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Syeda Tanzia Sultana
Mohammad Jasim Uddin

BLUE ECONOMY OF BANGLADESH

Abstract

To achieve the vision of being a maritime nation, Bangladesh has to realize its enormous potential in maritime domain since the settlement of maritime boundary delimitation disputes with Myanmar and India. Thus, blue economy is of high priority for Bangladesh. Against this backdrop, the paper aims to identify the priority sectors and major public actors of blue economy of Bangladesh. It also attempts to find out major guidelines for the country's blue economy. With an analytical framework, the paper identifies four priority sectors for Bangladesh's blue economy—exploration and exploitation of resources, advancing/expanding marine activities, protection of resources and technology acquisition. To facilitate the sectors, it analyzes the roles of some specific groups of major public actors for Bangladesh's blue economy. It also provides some possible options for the future of the country's blue economy. These includes making a comprehensive multi-sectoral national blue economy policy, adopting national maritime strategy and legal frameworks, maintaining institutional harmonization, formulating a Maritime Spatial Planning (MSP), survey of sea resources, building marine technological capacity, providing standard maritime education, research and development, allocating adequate public and private funds, attracting foreign investments and maintaining cooperation among littoral states in regional and global platforms through pursuing maritime diplomacy.

Keywords: Blue Economy, Priority Sectors, Public Actors, Blue Resources, Marine Spatial Planning

1. Introduction

According to Gunter Pauli, the concept of blue economy is evolving yet.[1] In general, blue economy refers to sea, ocean and coastal area based economic activities. It also entails exploitation of marine resources, optimal utilization of

Syeda Tanzia Sultana is Research Officer at Bangladesh Institute of International and Strategic Studies (BIISS). Her e-mail address is syedatanziasultana@gmail.com; **Mohammad Jasim Uddin, PhD** is Senior Research Fellow at Bangladesh Institute of International and Strategic Studies (BIISS). His e-mail address is jasim_biiss@yahoo.com

[1] Gunter A. Pauli, *The Blue Economy 10 Years, 100 Innovations, 100 Million Jobs*, New Mexico: Paradigm Publications, 2010.

oceanic resources and preservation of ocean health.[2] Being a littoral state of the Bay of Bengal (BoB), with a vast coastal area, it is fundamental for Bangladesh to nurture the concept. Realizing the enormous potential of the maritime domain of Bangladesh, the Father of the Nation Bangabandhu Sheikh Mujibur Rahman enacted the 'Territorial Waters and Maritime Zones Act, 1974'.[3] It is high time to reexamine the clauses of the act to accomplish the vision of being a maritime nation. Because it will help the country to facilitate one of the targets of the Sustainable Development Goals (SDGs)—"increasing economic benefits…from sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism".[4] The word 'sustainable' has thus entered into the concept of blue economy. There are principles for a blue economy to be sustainable.[5]

Following the settlement of its maritime disputes with India and Myanmar, Bangladesh has stepped up efforts to develop its blue economy to get it transformed from scarcity to abundance through exploitation of its vast oceanic resources.[6] As Prime Minister Sheikh Hasina remarked, "blue economy is a concept which can significantly contribute to the socio-economic development of Bangladesh. The role of marine resources in poverty alleviation, acquiring autarky in food production, protecting environmental balance, facing adverse impacts of climate change and other economic activities is unlimited."[7] Hence, the concept has ushered in a new horizon for the economic development of Bangladesh through utilizing the sea and marine resources.

With expanded maritime zones, for Bangladesh, significance of harnessing oceanic resources under blue economy programme has increased. Thus, efficient exploitation of marine resources and taking optimal benefit from the geographical location are crucial. Consequently, maritime activities, e.g., marine fishing (fisheries and aquaculture), deep-sea mining (sea minerals, oil and natural gas, hydrocarbons, petroleum, rare earth metals, etc.) and surging of sea-borne trade with advanced ports and shipping services need to be broadened. Besides, materializing marine renewable

[2] Charles S Colgan and Judith Kildow, *Understanding the Ocean Economy within Regional and National Contexts*, California: Centre for the Blue Economy, Monterey Institute of International Studies, March 2013, pp. 11-14; Charles S Colgan, *Measurement of the Ocean and Coastal Economy: Theory and Methods*, California: Centre for the Blue Economy, National Ocean Economics Program, 2004, p. 5.

[3] Abul Kalam, "Maritime Destiny of Bangladesh: Legacies and Prospects", *BIISS Journal*, Vol. 36, No. 4, 2015, p. 293; Mohammad Rubaiyat Rahman, "Blue Economy and Maritime Cooperation in the Bay of Bengal: Role of Bangladesh", *Procedia Engineering*, Vol. 194, 2017, p. 358.

[4] Md. Monjur Hasan, B. M. Sajjad Hossain, Md. Jobaer Alam, K. M. Azam Chowdhury, Ahmad Al Karim and Nuruddin Md. Khaled Chowdhury, "The Prospects of Blue Economy to Promote Bangladesh into a Middle-Income Country", *Open Journal of Marine Science*, Vol. 8, 2018, pp. 357-359.

