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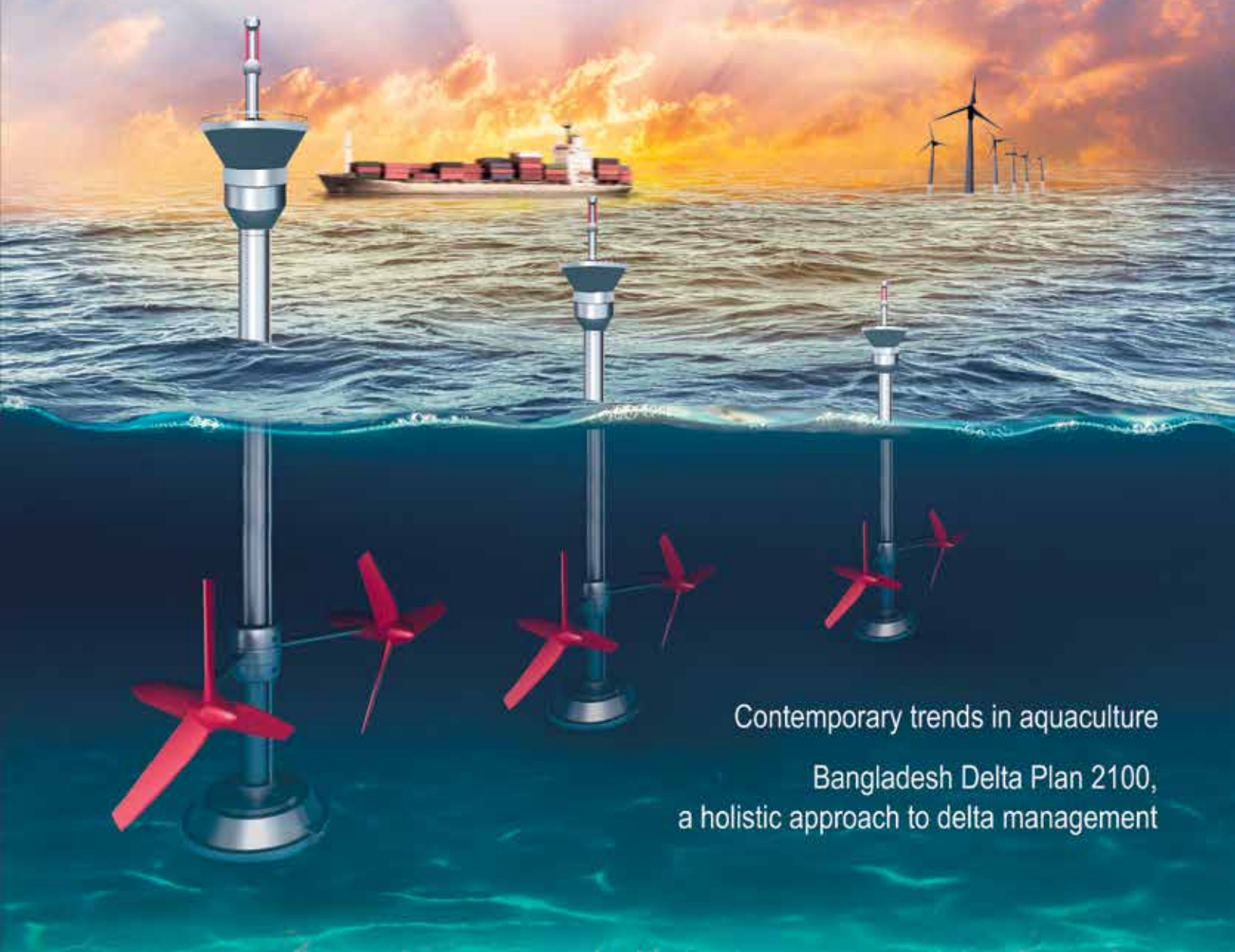
MARITIME CAMPUS

A QUARTERLY MAGAZINE OF
BANGABANDHU SHEIKH MUJIBUR RAHMAN
MARITIME UNIVERSITY, BANGLADESH

Bangabandhu, the beacon of women empowerment in Bangladesh

Marine Renewable Energy and its prospects for Bangladesh



Contemporary trends in aquaculture

Bangladesh Delta Plan 2100, a holistic approach to delta management

INFOGRAPHICS

Zero-carbon fuels for shipping

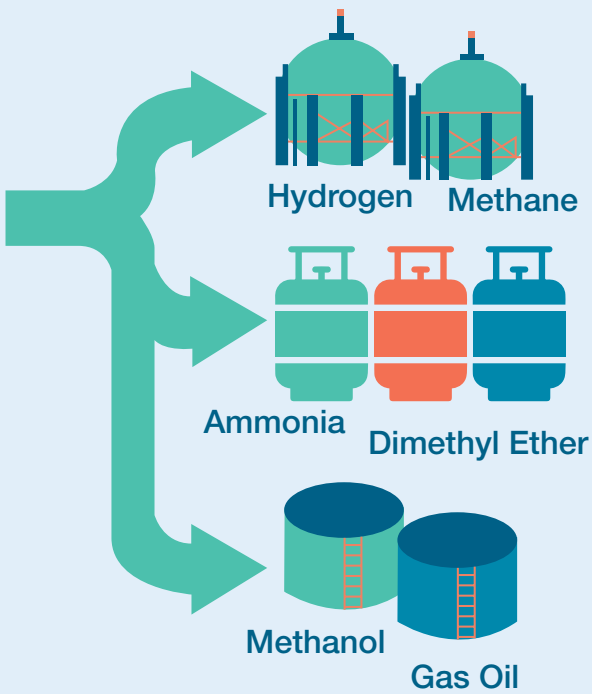
Renewable energy source options + products

Electro-fuels

Production of gaseous/liquid zero-carbon electro-fuels from sustainable sources.

Electrification

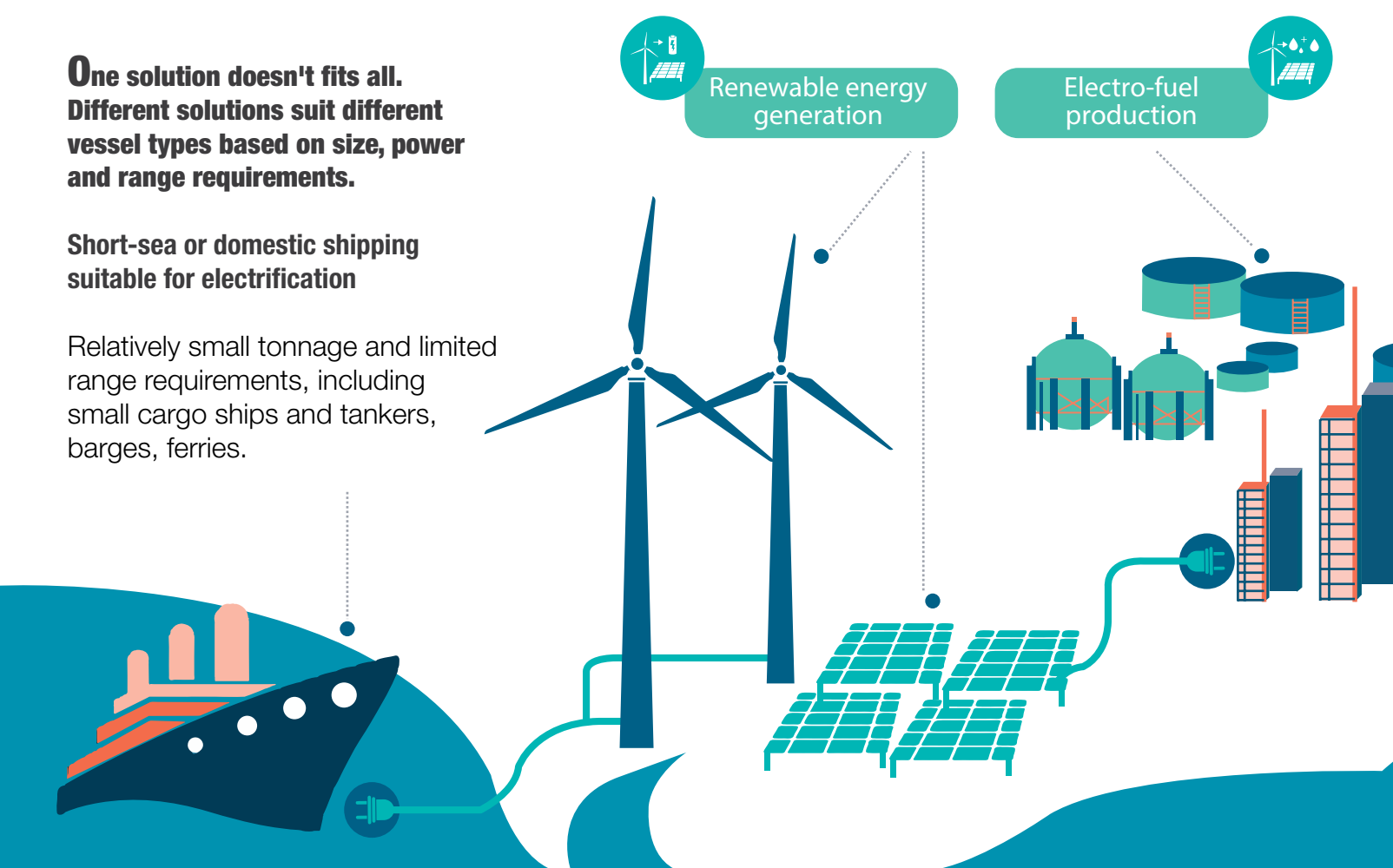
Production of electricity from renewable energy resources in combination with battery storage technology.



One solution doesn't fits all. Different solutions suit different vessel types based on size, power and range requirements.

Short-sea or domestic shipping suitable for electrification

Relatively small tonnage and limited range requirements, including small cargo ships and tankers, barges, ferries.



1

Using a mix of electro-fuels and electricity, both made from renewable energy, plus some limited bio-fuels, shipping can achieve the IMO GHG target and reduce its emissions further.

A number of limitations are associated with bio-fuels. That is why electro-fuels and electricity generated from renewable energy are likely the more sustainable options.

Bio-fuels + limitations

1st Generation

Produced from food resources, such as wheat and sugar.

Resource competition
Life-cycle emissions

2nd Generation

Produced from bio-mass resources such as wood and organic waste.

Resource competition
Land use alteration

3rd Generation

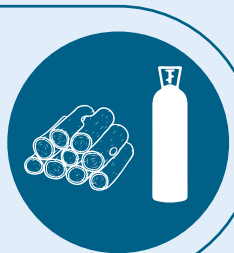
Produced from sustainably cultivated organic materials such as algae.

Life-cycle emissions
Commercial viability

4th Generation

Produced from bio-mass resources in combination with carbon dioxide capture and storage.

Resource competition
Land use alteration



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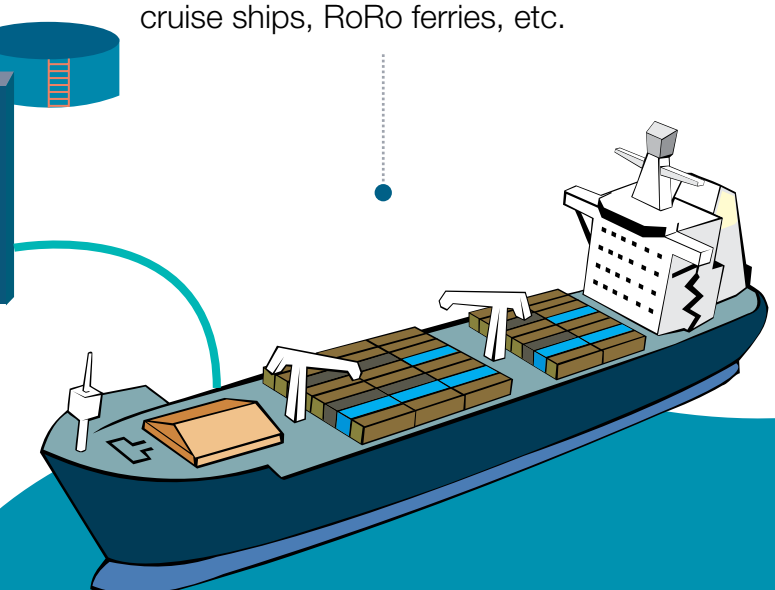
Deep-sea shipping requiring electro-fuels

Large tonnage and considerable range requirements, including large container ships, bulk cargo and gas carriers, larger tankers, cruise ships, RoRo ferries, etc.



3

Further work is needed for the transition of maritime industry to zero-carbon fuels.

- Infrastructure
  - Scale up production of renewable energy & zero-carbon fuels
  - Improve availability reduce costs
- Ship level
  - Scale up deployment of zero-emission vessels
- Regulations
  - Develop supportive policy, standards and rules

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Editorial

Bangladesh should look towards renewable marine energy sources

Bangladesh's energy needs are expanding, and non-renewable energy sources like gas will be insufficient in future. Furthermore, the growing worry about the effects of non-renewable energy sources on the climate necessitates the urgent exploration of alternate sources, notably renewable energy sources. Due to Bangladesh's proximity to a huge body of water, Marine Renewable Energy (MRE) is the most practical alternative for the country. In this regard, the goal of our lead article is to look at the possibilities of harnessing MRE from our vast coastal and maritime area.

The country is celebrating the birth centenary of the Father of the Nation Bangabandhu Sheikh Mujibur Rahman. To honour his devotion, leadership and holistic contribution to Bangladesh's liberation and post-war reconstruction, Maritime Campus has published a series of articles to pass on his ideology among the students of BSMRMU. This issue of the Maritime Campus features an article about his vision and efforts to empower women during his nation-building period.

Deep-sea fishing projects have previously been discouraged in Bangladesh due to the higher financial investment, lack of skilled manpower, and unavailability of advanced technology required to harvest. However, the government's Blue Economy initiative calls for deep-sea fishing enterprises to catch and conserve fish. The authors of the article in our Academia section have described the present scenario of deep-sea fishing in Bangladesh and recommended some initiatives to follow.

There is a widespread idea that St. Martin's Island in Bangladesh's Bay of Bengal would be submerged due to the loss or extinction of corals on the island. An article in our Vantage Point section attempted to explain the truth and disputed the prevalent belief.

Furthermore, the 'Campus Canvas,' 'Maritime Bangladesh,' and 'Around the World' sections will keep you up to date on all major maritime events and developments that occurred in the third quarter of 2021.

Finally, I'd like to thank the Chief Patron and Honourable Vice-Chancellor for his invaluable support in bringing this issue to light. I'd also like to thank all of the departments for their cooperation in providing information about their individual departments' activities.

Finally, I want to thank the members of the Editorial Board for their tireless efforts to get this magazine published as soon as possible.

Thanking you

Captain A T G M Sarker, (TAS), psc, BN (retd)
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Bangabandhu

the beacon of women empowerment in Bangladesh

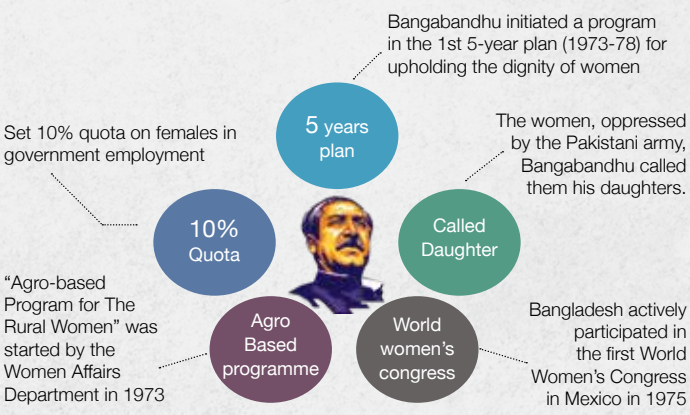
Editorial desk

Gender equality is a human right first and foremost. A woman has the right to live with dignity, free from hunger and fear. Bangabandhu Sheikh Mujibur Rahman's entire life provides evidence of his unwavering leadership and giving heart, as well as his profound love and devotion for Bangladesh and Bengalis. The role of Bangabandhu in women's empowerment and dignity is an extremely important topic this year, as the country commemorates the Father of the Nation's birth centenary. Bangabandhu established equal rights for women in all aspects of life.

