has limited shipping companies. The next requirement is to look into the state's local laws and be respectful of them. Selection of staff/crews for ships and at sea is another important area that continually needs proper attention. An experienced captain is responsible for sailing the ship, boarding the right crew and technicians for maintenance and staff for handling customers and orders using appropriate, affordable gadgets. During the recent depression in the dry cargo sector, ship owners adopted two tactics: Learn how to survive and Look for opportunities. Ideally, ship-owners should behave like strategic managers and think in line with Michael Porter's (1980) strategy of "cost leadership" mainly through economies of scale, cutting-down fleet's average age, and total cost. Bigger ships have lower unit costs, and unit cargo handling and storage are also cheaper at high throughput volumes. For a newcomer in the shipping sector, the followings are important:

- > Stable platform with satisfactory design, assistance in technology transfer and effectively trained crew

- > Government support, favourable access to international and domestic support; know how to be competitive in the market

- > Combination of short and long term charters (preferable); a future market estimation; minimum crew; the right time between dockings, and a more efficient propeller design

- > Economies of scale; minimum port time; a long term chartering contract

- > Third-Party ship managers for part or all of the owners' management functions

Bangladesh is gradually emerging as a shipping power with its limited resources. The vast maritime community needs to be encouraged by the state to remain more attached to this enormous sector. In order to promote the shipping business within the business community, the government may provide incentives in different forms. A few examples are mentioned below:

Subsidies for capital investments to shipping companies to acquire ships are a suitable option. This support may be given to both shipbuilding and shipping industries simultaneously. South Korea has such subsidies with a double aim and channel to support their local shipyards via their domestic shipping companies. Even during the challenging limitations of IMO 2020 sulphur-content (0.5% sulphur fuel) of marine fuels, they have provided subsidies to the entrepreneurs. Subsidies are also required for maritime knowledge, and innovation is another outstanding scheme to advance progress in the field. For example, Singapore's Maritime Innovation and Technology Programme (MINT) funds universities.

Tax exemptions of shipping companies are the area where entrepreneurs are more interested in getting support at the initial stage of business. These are corporate income taxes, either via shipping-specific alternative taxes (the tonnage taxes) or via other exemptions from regular corporate and business taxes, advance income taxes etc.

Because shipping is the backbone of international trade, Bangladesh, as a rapidly rising economy, must encourage new entrepreneurs to enter the sector. The government of Bangladesh has rightly identified the strategic importance of the shipping sector by enacting the Bangladesh Flag Vessel (Protection of Interest) Act of 2019. This encourages Bangladeshis to own and invest in ocean-going vessels, thereby saving valuable foreign exchange and creating a large number of job opportunities for Bangladeshis.

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Was the Russia-Ukraine War Avoidable?

Cdre Md. Abdur Razzak, NUP, ndc, psc, MPhil, BN (retd)



On 22 February 2022, the President of the Russian Federation Vladimir Putin stopped the world from guessing his intention over the Ukraine standoff that started in November 2021. He recognised the independence of the Donetsk and Luhansk People's Republics. The next day, he marched troops into the Donbas region on a "peacekeeping mission", gradually widening military operations across Ukraine and heading to Kyiv. In response to the Russian attack, European Union and US allies continue to impose targeted sanctions against Russia. Calling economic sanctions and European leaders' statements provocative, Putin, on 27 February 2022, put his nuclear forces on high alert, adding tension to the situation unfolding on the ground and forcing the world to new guessing. This war was not borne but created on the geopolitical chessboard.

President George W. Bush in his speech to National Defence University at Fort McNair, Washington DC, on 1 March 2001, emphasised: "not to fall out with Russia, and that the USA and Russia are not and must not be strategic adversaries". After two decades of President Bush's rhetorical optimism, the USA and the Russian Federation are 'strategic adversaries' on the global stage. Contrary to President Bush's wish, NATO, led by the USA, had been expanding the alliance eastward with a missile defence network. NATO's expansion toward east Europe is the USA's containment strategy against Russia, which

the USA views as the remnant of the Cold War phantasm encountered for the first time in Syria since the fall of the USSR in 1990.

Expansion began eastward with Poland, the Czech Republic and Hungary joining the alliance on 12 March 1999. NATO continued its enlargement and included seven more countries from the former Warsaw Pact and three from former Soviet Republics. The adversarial tension between NATO and Russia was exposed after the USA offered NATO membership to the former Soviet Republics of Georgia and Ukraine in 2008. Germany and France called President Bush's offer of NATO membership "unnecessary". The opinions of Germany and France might have been logical in the context of stories from Finland and Sweden since the Cold War period. If the United States and the Soviet Union had been able to rely on the neutrality of Finland and Sweden throughout the Cold War, Ukraine as a neutral country would not have put anyone's security at risk.

Russia's President Vladimir Putin reacted to the US offer of NATO membership to Georgia and Ukraine saying, "NATO's enlargement towards Russia would be taken in Russia as a direct threat to the security of our country." Subsequently, Russia attacked Georgia on 1 August 2008. In a brief war, Russia-backed rebels formed the Republic of South Ossetia and the Republic of Abkhazia. Russia recognised both the republics.



Georgia retains a claim over lost territories, and the US supports it. Russia established two military bases in the two republics. Before attacking Georgia, the chief of Russian armed forces said on 11 April 2008 that besides military actions against Georgia, Russia would act differently to stop former Soviet Republics from taking NATO membership. By 2008, former Soviet Republics Latvia, Estonia and Lithuania became NATO members.

Six years after attacking Georgia, protests boiled against Russia-backed former President of Ukraine Viktor Yanukovich. Protesters demanded warmer relations with European Union and NATO. The protest resulted in Viktor Yanukovich's ouster. Russia reacted by taking back Crimea into its sovereignty which former USSR President Nikita Khrushchev gave to Ukraine in 1954. Besides, a rebellion began in Donetsk and Luhansk of the Donbas region in eastern Ukraine. Russia, Ukraine and rebel leaders of Donetsk and Luhansk signed Minsk Agreement in 2014 to end the conflict in these two breakaway republics. Germany, France and the Organisation for Security and Cooperation in Europe (OSCE) mediated the agreement. The relationship between Russia and Ukraine started to fall apart as Ukraine was displaying its intention to do away with the Minsk Agreement and its inclination to obtain NATO membership.

Russia was very suspicious of both NATO and Ukraine's intention, and to stop it from getting NATO membership, deployed a large number of troops around Ukraine to keep up the pressure. Keeping the troops on alert at the border, Russia declared the red line, 'demanding NATO not to concede membership to Ukraine and roll back from eastern Europe'. The USA raised the alarm bell with forewarning of the Russian invasion of Ukraine. Amid tensions of a possible war, the German Chancellor met the Russian President on 14 February 2022 and offered to hold up Ukraine's NATO membership in exchange for Russia withdrawing troops from the Russia-Ukraine border. Putin did not take the proposal into cognisance due to his distrust of the USA and NATO, and because NATO did not take the initiative to discuss his demand.

Ukraine kept the option open of joining NATO. NATO Secretary-General told that NATO members and Ukraine would decide when Ukraine would join the alliance. While the alliance's "open door policy" in theory remains in place, there has been no indication if Ukraine would admit it anytime soon. There were hints of a softening in Ukraine's approach. President of Ukraine Volodymyr Zelenskyy said at a news conference on 14 February 2022 that joining the alliance could be "like a dream" (CGTN, 19 Feb 2022). Russia might have interpreted Volodymyr Zelenskyy's statement as no reversal of his decision but as joining NATO. Diplomacy was playing with twists and turns around the political and military standoff since 2008 despite the risk of a full-blown war.

The Russia-Ukraine war passed its 14th day on 9 March 2022, with an important statement from Ukraine President Volodymyr Zelenskyy saying, he is no longer pressing for NATO membership for Ukraine, he does not want to be the President of a "country which is begging something on its knees", he is open to "compromise" on the status of two breakaway pro-Russian territories of Donetsk and Luhansk. He was also quoted saying on 7 March 2022 during an interview with ABC News, "I have cooled down regarding this question a long time ago after we understood that ... NATO is not prepared to accept Ukraine. The alliance is afraid of controversial things and confrontation with Russia" (EWN, 9 March 2022). If this was his realisation, it came late at a cost that he could have avoided. Anyway, better late than never. Russian Foreign Ministry immediately reciprocated Zelenskyy's statement saying, "Russian Army's aim is not to occupy Ukraine or the destruction of its statehood or the overthrow of the government. It is not directed against the civilian population." Both statements can only be regarded as a prelude to an intention for a low-cost compromise to stop the costly war, which was otherwise avoidable.

Writer: Cdre Md. Abdur Razzak, NUP, ndc, psc, MPhil, BN (retd) is a security analyst.



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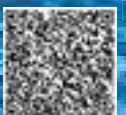
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Matarbari Port Development Project (MPDP): Future Gateway to the Country's Booming Trade

Cdre Md. Mostafizur Rahman, (TAS), NGP, afwc, psc, BN



Background

There is no denying that Bangladesh is one of the fastest growing economies in the world and the fastest-growing economy in South Asia. It has achieved steady economic growth of approximately 6% per annum, and the population growth rate has been about 1% in recent years. Accordingly, the export and import volume has increased by more than 10% per year. Considering this strong growth of trade activities recorded in Bangladesh in the recent past, one of the main hindrances to its further economic growth is identified as the lack of a sufficient and reliable gateway port. So, establishing a deep seaport has become strategically essential for Bangladesh, considering its potential impact on economic growth and sustainable development.

About 92% of Bangladesh's total cargo handling volume has been handled at Chittagong Port. However, Chittagong Port, a port along the Karnaphuli River, cannot accommodate more than 2,400 TEUs sized container vessels due to its limited water depth and sharp bends in the navigable channel. The fact keeps negative impacts on the shipping lines' mainline

deployment and affects the competitiveness of exporters and importers. Therefore, the development of a deep seaport is considered one of the pressing needs in Bangladesh.

The Perspective of Matarbari Port Development Project

Matarbari Port Development Project (MPDP) is undoubtedly an important Fast Track Project of the Government of Bangladesh. This project is an outcome of the concept of the initiative of "BIG - B" (The Bay of Bengal Industrial Growth Belt) jointly announced by the Premiers of Bangladesh and Japan in September 2014. This project aims to develop a reliable and low-cost logistic network for seaborne cargo, freight handling and transporting facilities to maintain the competitiveness of Bangladeshi products in the global market and make the port a regional trans-shipment hub.

In order to achieve these objectives, a new commercial port and a port connecting road with the national highway (N1) at

Matarbari, Moheshkhali and Chakoria area in Chattogram Division will be constructed. On 10 March 2020, the Executive Committee of the National Economic Council (ECNEC) approved the "Matarbari Port Development Project". According to the JICA survey report, the geographical nature of Matarbari in Moheshkhali and Kashima in Japan is almost the same. Therefore, Matarbari port will be built on the "Kashima port" model.

Container Cargo Throughput

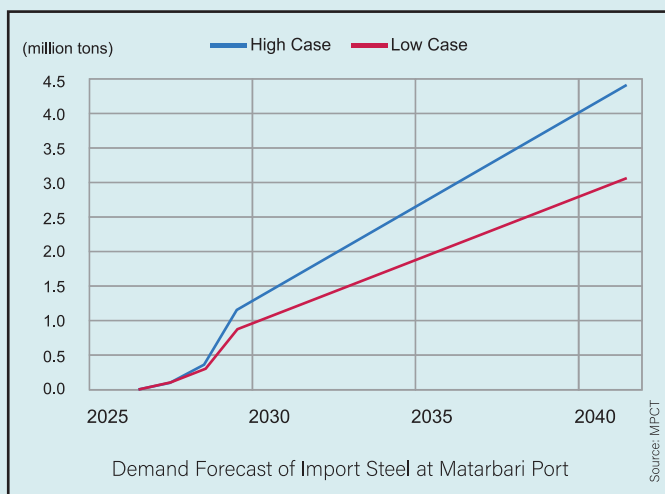
Presently, Chittagong Port handles 98% of the country's container cargo, while Mongla Port handles the remaining 2%. Container throughput at Chittagong Port has increased steadily over the years, and the total container throughput in 2021 was a record of 3.2 million TEUs. The container cargo throughput of Bangladesh will substantially increase to 10.1 to 12.6 million TEUs in 2041, according to the study of the Matarbari Port Consultant Team (MPCT).