[5] Ibid.

[6] Md. Khurshed Alam, "Delimitation of Maritime Boundary between Bangladesh and Myanmar by the ITLOS", *The Northern University Journal of Law*, No. 3, 2012, p. 7.

[7] Ibid.

energy, increasing marine biotechnology and promoting coastal urbanization[8] are essential.[9] At the same time, protection of maritime resources (i.e., securing marine organism, evolution of species and interaction between species) from the risk of extinction and secular depletion through formulating national policies and strategies at the national level; arousing debate at the global platform; creating or streamlining legal and regulatory institutions; coastal protection; conservation of marine habitats; regulation of fishing sectors (to protect overfishing, Irregular, Unreported and Unregulated (IUU) fishing); regulating adverse effects of expanded tourism activities and regulation of uncontrolled rise of coastal urbanization is crucial. Moreover, governance of resources through surveillance and environmental protection from overexploitation are significant. On the other hand, technology acquisition through regional (engaging with Indian Ocean Rim Association, IORA, etc.) and global cooperation are important. All these substantiate that blue economy is something that is to be monitored by concerned actors.

Against this backdrop, the paper purports to study the following questions: what are the priority sectors of Blue Economy for Bangladesh? Who are the major public actors for nurturing the concept in the country? What are their important roles? What are the major ways that would guide Bangladesh's Blue Economy? The concept of Blue Economy is much wider and inclusive. Thus, the paper limits its scope in addressing the role of the most important public actors of Bangladesh's blue economy.

The research followed a qualitative method. Data has been collected both from primary and secondary sources. This includes literature review for qualitative/ textual data, and Key Informant Interviews (KIIs) with practitioners, academics and analysts. Literature has been collected from a variety of sources, e.g., government and non-government documents, academic journals, books and newspaper articles, clippings and articles sourced from print media. On the other hand, the paper followed semi-structured interview method of KIIs comprised of four phases: constructing topic guide; selecting respondents; arranging interview and setting up of interpretive outlines in realizing relations of actors with predefined theoretical concepts and observations. The paper follows interpretive approach, a method of qualitative data analysis. To analyze the priority sectors and public actors of the blue economy of Bangladesh, thick interpretation approach is adopted.

[8] Port cum megacities like Chattogram and Khulna as well as 16-20 expanding semi-urban towns are located in the coastal zone. New sites of EPZs and tourism complexes are being planned in the area. Shipbreaking activities in coastal Chattogram are also expanding. Thus, the coastal zone is the preferred site for urbanization and commercialization. See also, Abul Kalam Azad, "Delimitation of Marine Boundaries and Prospect of Blue Economy for Bangladesh: A Critical Overview", *Journal of International Relations*, Vol. 6, No. 1, 2014, p. 41.
[9] S.K. Mohanty, Priyadarshi Dash, Aastha Gupta and Pankhuri Gaur, *Prospects of Blue Economy in the Indian Ocean*, New Delhi: Research and Information System for Developing Countries, 2015, p. 5.

The paper is divided into six sections, including introduction and conclusion. The second section provides an analytical framework. The third section deals with priority sectors of blue economy of Bangladesh. The fourth section identifies the role of public actors of Bangladesh's blue economy. The fifth section provides some ways to guide the future of the country's blue economy. The sixth section concludes the paper.

2. Understanding Blue Economy: Priority Sectors and Actors

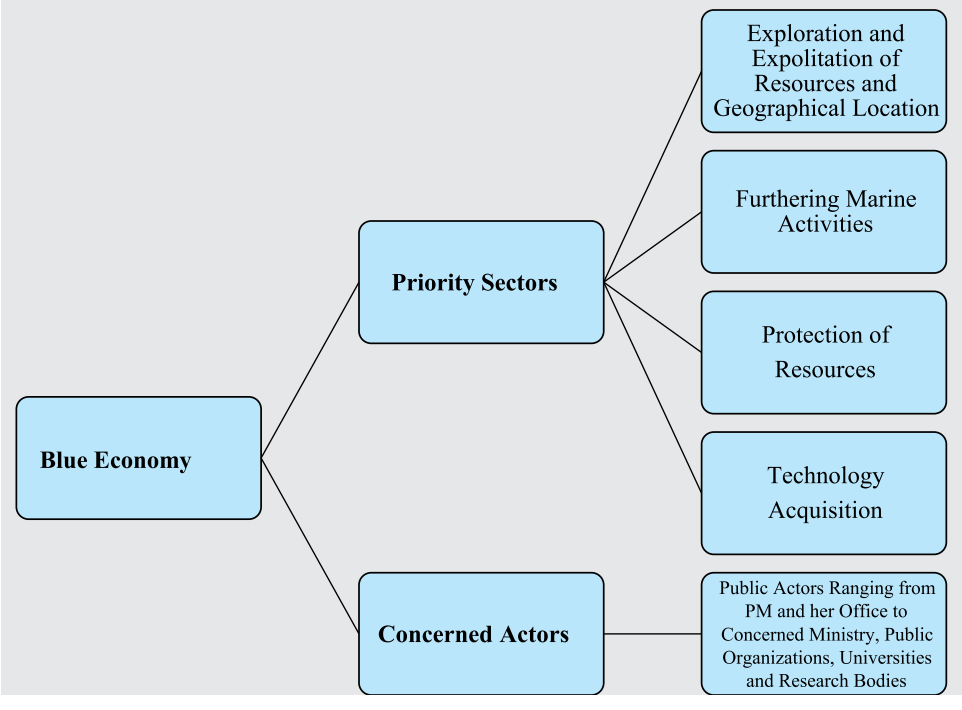
During the past few years, the term 'Blue Economy' or 'Blue Growth' has surged into common policy discussion all over the world. Despite high-level adoption of the blue economy as a concept and as a goal of policymaking and investment, there is still no widely accepted definition of the term. Blue Economy means the use of the sea and its resources for sustainable economic development. Again, it simply refers to any economic activity in the maritime sector, whether sustainable or not. The concept of blue economy is thus, at an evolving stage and is subject to multiple interpretations owing to the coverage of activities, geographical locations, sectors and actors.