Women's Role in the Liberation War

The 1972 Constitution declared unequivocally that actions should be taken to ensure women's involvement in all aspects of social life (Article 28). Bangabandhu thought that empowered women are better equipped to have more awareness and self-confidence, which helps them in combating inequalities in all areas. Women in government jobs were no longer restricted, and a 10% quota was set aside for them, allowing them to participate in all fields of work. In 1973, two women were appointed to the Cabinet, and in 1974, one woman was selected as the Director General of the Bangla Academy.

During the Liberation War of 1971, Bangabandhu recognised the contribution of the mothers and sisters who were tortured by Pakistani occupying forces and their local allies. The organisation dedicated to their rehabilitation after independence is a shining example of women achieving their long-awaited freedom. Women made outstanding contributions to our fight for freedom, and they were key figures in the 1952 Language Movement. Women's diverse participation during the



Major contribution of Bangabandhu in women's empowerment 1971-75

Liberation War aided in the establishment of women's political rights in Bangladesh. Expatriate women aided the Liberation War's progress by volunteering at refugee camps and influencing public opinion.

Both men and women must be recognised for their bravery and direct action in the war, however, women's direct involvement has been neglected in favour of emphasising their indirect involvement. Bangabandhu, on the other hand, encouraged everyone to treat women with respect. He provided a compassionate example by stating that it was not just men who gave their lives and honour for freedom, but also women. On December 22, 1971, the Bangladeshi government recognised victims of rape during the war as Birangana or brave women.

It is also worth mentioning Bangabandhu's great admiration and affection for his wife, Bangamata Begum Fazilatunnesa Mujib. He owes her everything because she was the one who looked after the family while he was away.

Bangabandhu's government established facilities for jobs and compensation for the spouses and daughters of those who were martyred during the Liberation War. In 1972, he established the Bangladesh Women's Rehabilitation Board, which was renamed the Women's Rehabilitation and Welfare Foundation in 1974.

His daughter, Bangladesh's Honourable Prime Minister Sheikh Hasina, has made a number of steps to ensure the development of women and children. She is determined to put women's empowerment at the centre of our development efforts in order to attain Bangabandhu's dreams of ensuring the rights and dignity of women as established in the country's constitution.

Women's Empowerment in Political Sector

Women's participation in political and economic activities is considered a cross-cutting problem and one of the primary drivers of development in Bangladesh's 7th Five Year Plan (2016-2020). Notably, the President of Bangladesh recently signed legislation making the death penalty the maximum punishment for rape, rather than life imprisonment. The ordinance is titled Women and Children Repression Prevention (Amendment) Ordinance-2020, and it went into effect immediately. Bangladeshi women are making their mark in politics, just as they are in other fields. They are currently dominating the political arena with tremendous success. Bangladesh has aimed to include women in national politics through electoral quotas since its independence in 1971. In Parliament, 15 seats (4.8% members) were set aside for women under the constitution. In 1979, the number of seats set aside for women was increased to 30 (or 9.7% of the total).

Women's Empowerment in Educational Sector

Bangabandhu encouraged women in the country to get an education and establish themselves in society on an equal footing with their male counterparts since they will have to forge their path and no one will come forward to help them improve their future.

Various initiatives and activities by the state, NGOs, and women's rights organisations have inspired legal changes and improved women's wellbeing, as well as improved opportunities for education, financial participation, and inclusion in governmental affairs. Women's participation in the larger society was traditionally limited to the private sphere. Women are mostly responsible for household chores and child-rearing. As a growing number of women have joined the workforce, political, and social sectors during the last 40 years, this notion has been put to the test. In 1990, 24.72% (aged 15 and up) participated in the labour force. Over the course of time, this rate has risen. The rate was 36.41% in 2020. It is evident that, over time, women have become more financially independent while also contributing to the growth of the nation's economy.

Three female cadets are seen working on a vessel of the Bangladesh Shipping Corporation.

It is challenging to ensure quality education for all students in a developing country like Bangladesh. However, despite the challenges, Bangladesh is doing a fantastic job of ensuring education, particularly for women. Women's literacy was 41.8% in 2001, while total literacy was 46.1%. In 2010, the percentage of women who were literate grew to 53.9%. Within ten years, the rate has risen by 7.8%, which is a huge accomplishment.

The FSP (Female Stipend programme) provides a stipend to encourage families to send their young daughters to school and to help with school expenditures. Young girls in rural areas in Classes 6–10 are eligible for the stipend under the program, with the condition that they maintain at least 75% participation, score at least 45% on yearly school assessments, and remain unmarried until the Secondary School Certificate assessment in Year 10.

Improvements in Maternal Health

Bangladesh has made significant progress in the health sector, particularly in maternal health. Maternal well-being is a key factor in determining a child's health, particularly in the early stages. Low maternal nourishment levels were linked to a larger risk of miscarriages, and low birth weight was linked to serious medical problems in infants.

Conclusion

In all aspects of society, Bangabandhu provided equal rights for women. Bangabandhu thought that empowered women can obtain a greater sense of awareness and fearlessness, which helps them fight a variety of inequalities in all areas. Bangabandhu Sheikh Mujibur Rahman, Bangladesh's Father of the Nation, started the process of elevating women's status by establishing equal rights, while his daughter, Honourable Prime Minister Sheikh Hasina, has taken several steps to ensure the success of women and girls in Bangladesh. She is determined to make Bangabandhu's goals a reality by ensuring women's rights and dignity in accordance with the country's constitution and putting women's empowerment at the centre of our development efforts.

Marine Renewable Energy and its prospects for Bangladesh

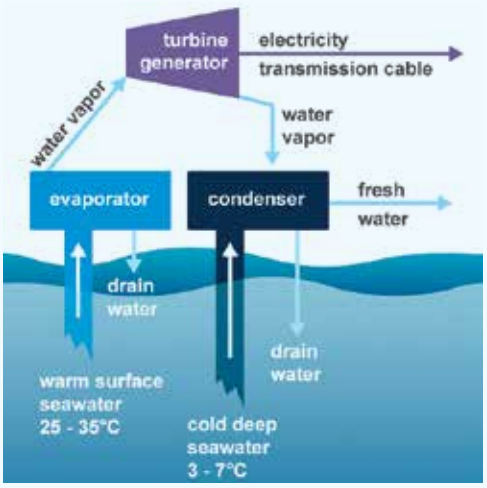
Editorial desk

Marine Renewable Energy (MRE) refers to the renewable form of energy that uses the kinetic, potential, thermal, or chemical properties of the ocean. This energy from the ocean can be harnessed and turned into other useful forms, most commonly electricity. In today's age, when there is a growing shortage of fuels, not to mention the harmful environmental impact of using fossil fuels to produce energy, this presents great potential. MRE can also help in fulfilling the Sustainable Development Goals 2030. Due to the large area covered by oceans, coastal countries all over the world can turn MRE into electricity.

Various forms of Marine Renewable Energy

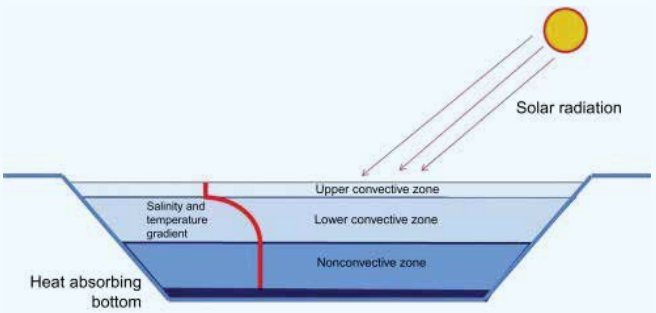
Marine Renewable Energy technologies are frequently classified according to the resource that is used to generate electricity. Apart from tidal range, which is only suited in a few locations, tidal stream and wave energy converters are the most commonly established technology throughout regions. Other MRE technologies that extract energy from temperature variations (such as ocean thermal energy conversion, OTEC) or salinity differences may become more relevant throughout time.

• **Ocean Thermal Energy Conversion (OTEC):** The temperature difference between the ocean's surface and deeper layers is used to generate OTEC. Energy can be produced using heat exchangers and turbines in regions where the temperature difference is roughly 20 degrees Celsius. OTEC has the biggest worldwide technical potential of all ocean energy sources, with 44000 TWh per year. Although the technology is still in its early stages of development, demonstration plants rated at 100 kW have proven to be successful in Hawaii and Japan.



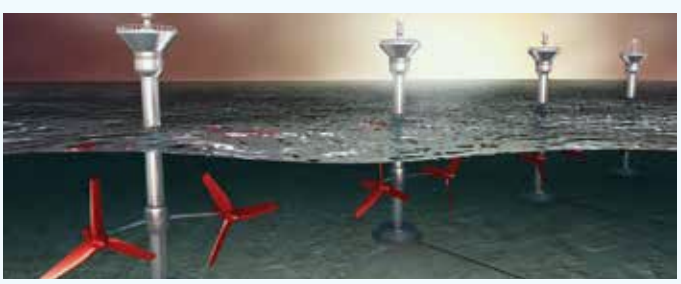
OTEC can produced electricity using heat exchangers and turbines

• **Salinity gradient:** The difference in salt content between two fluids can be used to create energy via pressure-retarded osmosis or reverse electrodialysis. The place where freshwater flows into the sea is suitable for this technique. However, this method has the least potential of all ocean energy technologies, with only 1 650 TWh per year due to geographical constraints.



Salinity gradient solar pond

• **Tidal energy:** Tides in the oceans are caused by the gravitational pull of the moon and sun, as well as the rotation of the earth. Tides can cause water levels along the shore to increase and fall by up to 40 feet in some places. More than a thousand years ago, people in Europe harnessed the movement of water to power grain mills. There are now tidal energy systems that produce electricity. A tidal range of at least 10 feet is required for economically producing tidal energy.



Tidal energy technology can be a game-changer in the field of renewable energy generation near future

• **Wave energy technology:** Wave energy has a theoretical capacity of 29500 TWh per year and is primarily found between 30 and 60 degrees latitude and in deep-water (> 40 metres) sites. The movement of a buoy induced by waves flowing from all directions generates energy relative to the base connection. Wave energy has a lesser level of technology development than tidal, and its implementation is currently limited to demonstration and pilot projects. As a result, only about 2.5 MW of power is installed globally.

In wave energy technology, the movement of a buoy induced by waves flowing from all directions generates energy relative to the base connection

No	Country	Wave Energy potential (Terawatt-hour /year or TWH/year)	Current power production from wave	Recent Investment
1	Australia	2760TWh/year	1.25 Megawatt (MW)	AUD43Mil/3MW
2	USA	2640TWh/year	0.06MW	(Oregon)/1.5MW USD64 Millions
3	Canada	1863TWh/year	0.759MW	None
7	Japan	19TWh/year	0.15MW	350MW
8	All Europe	2830TWh/year	2.25MW	85.6MW
9	Global	11400TWh/year, (1700TWh/year sustainable production)	Around 4MW	Around 411MW
5	UK	350TWh/year	1MW	40MW
6	China	0.5TMW	2.8MW	
4	South Korea	0.5TMW	0.3MW	

Table 1: Top wave energy potential countries and their current production (Rony)

• **Offshore wind:** Offshore wind technology enables countries to develop new sites with abundant wind resources, such as gigawatt-scale wind farms near highly populated coastal areas. As a result, offshore wind is a big contributor to the decarbonisation of the energy sector's technology portfolio. Floating foundations provide the offshore wind sector with two significant advantages: they allow access to locations with deeper water (below 50 metres) and distances of up to 80 kilometres from the coast. In recent years, there have been significant and exciting advancements in the field of floating foundations. Equinor, a Norwegian energy corporation, is intending to build Hywind Tampen, a floating offshore wind farm.

Offshore wind mills to generate marine renewable energy

• **Floating solar photovoltaic (PV):** Floating solar PV is a new technology that has the potential to grow quickly. The global cumulative installed capacity of floating solar PV plants was 1.1 GW at the end of September 2018. Because the cost of the ocean's surface is often lower than the cost of land, demand for floating solar PV is growing, particularly on islands (and other land-constrained areas). With a capacity of 150 MW and the potential to generate about 78000 megawatt-hours (MWh) in its first year, a facility in eastern China (in Panji District, Huainan City) is one of the world's largest operational floating solar plants.

Demand for floating solar PV is growing, particularly on islands and coastal areas

Benefits of using renewable energy for Bangladesh

Bangladesh can greatly benefit from marine renewable energy, owing to the great shoreline of the Bay of Bengal which Bangladesh has access to. The southwest side of Cox's Bazar, Kutubdia island, Sandwip island, and Heron point are the best sites for wave energy production. In the Bay of Bengal, the annual average of the wave power density is about (8-15) KWm-1. Oscillating Water Columns (OWCs) can be installed at Saint Martin, Kutubdia, and Sandwip islands where the power density of waves is optimal for cost-effective energy production. From Bangladesh's perspective, a focus on wave energy is highly desirable.

The collection of wave energy devices might greatly reduce the wave height, saving coastlines from tidal currents and severe coastal erosion. The offshore renewable energy farm could serve as an excellent habitat for marine wildlife as well as a fishery protected zone. Wave energy can be a sustainable solution to the electricity shortage if the benefits are considered. A system like this would give a greener alternative while reducing carbon dioxide emissions and satisfying the targets of SDG 7 and COP21. Through collaboration and mutual interest, all public and private sectors could be potential partners in green energy utilisation to boost economic development. Comprehensive studies on wave energy resource modelling and mapping have now become important for Bangladesh's recent push towards the Blue Economy to succeed. Wave energy is gaining ground and is becoming a focal point as an alternative energy source in several countries. The most ideal wave energy devices for Bangladesh are OWCs and Pelamis devices due to geographical conditions and wave energy potential. Wave energy may not appear to be cost-effective on its own at this time, however, when combined with wind and tidal energy, it can make a significant difference and have a great impact on Bangladesh's progress.

Tidal energy as an MRE

Tidal energy is distinctive because it can deliver reliable, clean power while also providing security of supply. When compared to wind and wave, the tide and the resulting electricity are predictable and dependable, making the energy appealing in a future renewable weighted energy market. In nations with abundant tidal energy resources, such as Canada, China, Iran, Russia, Korea, the United Kingdom, Mexico, Brazil, and India, a number of tidal plants have been built. The Sihwa dam in north-eastern South Korea, constructed in 2011 and functional since 2012, is the world's largest and newest tidal barrage.

Built across a suitable harbour or estuary, tidal barrages are designed to capture the potential energy of tides using turbines installed inside the barrage. The potential energy created by the difference in water levels across the barrage is turned into kinetic energy as fast-moving water passes through the turbines. The blades of the turbine then transform this into rotating kinetic energy. To generate power, the rotating turbine drives a generator, which produces electricity. When it comes to tidal power, five different methods of power generation are used. These are:

1. Single Pool Ebb Type Generation: This is a one-way process of generating power. Water flows from the basin to the sea. During the ebb tide or low tide, electricity is generated.

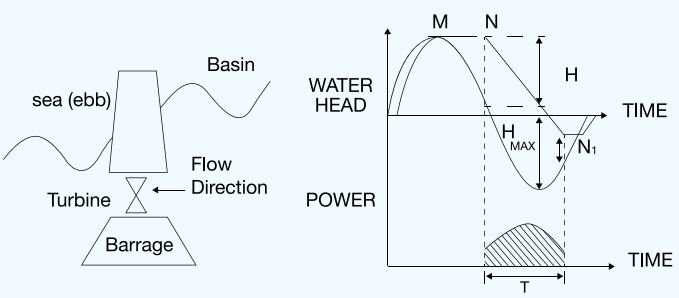


Figure 1: Schematic diagram of a single pool ebb system
Courtesy: Myisha Ahmad

2. Single Pool Flood Type Generation: The method for generating floods in a single pool is comparable to the first. The sole difference is that with this method, power is generated as the basin fills.