Bulk Cargo Demand Forecast

Coal: Coal import has reached 1.4 million tons at Chittagong Port and 110 thousand tons at Mongla Port. The import of coal is estimated to increase to supply coal-fired power plants planned in Bangladesh. The coal trans-shipment terminal planned at Matarbari Port is expected to import 9 million tons of coal in 2026, 14 million tons in 2031 and 41 million tons in 2041.

Cement Clinker: The import of cement clinker has increased to meet the demand for cement production. The clinker imported is estimated at about 65 million tons in 2041, half of which would be handled at Matarbari Port.

Steel Products and Scrap Iron, Import of Vehicles: The import of steel products and scrap iron is estimated to be about 9.9 million tons in 2026 and 17.8 million tons in 2041. Import of vehicles by RO-RO ship is estimated at 90,000 - 298,000 units in 2041.



Besides, there is a growing requirement for berthing LPG and LNG carrying vessels. Import of crude oil will be carried out by

large tankers moored at Single Point Mooring (SPM) that is being constructed in the outer anchorage area of Matarbari Port.

Phases of Construction of Matarbari Port Development Project (MPDP)

Aiming at the ship's navigation into the coal-powered electricity project, the CPGCBL, financed by JICA, created a 14.3-Kilometer-long navigation channel with a width of 250 meters and a minimum depth of water 18.5 meters from the Mean Sea Level (MSL). The Matarbari Port Development Project under CPA has recently widened the existing channel up to 350 meter. Once completed, Matarbari is expected to be the future trans-shipment hub of this region. The port will help the country handle rising exports and imports and ease the pressure on the Chittagong port.



Matarbari Port Development Project along with Navigation Channel

The port will be constructed in two stages. In the phase-1 of the first stage, the port will have an annual handling capacity of 0.8 million TEUs of containers and 1.7 million tons of bulk cargoes in the first 5 years of operation and be able to accommodate 320-340 m Length Over All (LOA) and 8,000 TEUs container carrying vessels. The port will be connected to the national highway that will have access to Chattogram, Cox's Bazar, and further country places by sea through other seaports and river ports. In the second phase of the first stage, the port will have three jetties ready for container handling and four to six jetties for multipurpose use (Coal, LPG and LNG) by 2028 to 2030. Meanwhile, its container handling capacity will grow to 2.8 million TEUs, and cargo handling capacity will reach 2.5 million tons per year.

Phase -1 of the First Stage Development (Target Year 2026)

Phase-1 of the first stage of development consists of developing one multipurpose berth with a length of 300m and a back area of 17ha and one container berth with a length of 460m and a back area of 20ha. Phase-1 is expected to be completed by the end of the year 2025.



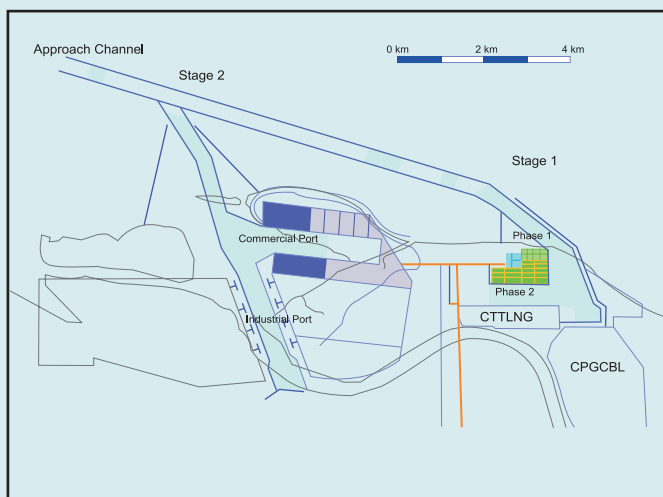
Artist Impression: Matarbari Port Development Project Phase-1 of the First Stage

Phase-2 of the First Stage Development (Target Year 2026-2030)

Phase-2 of the first stage of development will expand the turning basin to the south and add three full-size container berths, with a length of 1,050m and a back area of 50ha. The future expansion area will be used for truck parking, warehouses, logistic park, ancillary services, and further expansion of container berths if necessary. The expansion of the turning basin to the south enables the development of the Coal Trans-shipment Terminal (CTT), LPG & LNG terminal, accommodating 80,000 DWT coal bulkers, LPG VLGC 145,000 to 260,000 cubic meter type LNG carriers.

Second Stage and Industrial Port Development (2030 to 2041)

The second stage of port development is recommended at the face of the Kohelia River, as shown in the figure below. In addition to phases-1 and 2 of the first stage, three full-size container berths are proposed on the west side of the commercial port with a length of 1,050m. On the east side of the commercial port, multipurpose berths and bulk berths are proposed with a length of 1,200m. Stage-2 is tentative and will



require further study from the viewpoints of commodities and volume of maritime cargo, vessel type and size of call, cost allocation between the industrial port and commercial port, and so forth.

Current Ship Handling Operations by CPA in Matarbari Channel

Bangladesh's first-ever deep seaport at Matarbari in Cox's Bazar has welcomed the very first ship to its harbour on Tuesday, 29 December 2020 morning. Interestingly enough, on 29 December 2021, the Matarbari Channel marked the 01 (one) year of ship handling activities, which seems to be one of the outstanding achievements of "Mujib Shotobarsha" by CPA and a prosperous milestone in the national economy. With Chittagong Port Authority and Coal Power Generation Company Bangladesh Limited's (CPGCBL) sincere efforts, 49 ship handling activities have been successfully completed through these jetties within the 1st year of operations. A total 71 of sea-going merchant ships carrying the project cargo and 81968 Tons of cargoes have been handled in Matarbari CPGCBL jetties until 15 March 2022 with a steadily increasing revenue.

A Deep Sea Terminal of Maritime Potentials

Bangladesh is a country with a rich maritime history. Since ancient times, many globetrotters, traders and historians have visited and explored this land of maritime opportunities. Situated at the North of the Bay of Bengal, Bangladesh vows to regain its past maritime glory. The country has observed tremendous growth in every economic sector throughout the last decade. Social and political stability, together with economic motivation, has lifted the country from an abyss of uncertainty onto the track of sustainable development. To move fast upon the development track, the Government of Bangladesh has taken steps to build new seaports and modernize the existing ones. Considering the present growth of the country's maritime trade and commerce, building a new deep seaport has become a dire necessity. Besides, there would be a huge foreign investment injection; new momentum would be created in the trade and commerce of the country. There would be development in infrastructure and communication systems; the employment rate would also be significantly increased. Opportunities for the extraction and use of oil and gas and other sea resources will be expanded. Once the Matarbari Port comes into the entire operation, it is expected that the country's first deep seaport will contribute 2% to the growth of the national economy. It goes without saying that the deep seaport is an unfathomable matter in a geopolitical sense. In fine, Port in Matarbari is now more than a reality, shifting the geopolitical prominence of Bangladesh from one dimension to another.

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Beyond Fish and Ships

CLIMATE REGULATION



Covering 70 of the earth's surface, the ocean transports heat from the equator to the poles, regulating our climate and weather.

THE AIR WE BREATHE

>50% 

The Ocean produces over half of the world's oxygen and store 50 times more carbon dioxide than our atmosphere.

BLUE CARBON



Mangroves, seagrass and salt marshes remove CO2 from the atmosphere 10 times more than a tropical rainforest - and store 3 to 5 times more carbon, thus decreasing the impacts of climate change.

Estimated blue carbon value in the EAS region:

~ **\$68 B** for mangroves

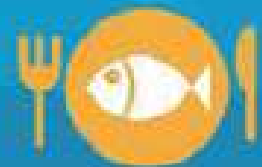
~ **\$20-40 B** for seagrass

HOME



The East Asian Seas (EAS) region is home to **31%** of the world's mangroves, **33%** of seagrass beds, and **31%** of the world's coral reefs, supporting diverse species of flora and fauna, and an array of ecosystem services.

FOOD



15% of animal protein comes from fish. Countries of the EAS region account for **63%** of total global fisheries.

40% of world's capture fisheries = **\$35 B**

80% of world's aquaculture = **\$197 B**

OIL AND GAS

\$34 B



There are around 1400 offshore oil and gas platforms in the EAS region... with production of 2 million barrels of oil per day.

Our Ocean Provides...

SHORELINE PROTECTION



Mangroves, seagrass and coral reefs are natural barriers. . . saving money and reducing impacts of storm surge, erosion and flooding.

- Coral reefs reduce **97%** of wave energy.
- Mangroves reduce **66%** of wave height.

OCEAN ENERGY



The ocean can produce thermal energy from the sun's heat, and mechanical energy from the tides and waves. It is estimated that 0.1% of the energy in ocean waves could be capable of supplying the entire world's energy requirements five times over.

OFFSHORE WIND POWER



Higher wind speeds are available offshore compared to on land.

TRADE AND TRANSPORTATION



The East Asian Seas serve as conduit of 90% of world trade through shipping.

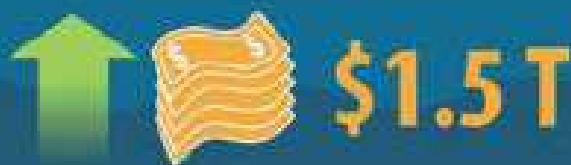
TOURISM AND RECREATION

>\$258B 

in tourism revenues. The EAS region account for 26% of worldwide tourist arrivals.

Swimming, boating, snorkelling, diving, dolphin and whale watching. . . the ocean provides us with so many unique amenities and activities.

INCOME AND JOBS



The ocean economy contributes **3% - 87% of the GDP** of the countries in the EAS region.

MEDICINE



Many medicinal products come from the ocean, including ingredients that help fight infection, cancer, arthritis, HIV, heart disease, and Alzheimer's disease.

Maritime Cyber Risk: An Emerging Concern for Maritime Industry

Lt Cdr S M Anisur Rahman, (H3), BN



Introduction

Seas have always played a great role in defining the world's destiny, be it as means of transportation, trade routes or hub of resources. They have also played a significant involvement in bringing people closer, breaking barriers between cultures and religions as well as it helped in spreading new ideas and thoughts. Today, as we stand in the 21st century, seas are essential for the economy in addition to the military needs. Presently, almost as high as 90% of world trade and commerce is being conducted through the sea. The majority of the needed energy sources like oil, gas, and petroleum are extracted and transported through the seas. In fact, maritime trade routes form the lifelines of modern civilization. Today, the whole rhythm of human civilization's development and prosperity depend on the prowess of nations at sea.

Now, the entire world is evolving through digital know-how. Information security and data safety issues are critically important here. Even in the maritime sector, large IT companies develop complex software and hardware solutions;

still, their internet platforms and IoT (Internet of Things) devices often cannot provide them with the required level of cybersecurity. Like other developed maritime nations, the maritime sector of Bangladesh is also growing digitally. As a result, these maritime industries must be aware of the threat of adversarial cyber-attacks.

Present Digital Protection of Maritime Industries

According to CEOWORD Magazine Research, in 2021, Greece was the top maritime country in the world in terms of the maritime industry. Surprisingly, five locations in Asia (Japan, China, Singapore, Hong Kong and South Korea) were among the top 10 major players in this sector. Bangladesh, India, Pakistan, and Vietnam had significant maritime expansions in South Asia over the last few years. In 2021, during the COVID-19 pandemic, BIMCO conducted their annual Maritime Cyber Security Survey to examine how the maritime industries were handling digital protection in the wake of high-

profile cyber incidents. A total of 350 individuals took part in the survey, filling out 25 questions in total. More than a fifth of respondents acknowledged that they had been victims of cyber-incidents, with 72% of these respondents mentioning that their companies were the victims of cybercrime-related incidents in the last 12 months. Phishing and malware-like viruses (49%), Trojans and worms (44%) were the most common form of incident faced by respondents, mostly leading to service disruption (49%) and system downtime (44%). Due to these attacks, 49% of respondents acknowledged that they had various service disruptions, except system downtime, reputational damage, financial loss, criminal activities, cargo theft etc. The survey also revealed that all the incidents had cost involvements. Many cyber incidents occurred exclusively onboard ships and caused multiple damages. The shipping agencies are also targeted to manipulate various information, e.g. cargo data, crew and passengers documents, etc. In July 2021, Sky News reported that only cyber attackers from Russia had spoofed ships' GPS at least 7,910 times between 2016 and 2019, affecting about 1300 commercial ships. In 2017, North Korean navigation jamming was said to be behind the forced return of hundreds of South Korean fishing vessels, and its cyber-attacks led to the devastating NotPetya attacks that crippled the large Maersk shipping line in the same year.