The World Wildlife Fund (WWF) defines blue economy as a marine-based economy which provides social and economic benefits for current and future generations by contributing to food security, poverty eradication, livelihoods, income, employment, health, safety, equity and political stability. Moreover, it restores, protects and maintains the diversity, productivity, resilience, core functions and intrinsic value of marine ecosystems.[10] Similarly, World Bank Group describes the concept as 'comprising the range of economic sectors and related policies that together determine whether the use of oceanic resources is sustainable'. It aims to balance both the economic opportunities and environmental limitations of using the ocean to generate wealth.[11] Similar to the definition of WWF, Economist Intelligence Unit (EIU) conceptualizes blue economy as balancing economic activity in the ocean in accordance with the long term capacity of ocean ecosystems to support this activity and remaining resilient and healthy.[12]

[10] World Wide Fund for Nature, *Principles for a Sustainable Blue Economy*, Gland: World Wide Fund for Nature, 2015, p. 4.
[11] Pawan G. Patil, John Virdin, Sylvia Michele Diez, Julian Roberts and Asha Singh, *Toward a Blue Economy: A Promise for Sustainable Growth in the Caribbean*, Washington, DC: The World Bank, 2016, pp.18-25.
[12] Economist Intelligence Unit (EIU), *The Blue Economy: Growth, Opportunity, and a Sustainable Ocean Economy*, London: EIU, 2015, p. 7.

A set of literature contextualizes the taxonomy of blue economy sectors[13] and concludes that exploitation of resources and at the same time their protection are the priority sectors of blue economy. Elaborating on the important role of public and private actors, WWF outlines three basic principles for blue economy to be sustainable.[14] Reviewing the existing literature, the paper proceeds with the analytical framework presented in Figure 1 which is comprised of two things: (a) priority sectors of blue economy and (b) its concerned actors.

Figure 1: Analytical Framework



Ocean, conceiving pivotal strategic significance, is of high potential for power politics and geopolitical tension. This is because ocean has the biggest source of offshore hydrocarbon reserves including gas, oil and living resources like fishes, herbs and corals. Hence, exploration and exploitation of resources are

[13] Gunter A. Pauli, op. cit.; Economist Intelligence Unit (EIU), op. cit.; Pawan G. Patil et al., op. cit.; Jennifer J. Silver op. cit., "Blue Economy and Competing Discourses in International Oceans Governance", *The Journal of Environment & Development*, Vol. 24, No. 2, 2015, pp. 135-160; Michelle Voyer, Genevieve Quirk, Alistair McIlgorm, Kamal Azmi, Stuart Kaye and Michael McArthur, *The Blue Economy in Australia*, Canberra, Australia: Sea Power Centre, 2017, pp. 37-40.

[14] World Wide Fund for Nature, op. cit.

increasingly being prioritized. As the taxonomy of blue economy sectors is being broadened, maritime activities now range from marine fishing; deep-sea mining; shipping and surging sea-borne trade to mobilizing sustainable coastal urbanization; producing marine renewable energy; flourishing coastal and marine tourism and most importantly, increasing research and innovation. Moreover, increasing marine activity through judicious management helps protect maritime resources from the risk of extinction and secular depletion.

Dispute settlement of maritime area; sovereignty and control over the settled area; problems of IUU fishing; marine pollution; ineffective and lack of marine regulation and non-traditional security menace[15] are some important issues that individual states are rigged with. Therefore, protection of resources through exercising best ocean governance practices is of contemporary demand. It also entails multi-level cooperation on regulation of the coastal marine environment, marine protected areas, maritime safety and security of ports and sea lanes of communication (SLOC).[16] Besides, there is dire need of cooperation in case of technology acquisition, even for the developed nations. For a developing state, enhancing marine biotechnology and producing renewable energy is like a dream in the absence of hi-tech capability. Hence, cooperation at the regional or global (e.g., IORA) level is essential.