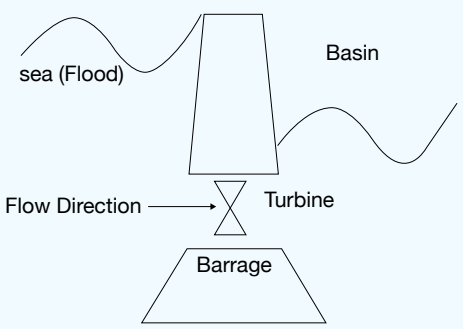


Figure 2: Single pool flood system Courtesy: Myisha Ahmad

3. Single Pool Two-Way (both Flood and Ebb) System: The third option makes use of the bidirectional turbine's features. During the flood tide, when the basin is filling, and during the ebb tide, when the basin is draining, electricity can be generated.

4. Two Pool Ebb and Flood System: The first two approaches are combined in this method. One of the two pools is controlled by a single pool flood system, while the other is controlled by a single pool ebb system.

5. Two Pools One-Way System (high and low pools): The fifth method requires the use of two physically independent pools, namely high and low pools. During the flood tide, the high pool fills up. During the ebb tide, the low pool on the opposite side is drained. The turbine generates electricity while transferring water from the high pool to the low pool.

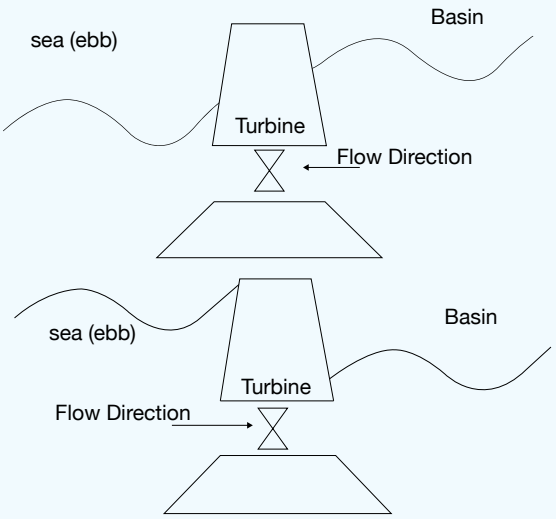


Figure 3: Schematic diagram of a single pool two way (flood and ebb) system
Courtesy: Myisha Ahman

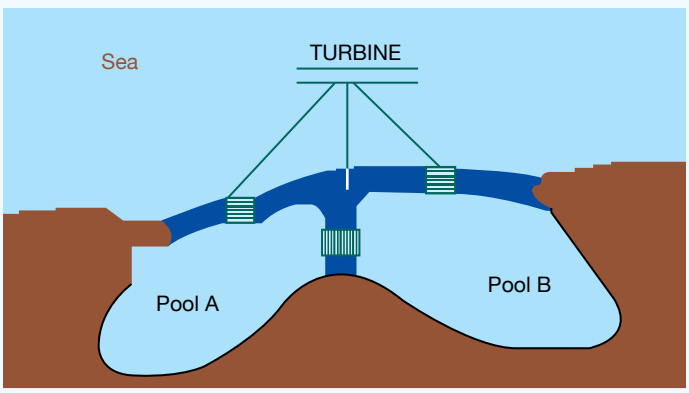


Figure 4: Two pools ebb and flood system Courtesy: Myisha Ahman

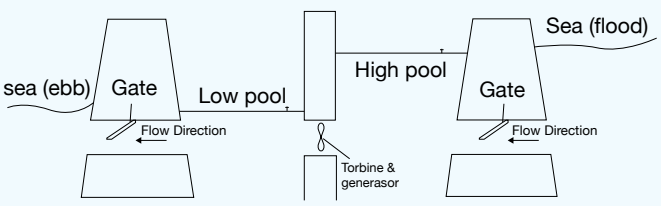


Figure 5: Schematic diagram of a two-pools one-way system
Courtesy: Myisha Ahman

The potential for power generation per square metre of land suggests that tidal power in Bangladesh has a promising future. Because space is not an issue in Bangladesh's Bay of Bengal location, it would be simple to put up numerous stream type machines in succession, producing a significant amount of power. Hiron Points, Sundarikota, Mongla, Char Changa, Cox's Bazar, Golachipa, Patuakhali, Sandwip, Barisal, and other coastal places in Bangladesh have numerous potential locations for constructing large tidal power stations.

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

Table 2: Probable power generation stations and estimated output
Courtesy, Mohammad Asadul Haque

Finally, it can be stated that tidal power can play an important part in Bangladesh's national-grid power connection as a new source of renewable energy.

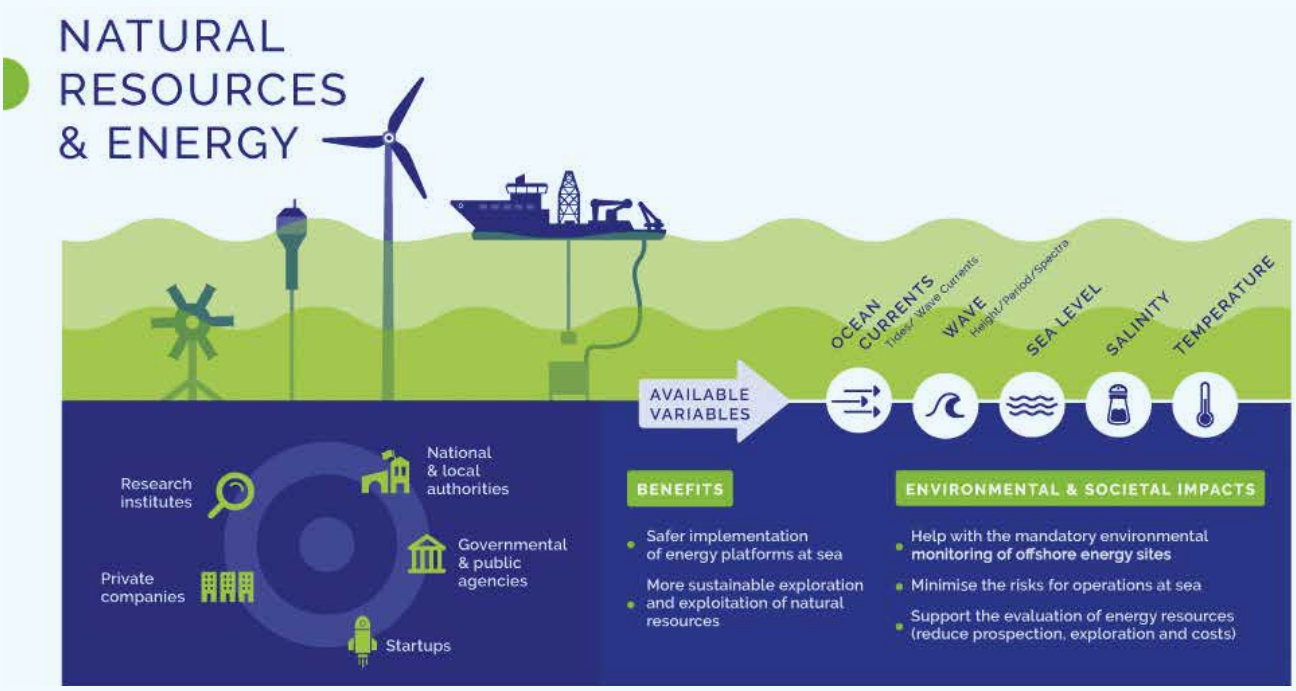
MRE for environmental benefits

Marine Renewable Energy production is a safe and ecologically friendly technique of energy generation. Although the generated power is not as high as other alternatives, the key benefit is that the resources are inexhaustible. The use of clean renewable energy resources must be expanded in an attempt to reach the 2030 Sustainable Development Goals. To limit the loss of primary resources without jeopardising the climate, increased energy consumption efficiency and conversion methods must be implemented.

Targeted study programmes are urgently needed, particularly for the potential drawbacks of Marine Renewable Energy Installations (MREI), as well as the potential of MREI for habitat enhancement and even environmental rehabilitation. It is critical that currently implemented MREI be thoroughly investigated in order to quantify their impacts and benefits, with the findings being fed back into the design and deployment stages of future installations and used to model the anticipated implications of larger-scale projects. It is critical that all stakeholders, including energy companies, engineers, local communities, governmental and non-governmental organisations, fisheries, and academic institutions, are involved at all stages from design, siting, pre-construction monitoring/ impact assessment, construction, operation, and decommissioning, whether the project is designed to be relatively environmentally benign or to enhance biodiversity.

Conclusion

Bangladesh has a growing need for energy which will be difficult to fulfil through just non-renewable energy sources like gas. Plus, the increasing concerns over the effects of using non-renewable energy sources on the climate means there is an urgent need of exploring alternative sources, namely renewable sources. Bangladesh is blessed with access to a large body of water, making marine renewable energy the most viable option for the country. While MRE has several choices, the best are wave and tidal energy. If the government focuses on developing this energy sector and harnessing the energy of the ocean, the country will see economic growth while also taking a big step towards cutting down emissions of greenhouse gases. A report by the High-Level Panel for a Sustainable Ocean Economy stated that switching to ocean-based climate solutions could cut down the global emissions of greenhouse gases by nearly 4 billion tons of carbon dioxide by 2030. Additionally, what makes ocean energy lucrative to Bangladesh is the range of socioeconomic benefits it also provides. It will offer new opportunities for economic activity, employment opportunities, and improve local value. In this way, it will be the main driving force to take the Blue Economy forward. Considering these factors, the ocean is full of potential, and the sooner the country takes steps to take advantage of this potential, the more it will benefit.



Prospects of deep-sea fishing in Bangladesh

Cdre Kutubuddin (retd) and Nayeema Rashid

Introduction

Bangladesh is bordered by India to the west, north and east, Myanmar to the southeast, and the Bay of Bengal is in the south. Neighbouring Nepal and Bhutan are separated by a piece of land called the Chicken's Neck Corridor. Numerous rivers such as Padma, Jamuna, Meghna, Karnaphuli, etc. are flowing in a crooked manner across this area.

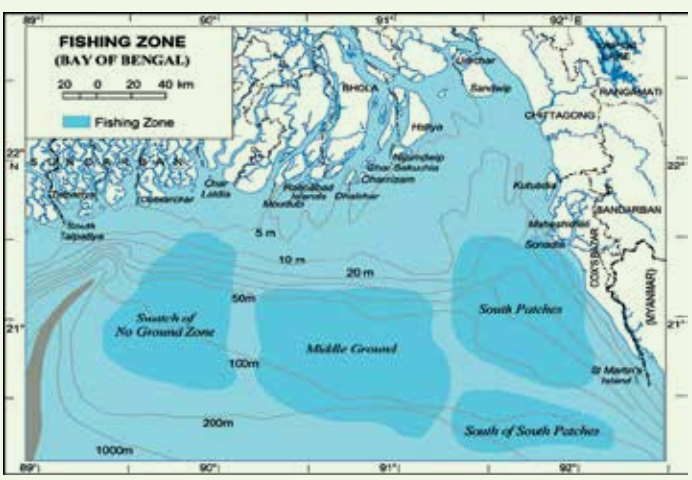
Course of different rivers

Three rivers delta

The Bay of Bengal, the northward extension of the Indian Ocean, covers an area of 1,000 miles (1,600 km), has an average depth of about 2,600 metres and a maximum depth of 4,694 metres. As a coastal country of the Bay of Bengal, the total coastal area of Bangladesh is about 710 km wide.

Maritime boundary settlement and golden opportunities

At present, the total maritime area of Bangladesh is 118,813 sq. km with 200 nautical miles of Exclusive Economic Zone (EEZ) and 354 nautical miles of the continental shelf. After the settlement of maritime boundaries with India and Myanmar, the door is now open for Bangladesh to discover and extract the vast fishery resources untapped in the Bay of Bengal. Bangladesh ranks 3rd in terms of biodiversity after China and India in Asia. About 1.2 million and 0.5 million people have been employed by inland water and marine fisheries, respectively.



Fishing grounds of Bangladesh

At present, a total of 220 industrial trawlers are engaged in fishing in Bangladesh which is around 20 % of marine fish catch and it contributes 115,354 tons (approximately), whereas, mechanised and non-mechanised boats contribute 376, 435 tons (approximately).

Considering the situation, the present opportunities and demand of Bangladesh should be created through the extraction of Pelagic fish.

The role of fisheries resources in the economy of Bangladesh

The Bay of Bengal is the "third neighbour" for Bangladesh. The fisheries sector contributes 3.50% to the national GDP and 25.72% to the total agricultural GDP of the country. The last 12 years' average growth performance of this sector is 5.01%. More than 12% of populations are directly or indirectly engaged in various activities under the marine fisheries sector for their livelihood.

Fishing in coastal zones

After jute and garments, the fisheries industry is in the 3rd position with 12% of the total export earnings.

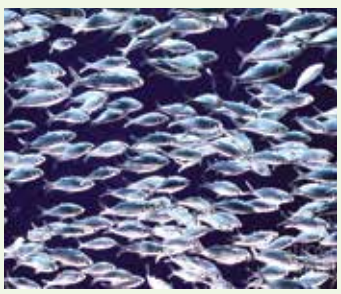
Deep-sea fishing

Data from three surveys (FAO / NARAD / BGD, 1989-80 BGD 1973 and FAO / BGD 1984-86) show that the stock of Demersal Fish is 50,000-160,000 tons at depths of 10-100 metres, recorded from the continental shelf.

Among some economically important fish species, stocks of Poya and katamach have been found to be around 40,000 tons. The stock of Rupban fish was found to be 6,000 tons and Loitta was found to be 1,000 tons. However, the total reserves of moderately saline and freshwater fish were found to be 264,000 tons.

The total fish stocks in the Continental shelf of Bangladesh are estimated at 552,500 tons (318,500 tons of terrestrial fish, 200,000 tons of surface fish, 9,000 tons of shrimp and 25,000 tons of other marine animals). There are 16,831 domestic non-mechanised boats, 20,359 mechanised boats and more than 1,000,000 fishermen engaged in direct marine fishing.

Jewfish



Threadfin breams

Jacks fish

Mackerel fish

Fish species in the Bay of Bengal

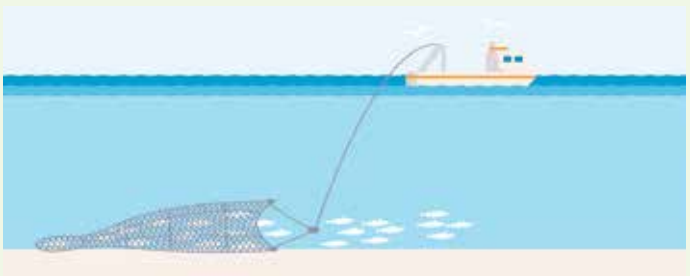
In general, there are two types of economically profitable fishes available in the Bay of Bengal, Pelagic fishes and Demersal fishes.