What is Maritime Cyber Risk?

International Maritime Organization (IMO) defined the, maritime cyber risk as 'To a measure of the extent to which a technology asset could be threatened by a potential circumstance

or event, which may result in shipping- related operational, safety or security failures as a consequence of information or systems being corrupted, lost or compromised.' Many globally connected networks and infrastructures at sea still leverage legacy technologies that are not built to be connected to the internet. These complex networks include a blend of Information Technology (IT) and Operational Technology (OT) systems and are used by internal crew and third-party vendors, extending the potential for compromises by hackers or even insider threats.

There was a time when connectivity on a vessel was minimal, and ship control engineers addressed security issues with air-gapping to physically isolate a secure network from unsecured networks. By definition, an air-gapped system is neither connected to the internet nor any other system. But now, using something as simple as a USB flash drive or unsecured Wi-Fi connection, a malicious hacker or even an inexperienced insider can infiltrate and infect critical systems. This development is especially concerning because of the connectivity of modern maritime vessels to the internet or external devices. These may cause instability or mistrust of bridge control, propulsion & power, navigation, loading & stability, safety systems, communications, operations security, network security, physical security, ship networks and the e-supply chain of any marine vessel. In recent days, significant technological advances in navigation, communication, and propulsion systems are becoming more ubiquitous, providing the crew with a more comprehensive view of what is happening inside and outside of a ship. Even in the ocean or



high sea, ships may always need to be globally connected. As a result, the requirement for human crewmembers is being reduced day by day to man modern ships. This dependency on technologies increases the vessel's presence in the cyber domain, increasing its chances of being targeted and offering new vectors for such attacks. Thus, any modern vessel is always at risk or may be targeted for the following cyber-attacks:

- > Denial of Service (DoS): Targets the availability of data
- > Spoofing: Targets the integrity of data
- > Packet sniffing: Targets the confidentiality of data
- > Replay/Man-in-the-Middle (MITM): Targets both confidentiality and integrity of data

International Maritime Organization (IMO) Safety Code and Its Challenges

IMO has included a cyber-chapter with specific compliance terms, including mandatory obligation: MSC-FAL.1/Circ.3 guidelines on maritime cyber risk management. According to the regulation, all vessels are required to implement the necessary cybersecurity measures no later than January 2020. The said regulation mandates the implementation of several layers of protection to be implemented in addition to conducting a cyber-risk assessment. IMO regulation is part of much larger guidance and standards such as BIMCO, CLIA, ICS, OCIMF, ISO/IEC 27001 standard on information technology, and the United States NIST framework for improving critical infrastructure for cyber security.

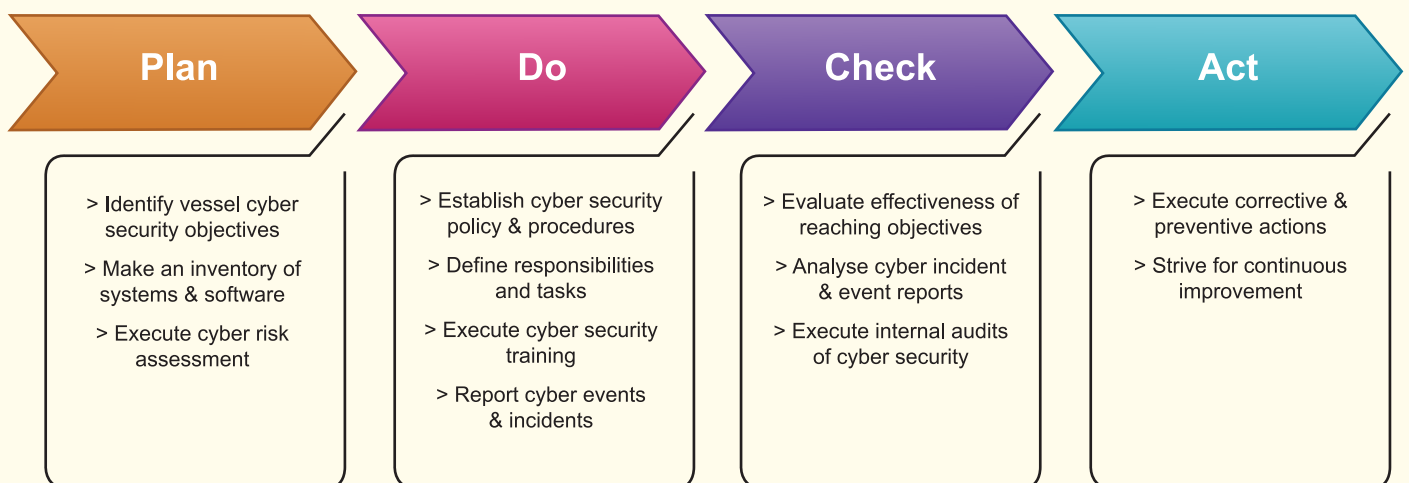
Though IMO is cogent about maritime cyber risk management, most shipping industries face many challenges to accomplish. The following are some of the most common cybersecurity challenges faced by the maritime industry, which are similar to those faced by other industries that engage with IT networks:

- > No clear understanding of all systems and devices on the Operational Technology (OT) network across a fleet or operation

- > Lack of visibility into each vessel's OT networks
- > Lack of real-time monitoring or segmentation of the OT network
- > Inadvertently connected IT and OT networks
- > Use of unsecured wireless networks
- > 24/7 remote access granted to third-party from Original Equipment Manufacturer(OEM)
- > Lack of visibility into third-party OEM networks (black box)
- > Poor physical security controls
- >Lack of cybersecurity awareness among the crew, employees and contractors

Cyber Risk Mitigation Approach in Shipping

An essential step to mitigating cyber-attacks on maritime vessels is updating existing ship systems and, more importantly, designing ships for increased security. It does not necessarily require fancier and more expensive equipment but can be achieved with intelligent isolation of different and more secure systems which is still usable, e.g. password-protected. Machineries or systems subject to compromise must have recovery mechanisms. Furthermore, the provision of alerts for instability in all IoT devices and inter/intra connected systems should be obligatory. It will also help to detect exploitation by any vector for cyber-attack. Here the resilience of command and control systems is also essential. The modern navies are already developing Resilient Hull, Mechanical and Electrical Security (RHIMES), which aims to introduce diversity and prevent the same exploit from succeeding on multiple controllers. However, as these systems are currently limited and shall be limited until the next generation of ships, it is prudent to take advantage of the human element onboard ships. A human crew may be advantageous in many ways in terms of security. Firstly, the crew may verify that the systems function as intended. Secondly, if the systems are modified only by the authorized and trained crew, it is more difficult for an attacker to go undetected during any potential cyber-attacks. Training on how to keep these systems secure

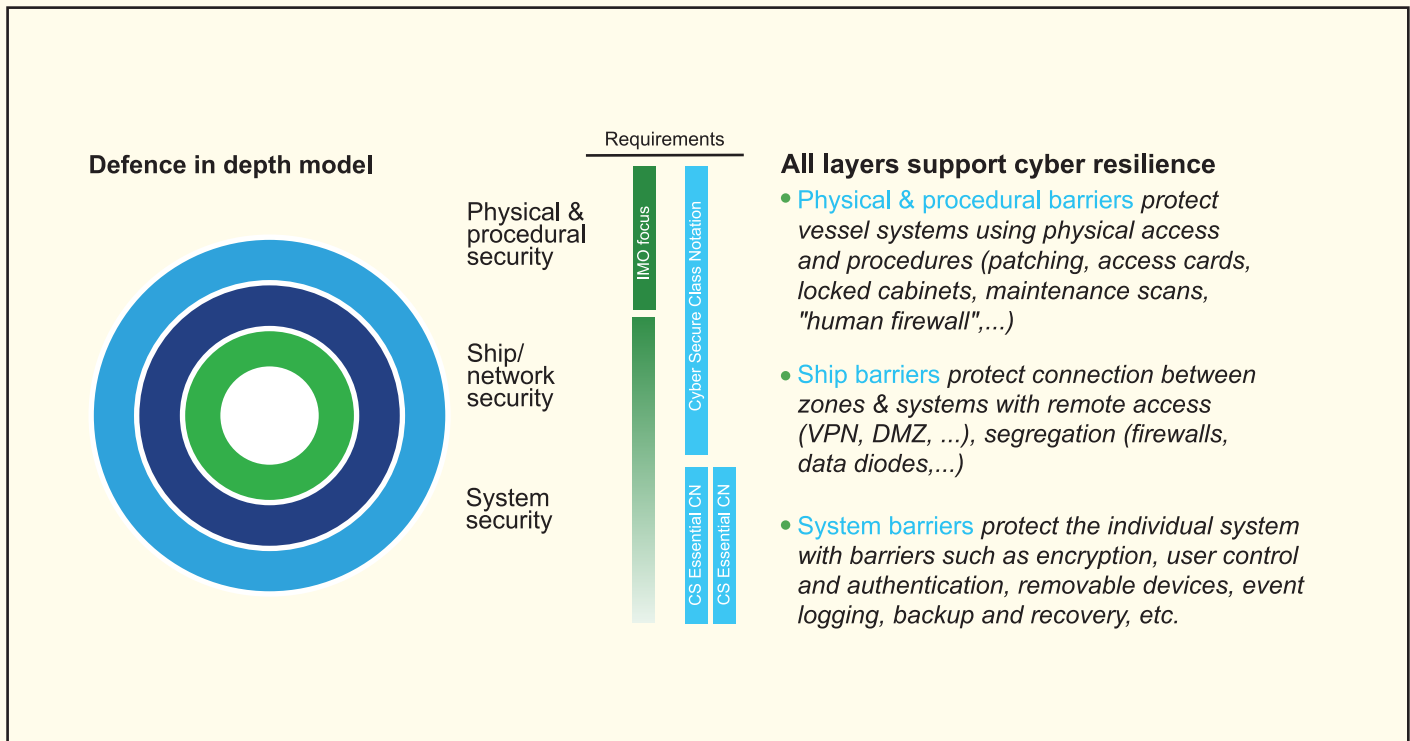


is also essential. There are many cyber risk management models which can be followed onboard marine vessels. One of the most followed processes is Plan-Do-Check-Act (PDCA) model.

In the PDCA model, the first step in the 'Plan' phase is to identify cybersecurity objectives relevant to the vessel's safe operation. In addition to the IMO requirements, other internal and external stakeholder requirements on cybersecurity should be accounted for when determining the objectives. In the 'Do' phase, the cyber risk assessment results should be utilized to define an implementation plan for rolling out suitable

Conclusion and Way Forward

Any marine vessel that is built is usually put to use for a long time. Though all the marine vessels maintain their routine maintenance from time to time, most of the firmware of the core systems remains untouched. Thus, the software used by the hardware becomes outdated. Often ships are being built without cybersecurity in mind. As a result, the possibility of being attacked by the vulnerable vector/threads is becoming an emerging concern for maritime industries. Both security firms and hackers have found specific and real-world flaws within the systems running in the maritime industry. To date,



barriers. In the 'Check' phase, the effectiveness of the cybersecurity measures must be checked continuously. In the 'Act' phase, corrective and preventive actions should be implemented based on the findings of the internal and external review reports.

Another widely followed cyber risk management process is the 'Defence in depth' model, applied on different ship safety layers, commonly known as barriers. These barriers are implemented based on IMO security requirements and cybersecurity guidelines, which confirm the marine vessel's system, network, and physical security. As the vessels and systems are increasingly interconnecting and malicious cyber threats are continually changing, the key to future successful cybersecurity resilience is to improve continuously by updating the cyber risk assessment, policies and procedures.

several successful cyber-attacks have been launched on the navigation systems of ships. Presently, all modern ships are designed with integrated compact modules that include communication, navigation, propulsion and cargo handling systems. This integration leads to the probability of being infected by any of the systems and being compromised by cyber-attackers. International Ship and Port Facility Security (ISPS) should be expanded beyond physical safety and security aspects. Revisions of national and international legal as well as regulatory frameworks are also necessary to fight against cyber-related maritime threats.