A balance is crucial between furthering marine activities and protecting resources. Blue Economy is to respect ecosystem integrity through developing a circular economy. And, sustainable blue economy needs to be governed by public and private processes. These processes need to be inclusive, well-informed, precautionary and adaptive, accountable and transparent, holistic, cross-sectoral and of long-term nature, innovative and proactive.

The actors require to undertake several initiatives. ***First,*** they must set relevant, measurable and internally consistent goals and targets along with integrated and coherent planning and policies for different socio-economic and ecological areas. ***Second,*** actors need to monitor and assess performance on the goals and targets. They have to communicate to all concerned in a transparent and accessible way. ***Third,*** they should establish economic instruments (e.g., taxes, subsidies, fees, etc.) for internalizing benefits, costs and risks as well as frame, implement, enforce and continuously improve international and national laws and agreements. ***Fourth,*** it requires planning, managing and effectively governing the use of marine space

[15] Christian Bueger and Timothy Edmunds, "Beyond Seablindness: A New Agenda for Maritime Security Studies", *International Affairs*, Vol. 93, No. 6, 2017, p. 1293; Sam Bateman, "Maritime Security Governance in the Indian Ocean Region", *Journal of the Indian Ocean Region*, Vol. 12, No. 1, 2016, p. 9.

[16] Abul Kalam Azad, "Maritime Security of Bangladesh", in Mufleh R Osmani and Muzaffer Ahmad, *Security in the Twenty First Century: A Bangladesh Perspective*, Dhaka: BIISS, 2003, p. 165.

and resources as well as applying inclusive methods and ecosystem approach. ***Fifth,*** actors should develop and apply global standards, guidelines and best practices. ***Sixth,*** they also need to recognize that maritime and land-based economies are interlinked and many of the threats that marine environments face, originate on land. ***Seventh,*** they must participate during the implementation phase of policies and reach out national, regional, sectoral, organizational and other areas in order to ensure collective stewardship of common marine heritage.

For Bangladesh, blue economy refers to direct and indirect activities in the seas, oceans and coasts which can contribute to sustainable and inclusive economic growth through employment creation, eradication of poverty, ensuring food security and nutrition intake and mitigation and adaptation of climate change. Blue economy conceptualizes oceans and seas as 'Development Spaces' where spatial planning integrates conservation, sustainable use of living resources and mineral wealth extraction, bio-prospecting, sustainable energy production and marine transport.

Blue economy not only requires a balanced approach between conservation and development but also entails fundamental and systemic changes in their policy-regulatory-management-governance frameworks.[17] Based on the analytical framework given in Figure 1, for Bangladesh, blue economy is to be a marine-based economy that includes exploration and exploitation of resources, increasing marine activities as well as acquisition of clean technologies and renewable energy. Stakeholders, particularly public actors are to guide decision-making processes, educational and awareness-raising settings and to mobilize commitments to the vision of a sustainable blue economy and act to turn the vision into reality.

3. Priority Sectors of Bangladesh's Blue Economy

This section deals with four priority sectors of Bangladesh's blue economy in line with Figure 1: exploration and exploitation of resources, expanding marine activities, protection of resources and technology acquisition.

3.1 *Exploration and Exploitation of Resources*

Marine resources of Bangladesh are blessed with rich coastal and marine resources. It also hosts a wide range of biodiversity, e.g., fishes (about 475 species