Pelagic fish

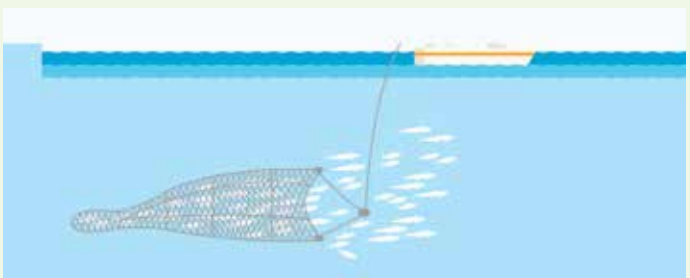
Demersal fish

Major ways to catch fish

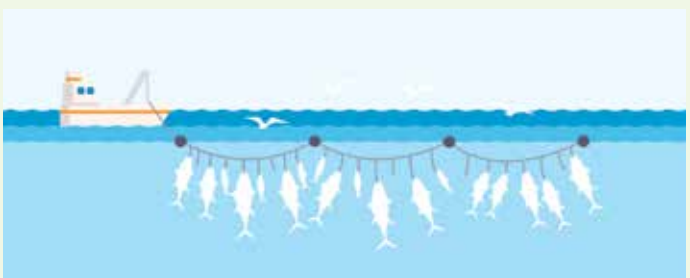
In general, there are five ways we can catch pelagic and demersal types of fish. Those are Bottom Trawling, Mid Water Trawling, Longlining, Trawler-purse Seiners and Gill Netting.



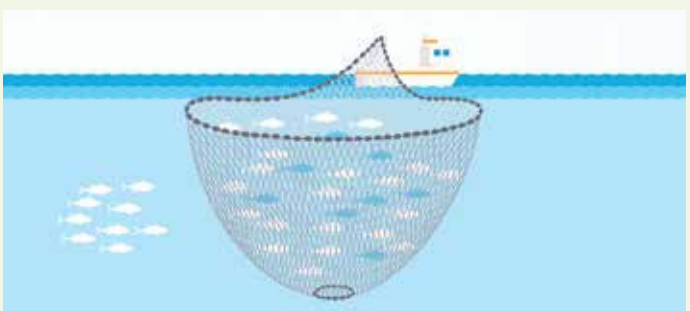
Bottom trawling



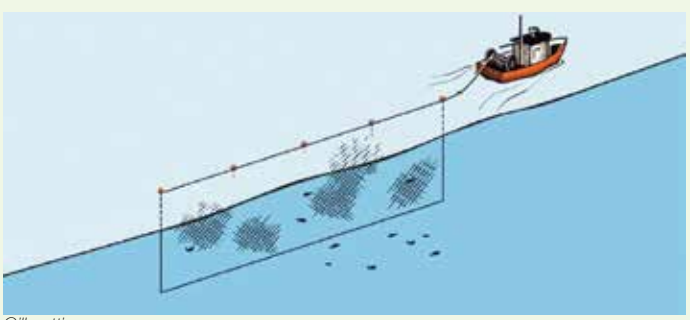
Mid Water Trawling



Longlining



Trawler-purse seiners



Gill netting

Modern methods of fishing

Since the various parameters of the marine environment are constantly changing with the passage of time or area, the data obtained from the satellite remote sensing will help to monitor the actual condition of the vast ocean area and determine the probable location of tuna or pelagic fishes.

IOTC (Indian Ocean Tuna Commission) is a corporate organisation that provides information on the possible location of fast-moving tuna fish by collecting data from various satellites and combines the data at a given time that can be used to catch fish by Bangladesh in the Bay of Bengal.

Types of trawlers in Bangladesh

Mid-water trawlers, shrimp trawlers and Mechanical /Non-mechanical boats are mainly used in Bangladesh.

Mid-water trawlers

Shrimp trawlers

Mechanical /Non-mechanical trawlers

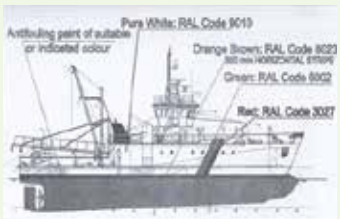
Shrimp trawlers conduct bottom trawling. However, mid-water trawlers, which are designed to fish within the middle depth of the ocean, often do bottom trawling although it harms the sea bed environment. On the other hand, most of the mechanical/ non-mechanical deep-sea fishing boats catch fish without the help of modern technology. The current government has been encouraging to reduce bottom trawling by promoting longliners, trawler-purse seiners, etc., which are already accepted as modern methods for deep-sea fishing.

Obstacles to the marine fisheries industry in Bangladesh

Since there are about 435 species of fish in the Bay of Bengal, Bangladesh is deeply interested in developing the marine fisheries industry to support the government initiated Blue Economy. However, there are a few roadblocks in Bangladesh's marine fishing industry, such as a lack of critical infrastructure, installations, qualified workforce, research, and trained manpower to exploit maritime resources. It is impossible to conduct necessary survey works for harvesting fishery and other maritime resources unless the aforementioned issues are resolved.

Steps of the fisheries survey of the Government of Bangladesh.

In 2016, the Government of Bangladesh procured a multipurpose fish survey vessel named RV Meen Sandhani. The ship is equipped with the necessary equipment for modern research and survey operations within the EEZ of Bangladesh. It also provides a thorough and detailed set of species identification, size distribution (length-frequency) and biomass (length-weight) data.



19 RV Meen Sandhani

Marine fisheries research ships

For a coherent, comprehensive and accurate record of fisheries catches, Bangladesh needs a modern fisheries research ship with the latest technology and experienced trained manpower who have vast knowledge on marine science, fisheries and marine environment. The

Various types of fisheries research activities

marine fisheries research vessel should have the all-weather capability with about 2,000 tons, an operating radius of 6,000 nautical miles, a maximum speed is 15 knots and a crew of 50 people.

The Ministry of Fisheries and Livestock will be able to obtain data from the research ship in order to make choices on marine fisheries resource management. These data can be used to meet the future needs of biodiversity and achieve the Blue Economy objectives through conserving, protecting, and developing Bangladesh's maritime resources.

Pelagic industry trawlers

Bottom fishes are primarily caught in Bangladesh and 100 species of those fished are economically important. The 3 most important families are Ariidae (Catfishes) 11.99%, Sciaenidae (Jewfishes) 1.38% and Nemipteridae (Threadfin breams) 9.00%.

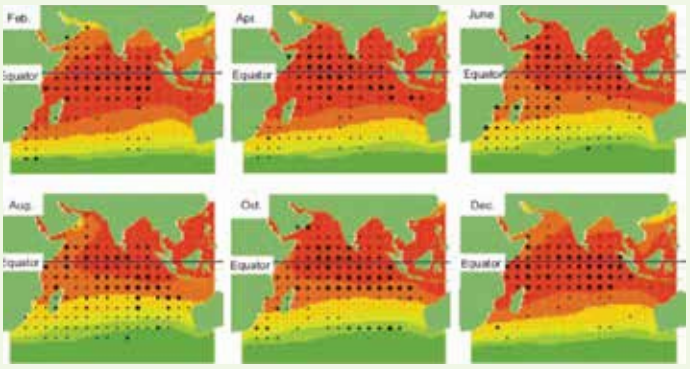
Pelagic fishing trawler

It is necessary to promote deep-sea industrial trawlers for fishing in the EEZ fitted with world-class equipment and facilities, modern fish processing and conservation facilities and energy-saving capacity.

Purse seiner longliner vessel

According to the FAO, tuna can be found in half of the world's marine fisheries, in the Pacific, India and the Atlantic Ocean. However, the world's 65% tuna can be found in the Pacific Ocean, 22% in the Indian Ocean and 13% in the Atlantic Ocean. There are 4 species of tuna available in the Indian Ocean and each of them has a specific roaming area.

Yellowfin, bigeye and albacore fish species



Location of tuna fish in the Indian Ocean

To catch tuna in the EEZ of the Bay of Bengal, Bangladesh should have a few large purse seiners with a fishing capacity of about 25,000-30,000 tons. Purse seiners catch skipjack, yellowfin, and occasionally bigeye tuna when they are young and roam the ocean's surface.

However, large, long-line vessels catch older bigeye and yellowfin tuna. The longliner vessels can provide a huge dividend for the national fishing fleet of Bangladesh.

Conclusion

It is evident that deep-sea fishery resources will provide Bangladesh with new opportunities for economic development. Currently, the number of different fish species in the fishing areas is gradually diminishing and unregulated fishing of small/immature fish is one of the reasons. Besides, the existing fishing techniques are also very old and need to be modernised through human resource development and management. Deep-sea fishes are not available, eaten, or preferred in most places of Bangladesh. Furthermore, there is insufficient information about Bangladesh's deep-sea or pelagic fish stock. Deep-sea fishing initiatives have been discouraged in the past due to the higher financial investment, experienced workforce, and sophisticated technique required to harvest this sort of fish. To promote such fishing, it is important to conduct proper survey work in Bangladesh's maritime area. In addition, the government must develop new finance schemes to encourage more entrepreneurs to take on deep-sea fishing tasks.

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Khulna Shipyard

The past, present and future

Maritime Campus desk

The country's second-oldest shipbuilding and repair enterprise, Khulna Shipyard Limited, is located on the bank of Rupsha river in Khulna. The Pakistan Industrial Development Corporation (PIDC) hired Messrs. MS/Stulken Shon, a well-known West German business, to build a sophisticated shipyard in Khulna after the country won independence from British colonial power in 1947. On 23 November 1956, the shipyard commenced construction. This industrial building was constructed to build and repair ships with a maximum lightweight of 600 tons and a cargo capacity of 2500 tons.

From the start of construction until 1959, the shipyard was administered by the building company, and subsequently by German and British management until 1975. In 1965, the East Pakistan Industrial Development Corporation (EPIDC) took over control of the business. Following independence, the company's administration was transferred to the Bangladesh Industrial Development Corporation (BIDC), and then to the Steel and Engineering Corporation (BSEC). The company was profitable at first, but by the mid-1980s, it was in the red. The company's deficit record continued to worsen, and by the 1990s, it was on the verge of going out of business due to losses. In this situation, on 3 October 1999, the then Honourable Prime Minister Sheikh Hasina chose to hand over the company to Bangladesh Navy.

Following the transfer of responsibilities to Bangladesh Navy, a Board of Directors (BOD) was established, with the Chief of Naval Staff serving as Chairman. Assistant Chief of Naval Staff (Operations), Assistant Chief of Naval Staff (Material), also the Vice-Chairman, Assistant Chief of Naval Staff (Logistics), Additional Secretary (General) from the Ministry of Defence, Additional Secretary (Admin) from the Ministry of Shipping, Additional Secretary (Admin) from the Ministry of Industries, a Professor from Bangladesh University of Engineering and Technology, Commodore commanding Khulna, Managing Director of Khulna Ship Yard (KSY), President of ICMAB, General Manager (Finance) of KSY, also the Member Secretary, General Manager (D&P), KSY, the Director Shipbuilding, and also the Chief Coordinator are all members of the board. The General Managers and Deputy General Managers make up the organisational pyramid below the Managing Director.

Due to the tireless efforts of officers, employees and workers at all levels, the shipyard has now become a profitable organisation after overcoming the outstanding debt of the past. For the past five financial years, Khulna Shipyard has been acknowledged as the biggest income tax-paying enterprise in the Khulna region. Furthermore, in the last 15 years, the yard's yearly revenue has grown nearly 17.44 times, from BDT 16 crore to BDT 279 crore.

Khulna Shipyards aspires to become a globally recognised shipbuilding company. It has a huge number of skilled workers who are professionally qualified, experienced, and educated in the construction of finely crafted ships, vessels, and other engineering structures. It aspires to achieve the National Goal-2021, where the country aims to become a middle-income country, and the Vision-2041, which aims to meet the current and future difficulties in maritime asset management. As a Bureau Veritas certified organisation of ISO 9001:2008 standard, Khulna Shipyards has prepared and implemented a specified quality control system to meet the criteria of international classification bodies as well as all customer specifications outlined in contracts and work orders. Because the system was designed to be customisable, it can also be used to complete productive work for a variety of customers, which include commercial and government organisations. To ensure that the customers get a high-quality product, the system and its operations are reviewed, adjusted as needed, and implemented on a regular basis. Customers expect proven technological reliability, quality standards, timely delivery, competitive rates, satisfaction and development from the organisation. Khulna Shipyard Limited's multi-skilled workforce and professional management are committed to providing the highest possible quality vessels and services to its customers.

Khulna Shipyards has made significant investments in advanced shipbuilding, as well as the construction of harbour or coastal and seagoing tugs, barges, ferries, landing crafts, etc. It can also repair various types of ships, including warships, patrol craft, merchant ships, and so on. Engineering work includes overhauling and repairing boilers, turbines, diesel engines, pumps, compressors, generators, and transformers; manufacturing engineering parts for sugar mills, paper mills, cable factories, cement factories, jute mills, and power plants; fabrication of steel structures, foot over bridges; design and production of chimneys and steel dustbins; and dredging and earth filling. The Design and Planning Department of Khulna Shipyards plays a crucial role in achieving the above objectives through efficient planning and management. The department is responsible for developing new project designs and documents, as well as modifying existing ones. Quality control methods are also ensured by the design and planning department. The department's main responsibilities include preparing estimates, preparing offers, participating in tenders, coordinating/maintaining liaison with customers, preparing ships and mechanical drawings, certificates for jobs performed, preparing contract agreements, technical specifications for newly constructed vessels, preparing comparative statements, corresponding with local agents and foreign principals to obtain machinery/equipment for vessels, and preparing monthly requisitions.

Khulna Shipyards' yard facilities include a couple of slipways and carriages for docking and undocking vessels up to 700 tons lightweight and overall length of 90 m, 8 berths (tracks) of 100 m length for building or repairing vessels, 4 berth cranes (one with 8 tons capacity, two with 5 tons capacity, and one with 40 tons capacity), 1 jetty crane with 30 tons capacity, one fabrication shed with two tracks of 100 m length. Workshops have overhead cranes with capacities ranging from 5 to 30 tons, as well as a large load shipyard transporter with a capacity of 70 tons. The main assembly and manufacturing work for building ships is done in Khulna Shipyards' workshops. The essential features of the Khulna Shipyards workshop include the platter shop, carpentry shop, civil section, machine shop, electrical shop, foundry shop, docking section, and main store. To repair and manufacture the ships, the Platter Shop

A vessel is being built at Khulna Shipyard

contains a variety of bending and shearing machines. The carpentry shop has a variety of machinery for woodworking, making furniture, and ship fitting, as well as pattern making, sandblasting and painting, lagging and insulation, and garments and Rexine item fabrication. The Civil Section is in charge of civil works on ships, building repair and maintenance, yard roads and berths, cement and R.C.C work, and other tile fitting and manufacture of garments and Rexine products. The machine shop is in charge of alignment, installation, and repair of propulsion systems, main engine installation and overhauling, turbine overhauling, etc. The electrical shop is responsible for the installation, repair, and maintenance of electronic devices, as well as the servicing and production of switchboards, starters, IPS, and all types of wiring and cabling. The foundry shop casts a variety of ferrous and non-ferrous materials, as well as non-ferrous castings of bronze, gunmetal, aluminium, and other metals using a crucible furnace.

A rubber factory has been established under the Khulna Shipyards to produce high-quality rubber products for ships, submarines, tugs, boats, pontoons, jetties, and other vessels for Bangladesh Navy, Bangladesh Coast Guard, BGB, port authorities, and other maritime organisations. CNC machines for mould fabrication, kneading and rolling mills for rubber compounding, calendar machines for rubber

A computer generated bird-eye view of Khulna Shipyard

sheeted in fabric, sandblasting machines for metal inserts inside the rubber, hydraulic press machines for vulcanising, and various test equipment for stringent quality control are all available. It is, without a doubt, a one-stop destination for the creation of specialised rubber products. KSY Rubber Factory has a total area of 50,000 sq. ft, with a 17,000 sq. ft main production facility equipped with various equipment, a mould warehouse, a raw material store and a finished product store. There is a 3,200-square-foot test laboratory and office space. Furthermore, there is room for continued expansion (26,600 sq. ft). Approximately 300 moulds of submarine rubber items made in China are stored in the factory. Mould fabrication devices from KSY can create any shape of a rubber mould. Many innovative rubber items of global standards can be made using these moulds.