Writer: Lt Cdr S M Anisur Rahman, (H3), BN is the Director (Admin) of BIMRAD.

Amazing Marine Sculptures with Plastic Wastes: A Creative Effort to Prevent Plastic Pollution at St. Martin's Island

BIMRAD Correspondent



Saint Martin's Island (SMI) is the only coral-bearing island in Bangladesh, situated at the country's southernmost point. The small island with an area of only 8 sq. km is located 9 km off the southern tip of Cox's Bazar-Teknaf peninsula. The small island, locally known as Narikel Jinjira (Coconut Island), is a habitat of some coral colonies. Here till now, 81 hard coral species from 22 genera have been recorded, and the most abundant coral species are *Porites* spp, *Acropora* spp, *Favites* spp., *Goniopora* spp, *Cyphastrea* spp and *Goniastrea* spp. Because of the presence of diverse coral colonies, the tiny island has become a heaven for fishes, crustaceans, echinoderms, molluscs, seaweeds, aquatic birds, and so on. There are 204 species of reef fishes recorded in SMI. Additionally, 154 species of seaweeds, 85 species of birds, 27 species of reptiles, and 19 species of mammals are also recorded. The most abundant coral-

associated fish species are Damsel, Parrot, Surgeon, Groupers, Snappers, Emperors and Butterfly.

Considering the ecological importance of the island, the Government of Bangladesh declared it an Ecologically Critical Area (ECA) in 1999 and Marine Protected Area (MPA) in 2022. But it is an irony of fate that this diverse island is now on the verge of destruction due to plastic and other marine debris pollution through the unbearable pressure of unplanned tourism. The island has become one of the most popular tourist destinations in the country after its publicity in films and other media in the 90s. During peak season, nearly 3,000 tourists stay overnight on this little island and its 10,000 permanent residents, but the Government has set a limit of 1,250 guests each day. However, the concerned authorities are yet to take any pragmatic step to alleviate the pressure of incoming tourists.

The vast majority of tourists are either unaware of the importance of this natural island or unwilling to help keep the island and its sea beach clean. Hundreds of plastic bottles of water, beverage, juice, and chips packets are brought, and these plastics are eventually left behind on the island. Additionally, to serve tourists, a lot of authorized and unauthorized infrastructure such as hotels, motels, shops, etc., have been established. With the increasing number of tourists, the use of plastics is dramatically rising. Plastic wastes are to be seen everywhere on the island. Furthermore, along the sandy beach, hotels and ships use bright lighting and loud sound systems, which disrupt turtles who are laying eggs. The roaming and bathing of tourists as well as anchoring of boats on the rock, destroy the coral ecology and uproot the seaweeds. The research team led by Dr Kazi Ahsan Habib, Professor of Marine Biology at Sher-e-Bangla Agricultural University (SAU) observed various plastic items such as bottles, chips packets, glass, and tin containers laying under the water during his underwater biodiversity survey. The team also discovered that fishers and local people's abandoned nets and nylon bags had been put on corals, causing coral bleaching beneath them.

To make the tourists and visitors aware of the impact of heavy plastic pollution and encourage them to keep SMI free from plastic wastes and other marine debris, recently two attractive giant sculptures of a coral fish and a sea turtle have been set up on this beautiful island with the planning and initiative of Professor Dr Kazi Ahsan Habib. Interestingly, these sculptures were created from discarded plastic and polythene wastes collected from the beach. Tourists flocking to the island from different parts of the country are taking selfies and pictures with these creations.



The sculptures were constructed entirely from plastic and other debris that have been thrown onto the beach by unaware tourists and floating shops such as plastic chips packets, pickles packets, polythene, cans, teacups, water bottles, plates, straws, food packets, fishing nets, nylon ropes etc. These one-of-a-kind art pieces are part of an awareness-raising activity and educational signage for a Krishi Gobeshona Foundation

(KGF)-funded research project on assessing the plastic pollution in SMI to encourage reducing, refusing, reusing, repurposing, and recycling of plastic pollutants.



Hundreds of attached plastic bottles and colourful packets sparkle in the sun and the sculptures are illuminated with soothing LED lights that twinkle against the backdrop of the sea and beach at night, serving as a monumental reminder to keep the beach clean of plastic waste and other debris and to recycle. The plastic sculptures of two sea creatures highlight the dangers that plastic pollution poses to our natural world, particularly to the species who dwell in the SMI sea, as well as the significance of recycling and reusing plastic materials. Some details about marine plastic pollution and its impact on the environment and biodiversity are also written on a tiny billboard near the structures to pique the passengers' interest and raise awareness. For example, 'One million marine animals are killed by plastic pollution every year'; 'There will be more plastic in the world oceans than fish by 2050'; 'Ten million tons of plastic are dumped in our oceans annually'; 'A great garbage patch made of floating plastic trash and marine debris has grown in the central North Pacific Ocean which is about 11 times larger than the area of Bangladesh and so on.

Professor Dr Kazi Ahsan Habib, the project's principal investigator, said, "I have taken a research project to assess the accumulation of micro and macro plastic in SMI. But I felt only the research is not enough; it is also urgently needed to raise mass awareness to the tourists visiting the island to prevent this huge plastic pollution in this natural treasure of Bangladesh." Sabbir Hossain, a master's degree student of Fine Arts at Jagannath University, created these unique sculptures when Professor Habib shared his idea and asked for his assistance. The research team members organized several beach cleanups to gather plastic waste as much as possible before construction, which a popular TV channel in Bangladesh aired live.

Regarding the recent declaration of MPA by the Government to protect SMI, Professor Habib said, "just declaring the island as an ECA and MPA are not enough. Proper implementation of the rules and regulations for ECA and MPA, sustainable and controlled tourism, control of pollution, alternative livelihood for



the local people who are involved in coral extraction, banning of using single-use plastic on the island, ensuring proper disposal and management of other non-biodegradable wastes as well as relevant research should be immediately undertaken to safeguard the rich biological resources of this important island".

Synchronized management with a proper implementation plan must be formulated based on intergovernmental coordination

and cooperation. All the stakeholders, including policymakers of the Government, should come forward to protect the unique biodiversity of this critical island. Though the ecological damage has already been made up to a great extent, still, there may be time to save the leftovers; otherwise, it may be too late to conserve this beautiful island of Bangladesh.

6 REASONS TO REFUSE SINGLE-USE PLASTIC



1 Made from fossil fuels



2 Huge carbon footprint



3 Will still be here in hundreds of years



4 Only a tiny percentage is recycled



5 Leaches toxins into food & drink



6 Causes hormone disruption & cancers

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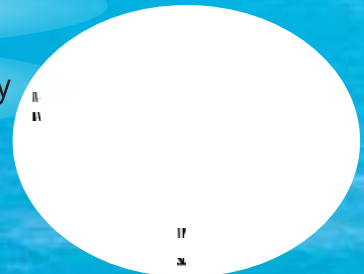
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Project Summary Report on “Local Level Strategy of Reducing Climate-Induced Loss and Damage of Seagoing Fishers of Bangladesh”

BIMRAD Correspondent



The coastal region of Bangladesh is about one-third of its total area covering southern part of Bangladesh. Along her 710 kilometres of coastline, several million people from the 14 coastal districts and 49 Upazilas are estimated to live. One-third of these populations mostly depend on marine fishing for their livelihood, either for the whole or part of the year. It is not easy to count down how many people rely exclusively on fisheries or related activities in Bangladesh, but a significant portion is involved. Fisheries and related activities support more than 7% of the country's population. The number of fishers increases dramatically between June to October each year because of the harvesting period and availability of fish. Presently there are 255 registered trawlers out of 236 operating numbers, and a total of 67,669 mechanized and non-mechanized boats are engaged in fishing. More than 600,000 people are engaged in shrimp farming activities alone.

Several studies confirm that commercial fishing is still one of the most hazardous occupations worldwide. Considering Bangladesh and its vulnerability to climate change, the risks for

the seagoing fishers are at the apex. Climate change is an incurable threat to the coastal community of Bangladesh, especially to the fishing community. Statistics show that about 15% of fishers are changing their profession due to climate change.

Mainly the pre-monsoon and monsoon are the most catastrophic season for sea fishing. The most disaster-prone areas are the Khulna, Patuakhali, Barishal, Noakhali and Chattogram. Every year, many fishers lose their lives due to the sudden change in weather. Just recently on 22 March 2022; some seven fishing trawlers went missing in the Bay of Bengal due to rough weather. According to the Bangladesh Coast Guard, at least seven fishermen were missing. The trawlers disappeared in the Bhashanchar route after starting from Banskhali Upazila of Chattogram. These are regular phenomena, and they are often delegated as a minor priority concern for the country.

Different training programs aiming to increase the awareness among fishers about the severe occupational risks inherent in

their work and safety protocols are essential for the time being. Appropriate training and awareness measures must incorporate visual and written safety messages which favourably influence attitudes, beliefs, and behavioural intent related to high priority risk factors identified by fishers.

AOSED-An Organization for Socio-Economic Development was established in 1999 to work together for conserve the environment, ecology, biodiversity and address challenges of climate change to improve the standard of life and livelihoods of vulnerable communities of the southern coastal region of Bangladesh. BIMRAD signed an MoU with AOSED to establish collaborative initiatives. Based on this, an agreement was made on 01 November 2020; by and between AOSED and BIMRAD to develop a training module on Local Level Strategy of Reducing Climate-Induced Loss and Damage of Seagoing Fishers and conducting a Training of the Trainers (TOT) on the developed module.



After successfully developing the training module titling “Local Level Strategy of Reducing Climate induced Loss and Damage

of Seagoing Fishers of Bangladesh”, an inaugural session of three-daylong Training of the Trainers (ToT) was held at the CSS Ava Center, Khulna, on 10 March 2022. The Honorable Mayor of Khulna City Corporation, Mr Talukder Abdul Khaleque, was the Chief Guest of the session. Captain M Shafiqul Alam, (G), psc, BN (retd), Lead trainer; Afifat Khanam Ritika, Research Officer, BIMRAD; Md. Ali Akbar, Panel Mayor-2 and Councilor, ward no-25, were the special guests. Many officials and representatives from different GOs, NGOs, and stakeholders participated in the session. They unveiled the training module jointly developed by BIMRAD and AOSED for the seagoing fishers during the inaugural session. Mr Shamim Arfeen, Executive Director of AOSED, moderated the inaugural session.

After the completion of the inaugural part, the three-daylong ToT was continued by the BIMRAD officials. A total of 22 participants from AOSED attended the ToT session, who will then train up the seagoing fishers to reduce climate-induced loss and damage to Bangladesh. Captain M Shafiqul Alam, (G), psc, BN (retd), the Lead trainer, explained the adverse impacts of climate change on sea fishing and provided practical overviews with training on different safety and security measures.

The participatory-based training session was a very interactive, fruitful one. Trainers learned about using different safety gears, their importance in saving a life, locating the position while missing the sea and communicating with responsible authority in an emergency during their fishing period. It is expected that this training extension will develop awareness among the seagoing fishers, and they will learn about tackling the hazardous impacts of climate change or uncertainties during their tenure of sea fishing. It will also facilitate making both their livelihoods and lives safer.



Seminar on "Seaweed and Green Mussel Farming"

BIMRAD Correspondent



Bangladesh is prosperous, with 133 species of seaweed, and 8 of them are commercially important. These could be produced commercially on a large scale. Seaweed has excellent value in providing low-cost, wholesome nutrition and therapeutic protection. Bangladesh should therefore promote the cultivation and consumption of seaweed among its people. Seaweeds are grown/cultured in selected intertidal zones. Mass production techniques and marketing facilities should be developed for this.