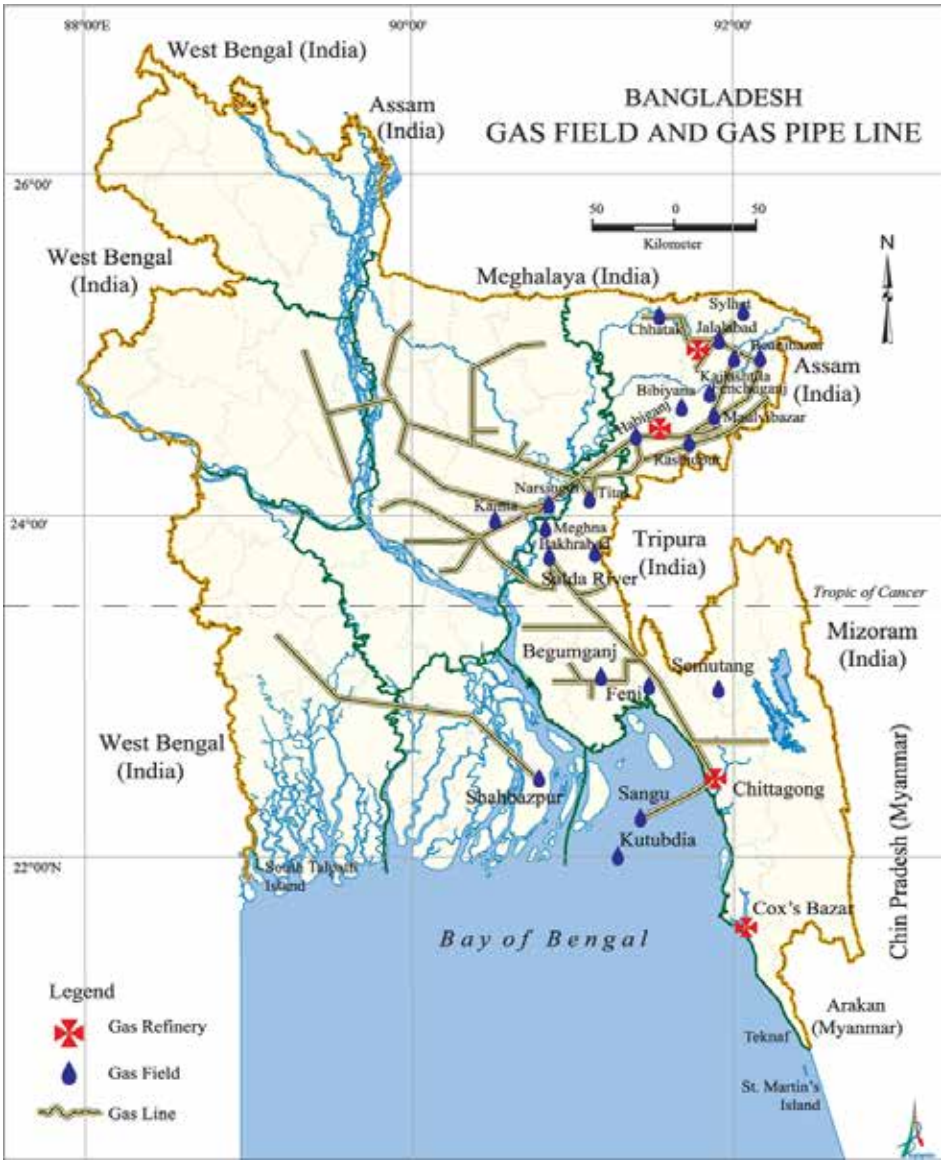
[17] General Economics Division (GED), *Seventh Five Year Plan (FY2016 – 2020): Accelerating Growth, Empowering Citizens*, Dhaka, Bangladesh: Planning Commission, Government of the People's Republic of Bangladesh, 2015, pp. 45-46; Lailufar Yasmin and Md. Rezwanul Haque Masud, "Maritime Security in the Indian Ocean Region: Bangladesh Cognition", in ASM Ali Ashraf, *Intelligence, National Security and Foreign Policy*, Dhaka: BILIA, 2016, pp. 169-182.

of fish in the coastal areas of Bangladesh); shrimps; molluscs; crabs; mammals; seaweeds; micro or macroalgae; mussel; oyster; other shellfish; sea urchin; sea cucumber; etc.[18] Hilsa accounts for nearly half of total marine catches.[19] Large pelagic fishes, e.g., tuna and other species are yet to be harvested.[20] Marine aquaculture is largely based on tiger shrimp; soft shell crab is also cultured at a limited scale. Untapped microorganisms and other living resources of the BoB are potential sources for marine-based biotechnology. Bangladesh is also blessed with diverse coastal habitats, e.g., mangrove forests, salt marsh and beds. The exact amount of carbon stored by the ecosystems is, however, yet to be traced. Also, no recent information is available on blue carbon sequestration by coastal habitats.

Within the maritime territory of Bangladesh, there might be a number of rich gas reserves which need to be explored in a coordinated manner. The foot of the continental slope in the BoB is at an average distance of 50 nautical miles (nm). It is estimated to be potentially rich in gas.[21] Until now, Bangladesh drilled 26 wells in the offshore locations of the BoB but only two gas reserves were discovered.[22] So far, a total of 26 Trillion Cubic Feet (TCF) gas reserves have been discovered.[23] Among those, Sangu reserves having 0.8 TCF is discovered already depleted. Kutubdia reserves having 0.04 TCF is yet to be developed. Drilling at two other offshore places, viz. Magnama (3.5 TCF) and Hatiya (1.0 TCF) has not yet completed.[24]

[18] Department of Fisheries, *Yearbook of Fisheries Statistics of Bangladesh 2017-18*, Bangladesh: Ministry of Fisheries, Vol. 35, 2018, p. 129.
[19] Sophie Arnaud-Haond, Jesús M. Arrieta and Carlos M. Duarte, "Marine Biodiversity and Gene Patents", *Science*, Vol. 331, No. 6024, 2011, pp. 1521-1522; and Department of Fisheries, op. cit.
[20] Food and Agriculture Organization of the United Nations, *The State of World Fisheries and Aquaculture*, Rome: FAO, 2014, pp. 34-39.
[21] M. Gulam Hussain, Pierre Failler, A. Al Karim and M. Khurshed Alam Khurshed Alam, "Review on Opportunities, Constraints and Challenges of Blue Economy Development in Bangladesh", *Journal of Fisheries and Life Sciences*, Vol. 2, No. 1, 2017, pp. 45-57.
[22] Shahiduzzaman Khan, "Intensifying offshore drilling for hydrocarbon", *The Financial Express*, 11 January 2020.
[23] Jack Detsche, "Bangladesh: Asia's New Energy Superpower?", *The Diplomat*, 14 November 2014.
[24] M. Gulam Hussain et al., op. cit.