Bangladesh Navy, Bangladesh Army, Bangladesh Coast Guard, BGB, Fire Service and Civil Defence, BIWTA, BIWTC, Mongla Port Authority, Chittagong Port Authority, and others have built and repaired ships at Khulna Shipyard. Furthermore, many private owners are increasingly interested in having their ships built and repaired at the Khulna Shipyard. It's worth noting that this yard has already constructed two patrol crafts in Bangladesh for the first time. Bangladesh Navy has contracted the yard to build two Large Patrol Crafts (LPC) and two submarine handling tugs. Aside from this, the yard also gave Bangladesh Navy two Landing Craft Utility (LCU) vessels. In addition, three fire service pontoons have been constructed, and construction work on two fire-floats is moving forward.

Det Norske Veritas-Germanischer Lloyd (DNV-GL), Nippon Kaiji Kyokai (NKK), China Classification Society (CCS), Lloyd's Register (LR), Bureau Veritas (BV) and Registro Italiano Navale (RINA) have all approved and certified Khulna Shipyard's shipbuilding work. It received the 2nd Best Corporate Award in 2012 from the Institute of Cost and Management Accounting of Bangladesh (ICMAB). It also won the National Productivity and Quality Excellence Award 2013 from Bangladesh's Ministry of Industries' National Productivity Organisation (NPO), as well as the Best Shipbuilding Company of the Year 2013 from Business Asia, Bangladesh. It received Singapore's Business Excellence Award in 2014 and Bangladesh's ICMAB Best Performance Award in 2014.

All of the structures inside the Khulna Shipyards are easily visible after you enter the main gate. The administrative building, design and planning department, platter shop, fabrication shed, berth cranes, slipway carriage, machine shop, electrical shop, carpentry shop, maintenance section, powerhouse, main store, officer's residency, and gymnasium, madrasah, school, and college, central mosque, technical training centre, worker's canteen, worker's residency, sickbay, etc. are all located within the premises.

Khulna Shipyards is dedicated to its Corporate Social Responsibilities (CSR) in addition to its business. Sickbay, Employee's Club, Technical Training Centre (TTC), KSY School and College, Mosque, and Madrasah are all facilities developed as part of the company's CSR. For the children of its employees, Khulna Shipyards operates a primary school, a high school, and a college.

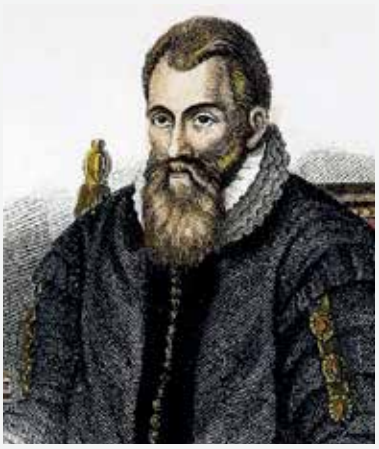
Khulna Shipyards plans to construct a slipway/dry dock on empty land on the shipyard's southern borders to manufacture and repair ships that weigh up to 2500 tons. It also intends to build new vessels at the shipyard for domestic and international customers, either independently or in collaboration with a foreign shipbuilder. It aims to give prospective international investors the opportunity to lease and develop new land for the future shipbuilding industry.

Numerous shipyards from Korea, the Netherlands, Croatia, China, and Turkey have already expressed a desire in forming a partnership based on the yard's current status and standard of work. Various initiatives are being undertaken to improve the shipyard's efficiency. Over the years, KSY has emerged as a leading enterprise in the field of shipbuilding, repair and manufacturing of engineering items for various industries of Bangladesh. One of the factors behind Khulna Shipyard's success is everyone's optimistic outlook, as well as the management's honesty, dedication, integrity, and commitment.

Khulna Shipyard has established itself as a leading company in the fields of shipbuilding, ship repair, and engineering item production for Bangladesh's diverse sectors.

History of *e*

Dr Mohammad Tanzil Hasan



John Napier (Scottish scholar)

The number *e* first comes into mathematics in a very minor way. In 1618, Napier computed the value of logarithms with help of class of geometry. He published a book with series of logarithms. There we get a table of natural logarithm number. But he did not know that *e* was the base of logarithms. A few years later in 1624 again *e* almost made it into the mathematical literature but not quite. In that year Briggs gave a numerical approximation to the base 10 logarithms of *e* but did not mention e itself in his work.

In 1647 Saint-Vincent computed the area under a rectangular hyperbola. He, however, did not understand the relation between hyperbola and logarithms. But Huygens understood the relation between hyperbola and logarithms. Huygens calculated the value of *e* in about 17 decimal places. When he worked in mathematics, he used *e* as a constant.

In 1668 Nicolaus Mercator published a book named "Logarithmotechnia" which contains the series of expansion of log(1+x). Here Mercator uses the base of *e* to solve mathematical problem. In this work Mercator uses the term "natural logarithm" for the first time for logarithms to base *e*.

In 1683, Jacob Bernoulli tried to find out the limit of $(1+1/n)^n$ when $n \to \infty$. He had proved the limit value $(1+1/n)^n$ lie between 2 and 3 by using binomial theorem. We can take it the approximation value of eat first.

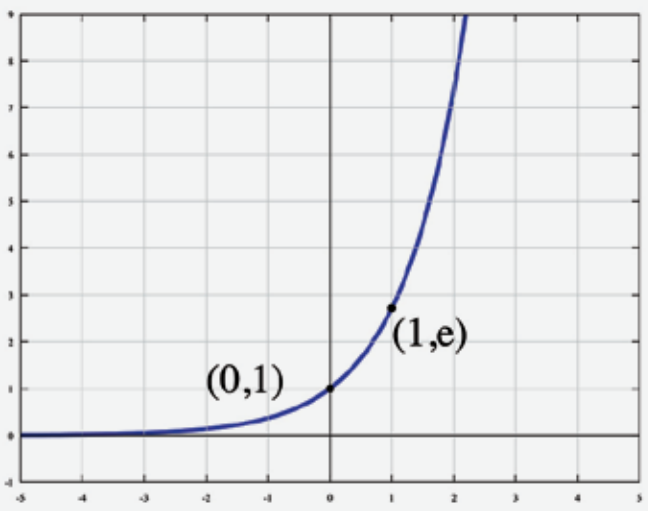
We deduce that $t=\log_a x$ from the equation $x=a^t$ where a is the base of log x. Here we think log as a function, while early workers in logarithms thought purely of the log as a number which aided calculation. It may have been Jacob Bernoulli who first understood the way that the log function is the inverse of exponential function. On the other hand, the first person to make the connection between logarithms and exponents may well have been James Gregory. In 1690, *e* was introduced as number. In this year Leibnitz wrote to Huggens with a symbol 'b' which is known today as *e*.

Euler showed that *e*=1+1/1!+1/2!+1/3!+... and he indicated '*e*' the base of natural logarithms. He gave an approximation of e to 18 decimal places, *e*=2.718281828459045235 without saying from where this came. Euler also gave the continued fraction expansion of *e* and noted a pattern in the expansion. In particular, he gave the following equation.

$$\frac{e-1}{2} = \cfrac{1}{1+\cfrac{1}{6+\cfrac{1}{10+\cfrac{1}{14+\cfrac{1}{18+\cdots}}}}} \quad \text{and} \quad e-1 = 1+\cfrac{1}{1+\cfrac{1}{2+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{4+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{6+\cdots}}}}}}}}$$

The continued fraction expansion of e and a pattern in the expansion

Euler did not give a proof that the patterns he spotted continue but he knew that if such a proof were given it would prove that *e* is irrational. For, if the continued fraction for (*e*-1)/2 were to follow the pattern shown in the first few terms, 6, 10, 14, 18, 22, 26… then it will never terminate; so (*e*-1)/2 cannot be rational. This was the first attempt to prove that *e* is not rational.



The natural exponential function $y=e^x$

In 1854, the first person to give *e* to large decimal places was Shanks. Glaisher showed that the value of *e* was corrected after 137 decimal place which was found out by Shanks. Then Shanks corrected his fault and published the value of *e* in about 205 decimal places. In 1884 Boorman calculated the value *e* about 346 decimal places. The value of *e* of Boorman is equal to the value of *e* of Shanks about 187 decimal places. In 1887 Adams calculated the base 10 log of *e* to 272 places.

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INFOBYTES

7 technology trends that are shaping the **shipping industry**

For many years, the shipping industry has played a major role in the growth of business and trade. It is the most efficient trading method and has a big impact on the global economy. Technology has offered a number of techniques that can assure an improvement in the shipping industry's entire functioning. Megaships, robots replacing people, new and enhanced materials, and alternative fuels are all going to revolutionise the shipping industry dramatically. Let us study some of the major shipping trends here, which are shaping the future of the shipping industry.

Robotic Automation

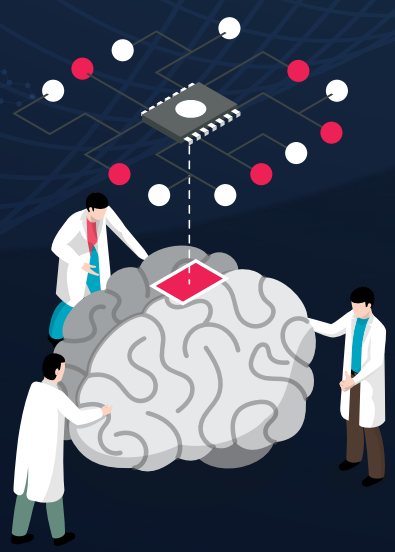
In recent years, the usage of robots in almost every industry has become increasingly common. Robots are gradually being deployed to assist all jobs in the shipping sector since they can easily carry out tasks such as packing, delivering, inspecting, and combating fires. Given the growing trend of robotic automation, it is likely that people onboard ships will be significantly reduced in the next years.

Maritime Autonomous Surface Ships (MASS)

Autonomous systems in shipping are gaining immense popularity on account of their capability to deliver goods without direct human interference. Different methods and levels of autonomy can be achieved through monitoring and remote control from a nearby manned ship, an onshore control centre or through artificial intelligence and machine learning, letting the vessel itself decide the course of action.

The Growth of Sensor Technology

There is no need to physically examine the equipment on ships now that sensors have been introduced. Furthermore, when the sensors are integrated with machine learning and artificial intelligence, they can reach remote locations and analyse data, sending out alerts immediately if any of the ship's sections require maintenance. If properly calibrated, sensor technology can provide the most efficient operation for ships.



IoT (Internet of Things)

IoT primarily consists of a GPS and a cloud-based database that stores all the data collected by devices on the ship. IoT also connects the sensors, robots and other devices through a wireless network. The advantage of using IoT is that, since it keeps track of all devices and shipments, the shipping industry will be able to provide better customer service.

Advanced Environment-Friendly Material

The shipping industry adds substantially to pollution and environmental degradation. Waste effluents, ship fuel, oil spills, and other shipping-related challenges have necessitated a more environmentally conscious approach in the maritime industry. Megaships are being developed using more sustainable materials, such as fibre-reinforced plastic, to carry a big amount of cargo at once, minimising traffic congestion. Besides, the ships' carbon footprint will be decreased as a result of the reduced traffic.

Efficient Propulsion Techniques

Ships utilise a lot of fuel, which has a negative impact on the environment. New technology paired with innovative thinking has resulted in the replacement of common fuels with low-carbon and alternative fuels, lowering greenhouse gas emissions such as carbon and sulphur. Increased propulsion can be achieved by making changes to the sails, hulls, and other sections of the ship, all of which have a beneficial environmental impact.

Port Management

The use of technology to improve port operating procedures can shorten the time a ship waits at the port. The reduced wait time will result in fewer carbon emissions from ships berthed. It is critical to use automation and other gears to lift big cargo in order to speed up the ship's loading and unloading.

Will St. Martin's Island go vanish? NO.

Dr Aftab Alm Khan

There is a belief, by and large, that St. Martin's Island of Bangladesh situated in the Bay of Bengal will be lost under the sea due to the loss or extinction of corals in the island. This notion has cropped up in the minds of the people barely from some vested propaganda who are after so-called climate fund to grab money in the name of protection of this island from vanishing which is a big lie or ignorance of the reality. It is an irony that we do not know the difference between an island and a coral. Partial knowledge is greatly responsible to mislead the general people. It is my humble suggestion not to run after a crow without being definite of the status of own ear. However, the article is an effort to explain the reality of the said notion. An island is physically and more precisely geologically formed due to the uplift and deformation of geophysical features at the sea/ocean bed. On the other hand, coral is biologically formed under suitable temperature, salinity, sunlight and turbidity conditions of the sea/ocean water. An island is structurally formed due to tectonic force, and/or due to volcanic eruption at the sea bed forming a linear long ridge that eventually may be part of a subsided volcanic cone with a circular hard rock surrounding the volcanic cone where volcanic activities are common, known as an atoll. On the other hand, tectonically uplifted sea/ocean bottom may lead to the development of a structural fold known as the anticline. The central long axial region of the anticline may form a ridge. St. Martin's Island is an example of a tectonically formed north-south elongated anticlinal structure undergoing uplift of the eastern part and subsidence of the western part of the island. The circular rock masses along with the volcanic cone may undergo subsidence in the sea/ocean forming a conducive environment for the coral to grow over the rock masses. As volcanic cone subsides, coral start forming around the rock mass as fringing reef continues to form a barrier reef, and finally can form an atoll with coral over it. The Great Barrier Reef is the world's largest coral reef system composed of over 2,900 individual reefs and 900 islands stretching for over 2,300 km over an area of approximately 344,400 sq. km which is located in the Coral Sea, off the coast of Queensland, Australia. This reef is composed of and built by billions of tiny organisms, known as coral polyps. The rock mass may have a variable mineralogical and chemical composition that may serve as food and nutrients for the corals. A reef is a ridge-like feature at or near the surface of the ocean. Reefs are made of rocks over which the corals may grow. A coral reef is an underwater ecosystem characterised by reef-building corals. Reefs are formed of colonies of coral polyps held together by calcium carbonate. Most coral reefs are built from stony corals, whose polyps cluster in groups. Great Barrier Reef is a ridge of rock masses formed both by tectonic uplifts and volcanic eruptions before the coral grows onto it. Similarly, St. Martin's Island has formed by tectonic uplift. No evidence is found in favour of volcanic activities.

The photograph above is a demonstration of a dead coral site and hard calcareous rock (known as concretion) in the southern part of St. Martin's Island.

As the island was uplifting coral started to grow at the flanks of the anticline as fringing corals as long as the optimum conditions pertaining to salinity, temperature, sunlight and clear water were maintained. Coral could grow and survive as long as these optimum conditions were maintained. But since these conditions started to deteriorate, coral started to die. Increased turbidity due to the enhanced sediment supply in the northern part of the island causing drastic degradation of all the optimum physical and chemical conditions of the island, the death of coral is very fast. Death of coral in the island has also many other reasons, mostly anthropogenic, namely excessive tourist influx, increased fishing activities, anchoring of large number of fishing boats in the shore, removal of hard rocks from the shore, tie up the fishing boats with the hard rocks. Removal of stones from the shore is now causing land erosion to allow the sea to enter inside the island at the northern side inducing a dangerous rip current zone. Hence, all the degrading and damaging activities on St. Martin's Island are causing massive deaths of the corals. But the island itself is expanding to

The photograph above is the display of the southern tip of the exposed land of Bangladesh in St. Martin's Island.

the south and the St. Martin's Island will exist as long as the Bay of Bengal will exist, may not be as an island of rich biodiversity. The island is expanding to the south, where coral is forming, which is a good sign. Coral at the north of the island may be restored if all the anthropogenic activities are stopped for a certain period of time. Another detrimental aspect of the island is the increasing population of dogs caused the complete abandonment of sea turtles in the island along with the destruction of coral.

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Banglar Agradoot (Oil Tanker)

Registration of merchant vessels

British colonial period to present-day Bangladesh

Md. Mostafa Aziz Shaheen

Registration of vessels is an antiquated maritime practice that dates back to Roman times. The practice of flagging out started during the period between the two world wars of the 20th century and grew significantly in the post-colonial era. In recent times, it has proliferated to the extent that over 50% of the world fleet today is registered with a flag.