Seaweed and green mussels are recognized as critical marine resources and could play a vital role in Bangladesh's economy if they are correctly planned and commercially developed. Seaweed is mainly a source of food, income and livelihoods, export earnings, medicine, and other essential ingredients like additives, emulsifiers, adhesive, coating material, ingredients for bio-chemicals, etc. Seaweed is an unconventional fisheries item in Bangladesh.

There is no regular seaweed industry in Bangladesh. Some local seaweed collections can occur for two to three months, from November to January. A few people are involved in seaweed cultivation on Bangladesh's southeast and southwest coasts. Introducing seaweed culture in areas suitable for their cultivation through familiarizing the poor farmers with cost-

effective technology could open up a new avenue for expanding the seaweed industry in the country. The methods of cultivation of seaweeds use indigenous materials like bamboo and rope. The main culture methods involve either vegetative propagation using fragments from mother plants or by different kinds of spores such as zoospores, monospores, tetraspores and carpospores.

The demand for the seaweed industry in Bangladesh is enormous, but the present production from natural habitats is deficient. A survey related to seaweed farming revealed the existence of vast seaweed resources along its coastal belts. Abundant seaweed resources are present in the inter-tidal and sub-tidal regions. These resources have great potential for developing the seaweed-based industries of Bangladesh. In addition, the conservation of natural seaweeds beds is one of the essential advantages of the seaweed culture in Bangladesh. As seaweed cultivation requires low inputs, provides good returns and can employ many people, seaweed culture could be a good industry for coastal communities in Bangladesh.

However, the successful development of the seaweed industry requires appropriate natural environmental conditions and the availability of workable technical methods and receptive and supportive social and economic conditions.



Based on this concept, a day-long Seminar on “Seaweed & Green Mussel Farming and Blue Food Festival” was organized by USAID funded Enhanced Coastal Fisheries in Bangladesh II (ECOFISH II) on 19 March at Seagull Hotel, Cox’s Bazar.

The objectives of the event included mainly the demonstration of activities on seaweeds and green mussels farming, product development and marketing, familiarizing participants with various seaweed and green mussel cuisines; encouraging the local fishing communities to engage in seaweeds and green mussels farming, and encouraging the private sector in product development and marketing activities of seaweeds and green mussels.

Hon’ble Emeritus Professor Dr. Md. Abdus Sattar Mandal, Former Vice-Chancellor of Bangladesh Agricultural University (BAU), Mymensingh, and former member of General Economics Division, Planning Commission, Bangladesh, was present as a Chief Guest.

Captain M Minarul Hoque, Director General, Bangladesh Institute of Maritime Research and Development (BIMRAD); Ashraful Haque, Project Management Specialist of USAID Bangladesh; Dr. Md Sharif Uddin, Director (Marine), Department of Fisheries attended the event as the special guests.

Dr. Md Asaduzzaman, Assistant Professor of Chattogram Veterinary and Animal Sciences University, Dr. Abdullah Al Mamun, Professor and Chairman, Noakhali Science and Technology University, Dr. Mostafa Ali Reza Hossain, Professor of Bangladesh Agricultural University, Zahanara Islam, Chairman, Zahanara Green Agro, addressed in the event. Several seaweed farmers, traders, consumers, processors, chefs, scientists, academia, entrepreneurs, policymakers and other stakeholders participated in the event. Prof Dr Md Abdul

Wahab, Team Leader, ECOFISH II, WorldFish Bangladesh, presided over the programme.

Speakers mainly emphasized popularizing seaweed and green mussel as food sources and considered those as viable economic crops in the blue economy initiative. Seaweed and green mussel farming could be one of the alternative sources of income for the fishing community. Speakers at the event also emphasized the necessity to harness seaweed’s potential.

The chief guest Dr. Md. Abdus Sattar Mandal emphasized the formation of a sea-centric food security forum to ensure food and nutrition security and proper utilization of marine resources.



The special guest Captain M Minarul Haque highlighted the importance and prospects of flourishing this sector and appreciated ECOFISH II for such an innovative program. They hand over the gift hamper to the seaweed processors.

As a maritime think tank, BIMRAD always appreciates such research-based activities that flourish the country’s blue economy.

JICA to Carry out Project for Development of Coastal Fishermen



A Japanese delegation led by Jica Chief Representative Yuhu Hayakawa revealed the plan to set a pilot project for the development of fishermen in coastal areas of the Bay of Bengal by providing technical assistance while meeting with Fisheries and Livestock Minister SM Rezaul Karim at his secretariat office on 03 March 2022.

Fisheries and Livestock Secretary Dr Mohammad Yamin Chowdhury, Additional Secretaries Shyamal Chandra Karmakar and Md Taufiqul Arif, Director-General Khandaker Mahbubul Haque, and Takeshi Saheki, senior representative of

JICA, were present at the meeting.

Jica intended to carry out a five-year project in Cox's Bazar's five Upazilas, including Teknaf, Ukhiya, Cox's Bazar Sadar, Moheshkhali, and Kutubdia.

According to the media release, JICA aims to focus on value chain development in the fisheries sector, marine fisheries processing, socioeconomic surveys, training, seafood processing, fisheries management, nutrition development, and technical assistance to fisheries stakeholders through this project.

Bangladeshi Youth Fisher-led Initiative Cleaned Sea Beaches Removing 12068kg Pollutants in 2021

Blue Guards, a youth fisher-led beach cleaning initiative, removed 12,068kg of non-decomposable pollutants from the sea beaches covering Cox's Bazar Sadar, Moheshkhali, Ramu, Teknaf, Ukhiya and Patuakhali's Kuakata in March-December 2021.

The pollutants include plastic bottles, polythene bags and sheets, food packets, single-use plastics, and discarded nets.

WorldFish Bangladesh, which mobilised the initiative under its USAID-funded ECOFISH II Activity, said in a press release on 24 January 2022.

Dr M A Wahab, team leader of ECOFISH II, said, "Ocean is home to most of the World's biodiversity and is the primary source of protein for more than a billion people around the



globe, but ocean pollution has reached an alarming level day by day. "Aiming to conserve the marine biodiversity and optimise the blue economy's potential in Bangladesh, we have mobilised the Blue Guards," he said.

So far, about 100 youths (including 20 per cent women) are engaged as Blue Guards, and the number will be increased to 200, and the initiative will cover the St. Martin's Island this year, 2022.

Indian Ocean Naval Symposium Holds Maiden Maritime Exercise



The premier forum Indian Ocean Naval Symposium (IONS), held its maiden Maritime Exercise 2022 (IMEX-22) at Goa and in the Arabian Sea from 26 – 30 March 2022, engaging participants number 16 out of the 25 member nations of IONS. “The exercise aimed to enhance interoperability in Humanitarian Assistance and Disaster Relief (HADR) operations among member navies,” the Navy said. The participants validated the IONS HADR guidelines and developed response mechanisms for providing HADR from sea to shore and rendering assistance to ships and crafts in distress at sea.

The exercise is seen as a significant stepping stone for regional navies to collaborate and respond collectively to natural disasters and paves the way for further strengthening regional cooperation, a Navy official said.

The Navy said that the chiefs of the Indian and French navies witnessed exercises during the sea phase and attended the post-exercise debrief.

EU, US can Work Together with Bangladesh on Indo-Pacific Strategy: EU Special Envoy



The EU special envoy mentioned the similarities between The European Union’s strategy and the United States’ updated Indo-Pacific Strategy (IPS). They think similarly about involving Bangladesh in the IPS as both are interested in working with Bangladesh while speaking at an exchange of views with diplomatic correspondents at the National Press Club in the capital on 01 April 2022.

Diplomatic Correspondents Association, Bangladesh (DCAB) organised the session attended by Deputy Head of Mission of the European Union to Bangladesh Jeremy Opritesco, DCAB President Rezaul Karim Lotus, and its General Secretary AKM Moinuddin.

Gabriele Visentin said that since the priorities of the US and the EU are similar and think similarly about involving Bangladesh, both sides can work together on various issues

with Bangladesh. And there is no need to work with all the elements. There are opportunities to work where Bangladesh wants to work.

The envoy said the EU’s strategy is all about “cooperation, not confrontation.”

He highlighted seven priority areas for EU action – sustainable and inclusive prosperity; green transition; ocean governance; digital governance and partnerships; connectivity; security and defence; and human security.

He appreciated Bangladesh’s generosity in hosting over 1.1 million Rohingyas. He said this should not be seen as a permanent solution but should be seen as a temporary solution until the situation and conditions allow them to return to their homes in the Rakhine state of Myanmar.

BIMSTEC Charter Signed in Colombo to Boost Regional Cooperation



Leaders of the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) signed the BIMSTEC Charter at the 5th Summit held in the Sri Lankan capital on 03 April 2022, hosted by current BIMSTEC chair Sri Lanka on a virtual platform.

Prime Minister Sheikh Hasina and her Indian counterpart Narendra Modi joined the Summit from Dhaka and New Delhi, respectively, with other BIMSTEC leaders from Bhutan, Nepal, Thailand and Myanmar.

BIMSTEC Convention on mutual legal assistance in criminal matters was signed by the Minister of Foreign Affairs, Minister of Justice or the nominated signatories of the BIMSTEC member states.

Memorandum of Association (MoA) on the Establishment of BIMSTEC Technology Transfer Facility (TTF) in Colombo, Sri Lanka, was signed by Ministers of Foreign Affairs or the nominated signatories of the BIMSTEC Member States.

On the other hand, the Memorandum of Understanding (MoU) on Mutual Cooperation between Diplomatic Academies/Training Institutions of BIMSTEC Member States was signed by the Minister of Foreign Affairs or the nominated signatories of the BIMSTEC Member States.

Foreign Minister Dr AK Abdul Momen attended the Summit in person.

Integrate Climate Change Adaptation Into National Development Planning: Experts

A dialogue on 'National Level Dialogue for Mainstreaming National Adaptation Plan (NAP)' was jointly organised by the Ministry of Environment, Forest and Climate Change, Economic Relations Division (ERD) and United Nations Development Programme (UNDP) on 27 March 2022, in Dhaka.

Climate change adaptation should be integrated into the national development planning process, said experts at a national dialogue on mainstreaming the National Adaptation Plan (NAP).



They also stressed the need for a climate change act to adapt to the changing climate.

“A legislative framework will be developed through this act for mainstreaming NAP”, said Professor Ainun Nishat, the NAP Consortium team leader.

Ms Fatima Yasmin, secretary, ERD of the Ministry of Finance, said, “We are hopeful that NAP will be a comprehensive strategy to adapt to the changing climate.”

Executive Director, Centre for Environmental and Geographic

Information Services (CEGIS) and Consortium Lead Malik Fida Khan has shed light on the goals, visions and principles of NAP.

As chief guest Planning Minister MA Mannan said, NAP is a landmark initiative to strengthen adaptation to future climate change.

Mr Sudipto Mukerjee, a resident representative of UNDP, was present as a special guest at the event, chaired by Md Mostafa Kamal, secretary of the Ministry of Environment, Forest and Climate Change.

Taking Action Now can Secure Future: IPCC Report on Climate Change



On 28 February 2022, a report by the United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) said that climate change is a threat to human well-being and the planet's health; by taking action now, humans can secure the future.