Map 1: Location of Sangu and Kutubdia in the Bay of Bengal[25]



Bangladesh has the potential to become one of the biggest sources of offshore hydrocarbon reserves. The discovery of the Krishna Godavari and Mahanandi Basins of India with potential reserve of 100 TCF of gas indicates that

[25] Available at http://en.banglapedia.org/index.php?title=File:GasField.jpg, accessed on 24 April 2020.

the prospect of hydrocarbon reserve in Bangladesh's part is probably high.[26] Besides, potential mineral resources are yet to be explored within the maritime boundaries of the country in the BoB and in the coastal areas. Though no updated survey reports on heavy minerals at the sea bed and beach region in Bangladesh is available, the entire coastal belt has been explored with the discovery of 17 deposits of potentially valuable minerals such as Zircon, Rutile, Ilmenite, Leucoxene, Kyanite, Garnet, Magnetite, Monazite, etc.[27] On the other hand, potential of renewable energy, e.g., wind, wave, solar, tide, hydro etc. in onshore areas and offshore islands of the country is yet to be explored. A wind generator with a capacity of 2 MW is already installed in the coastal area of Kutubdia Island, but it still remains inactive.[28] Besides, salt reserves in the onshore areas and offshore islands are important resources that are yet to be explored at a large scale.

3.2 *Furthering Marine Activities*

Marine activities have two aspects: expanding resources through exploration or exploitation activities and increasing maritime-related services.

Coming out of the traditional fishing practices and exploiting potentials beyond existing fishing grounds, harvesting large pelagic fishes from deeper zones within 200 nm of EEZ and up to the deep seas are the essence of furthering resource exploration and exploitation. Conducting a thorough survey to accomplish stock assessment of marine resources is thus crucial. For marine aquaculture, two broad initiatives at the coastal areas are to be taken: (a) hatchery-based quality seed production and mariculture of important marine species, viz. sea bass, grouper, marine eel, pomfret, mullets, etc.; and (b) intensifying soft shell crab farming by using hatchery produced seeds. Specific initiatives include intensification of tiger shrimp farming, seabass, pomfret and grey mullet breeding and farming of saline tolerant tilapia or genetically improved farm tilapia (GIFT)/molobicus strain farming. For non-traditional marine living species, it is crucial to identify suitable species and develop commercial cultural techniques. Also vital is to develop marine pearl culture at suitable inshore and coastal locations of Bangladesh and use nuclei placement at mental/gonad tissue of pearly mussels. Moreover, development and implementation of open water Integrated Multi Trophic Aquaculture (IMTA) in coastal areas to grow different finfish and shellfish with seaweeds in an integrated farm is important. Enhancing marine biotechnological tools for developing pharmaceutical drugs/

[26] Jack Detsche, op. cit.
[27] Ibid.
[28] Ministry of Foreign Affairs, Bangladesh, "Blue Economy-Development of Sea Resources for Bangladesh", available at https://mofa.gov.bd/site/page/8c5b2a3f-9873-4f27-8761-2737db83c2ec/OCEAN/nolink/Recent-Events, accessed on 13 March 2019.

chemicals and other products are necessary. Conducting a thorough survey for recording the estimates of carbon sequestration in vegetated estuaries and coastal habitat is essential. Also important is sequestering and storing carbon at mangroves, salt marsh and seagrass ecosystems.

To harness and identify more oil and gas reserves, it is essential to establish a logical plan conduct surveys with the present boundary in the BoB; appoint qualified international companies to accelerate offshore exploration and drilling activities to ensure future energy security. Besides, exploiting the potential deposits of marine minerals through deep sea mining is to be done. In case of marine renewable energy, speeding up implementation of already taken initiatives, technology transfer and training on renewable energy sources is important.

As Bangladesh's international trade is mostly handled by coastal ports and seaborne transportations, enhancing port facilities and related transport sectors are to be developed. For enhancing port facilities, the proposal to construct the Matarbari deep sea port on the Maheshkhali Island is a good initiative. It will be 18.7 metre deep and will be able to accommodate container vessels of 8,200 TEUs (twenty-foot equivalent unit).[29] Hopefully, by 2023 it will have an annual handling capacity of 0.8 million TEUs of containers and 2.5 million tonnes of bulk cargos and by 2041, special economic zones will be built.[30] The deep seaport will certainly reduce the dependency on and congestion in the prime sea ports at Chattogram and Mongla. It will also help to reduce the lead time. With regard to transportation, buying modern merchant ships and cargo fleets, strengthening local shipping companies for the expansion of fleet in terms of size and capacity and enhancing shipping and transport related activities are important.