Bangladesh is well known maritime nation having large sea coast along the Bay of Bengal adjoining the Indian Ocean. In 1929, the British government divided the Indian Coast into districts based on major ports and placed Principal Officer (PO) in charge of each district. Accordingly, Five Mercantile Marine Departments (MMD) were established in Kolkata, Yangon, Chennai, Karachi and Mumbai in 1930. On 17 June 1930, the first vessel was registered by the MMD was 'KALAVATI' with Official No.144930. At that time, MMD, Chattogram was set up under MMD, Kolkata.

After independence in 1947, the Pakistan Merchant Navy was formed and Pakistan inherited a fleet of four privately owned cargo ships. Established by the Pakistani government, the Ministry of Maritime Affairs, Mercantile Marine Department and Government Shipping Office were authorised to flag the ships and to ensure that the vessels were seaworthy. In 1963, the National Shipping Ordinance was promulgated and National Shipping Corporation (NSC) was established which procured its first ship, M.V. Rupsa in 1965. The national fleet comprised 53 vessels which were owned by 10 private shipping companies. The national fleet rose to 71 vessels before the separation of East Pakistan.

Banglar Doot (General Cargo Vessel)

Banglar Shourabh (Tanker)

After the War of Liberation and the emergence of Bangladesh in 1971, the state of the shipping sector was very deplorable because the National Shipping Corporation of Pakistan took all the merchant fleets to Pakistan, erstwhile West Pakistan. Bangladesh inherited no merchant vessel registered under her flag. The Father of the Nation Bangabandhu Sheikh Mujibur Rahman realised the importance of the shipping sector. On 5 February 1972, he established Bangladesh Shipping Corporation (BSC) under the President's Order No-10 of 1972. On 10 June of the same year, BSC acquired the first national ship 'Banglar Doot' which was the first registered ship after the independence of Bangladesh. From 1972 to 1975, BSC purchased 19 seagoing vessels at a low cost from a number of friendly countries. In the late 70s, some devoted private vessel owners hoisted the ocean-going shipping sector of

Banga Bodor (Container Vessel)

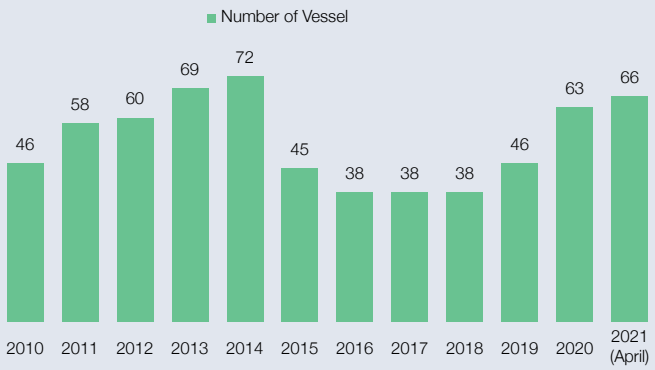
Bangladesh, notable vessel owners are Bengal Liner (Bengal Pride, Bengal Tower etc.), Aquatic Shipping (MV Sezan, MV Tehsin etc.), Atlas Shipping Line (Al Salma, Al Sawmruz, Al Sana, MV Safar etc.) and Bengal Shipping Line (Al Tafsir, Al Rahman, Al Tabith, Al Reza, Al Sabrina etc.). During the mid-to-late 1980s and early 1990s, a number of dedicated mariners entered the sector as vessel owners. Perhaps, that was the first time in the maritime history of Bangladesh that a generation of seamen became vessel owners. From the late 90s to 2008, some of the business giants (QC Shipping and HRC Shipping) became private vessel owners. They introduced containerised shipping in Bangladesh.

Shipping is an unpredictable and complex global platform in nature. Since the War of Liberation, the number of vessels under the Bangladeshi flag has been increasing. Several business groups have hoisted the Bangladeshi flag in the last decade. Bulk carriers with Bangladeshi flags are generally owned by a variety of corporate groups (Kabir Group, Basundhara Group, Meghna Group, Crown Cement Group, Akij Group, etc.) based on their industrial cargo (cement clinker, steel billet, sugar etc). The Bangladeshi flag fleet had been growing since the 2008 freight market collapse, reaching 72

Jahan Moni (Bulk Carrier)

boats at one point in 2014, though the number began to decline after that. Currently, the Bangladesh flag register contains just 66 foreign-going ships (April 2021), with 50 bulk carriers, 10 tankers, and 5 container ships flying the Bangladesh flag around the world.

Sahare (Container Vessel)



Source: Based on data from Mercantile Marine Office, Chattogram

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Observance of the National Mourning Day 2021

On 15 August 2021, a delegation of Bangabandhu Sheikh Mujibur Rahman Maritime University led by the Vice-Chancellor Rear Admiral M Khaled Iqbal (retd) paid homage to the Father of the Nation by placing floral wreaths at the portrait of Bangabandhu Sheikh Mujibur Rahman in front of Bangabandhu Memorial Museum in Dhanmondi, Dhaka to observe 46th anniversary of Bangabandhu's Martyrdom and National Mourning Day-2021. After placing the wreath, the team stood there in solemn silence for some time to show its deepest respect for the great leader. A discussion session on the life of the Father of the Nation was also organised at the university auditorium maintaining proper social distance. The Vice-Chancellor of the university Rear Admiral M Khaled Iqbal (retd) graced the occasion as the Chief Guest and delivered a speech. Professor Dr Imtiaz Ahmed of the Department of International Relations, University of Dhaka attended as the special guest and guest speaker. Faculty members, officers and staff of the university were also present. The event was live-streamed on BSMRMU's official Facebook page, and students were able to watch it online. A special prayer was offered for the eternal peace of Bangabandhu and other members of his family who were martyred on 15 August 1975.

Webinar held on "Geomorphological Features of the Bangladesh Delta: Challenges for Efficient Water Management"

On 28 September 2021, a webinar on "Geomorphological Features of the Bangladesh Delta: Challenges for Efficient Water Management"- was organised by Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU) in partnership with NUFFIC, Netherlands. The welcome address of the webinar was presented by the Vice-Chancellor of the university Rear Admiral M Khaled Iqbal (retd). To make this webinar rich in content, Professor Dr Dano Roelvink and Dr MICK Van Der Wegen from IHE Delft, Netherlands and Dr G M Tarekul Islam from Bangladesh University of Engineering and Technology (BUET) and Dr M. G. Mostofa Amin from Bangladesh Agricultural University presented their valuable papers. BSMRMU faculty and students along with delegates from other universities and organisations attended the webinar online.

Saplings plantation to mark Mujib Borsho and Golden Jubilee of Independence

On 05 September 2021, Vice-Chancellor of Bangabandhu Sheikh Mujibur Rahman Maritime University Rear Admiral M Khaled Iqbal (retd) planted saplings at the campus premises to mark Mujib Borsho and the Golden Jubilee of Independence. The Vice-Chancellor was accompanied by key university officials such as the Treasurer, Registrar, and Deans.

Later, a special prayer was offered for the eternal peace of Bangabandhu and the heroic freedom fighters.

The Vice-Chancellor of BSMRAAU made a courtesy call to the Vice-Chancellor of BSMRMU

On 17 August 2021, Bangabandhu Sheikh Mujibur Rahman Aviation and Aerospace University (BSMRAAU) Vice-Chancellor Air Vice Marshal Muhammad Nazrul Islam made a courtesy call to the Vice-Chancellor of BSMRMU. Following that, the Vice-Chancellor of BSMRAAU proceeded to the Bangabandhu Corner of the library, as well as the university's Marine Biotechnology and Marine Fisheries Lab. Both the Vice-Chancellors agreed on future academic and research collaborations between the two universities.

Semester final examinations held online at BSMRMU

Due to the country-wide outbreak of COVID-19, the regular academic activities of the university was hampered for a long time. As a result, the regular examinations could not be conducted in due time. However, to recover the loss, semester final examinations were conducted online in two slots. In the first slot, online semester final examinations for different Master's Programmes as well as 1st batch of BSc in Oceanography were held from 04 August to 26 August 2021. In the subsequent slot, online semester final examinations of different Honours Programmes were held from 29 August to 19 September 2021 accordingly.

Honourable Prime Minister received the prestigious UN SDG Progress Award

The Honourable Prime Minister Sheikh Hasina has received the 'SDG Progress Award'. The award was given by the United Nations Sustainable Development Solutions Network (SDSN). She received this award for her response to the universal call for action to eradicate poverty, protect the world and ensure peace and prosperity for all and lead Bangladesh in the right direction. Speaking at a press briefing in New York on 20 September, Foreign Minister A.K. Abdul Momen said, 'The Prime Minister accepted the award and dedicated it to the people of Bangladesh.' He hailed the award as an important international recognition of the country's achievements in achieving the Sustainable Development Goals (SDGs). The SDSN was established in 2012 under the auspices of the United Nations Secretary-General, led by Professor Jeffrey D. Sachs, a prominent economist and development strategist.

The goal of this platform is to employ scientific and technological experts from around the world to strengthen realistic solutions for sustainable development. Jeffrey Sachs described Sheikh Hasina as the 'Jewel in the Crown of the Day'. He lauded Sheikh Hasina's leadership in carrying out SDG campaign activities even during the global COVID-19 pandemic.

Bangladesh to get first maritime runway in 2024

The Honourable Prime Minister Sheikh Hasina on 29 August unveiled the foundation stone of the runway extension project of Cox's Bazar Airport, aiming to enable it to offer a longer range of domestic and international passenger services. The Honourable Prime Minister inaugurated the construction work on the maritime runway, the first of its kind in Bangladesh, virtually from her official residence Ganabhaban.

The government has taken up an ambitious project to extend the runway at Cox's Bazar airport by reclaiming land from the sea. Once completed, the new 10,700-ft runway will allow much larger aircraft to take off and land at the airport, paving the way for it to operate international flights.

The Civil Aviation Authority of Bangladesh (CAAB) inked the deal for the project with the Chinese joint venture of Changjiang Yichang Waterway Engineering Bureau (CYWEB) and China Civil Engineering Construction Corporation (CCECC) on February 9, 2021.

According to the project documents, the deadline to finish the construction is May 10, 2024. However, a spokesperson for the contractor said they would be given an additional commission if they could finish the construction before November 14, 2023. Under the agreement, the contractor will extend the existing 9,000ft runway by 1,700ft towards the Maheshkhali Channel through coastal land reclamation.

Bangladesh is the second-largest exporter of goods in South Asia

Apart from readymade garments, Bangladesh is gradually consolidating its position in the world market by exporting various other products including jute, leather and textiles. According to the latest report of the World Trade Organisation (WTO) titled 'World Trade Statistical Review 2021',

Bangladesh ranks 39th in global exports and 2nd among South Asian countries. Bangladesh is ranked third in this area, trailing only India and Pakistan.

In 2020, Bangladesh exported goods worth USD 34 billion. Due to the COVID-19 pandemic, exports fell 15% from 2019, but Bangladesh's global share was 0.2%. India ranks at the top in South Asia, and with exports of USD276 billion in 2020, it ranked 16th globally. Last year, the country's exports fell by 15%, but its share of the world market was 1.9%. Pakistan ranks 3rd among South Asian countries and ranks 45th in the world. In 2020, the country exported USD 22 billion worth of goods. Due to COVID-19, exports decreased by 6%.

On the other hand, Bangladesh is the 32nd largest importer of goods in the world. Last year, the import of goods was USD 52 billion. Imports decreased by 11% compared to the previous year. The global share is 0.4%.

Although it declined at the beginning of 2020, Bangladesh's exports started to turn towards the end. In the last fiscal year 2020-21, Bangladesh exported a total of USD 38.75 billion worth of goods, which is 15.10% more than the previous fiscal year 2019-20. Exports were valued at USD 33.67 billion that year. 81% of the total export income came from the readymade garments sector.

Prime Minister: students aged 12 or above to get COVID-19 vaccine in Bangladesh

The Honourable Prime Minister Sheikh Hasina said that the government has taken steps to vaccinate students of age 12 and above with the COVID-19 vaccine.

Responding to a question in the National Parliament on 15 September, the Honourable Prime Minister Hasina informed that steps have been taken to vaccinate 50% of the people by December 2021.

At another event in Dhaka on the same day, the Honourable Minister, Ministry of Foreign Affairs, Dr A K Abdul Momen told that Bangladesh is expected to receive 240 million doses of the COVID-19 vaccine from multiple sources by March-April next year. Vaccines will be coming through the COVAX initiative of the WHO as well as from other sources, said the Foreign Minister.

The Honourable Minister, Ministry of Health and Family Welfare, Zahid Maleque assured the National Parliament that Bangladesh will be able to manufacture vaccines soon with its effort. He also informed that despite the spike in oxygen demand, the situation has been under control as the government has set up a central oxygen supply in the hospitals and huge quantities of oxygen have been imported from India.

A marine technology institute is being established in Chattogram

The Institute of Marine Technology (IMT) is going to be established for the first time in Chattogram to develop skilled manpower for the shipbuilding industry. All are set to construct IMT on the bank of Karnaphuli river, adjacent to the Kalpalok residential area at Bakalia police station in the city.

The institute will be operated by the Manpower Employment and Training Bureau under the Ministry of Expatriate Welfare and Overseas Employment. The students of the Institute will be able to make a significant contribution to Bangladesh's emerging shipbuilding industry and increasing foreign remittances after completing studies at a very low cost. It will be constructed under a project taken to set up 40 technical training centres in 40 upazilas and one Institute of Marine Technology (IMT) in Chattogram. The project is scheduled for completion in 2022.

Captain Faisal becomes the new chairman of Chattogram section of Nautical Institute

Captain Faisal Azim, a former principal of the National Maritime Institute, was recently chosen chairman of the Chattogram section of the Nautical Institute, a UK-based global association for maritime professionals. Captain Habibur Rahman and Captain ABM Shamim were elected as vice-chairmen.

It is important to note that the Nautical Institute, established in 1971, has more than 7,000 members in at least 110 countries. The organisation acts as a consultant for the development of a country's maritime industry.

Gas drilling on Bangladesh island begins

On 29 September, India's ONGC Vid-esh Ltd conducted the first offshore drilling to delineate hydrocarbon reserves on the Maheshkhali island in the Bay of Bengal. Within the following three months, the oil and gas explorer will drill 4.20 kilometres deep into the Bay of Bengal. Over the last four years, this is the first drilling in any offshore well inside the country.

Australian oil-and-gas-exploration-company Santos along with state-run Bangladesh Petroleum Exploration and Production Company Ltd (BAPEX) earlier in February 2017 had drilled offshore Magnama-2 well under block 16 which was found dry after the drilling.

Currently, there is also no producing offshore gas well in the country and the entire natural gas output comes from the country's onshore gas fields as well as the import of liquefied natural gas (LNG).

Petrobangla signed two Production Sharing Contracts (PSCs) with the ONGC, the operator of blocks SS-04 and SS-09, on 17 February 2014.

Chattogram port has no shortage of ships, empty containers for transporting goods

Chattogram port is not facing any mentionable problem as there is no shortage of ships and empty containers for transporting goods from there. This information was given in a virtual meeting on 'Export of Shipping to Chattogram Port' from the meeting room of the Ministry of Shipping on 7 July. Secretary, Ministry of Shipping, Mohammed Mezbah Uddin Chowdhury presided over the meeting.

It was informed at the meeting that in the case of handling of goods and containers, the Chattogram port is working round the clock to ensure better services. The Chattogram port is open 24 hours even during the lockdown due to the COVID-19 pandemic. Unloading of goods and containers from the ship, delivery to the importer and loading of export container to vessels are being conducted normally, said in the meeting.