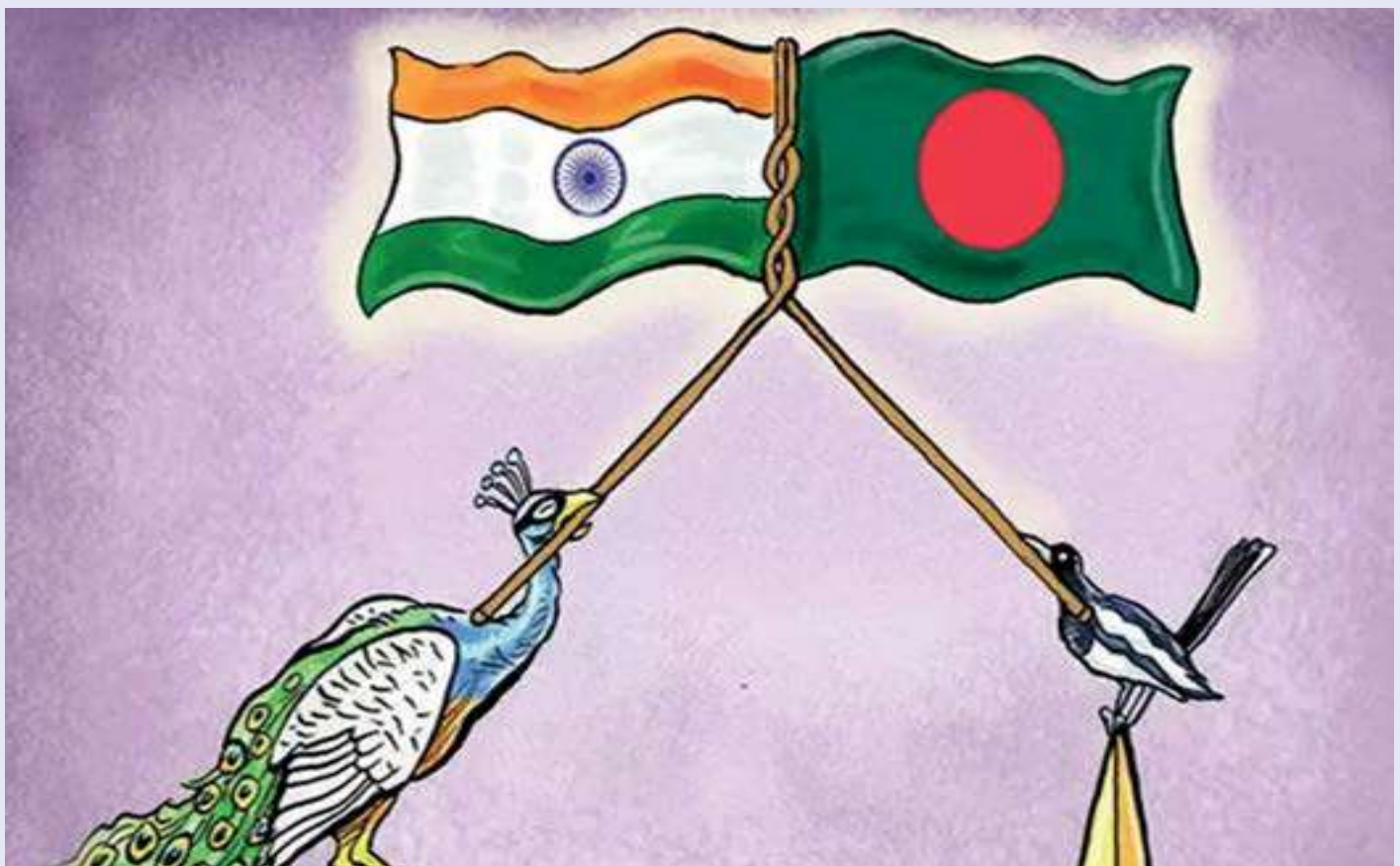
The report, "Climate Change 2022: Impacts, Adaptation and Vulnerability", states that human-induced climate change is causing dangerous and widespread disruption in nature and affecting the lives of billions of people worldwide, despite efforts

to reduce the risks. People and ecosystems least able to cope are being hardest hit.

The Summary for Policymakers of the IPCC Working Group II report was approved on Sunday, 27 February 2022, by 195 member governments of the IPCC, through a virtual approval session held over two weeks starting on February 14.

"This report is a dire warning about the consequences of inaction," said Hoesung Lee, chairperson of the IPCC.

India-Bangladesh Trade Portal Launched to Enable B2B Collaboration



Bangladesh's Information and Broadcasting Minister, Dr. Hasan Mahmud focused on improving people-to-people contact and strengthening connectivity to improve trade and business through waterways, railways, and airways at an event organised by the Indian Chamber of Commerce in February 2022.

Dr. Mahmud deliberated on the similarities in food, attire, culture, and language between Assam, India, and Bangladesh. Assam Industries and Commerce Minister Chandra Mohan Patowary also attended the session.

During the event, the India-Bangladesh trade portal was also launched, facilitating the business fraternity of both India and Bangladesh. It is a trade portal wherein the database of exporters

and importers of both NE India and Bangladesh is uploaded. It would enable B2B collaboration between buyers and sellers of both counterparts and allow business dealings and negotiations between the two sides.

Chittagong Port has a long historical association with Assam and the region since the British colonial period. The century-old seaport has been redeveloped to handle cargo ships with deeper depths. Chittagong Port is nearer to Guwahati compared to Haldia Port of Kolkata. This will reduce transportation costs and boost trade and commerce activities,' Mahmud said.

Patenga Container Terminal to launch in June: CPA Chairman



A conference was held in the CPA Building on 06 February 2022. At the conference, Chattogram Port Authority (CPA) Chairman Rear Admiral M Shahjahan said Patenga Container Terminal (PCT) in Chattogram will begin its operational activities in June 2022.

The CPA Chairman hoped that it would be possible to handle 145 million TEU containers per year after opening the terminal.

The Port chairman said that port's capacity to hold containers and as the working capacity will be increased more after the opening of Bay Terminal and PCT.

Nunziata, Ambassador of Italy, said that there is immense potential for trade and commerce in Bangladesh.

EU Ambassador Steward Whiteley said that the garments products carrying ship have launched in Chattogram-Italy route, for the first time which I think will create a conducive business environment between both countries.

BGMEA President Farooq Hasan's BGMEA delegation included its first vice-president Syed Nazrul Islam, Shahidullah Azim, vice-president (finance) Khandaker Rafiqul Islam, vice-president Md. Nasir Uddin, vice-president Rakibul Alam Chowdhury, director. M. Mohiuddin Chowdhury, AM Shafiul Karim (Khokon), Md. Hasan (Jackie), M Ehsanul Haq and Mohammad Miraj-e-Mustafa (Kaiser), guests, senior port officials, and media personnel attended the function.

PATENGA CONTAINER TERMINAL (PCT) CAPACITY

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4,500 TEUs can be stored at a time



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- ★ স্যাম্পল অথবা ড্রইং প্রাপ্তি সাপেক্ষে যে কোন ধরনের রাবার স্পেসার্স তৈরী করা হয়।
- ★ উন্নত কাঁচামাল ব্যবহার করে আন্তর্জাতিক মানের বিদেশী মেশিনে প্রতিটি রাবার স্পেসার্স তৈরী করা হয়।
- ★ আধুনিক স্যাবরেটরীতে প্রতিটি রাবার স্পেসার্স নিরীক্ষার মাধ্যমে মান নিয়ন্ত্রণ করা হয়।
- ★ প্রতিটি রাবার আইটেম কোয়ালিটি কন্ট্রোল সেল দ্বারা Qualified হওয়া সাপেক্ষে সরবরাহ করা হয়।
- ★ আমাদের কার্যক্রম আন্তর্জাতিক ক্লাসিফিকেশন সোসাইটি **Bureau Veritas** দ্বারা সনদ প্রাপ্ত।



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BIMRAD Participated in the Roundtable Meeting on MPA



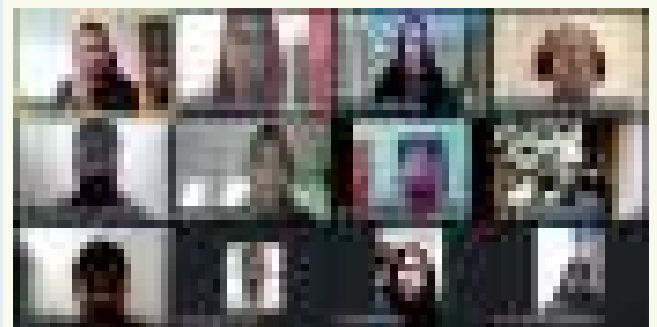
A roundtable meeting on the scope of Marine Protected Area (MPA) management and exploring further opportunities in Bangladesh was held at Westin, Dhaka on 29 December 2021, Wednesday, from 10.00 am to 2.00 pm. IUCN Bangladesh and ECOFISH II, being implemented by the Department of Fisheries and WorldFish Bangladesh and supported by the USAID jointly hosted the program titled "Ecosystem-Based Sustainable Management of Nijhum Dwip Marine Protected Area (MPA)".

Representatives from two ministries, i.e. Department of Fisheries and Bangladesh Forest Department, many scientists, members from Bangladesh Parjatan Corporation, leading Maritime and Oceanographic Research Institutes, Academicians, World Bank Bangladesh, Union Parishod of coastal area and fishers took part in the discussion.

While discussing on MPA, Captain M Minarul Hoque, (H), BCGM, psc, BN, Director General, BIMRAD mentioned that before implementing any restriction on fishers for fishing in the Nijhum Dwip MPA, they should be under cover of social safety net. The fishers of Nijhum Dwip should also be offered with alternative employment facilities during restriction periods. Moreover, developing awareness among fishers and tourists should be the key factor for protecting MPA, where marshalling in the MPA by the law enforcement authorities may play an additional role. He also mentioned that our total sea area is limited and demarcated. So achieving SDGs

through various blue economy initiatives should be done through proper scientific research, and all the stakeholders must be included in the process. Mr Raquibul Amin, Country Representative, IUCN Bangladesh moderated the entire program.

Researchers from BIMRAD Participated in ICCCAD and IUB E-Lecture on 'Impact of Climate and Weather Shocks on Food Security and Health'

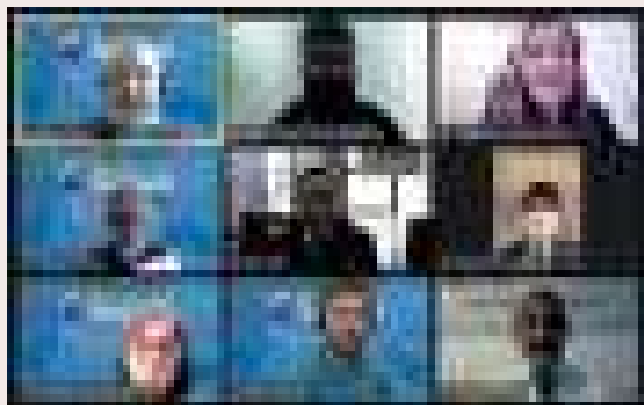


The first ICCCAD and IUB e-lecture series of 2022 was held on 30 January 2022 on the virtual platform. Dr Shouro Dasgupta, Environmental Economist of the Euro-Mediterranean Center on Climate Change (CMCC) and

Professor Elizabeth Robinson, Director of the Grantham Research Institute on Climate Change and the Environment, LSE presented their two papers. The first paper explored the impacts of climate shocks on child health based on secondary data. And the second paper revisited the correlation between climate change and food security, also based on secondary data. The presentation ended with briefly showcasing the policy implications of their research findings. The session was moderated by Professor Saleemul Huq, Director, ICCCAD.

Along with the Research Officers from BIMRAD, many scholars from different national and international sectors participated in the session. The e-lecture was very fruitful and interactive with the voluntary contribution of the participants.

Participation in EU CRIMARIO Webinar on 'High Seas Boarding with Flag State Permission'



EU Critical Maritime Route Wider Indian Ocean (CRIMARIO) project organises 'Tuesdays Second Chance Webinar Series' to highlight the challenges of maritime operations. This edition of Tuesday 01 February 2022 examined the case study of the boarding of the M/Y Simon de Danser of the Atlantic Coast of Portugal in 1997.

Andrew Mallia, the Law Enforcement and Capacity Building Expert of the CRIMARIO project, was the session's Keynote Speaker. He served as a naval officer within the Armed Forces of Malta for 25 years. Firstly, He examined the facts of the operation conducted by the UK Government to board Simon de Danser, a converted fishing vessel suspected of transporting narcotics. It was a Malta-registered motor yacht, and more than four tonnes of cannabis were found on the vessel when escorted into the Devonport dockyard. The legal trial collapsed in 1999, and all charges were dismissed. The Keynote Speaker presented the unfolding of these events and the decisions that affected the outcome. He outlined the legal and operational challenges in this regard. Finally, the

session ended with presenting some essential policy recommendations, where former and serving naval practitioners from India, Sri Lanka, Belgium, Japan etc., shared their views. Nur Ahmed, Research Officer (Maritime Affairs & Security) of BIMRAD, participated in the webinar.