As marine tourism is yet to provide adequate earnings for Bangladesh, special attention needs to give on expansion of coastal tourism, tourism in sea beaches and existing and newly developed islands. In addition, encouraging private sector to invest in coastal tourism, making national strategy for tourism, introducing small and medium sized luxury cruise and catamaran ships and construction of modern hotels, cottages and restaurants at the tourist spots along the onshore and offshore coastal locations are important. In this respect, Bangladesh can take lessons from Singapore and Malaysia.

[29] Shakahwat Hossain, "Bangladesh plans Matarbari sea port with Japanese loan", *The New Age*, 04 August 2019.
[30] Syful Islam, "Matarbari deep-sea port to outshine Asian peers", *The Financial Express*, 29 March 2019.

Shipbreaking, ship recycling and shipbuilding all are significant marine activities.[31] At present, shipbuilding yards are constructing 10,000 Deadweight Tonnage (DWT) seagoing ships for export and are expected to upgrade their capacity to 25,000 DWT.[32] Concentrated in Sitakunda, shipbreaking activities present both challenges and opportunities for coastal zone management. By providing a significant source of steel, saving a substantial amount of foreign exchange and generating employment and large amounts of revenue for various government authorities through the payment of taxes, shipbreaking activities play an important role in the national economy of Bangladesh. However, industrial waste, toxic fumes and other hazardous materials pose serious threat to the environment. Despite introduction of new national policy and legislation in 2011 with a view to improve the environmental and occupational health safety standards in the shipbreaking yards, enforcement of laws is often non-existent and the governance is poor due to lack of adequate monitoring. In contrast, using the Intertidal Ship Recycling method with a natural and concrete slipway, ship recycling facility meets a wide range of stringent environmental and social criteria in Bangladesh. Thus, it should be promoted and nurtured in all possible ways with all eco-friendly infrastructure and compliance of international convention.

3.3 *Protection of Resources*

Protection of resources comprises both protecting resources within a defined geo-graphical maritime boundary of Bangladesh and surveillance to the boundary itself. While discussing protection of resources, Bangladesh needs to take some issues into consideration, e.g., maritime piracy, illegal fishing and poaching, marine pollution, etc.

Marine fish biodiversity is declining day by day due to the use of estuarine set bag net, push net and beach seine fishing in the shallow coastal areas.[33] However, a good number of bottom trawls have already been converted to mid-water trawls to lessen the pressure on the demersal fish stocks to reduce the destruction of sea-bottom habitats and to exploit the mid-water fish stocks.[34] Bangladesh imposes a temporary ban on fishing, particularly of Hilsa, for a certain period. To protect marine biodiversity and to keep fish stocks at sustainable levels, several Marine Protected

[31] International Maritime Organization, "The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships", IMO, 2009, available at https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/normativeinstrument/wcms_154921.pdf, accessed on 06 July 2020.
[32] Ministry of Foreign Affairs, op. cit.
[33] Md. Shahidul Islam, "Perspectives of the Coastal and Marine Fisheries of the Bay of Bengal, Bangladesh", *Ocean & Coastal Management*, Vol. 46, No. 8, 2003, pp. 763-796.
[34] Ministry of Foreign Affairs, op. cit.

Areas (MPA) are declared. Bangladesh has taken decision to install Vessel Tracking and Monitoring System (VTMS) with satellite communication links in fishing vessels in phases to monitor and control their maneuver at sea.[35] As a trans-boundary species of the BoB, Hilsa's rehabilitation is needed and it requires a joint effort among Bangladesh, India and Myanmar to prevent the harvest of Hilsa juveniles and protect the mature brood stock during the banning period. Regulation can be adopted on indiscriminate harvesting of gravid mother shrimp, by trawling at the depth of 10-40 meters of inshore marine waters.

Marine pollution, due to shrimp farming, marine waste and litter, poses a serious threat of depletion of marine resources of the country. Coastal shrimp farming has adverse environmental impacts on the level of salinity, mangrove forest, water and soil quality, productivity of estuarine waters, agro-ecosystem, sedimentation and biodiversity.[36] To mitigate the negative impacts crucial is to undertake appropriate regulatory measures; proper management and ecological approach. It is also important to categorize coastal areas based on salinity level, improve traditional and semi-intensive culture systems, apply fertilizer at recommended doses, intensively monitor the environmental impact and establish procedures for Environmental Impact Assessment (EIA). Bangladesh also faces the worst marine pollution because of plastic and marine litter. According to a survey, plastic waste constitutes more than 60 per cent of the litter found on the beaches of Bangladesh. A total of 6,705 pieces of waste products were found on an 18.5 km stretch of the four sea beaches.[37] To manage marine waste, formulation of different strategies and action plans at the regional, national and local levels are vital. Again, to convey the effect of littering to the public for initiating long-term behavioural change, awareness raising through academic activities and information campaigns is essential.