It was also informed in the meeting that the Chittagong Port Authority (CPA) had handled 30,97,237 TEUs of containers, 11,37,29,373 metric tons of cargo and 4,062 ships in the Fiscal Year 2020-2021. In the Fiscal Year 2019-2020, it handled 30,04,142 TEUs of containers, 10,15,65,272 metric tons of cargo and 3,764 ships. Cargo, container and ship handling grew by 11.98%, 3.09% and 7.92% respectively in the Fiscal Year 2020-2021.

It was further informed at the meeting that a task force has been formed under the leadership of the Additional Secretary (Development) of the Ministry of Shipping Sultan Abdul Hamid to address the future demand of the port and solve potential problems.

FMC Dockyard gets foreign orders to build tugboats

Chattogram based shipbuilding company FMC Dockyard Ltd has received a new work order from the Sudanese government to build ASD tugboats, with the export value of the state-of-the-art marine vessels being USD 13 million.

"I have always focused on creating a new global market for Bangladesh. Consequently, there was an urge to prove that," said Mohammad Yasin Chowdhury, Chairman and Chief Executive Officer (CEO) of FMC Dockyard.

Yasin Chowdhury added that Bangladesh is gradually overcoming the stagnation in domestic and global trade. Various steps taken by the government for industrial establishments during the pandemic period have also been helpful to overcome this recession.

FMC Dockyard Ltd is now building various types of quite sophisticated vessels such as LCTs, TCVs, multipurpose and survey vessels with multibeam echo sounders, container ships, oil tankers, passenger ships, fishing trawlers, and dredgers and tugboats. The company is exporting vessels abroad after meeting local demand.

Spain keen to support Bangladesh's shipbuilding sector

Spain has expressed an interest in assisting Bangladesh's shipbuilding industry financially. On 14 September, Spanish Ambassador Francisco De Asis Benitez Salas met with State Minister for Shipping Khalid Mahmud Chowdhury in the secretariat and expressed his country's interest in this matter.

Spain, according to the envoy, is eager to invest in river-cleaning vessels to prevent pollution and clear up waste. They also discussed areas of common interest between the two countries during the meeting.

Spain, according to the state minister, has experience in the shipbuilding and maritime industries. He stated that the government has gathered dredgers in order to dig 10,000 kilometres of waterways and that Spain will assist in the collection of state-of-the-art copper and hopper dredgers.

Bangladesh and Spain will participate in the International Maritime Organization (IMO) elections in the C and B categories, respectively. The state minister and the ambassador expressed support for their respective countries in that election.

WMU hosted 40th Anniversary Conference for MET professionals

From 8 to 10 September, the World Maritime University (WMU) hosted a conference entitled “Seas of Transition: Setting a Course for the Future”, which brought together for the first time, the International Maritime Lecturers’ Association (IMLA) with all three of its Special Interest Groups: International Conference on Engine Room Simulators (ICERS), International Maritime English Conference (IMEC), and International Navigation Simulator Lecturers’ Conference (INSLC).

Dr Cleopatra Doumbia-Henry, President of WMU, opened the conference and delivered welcoming remarks. She congratulated IMLA on its milestone 40th anniversary with such a timely theme for the conference, particularly as we are living in unprecedented times and an era of uncertainty about our future. “With a high degree of uncertainty, there is one certainty: new technologies will dramatically change the nature of work across all industries and occupations. Modern technology is fundamentally changing our way of life and work by creating new opportunities and challenges for all of us,” she said. Three main challenges she noted relate to our capacity and ability: to use technology to empower people rather than replace them; to enable progress to serve society rather than disrupt it, and to foster the innovators to respect moral and ethical boundaries rather than cross them.

The Conference brought together over 100 Maritime Education and Training (MET) Professionals from 34 countries for interdisciplinary discussion and exchange of ideas on issues facing MET in the present era of rapid change in the global maritime community, with a view to harnessing the past to navigate the future. Session topics included Lifelong Learning in MET, Maritime Training in Safety and Risk, Quality MET for a Sustainable Future, Effective Communication and MET, Resilience in MET in the face of COVID-19, and Digitalisation and MET.

IMU signs MoUs with Admiral Ushakov State Maritime University, Russia

The Indian Maritime University (IMU) has signed agreements with several national and international organisations for the exchange of information on research and educational programmes that include Admiral Ushakov Maritime University, Russia. Short-term training programmes, seminars, webinars, conferences and workshops on topics of mutual interest will be organised jointly as per the MoU.

Besides, MoUs were also signed with the Ministry of Blue Economy, Marine Resources, Fisheries and Shipping, Mauritius, Batangas University, Philippines, and Erasmus University, Netherlands on the international level.

The Indian Maritime University has 3,115 students on its rolls on six campuses in Chennai, Kochi, Kolkata, Mumbai, Navi Mumbai and Visakhapatnam besides 2,735 students in 18 affiliated maritime training institutes.

World’s first green submarine among winners of the UK’s biggest clean maritime competition

The first ever green submarine study has been named as one of 55 winning projects of a GBP 23 million government-funded R&D competition, announced on 15 September.

The Clean Maritime Demonstration Competition, announced as part of the UK Prime Minister’s 10-point plan for the green industrial revolution, is supporting the development of innovative technology to propel the government’s commitment to have zero-emission ships operating commercially by 2025 – creating hundreds of highly skilled jobs across the nation and establishing the UK as world leaders in clean maritime.

A fully automated submarine fleet, powered entirely on green hydrogen, could help cleanse the oceans of toxic pollution by collecting microplastics on its pilot route between Glasgow and Belfast. While transporting cargo shipments, the fleet could secure significant emission savings of 27 tons of carbon dioxide (CO_2) emissions in the first year of operation, with an overall mission to reduce 300 million tons of CO_2 emissions as the fleet grows.

The IUCN World Conservation Congress held in Marseille

On 3 September, the world's biggest biodiversity summit, IUCN World Conservation Congress, was held in the port city of Marseille, France with a warning from French President Emmanuel Macron that "there is no vaccine for a sick planet".

Thousands of scientists, conservation experts and officials travelled to the Mediterranean city for the summit to discuss and share ideas relating to the protection of nature.

At the World Conservation Congress, IUCN members and partners committed to delivering a substantive and significant contribution to the post-pandemic recovery and the biodiversity-climate crisis.

The IUCN World Conservation Congress brings together IUCN's government, civil society and indigenous peoples' member organisations to take decisions related to major conservation issues.

World Maritime theme 2022: New technologies for greener shipping

'New technologies for greener shipping' has been chosen as the World Maritime theme for 2022, reflecting the need to support a green transition of the maritime sector into a sustainable future, while leaving no one behind.

The IMO Council, meeting for its 125th session (28 June-2 July), endorsed the theme following a proposal by IMO Secretary-General Kitack Lim. Mr. Lim said the theme would provide an opportunity to focus on the importance of a sustainable maritime sector and the need to build back better and greener in a post pandemic world.

The theme will allow for a range of activities to delve into specific topics related to promotion of inclusive innovation and uptake of new technologies to support the needs for a greener transition of the maritime sector, especially in the context of developing countries, and in particular the small island developing States (SIDS) and least developed countries (LDCs).

The theme is linked to the United Nations Sustainable Development Goals (SDGs), particularly SDGs 13 and 14 on climate action and sustainable use of the oceans, seas and marine resources; SDG 9 on industry, innovation and infrastructure; and SDG 17, which highlights the importance of partnerships and implementation to achieve these goals.

The United Nations celebrates World Maritime Day

The United Nations celebrates World Maritime Day on 30 September, highlighting the role of the men and women who work at sea. Seafarers: at the core of shipping's future, is the theme for 2021.

In his message for the day, the UN Secretary-General António Guterres said the goal is to "pay tribute to the professionalism and resilience of seafarers."

He said the day also recognises "their indispensable role securing vital global supply chains and transporting over 80% of world trade in extraordinarily challenging times." This trade includes medical supplies, food and other basic goods that are critical for the COVID-19 response, but the pandemic continues to place immense physical and mental pressures on the roughly two million women and men who serve in the world's merchant fleet.

Hundreds of thousands of seafarers also face a humanitarian crisis, with many, in effect, stranded at sea, unable to disembark from the ships they operate, due to lengthy contract extensions amid the pandemic.

Looking ahead, the Secretary-General said that seafarers will play a critical role in helping advance shipping's move towards sustainability, "helping the sector do its vital part in building a sustainable future for people and planet."

This year's theme is also connected to the Sustainable Development Goals (SDGs), particularly SDG 4 on education and training, SDG 8 related to decent work, SDG 9 on innovation and industry, and SDG 5 on gender equality.

MoU signed for mutual recognition of maritime training and certification of competency of seafarers between UAE and Georgia

The UAE's Ministry of Energy and Infrastructure has signed a Memorandum of Understanding (MoU) on 28 September with Georgia's Maritime Transport Agency, which is part of the Ministry of Economy and Sustainable Development. The UAE and Georgia will recognise maritime education and training, as well as certificates of competency issued by competent authorities in both countries, according to the MoU. This complies with the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers' regulations (STCW). The move helps the Ministry of Energy and Infrastructure's continued efforts to maintain the marine sector's safety and security, as well as strengthen bilateral maritime connections with various countries.

As per the MoU, both parties recognise education, training and certificates of competency in the maritime sector, as well as medical fitness certificates for seafarers issued by the Government of the other party, as well as seafarers on board ships flying the flag of the other Part. This is in accordance with the provisions of regulation I/10 of the STCW Convention, and cooperation between the two Parties in the training, certification and management of seafarers.

In addition to the mutual recognition of maritime training and certifications, the MoU also includes exchanging experiences and best practices to contribute to the strengthening of the maritime sector in both the UAE and Georgia.

Is the Bay of Bengal turning into Oxygen Minimum Zone?

Mohammad Azharul Islam

The Bay of Bengal (BoB) is one of the most dynamic seas on this planet earth. The reasons are its monsoon periods which force it to be a dynamic sea and dangerous too. Talking about dangers, cyclones, storms, water surges, etc. are some of the examples of natural disasters which are highly hazardous to human beings. But there is something else that could be more hazardous than these given examples. The decreasing amount of oxygen level in the sea, which scientists named as Oxygen Minimum Zone (OMZ).

What is OMZ? It means an area where the oxygen level is minimum as per its requirement. For example, in a particular area, the fish community needs a minimum DO (Dissolved Oxygen) for their living. But because of some substances, oxygen levels go below the need. That's what we call OMZ.

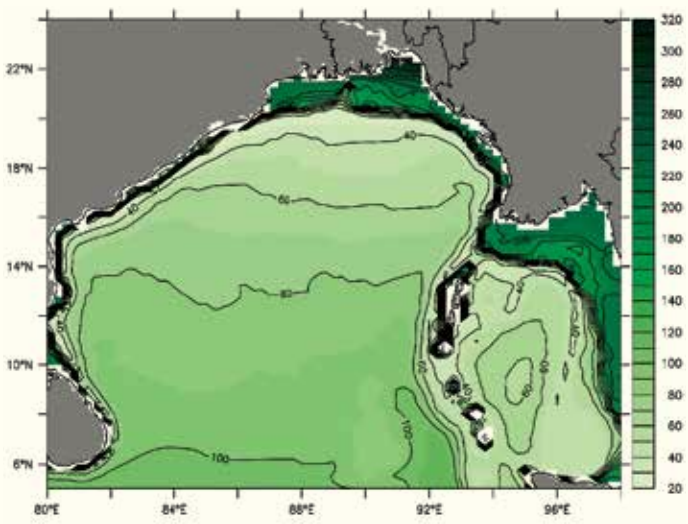
How it is related to the Bay of Bengal? We all know that the sedimentation rate is very high in this Bay because of the Ganges-Brahmaputra-Meghna (GBM) system. Sediments were weathered and transported from the Himalayas to the Bay of Bengal. About 1 billion tons of sediments were deposited into the Bay by the GBM system. Along with the GBM, rivers of east India and west Myanmar also deposits sediments in the Bay.

DO is high in the coastal region and low in the mid-sea. Coastal currents affect this as water moves at the right side and bottom water fills that gap. It's known as upwelling. Through this process, water mixes and nutrients get the chance to spread over the sea. But while we're leaving the coast, DO is decreasing rapidly. Again, at the southern BoB, DO is slowly increasing due to the effect of the equatorial current.

How is this sedimentation responsible for such a problem? Sediments contain nitrate, nitrite, phosphate and silicate compounds. These compounds are entrapped in between the roots of trees (especially in mangrove and coastal regions). But most of it travels to sea and brings the transparency of the water to zero. For that, there will be no photosynthesis in that particular area. If there is no photosynthesis, there will be no oxygen available. That is the first reason for the OMZ.

Secondly, there is a huge freshwater flux in the Bay of Bengal. When the freshwater comes into contact with the seawater it doesn't mix well because of the density differences. Freshwater lies upon the saltwater. When it travels further into the deep sea, it starts to create a barrier layer. And a barrier layer prevents two water layers from mixing. If the nutrients which come with the sediments do not mix well, then the fisheries community and the phytoplankton will die. That's another reason for the OMZ. But sometimes, it is good for the bottom dwellers and underwater fisheries as they are highly dependent on the nutrients for their food. The Bay of Bengal has an advantage on this among other seas on this planet.

Thirdly, if we assume that the layers mixed well and phytoplanktons are getting sunlight with good transparency, there is a possibility of OMZ in the BoB. As BoB is getting a huge amount of sediment, it is nutrient-rich. As we know that, the abundance of the nutrients will increase the abundance of the phytoplankton. And that will create an algal bloom which is very toxic and no life can form or live in that particular area. It will also consume the DO to dilute the properties.



Average dissolved oxygen around the BoB from 2000-2018.

As far we know, the reason scientists haven't observed such algal bloom in the Bay of Bengal might be because of its dynamic characteristics. Cyclones play a role in the barrier layer. A cyclone moves around with a huge amount of surface water to restraint its energy. So, it can break the barrier layer easily and help it to mix up well. But the first cause should be our concern because the sedimentation rate has not stopped or might not stop in the future. As a result, there's a chance that a large amount of nutrients and sediments in the Bay of Bengal will stifle oxygen generation. In the coastal region of Bangladesh, the oxygen level is decreasing highly from 2-3 metres underwater. In the deep sea, the number is significant. Scientists around this Bay of Bengal region should be more concerned about this disaster which may cause-

1. Fish unavailability,
2. Zero primary production,
3. Dead zone for fisheries and other communities,
4. Blue Economy disaster.

Otherwise, all the fishermen dependent on seafood will become unemployed. The part of a country's economy that is dependent on fisheries will fall. To prevent that situation from arising, we have to find an alternative solution to save our dream of the Blue Economy. We need more surveys in the Bay of Bengal to know more about the OMZ like in the Arabian Sea.

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It's time to explore the blue ocean

Meher Abzun

Back in November 2017, Bangabandhu Sheikh Mujibur Rahman Maritime University published the merit list of forty students. I remember I was thinking that of course, my name wouldn't be there. So I should go and check the waiting list instead. But that November, authorities only published the merit-listed forty students. However, I wanted to check the list from the end. I was checking it on my aunt's phone and we were both checking together but I couldn't see properly; it seemed like everything was blurry. Suddenly, she said, "Is this your name? Meher Abzun?" She zoomed out and asked me my roll number. Finally, we were sure that it was me and by that time I saw her tears drop on the mobile screen. And I was extremely happy, nervous and excited. At that moment I felt I had made my parents proud. My accomplishment instilled in me a sense of confidence. However, with hope, confidence and support, I was admitted to the Bangabandhu Sheikh Mujibur Rahman Maritime University in the Department of Oceanography and Hydrography. I attended orientation, introduction classes, and then started institutional classes. This is how my oceanographic journey started.

Why am I attracted to the ocean?