BIMRAD Participated in Second Bay of Bengal Maritime Dialogue



The Pathfinder Foundation and Centre of Humanitarian Dialogue (HD) organised the second Bay of Bengal Maritime Dialogue on Regional cooperation, following the legacy of the first Bay of Bengal Maritime Dialogue's outcomes, held in July 2021. A total of four sessions took place on 14th and 15th February 2022, which included marine environmental protection, marine scientific research, IUU fishing and interactions between fishing vessels and maritime law enforcement agencies. The sessions on "Promoting cooperation on marine environmental protection in the Bay of Bengal" and "Opportunities and challenges for marine scientific research in the Bay of Bengal" were held on 14 February 2022. Dr E Vivekanandan, Consultant, Central Marine Fisheries Research Institute, Madras Regional Station, India and representative of Thailand Ministry of Foreign Affairs TBC were the lead speaker of the sessions respectively.

The other parts of the session on "Preventing and mitigating illegal, unreported, and unregulated (IUU) fishing in the Bay of Bengal" and "Towards a regional approach for managing interactions between (foreign) fishing vessels and maritime law enforcement agencies?" took place on the following day. Dr Mas Achmad Santosa, Chief Executive Officer Ocean Justice Initiative, Indonesia was the lead presenter of the first session, while TBC made the lead presentation in the second session. Research officer Dr Halima Khatun from BIMRAD attended these sessions. She participated as a commenter and delivered a short speech on the prevention and mitigation of IUU fishing in the Bay of Bengal. All the experts, researchers, naval and maritime legal personnel emphasised marine resource conservation, preventing IUU fishing through integrated regional cooperation.

Participation in “Geopolitics of Indo-Pacific and Reconnecting the Bay of Bengal Littorals” Seminar



Bangladesh Institute of International and Strategic Studies (BISS) and the Embassy of Japan in Bangladesh jointly organised a Hybrid Seminar on "Geopolitics of Indo-Pacific and Reconnecting the Bay of Bengal Littorals" on Monday, 28 February 2022. Ambassador Kazi Imtiaz Hossain (Chairman, BIIS), Major General Muhammad Maksudur Rahman (DG, BIIS), special guest HE ITO Naoki (Ambassador of Japan in Bangladesh) and Chief Guest Mr Mohammad Faruk Khan MP (Chairman, Parliamentary Standing Committee on Ministry of Foreign Affairs, Bangladesh Parliament) delivered their respective remarks in the inauguration session.

Professor Imtiaz Ahmed (Department of International Relations, DU) talked about the changing nature of geopolitics in the context of Bangladesh, while Professor Lailufar Yeasmin (IR, DU) highlighted the importance of Japan-Bangladesh relations on the economic progress of Bangladesh. Professor KIKUCHI Tsutomu (International Political Economy, Aoyama Gakuin University, Japan) presented the strategic visions of Japan in the Indo-Pacific. Professor TAKAHARA Akio (Graduate School of Public Policy, the University of Tokyo, Japan) featured Japan's initiatives on FOIP and maritime cooperation. Professor Rashed Uz Zaman (Department of International Relations, DU) moderated the entire program. BIMRAD officials participated in the seminar.

BIMRAD Participated in BIPSS - Dhaka Tribune Roundtable on 'The Strategic Significance of the Bay of Bengal: Role of Bangladesh'

Bangladesh Institute of Peace and Security Studies (BIPSS) and Dhaka Tribune jointly organised their monthly roundtable on 28 February 2022, focusing on 'The Strategic Significance of the Bay of Bengal: Role of Bangladesh'. A panel of experts discussed the given topic. The first speaker,



Brigadier General Shahedul Anam Khan (retd), former associate editor of The Daily Star, spoke elaborately on the various aspects of the growing strategic importance of the Bay of Bengal. The second speaker, Rear Admiral Kazi Sarwar Hossain (retd), former Bangladesh High Commissioner in the Maldives and former DG of Bangladesh Coast Guard, explained the geopolitical rivalry between the concerned prominent state actors in the Bay of Bengal. The growing militarisation of the region was analysed through the comparative analysis of the naval strengths of the concerned states. The final speaker, Assistant Professor Parvez Karim Abbasi, East-West University, discussed the necessity of strengthening the capacity of the Bangladesh Navy in order to formulate a comprehensive marine resource protection strategy. BIPSS President Major General (retd) ANM Murriruzaman moderated the whole session.

Along with other participants, Nur Ahmed, Research Officer (Maritime Affairs and Security), represented BIMRAD at the roundtable.

Participation in Pathfinder Indian Ocean Security Conference Phase II



Following the success of the Pathfinder Indian Ocean Security Conference (PFIOSC) in 2020, Phase II of the PFIOSC was held virtually on 04 March 2022. The conference was organised by Pathfinder Foundation and sponsored by the US Government and the Government of Japan.

The conference started with the welcome address delivered by the Secretary-General of PFIOSC, Ambassador (Retd.) Geetha de Silva. Afterwards, opening remarks were delivered by the two Co-Chairs of the conference, Ambassador (Retd.) Bernard Goonetilleke and Ambassador (Retd.) Shivshankar Menon. The conference was also attended by Government Officials from the US and Japan.

The conference comprised three sessions; each focused on a particular security issue in the Indian Ocean region. The first session discussed the exploratory options to establish a new security architecture in the Indian Ocean region. The contextual dynamics of Maritime Domain Awareness in the case of the Indian Ocean were elaborated in the second session. The third session was focused on the conceptual aspects of Confidence-building measures (CBMs) and their applicability in the region. Research Officers from BIMRAD participated in the online session.

BIMRAD organised a Webinar on "Emerging Security Challenges in Indian Ocean Region: Assessing the Impacts of Geopolitical and Geo-Economics Maneuverings in the Bay of Bengal Littorals"



A webinar on the theme "Emerging Security Challenges in Indian Ocean Region: Assessing the Impacts of Geopolitical and Geo-Economics Maneuverings in the Bay of Bengal Littorals" was organised by the Bangladesh Institute of Maritime Research and Development (BIMRAD) on 15 March 2022 at 1100-1245 (BST).

Professor Dr Rashed Uz Zaman (Department of International Relations, Dhaka University) moderated the session. A welcome address was given by Captain M Minarul Hoque (H), BCGM, psc, BN, Director-General, BIMRAD. The webinar was designed with one keynote presentation and two-panel discussions.

Professor Dr Imtiaz Ahmed (Department of International Relations, Dhaka University) delivered the keynote presentation

on the topic "The Emergence of Indian Ocean as the Center of Global Competition: The Implications for the Geopolitical Dynamics of Bay of Bengal". He mainly discussed the economic importance of the Indian Ocean, the geopolitical dynamics of international trade and the potential role of Bangladesh for future economic growth.

Professor Dr Shahab Enam Khan (Department of International Relations, Jahangirnagar University) discussed on "The Growing Significance of Bay of Bengal in the Global Maritime Space: Strategic and Geo-Economic Implications for Bangladesh", and focused on the prospect of revisiting the maritime and naval doctrines of our country and the growth trajectory of Bangladesh.

Rear Admiral Muhammad Anwarul Islam, NGP, ndc, afwc, psc, BN (retd) talked about "Transcending Barriers to Maritime Cooperation: the Context of South Asia". He highlighted the importance of regional cooperation to combat maritime crises and crimes and pointed out some opportunities for the collaborative initiative in the Bay of Bengal.

Many proficient maritime scholars, academicians, maritime researchers, stakeholders and Navy officials participated in the webinar and exchanged views and thoughtful opinions. In the end, Captain M Minarul Hoque (H), BCGM, psc, BN, Director General, BIMRAD delivered his concluding remarks and showed his gratitude to the participants for their vibrant participation.

Participation in the Workshop on "Blue Economy in the Bay of Bengal"



The 3rd (final) workshop on "Blue Economy in the Bay of Bengal" was jointly organised by The Bridge Tank and Agence Française de Développement on 16 March 2022. This 3rd workshop aimed to identify the sector's political ambitions and willingness/possibility of regional cooperation with the contribution of the French know-how in the maritime field. Different national and international Government and NGO officials, experts, stakeholders and academia in the maritime sector participated in the workshop.

The workshop was separated into three sessions. Many prominent speakers from Bangladesh, India and Sri Lanka delivered valuable lectures on different issues. Afifat Khanam Ritika, Research Officer, BIMRAD, participated in the workshop as a speaker in session three and delivered her lecture on "Enhancing shared resources through a regional network". She mainly highlighted marine fisheries as a shared resource and has explained the opportunities and options for regional cooperation in enhancing the sustainable growth of the sector briefly. The workshop was engaging, with many regional and international cooperation solutions on the blue economy in the Bay of Bengal.

Participation in ICCCAD/IUB Distinguished Speaker Series on 'Fighting the Climate Crisis: Reinvigorating the Paradigm Shift from Paris'



The ICCCAD/IUB Distinguished Speaker Series on 'Fighting the Climate Crisis: Reinvigorating the Paradigm Shift from Paris' was held on 06 April 2022 at the Six Seasons Hotel, Dhaka. It was organised by the International Centre for Climate Change and Development (ICCCAD) – Independent University Bangladesh (IUB), along with the German Embassy in Dhaka as a partner.

The lecture was organised on the occasion of the 50 years of Germany-Bangladesh diplomatic relations. Ms Jennifer Morgan, German State Secretary and Special Envoy for International Climate Action was the distinguished keynote speaker of the program. Her lecture revolved around how we can create a connection between the policy outcomes of the COP conferences and the ground-level realities; and the role of G-7, EU and Germany in this regard. It was followed by a vibrant Q&A session featuring participation from representatives of different NGOs, research organisations, academic institutions etc. Mr Saber Hossain Chowdhury, Chairman of the Parliamentary Committee on the Ministry of Environment, Forest & Climate Change, delivered the concluding remarks of the session. Dr Saleemul Huq, OBE, Director – ICCCAD moderated the whole session. Mr Nur Ahmed, Research Officer, represented BIMRAD in this distinguished program.

Participation in BIISS Seminar on 'Bangladesh and the United States Relations: Moving Towards Enhanced Cooperation and Partnership'



Bangladesh Institute of International and Strategic Studies (BIISS) organized a seminar on 'Bangladesh and the United States Relations: Moving Towards Enhanced Cooperation and Partnership' on 24 April 2022. H. E. Dr. A. K. Abdul Momen, MP, Honourable Foreign Minister, Ministry of Foreign Affairs, Government of the People's Republic of Bangladesh, was the Chief Guest of the seminar. The newly appointed US Ambassador to Bangladesh, H. E. Mr. Peter Haas was the Special Guest.

The seminar was kicked off with the welcome speech of the Director-General of BIISS, Major General Mohammad Maksudur Rahman, OSP, BSP, psc. It was followed by three presentations delivered by distinguished experts. The first speaker, Professor Ruksana Kibria, Department of International Relations, University of Dhaka presented a comprehensive review of the evolution of the bilateral relations between Bangladesh and the US. The second speaker, Brig. Gen (Retd.) Dr. M. Sakhawat Hossain, Senior Fellow, South Asian Institute of Policy and Governance, North South University, provided a detailed overview of the two country's partnerships on security matters. The last speaker, Ambassador Humayun Kabir, President, Bangladesh Enterprise Institute (BEI), highlighted the contemporary dynamics of Bangladesh-US relations. Ambassador Tariq A. Karim, Director of the Centre for Bay of Bengal Studies, IUB delivered the concluding remarks of the seminar. It was followed by an interactive session featuring questions and comments regarding the recent developments in bilateral relations. The Chairman of BIISS, Ambassador Kazi Imtiaz Hossain chaired the whole session. Mr. Nur Ahmed, Research Officer, represented BIMRAD in this distinguished program.

Mariculture: Prospects for Economic Sustainability

Dr. Halima Khatun

Bangladesh is gradually emerging as an economic power with its limited resources and has become a centre of attention as one of the fastest-growing economies globally. The current economic turmoil in the South Asian region due to changing regional and global dynamics and frequent climate threats reminds us to rethink the existing economic management strategies and initiate alternative potential financial sources to avoid any economic crisis. The declining capture stocks, peaking protein demand by the growing population, and shrinking land-based resources are pointing to the essence of the expansion of mariculture to satisfy the excessive need. We have a substantial area from coastal lagoons to the open ocean for mariculture. Marine aqua farming is mainly carried out in tide-fed ponds/enclosures and coastal cages. The domestication of new species such as seabass, sea bream, mullet, hilsa, grouper, pomfret, mud crab, mussel, oyster, sea cucumber, microalgae, and seaweeds through mariculture ensures food security and reduces risk toward economic stability.