It's true that everyone loves the ocean and wants to spend their leisure time during vacations and holidays to relax at the sea beach. The ocean is the real beauty, of course. After getting admitted to BSMRMU, I got introduced to so many things. Slowly but steadily, I became enamoured with the sea. Gradually, oceanography is getting closer to my heart and I have started to learn more about it. It is a multidisciplinary subject - the combination of biological oceanography, chemical oceanography, physical oceanography, and last but not least geological oceanography. There are so many fascinating courses to choose from that will pique anyone's interest. Once you start to study the ocean, it becomes difficult to stop. Because the knowledge you need to acquire is as vast as the oceans themselves. The ocean body covers approximately 71% of the earth's surface. But our blue water body is almost unexplored till now and Bangladesh's situation is like

a child. I want to add that we have nearly used up all the resources, shelter, and food from the land. Perhaps in the future, we can rely on the ocean for our basic needs.

Maritime education

As I have stated, we may have to rely on the ocean for our fundamental necessities in the future. Since the ocean is mostly unexplored, we have to explore more. It's essential to develop our education system, to inspire the young generation and motivate them. This is the only way to build a strong community of people who will progress our ocean research. In our country's education system there is no major textbook included at primary, high school or college level about the ocean. So students cannot be motivated or inspired through the education system. They don't even know that the ocean can be a field of study. I think those who are connected to the ocean should be more concerned about the study of the ocean and encourage our next generation so that we can create a better possibility of understanding the necessity of ocean literacy for the masses of people. As it is a multidisciplinary subject and there is a huge opportunity to work, we need a large number of people in this field. The nature of development should be sustainable and ocean-friendly to protect and preserve our oceans for the sake of our present and future generations. We must focus on the Blue Economy, which is more than just about market enhancement. It provides for the protection and development of more intangible 'blue' resources such as traditional ways of life, carbon sequestration, and coastal resilience to help vulnerable states mitigate the often devastating effects of climate change. Working in the ocean industry is not an easy job, you have to be passionate about it, and you need patience and hard work. Understanding the scientific language, data analysis, physical presence in the sea for data collection, learning about methodologies, evaluation, researching them and so on. It's our responsibility to know about the law of the sea.

Ocean crisis

Day by day our ocean is going to become more polluted. The various industries emit carbon dioxide daily and their waste materials are discharged into the ocean. The result of these activities is global warming. Our polar ice caps are melting and sea levels are rising. We all know about climate change and are already facing the impacts. The use of plastics is not healthy because its ultimate destination is to pollute an ocean. As plastics is a non-biodegradable material, it remains unaltered for ages. All of the industrial wastes, polythene, plastics pollute our ocean extremely. In this way, the ocean environment becomes inappropriate for any kind of species to inhabit. As a result, a huge number of animals living in different regions are losing their habitats. The saddest thing is that we lost our ecosystem even though 80% of the ocean remains unexplored. It appears that we lost them before we were aware of their benefits. Seventy per cent (70%) of the atmospheric oxygen which we breathe comes from the ocean directly. The ocean produces oxygen through plants such as phytoplankton and algal plankton by the process of photosynthesis. As we destroy our ocean environment, one day we may die for insufficient oxygen. I think it's our responsibility to raise awareness among all the people out there and encourage them to save our oceans.

"Save oceans, save yourselves"

Every person should have a basic understanding of the ocean. Media can contribute a big role to broadcast updates about the discovery and other things regarding the ocean. Also, it can inspire people and make them more conscious about the ocean. Of course, the most crucial factor is finance; we require assistance from a variety of governmental and non-governmental organisations. I am drawing the attention of the government to provide support for maritime research. Besides, I believe there should be many seminars and conferences on maritime affairs through which we can highlight its importance. That may help us to reach out to various government and non-government organisations.

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Contemporary trends in aquaculture

Maritime Campus desk

Aquaculture is the world's fastest-growing food-production sector. Several environmental, economic, and social enterprises are contributing considerable changes in the sector.

As the world's population increases, so do the demand for large-scale food production. This can be met with farm-raised fish and seafood. However, in order to stay afloat, aquaculture enterprises must search out sustainable fish farming methods due to the growing threat of climate change, as well as economic and societal challenges.

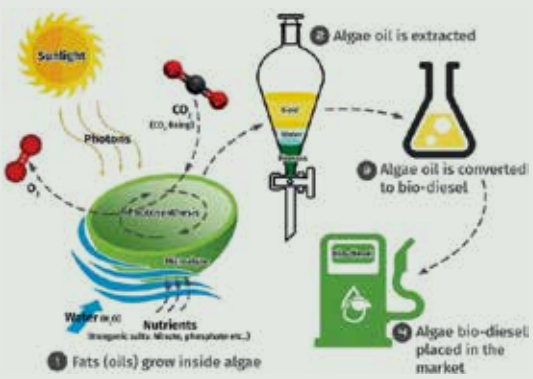
Aquaculture farming is now seeing five emerging trends.

1. Climate Change-Resistant Mussels

Many fish species are vulnerable to changes in the environment. Many species routinely cultivated in aquatic farms are threatened by rising water temperatures and changes in ocean acidity. Breeding resilient blue mussels are one method fish farmers can address this issue. These molluscs have the ability to change their genetic patterns in order to become more resistant to environmental changes. Selective breeding boosts the prevalence of this trait, increasing their chances of survival. Aquaculture enterprises can better withstand climate change by depending on these resilient mussels.

2. Shift Toward Microalgae Oil

Many fish require omega-3 fatty acids in their food in the same way that humans do, but they don't produce them. Larger fish receive omega-3 from consuming smaller fish, which get it from aquatic plants in the environment. Farms have traditionally used these smaller fish to feed their captive fish, but this is an unsustainable approach. An increasingly popular solution to this problem is feeding farmed fish with microalgae oil instead of traditional fishmeal. Food made from oil-rich algae doesn't require aquaculture centres to buy or catch wild fish, so they don't contribute to overfishing. Aquaculture enterprises and the environment both gain from feeding with microalgae oil.



3. Kelp Farming

Aquaculture may not always involve species. Aquatic plant cultivation, such as kelp, is a burgeoning industry. Kelp farming can help with a variety of environmental issues, such as the rising need for algae oil.

Kelp farming is far more environmentally safe than other types of aquaculture. The presence of this plant benefits several ecosystems due to variables such as nutrient content. It's even a good source of nutrition for humans.

4. Increased Sea Urchin Production

Sea urchins are another less common species that can benefit aquaculture. Sea urchins, like blue mussels, are resistant to climate change, making them a good choice for aquaculture in a fast-changing environment.

While these species may not be a menu item in Bangladesh, they are valuable commodities in Japan and other parts of the world. Urchins are native to many parts of the coast of Bangladesh, so raising them in Bangladeshi farms isn't a big deal.

5. Open-Ocean Aquaculture

Although most aquaculture takes place along the coastline, overcrowding in these places might result in concentrated waste in sensitive coastal waterways. Some of these concerns may be solved by moving fish farms inland, however, the process may be difficult.

Open-ocean aquaculture may be better located and controlled with the help of contemporary technology. Waste is managed by deep waters and stronger currents, which keep it away from the delicate nearshore ecosystems.

Open-ocean aquaculture will become a feasible option with time, research, and technological advancement. In a world where the future of aquaculture is dependent on environmental sustainability, it may prove to be a more sustainable kind of fish farming.

Bangladesh Delta Plan 2100, a holistic approach to delta management

Maritime Campus desk

The Bangladesh has the world's largest river delta, which is formed by the confluence of three major rivers: the Ganges, Brahmaputra, and Meghna. This delta is home to two out of every three Bangladeshis (about 110 million people), who rely on it for their survival and livelihood. The delta's effective planning and management is essential to the country's economic growth and development, especially as the threat of climate change and rising sea levels looms large. In view of the special long-term challenges for development, the Government of Bangladesh has adopted a long-term integrated techno-economic plan 'Bangladesh Delta Plan 2100' (BDP2100) which was approved at the National Economic Council (NEC) meeting, presided over by the Honourable Prime Minister and Chairperson of the NEC, on 4 September 2018.

Bangladesh Delta Plan (BDP 2100) is a comprehensive development plan that focuses on economic growth, environmental protection, and better climate resilience. The plan lays out the comprehensive and cross-sectoral actions that will be required to boost productivity and reduce disaster risks.

A business-as-usual scenario, coupled with rising climate hazards, will result in falling agricultural productivity, increased unemployment, and migration if the plan is not implemented. This would put additional pressure on urbanization resulting in an estimated decline in GDP growth to 6.8% by 2031 and 5.6% by 2041. By 2041, 25.1 million more people would be living in moderate poverty and 5.4 million in extreme poverty.

The Delta Plan, if properly implemented, will eliminate extreme poverty, create more jobs, and keep GDP growth over 8% until 2041. It will expand commercial and navigational possibilities while also bolstering food security. The Delta Plan will also aid in the reduction of urban migration by roughly 60%, coastal zone out-migration by 50%, and river area out-migration by 50%.

The BDP 2100 will incorporate a range of public and private finance from a variety of sources to be completed. The current investment plan for implementing the BDP until 2030 is estimated to be USD 38 billion, with 65 infrastructural projects and 15 institutional and knowledge development projects.

The World Bank has already invested USD 1.8 billion on improving the supply of safe pipe water, sanitation, drainage infrastructure, and embankment systems, and expanding the areas protected by polders from tidal floods and storm surge. It will also improve the navigability of 900 kilometres of interior waterways, reducing transit time and costs for both freight and passengers, enhancing national and regional trade. The World Bank is also working on a number of new projects to help with the execution of BDP 2100.

In addition, a series of institutional and policy reforms are in the process to help the implementation of BDP 2100. To provide strategic direction, a Delta Governance Council and an inter-ministerial forum led by the Honourable Prime Minister have already been established.

Bangladesh is on its path to becoming a global leader in delta and water management thanks to its strong commitment to BDP 2100. This will necessitate a long-term, comprehensive, integrated, and multi-sectoral strategy to water, land, and related resource management. The BDP investments will be made using an Adaptive Delta Management approach to guarantee that the necessary investments are made at the right time while operating in harmony with natural hydrological systems.

BDP 2100 Delta specific goals:

Goal 1: Ensure safety from floods and climate change related disasters;

Goal 2: Enhance water security and efficiency of water usage;

Goal 3: Ensure sustainable and integrated river systems and estuaries management;

Goal 4: Conserve and preserve wetlands and ecosystems and promote their wise use; and

Goal 5: Develop effective institutions and equitable governance for in-country and transboundary water resources management.

Furthermore, BDP has provided nationwide strategies on i) Flood Risk and ii) Freshwater Management. It has also provided strategies for a total of 9 thematic areas:

i) Water Supply Sanitation and Waste Management; ii) Transboundary Water Management; iii) Dynamizing Inland Water Transport System; iv) Agriculture, Food Security, Nutrition and Livelihood; v) Sustainable Land Use and Spatial Planning; vi) Environment, Ecology and Bio-Diversity; vii) Advancing the Blue Economy; viii) Renewable Energy and ix) Earthquake.

BDP 2100 has also devised strategies for six hotspots (the planning unit of BDP 2100):

i) Coastal Zone, ii) Barind and Drought Prone Areas, iii) Haor and Flash Flood Areas, iv) Chattogram Hill Tracts, v) River Systems and Estuaries and vi) Urban Areas.

How do ships die?

Atqiya Asima

We all know that everything that is born needs to die at some point. Like all other living and non- living things on earth, ships also die. The ocean dependent world has doubled the production of water-related vessels as everyone is looking forward to the Blue Economy. The ships and marine vessels play significant roles in pulling up the resources oceans hold and mostly in the export-import of goods. After a ship has been used for 20-25 years, it has to be dismantled or recycled. The recycling process involves them being broken and the parts being put in specific places to make them reusable.

The process of shipbreaking is different in developed and developing countries. But for both types of countries, some of the steps are the same. In both cases, shipbreakers bid for the ships and the highest bidder wins the contract and takes the ship away for further procedure. The price is estimated according to the weight of the ship (per ton). The value increases per ton because there are fewer environmental legislations.

Shipbreaking in developed countries

Ships in developed countries are dismantled in a very environment-friendly way. Their ship dismantling process follows technical guidelines published by the Basel Convention. In 2002, the Basel Convention adopted Technical Guidelines for the Environmentally Sound Management (ESM) of the Full and Partial Dismantling of Ships, a document for countries that already have or are establishing ship dismantling facilities. The Guidelines provide recommendations on procedures, processes and practices that must be implemented to ensure safe and environmentally sound practices. First, they remove all the hazardous and toxic elements present in the ship, extract available flammable vapours and elements and create holes in ship walls for ventilation. Next, the ship is taken to the dry dock and the propeller is removed. Taking that to the dry dock ensures no discharge of toxic elements in seawater and proper discarding of the waste products. Workers then strip the ship to the bare hull and separate each section using the necessary equipment. The electronic elements are taken aside and kept for selling. Asbestos found in the engine room is isolated and stored in plastic wrap and later is placed in secure steel containers.

The hazardous elements are managed in several ways. Some are recycled into new products, some destroyed by incinerating it at a high temperature whereas the flammable wastes are sometimes burned

as energy sources. The valuable metals like Copper, Aluminium or electric wires connected or mixed with other materials are extracted by shredding and separating them. Large useful parts like engines and generators are stored and later sold if they are still working well. The cutting starts from the upper deck, each hull cutting worth 300 tons per section. The sections which have paint on them are removed and sent to the furnace to be melted and turned into new products.

Shipbreaking in developing countries

When it comes to shipbreaking in developing countries, Bangladesh is very high up on the list. Bangladesh is one of the topmost countries in regards to breaking ships and using recycled steel. It has captured the world market of dismantling ships by recycling 47.2% of the world's water vessels, which is indeed a huge percentage. Bangladesh breaks 150-200 ships per year. The reasons why Bangladesh holds a huge percentage in ship breaking are mostly the saving of foreign currency as the scrap vessels provide steels, cheap labour and the steel can be reused as Bangladesh doesn't have any iron ore from which iron can be extracted. Each year thousands of people risk their lives in this ship breaking procedure just to earn their livelihoods. Each time a ship comes to die, it carries inside it many hazardous chemicals which can cause problems to the workers who take part in the ship breaking procedure. These chemicals get washed away in the seawater which pollutes it. The contract should state that the country sending the ship for breaking must first eliminate the toxic materials, discard them in the right place and then send it to Bangladesh or any other country. Otherwise, the workers in our country are losing their lives, getting affected by these chemicals and also the seas are getting dirty gradually. This might harm the sea creatures as well. Keeping this in mind, the Government of Bangladesh has also taken steps to follow the Blue Economy thread.

In Bangladesh, Basel Convention guidelines are not followed usually and hence the workers who don't have the necessary skills to perform such risky tasks end up taking risky steps for the breaking of ships. The workers, in the majority of cases, lack training, do not take adequate precautions, are unaware of the threats they will face, and do not have any safety equipment with them.

The workers are divided into three groups for shipbreaking:

1. Cutting group
2. Steel carrying group
3. Wire carrying group

The most dangerous part is done by the cutting group because they enter into the ship through hulls by not even stripping and making the hull bare. Inside, the chemicals, toxic gases and flammable substances which exist make their work very risky. There's no ventilation hole made in the ship to allow them to breathe properly. Because of this, the toxic gases can't even get out of the compartment which can cause an explosion sometimes because of the flammable substances being trapped inside. After cutting the parts, the steel carrying groups carry the parts to the furnace, that too by hand. Cranes are rarely utilised since the authorities do not want to spend more money on it.

The rope carrying group works for pulling the parts from the ship to the recycling shade. As the ship isn't taken to the dry-dock for cutting, the chemicals are directly discharged into the seawater. The steel obtained from the ship is recycled for further purposes. Other electronics items, the engine, and generators are sold as per the efficiency.

Shipbreaking is considered one of the most dangerous jobs in Bangladesh. It not only puts the lives of many people in peril, but it also makes the seawater toxic if it is not properly dismantled. Our main goal in ecologically sound ship breaking is to ensure that harmful chemicals are removed from ships before they arrive in our country, that ships are taken to dry docks for deconstruction, and that workers are kept safe.

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