Environmentally sustainable and socially acceptable aquaculture practices should be promoted concerning the environmental aspects and getting maximum benefit. Cost-effective and eco-friendly cultures such as integrated mangrove aquaculture (aqua-silviculture) and integrated multi-trophic aquaculture (IMTA) could be suitable options. Crab or shrimp, together with mangroves, can be integrated in Sundarban or adjacent coastal areas. It's a kind of mutual beneficiary system. On the other hand, in the IMTA system, species are selected depending on the available food from different trophic levels. Waste of one species could be food for others. Importantly, there is minimal use of artificial feed in this system, and it poses limited environmental impacts. Thus, different fishes integrated with oysters, mussels, and seaweeds can be farmed in Cox's Bazar-Teknaf coast and the Islands of St. Martin's, Moheshkhali and Sonadia. Crab also has immense potential in the coastal economy. This farming has a promising export market, especially in China (80% of the total export). Similarly, green mussel, clam and oyster farming, a low-investment business with good returns, can be an integral part of the development of the blue economy development. Other non-traditional species like sea coral, sea cucumber, microalgae and seaweed have infinite economic possibilities.



Notably, Bangladesh has undeniable potential for naturally available seaweeds along the extended coastline because of the promising environmental and climatic conditions. Economic importance, medicinal and therapeutic purposes, nutritional value, and role in protection against climate change have made seaweeds a farming attraction in our coastal area.

Commercial aquaculture depends on live feeds as most of the cultured species feed on it during their early stage. Besides facilitating marine aquaculture, the establishment of laboratories and institutions occupied with modern technologies might be an outstanding economic source. Thus the introduction of marine aquaculture will open a new dimension of multiple mariculture-dependent livelihood opportunities from the local level to the international network. Significantly, these employment sources may reduce the pressure on the government to provide 40kg rice/fishers to 4 lakh marginal fishers every year, thereby ensuring a secured social safety net. Often, we confine ourselves to the traditional lines of work and are unwilling to break down the wall of conventional professional preferences. But we must move on to adopting alternative livelihood options considering the limited land resources, climate change vulnerabilities, depletion of marine stocks and so on.

Obviously, it will take a long time to implement mariculture techniques and requires huge investment. However, effective participation of farmers, private entrepreneurs, industry, academia, researchers and respective authority can make it possible to initiate and continue the mariculture process and turn the sustainable blue economy into a green economy. Adequate cooperation among the investors, private entrepreneurs and respective governing authorities during the financial crisis and accidental damage may encourage the stakeholders to do so and achieve success. Only creating mass awareness and encouragement is not enough to initiate intensive farming of marine species. Comprehensive technical and financial assistance from government and private organizations triggers the magnitude and success of mariculture.

Writer: Dr. Halima Khatun is a Research Officer, BIMRAD.



The Livelihood of the Coastal Fishermen of Bangladesh is Under Severe Threat

Rafiqul Islam Montu



Frequent cyclones, depression, rising tidal waters, loss of navigability in nearby seas due to siltation, climate change, etc., are the contributing factors for enhancing the livelihood crises of coastal fishers in Bangladesh. Climate change and environmental crises have posed significant challenges to fishers' typical livelihoods. A large number of fishermen are being compelled to change careers. To make a living, many people have moved to the city.

Many coastal fishing communities believe that climate change is responsible for frequent natural disasters, which is a newly added challenge for their regular activities. On the other hand, imposing a fishing ban period by the Bangladesh government makes their lives difficult.

Woes of Coastal Fishermen

Nur Uddin, a 45-year-old fisherman from Bhola's Charfason Upazila, has spent his entire life fishing in the sea. Nur Uddin now realises that he can no longer go sea fishing like before due to numerous natural disasters. A few years back, there were only 2-3 cyclones or depressions in the rainy season,' Nur

Uddin claimed. 'Now, there are 2-3 more cyclones or depressions in the winter. The frequency of cyclones or depressions per year is very high and makes us defenceless.'

According to scientists, climate change causes more weather uncertainties. On the other hand, Fisherman Nur Uddin is utterly unaware of the concept of "climate change." He is, nevertheless, aware of the changes and their implications for his life. Nur Uddin shared his experience that his fishing trawler returned to shore without any fish two months back due to two consecutive sea depressions. The story didn't stop here. They were sitting idle for nearly a month due to the rough sea. Storms also claimed the lives of many fishers on the coast of Bangladesh time and again. Seven fishermen from Mujibnagar union, Charfason Upazila, Bhola district, were killed in a storm two years back.

'I will not let my children allow for fishing till I am alive,' uttered Rokeya Begum, whose husband was a fisherman and died in the storm while fishing at sea. She also added, 'My son is also afraid of going to the sea for fishing. Presently, I can't afford

meals three times a day, even though I work very hard to make my living. Whatever may be the case, I will not put my children's lives at risk by choosing the fishing as a profession.'

The increased number of storms in the Bay of Bengal has affected fishermen's livelihoods and other stakeholders dealing with sea fishing. 'Cyclone signals have been raised twice during my last trip for fishing,' claimed Ershad Ali, a trawler owner. He also said, 'I used to finish a fishing expedition in ten days. The present situation allows me to fish for three or four days on a trip. On some trips, we don't get any fish.'

Fishermen also stated that they could not go for deep-sea fishing due to a lack of proper navigation equipment and modern fishing gear. Earlier, fishers used to cast their nets in the sea after sailing the trawler for 3-4 hours, but today they have to sail the trawler for 10-12 hours to cast their nets, squandering time and money.

Natural Disasters are a Regular Phenomenon for the Coastal Life



'We are insecure not only at sea but also at home. How are we supposed to go to the cyclone shelter from our houses? Within two kilometres, there is no cyclone shelter. As a result, our risk of disaster has not decreased.' Abdur Rab Mridha, 60, of Charlathimara village in Patharghata Upazila of Barguna district, made these comments. Rab Mridha and his family live in a perilous house on the riverbank outside the embankment, prone to flooding during high tide. Super cyclone Sidr struck his area in 2007, causing widespread devastation. He, like many others, had to float in the tidal waves that day, yet he is trying to lead a secure life.

Abdur Rob Mridha had already withstood five storms in addition to cyclone Sidr. However, cyclones were not a regular phenomenon in the past; now, we have cyclones every year. What is different now than before? Abdur Rab replied to the question, 'The river's depth has decreased due to siltation. Previously, large amounts of tidal water would not reach the dwelling, but now, water spreads to the residence even at low tide. Previously, mangroves provided protection, but the forest has shrunk in size. Rising temperature is also a primary concern responsible for climate change. This climate change

has a significant impact on livelihood as well. I'm terrified of calamity now.'

'There is no possibility of getting shelter in times of calamity,' Abdur Rob Mridha claimed when discussing disaster management. 'When I hear the cyclone signal, my panic grows. Even though I am aware of the cyclone signal, I am unable to decide where to seek shelter due to the lack of a cyclone shelter in this area. An NGO just established a cyclone shelter, which is also far away from our house. Even at this distance, I won't be able to find a space to stand in that cyclone shelter.'

Mashuma Begum's Husband Went to the Sea and Never Returned



During the impact of cyclone Sidr in 2007, Mashuma Begum lost her husband; at that time, he was fishing in the sea. The cyclone Sidr hit the area with great force, and many fishermen like her husband could not return to their homes. Mashuma Begum and her four small children were at a stake after her husband died. She grew her children by working as a day labourer in the streets and other people's homes, carrying a load of tragedy with her for the rest of her life.

Mashuma was describing the incident of the terrible night of cyclone Sidr. It had been raining all day with an unusual increase in tidal water at night, so she took shelter in a close relative's house inside the embankment, but the water infiltrated there too. Fortunately, Mashuma Begum and her children survived. However, her husband, who went for fishing in the sea with other fishermen just two days before the Sidr, did not return.

Mashuma Begum has now been fully aware of disaster management after the cyclone Sidr. The cyclone demolished her house. She later reconstructed that. This time she raised the ground floor of her house significantly. The house is approximately six feet above ground level. Even still, if a large cyclone strikes, there is no way to safeguard the people of this region. 'The situation in this area has not improved much since Sidr's time,' Mashuma Begum added. 'When we hear the cyclone signal, we become terrified. The cyclone shelter is far away, and it is a school building.'

Fisherman Abdur Rahim is Looking for an Alternative Way of Earning



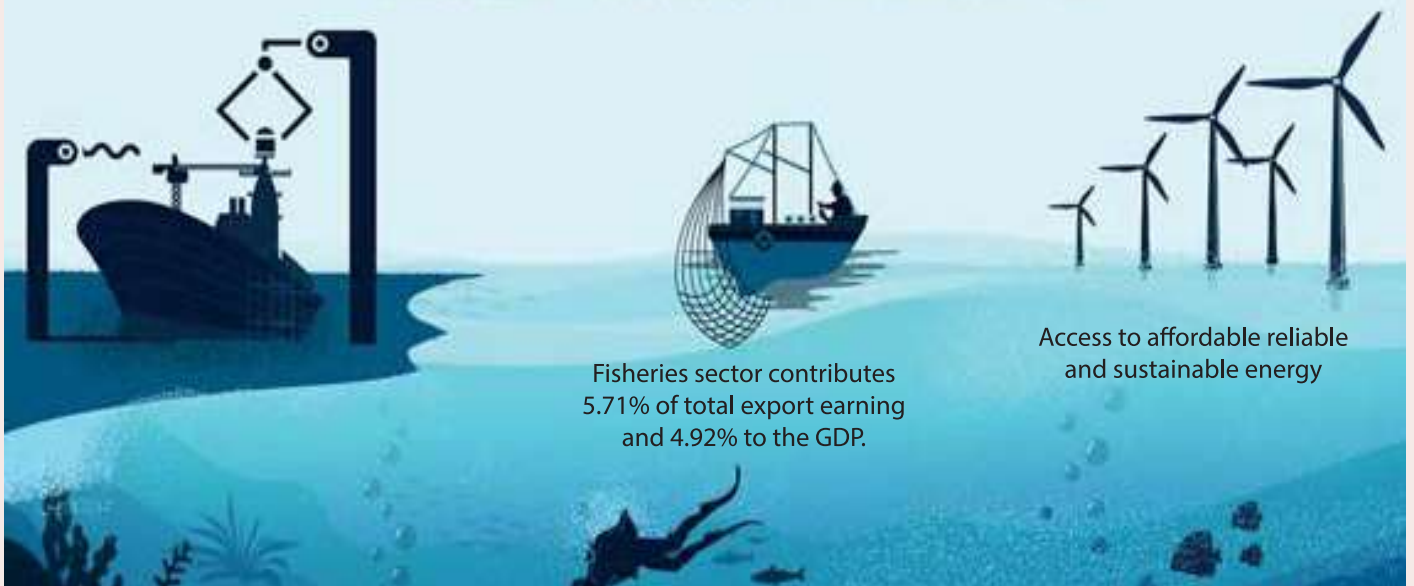
Many medium and small-scale fishermen in Patharghata are looking for alternate sources of income due to these frequent natural disasters. Abdur Rahim, a Padma village inhabitant, is one of them. He has been earning a living from fishing with his nets and boats for many years. At one point, he realised that fishing was more harmful than profit, and because of that, he emphasised and started agricultural cultivation on the land. He found that if there were a loss in fishing, it could not make up like agriculture. However, there is another stumbling block: extreme salinity may ruin his crops. After being motivated by an NGO, he eventually began cultivating using a different method

to minimise salinity. Abdur Rahim has shifted his concentration away from fishing and toward agriculture.

Abdur Rahim has found a way to prevent the disaster, and many villagers have joined him. 'Natural disasters have brought many changes in our lives, such as fishes are not being found in the sea or rivers like they used to be,' Abdur Rahim said. 'Those disasters are all around us, and we must adapt and discover new methods to make a livelihood.'

Writer: Rafiqul Islam Montu is a Coastal Journalist.

Ocean-based livelihoods





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