Strengthening maritime surveillance to protect resources from illegal maritime activities, e.g., international piracy and IUU fishing, to maintain maritime safety and security of its maritime boundaries, e.g., ports and SLOC is crucial. For maritime surveillance, Bangladesh Navy (BN) along with Bangladesh Coast Guard and Special Warfare Diving and Salvage (SWADS) play an important role. Bangladesh Navy has hundred and ten surface ships, craft and boats, including six guided missile frigates, two patrol frigates, six guided missile corvettes, thirty-eight

[35] Ibid.

[36] M. S. Hossain, M. J. Uddin and A. N. M. Fakhruddin, "Impacts of Shrimp Farming on the Coastal Environment of Bangladesh and Approach for Management", *Reviews in Environmental Science and Bio/Technology*, Vol. 12, No. 3, 2013, pp. 313-332; M.S. Islam, M. Serajul Islam, M.A. Wahab, A. A. Miah and A.H.M. Mustafa Kamal, "Impacts of Shrimp Farming on the Socioeconomic and Environmental Conditions in the Coastal Regions of Bangladesh", *Pakistan Journal of Biological Sciences*, Vol. 6, No. 24, 2003, pp. 2058-2067.

[37] Mehedi Al Amin, "Reckless plastic waste dumping greatly endangering Bay of Bengal", *Dhaka Tribune*, 17 December 2018.

minor surface combatants of various types, thirty auxiliaries and amphibious landing craft and thirty-two small response boats as surface assets.[38] Besides, submarine branch and naval aviation wing are being operated with two diesel-electric attack submarines and fixed-wing aircraft and rotorcraft.[39] SWADS is trying to conduct special reconnaissance, anti-piracy, counter insurgency, counter narcotics, counter terrorism, covert insertions/extractions, hostage rescue and personnel recovery, hydro-graphic reconnaissance, intelligence gathering, raid and underwater demolition with 150 commandos and 200 divers.[40] In contrast, Bangladesh Coast Guard (BGB) lacks adequate resources particularly high-powered ships and other vehicles. Hence, necessary initiatives to modernize other agencies for strengthening maritime surveillance are highly needed.

Besides, maritime surveillance requires maritime infrastructure building and regional cooperation. For maritime infrastructure building, BN is currently setting up two new bases. One is at Rabanabad in Patuakhali named BNS Sher-e-Bangla and another is at Khilkhet of Dhaka named BNS Sheikh Mujib. In addition, an underwater expressway tunnel namely Karnaphuli tunnel is under construction in Chattogram. Along with these, the upgradation of Chattogram and Mongla ports and construction of deep sea port in Payra and Matarbari will serve as major strategic outpost for protecting Bangladesh's maritime boundaries and its resources.[41] Besides, regional cooperation for surveillance and information sharing is need of the hour. It is high time for South Asian littoral states (Bangladesh, India and Sri Lanka) along with Myanmar to outline a coordinated regional approach. Bangladesh needs to be a member state of the Indian Ocean Tuna Commission (IOTC).

3.4 *Technology Acquisition*

For sustainable exploration and exploitation of marine resources, the necessity of utilizing technologies is undeniable and technology acquisition is considered as an important priority sector for Bangladesh's blue economy. For marine fish stock assessment, a survey vessel, 'RV Meen Sandhani' was procured from Malaysia in 2016. It is capable to assess fish stock up to 200 metre depth only.[42] Later a Norwegian vessel named Nansen research vessel arrived in 2018 to carry out an acoustic survey in the maritime boundary of Bangladesh. The vessel can explore the availability

[38] Available at https://web.archive.org/web/20190225223925/http://www.navy.mil.bd/ships.php, accessed on 20 November 2019.
[39] Moutusi Islam, "Maritime Security Challenges for Bangladesh: Response Options", *BIISS Journal*, Vol, 40, No. 3, 2019, pp. 269-280.
[40] Eric Sof, "Bangladesh SWADS", *Spec Ops Magazine*, 20 October 2012, available at pecial-ops.org/864/bangladesh-swads-special-warfare-diving-salvage/, accessed on 03 March 2020.
[41] Moutusi Islam, op. cit.
[42] Sohel Parvez, "Marine survey in Bay from August 2", *The Daily Star*, 27 July 2018.

of pelagic, mesopelagic and bottom fish up to 1,000 metre depth.[43] Despite these, crucial is to acquire appropriate deep-sea fishing technologies and methods, i.e., long line and hook fishing; improved, faster and eco-friendly fishing trawlers; crafts and vessels for harvesting large pelagic fish. For marine aquaculture, adopting various farming technologies like shrimp brood stocks domestication; Specific Pathogen Free (SPF) seed; brood stock production and semi-intensive farming are also vital. Instead of using manually operated local equipment, the adoption of mechanical equipment (water pump, leveler, etc.) and reliable weather forecasting technology and transfer of advanced production techniques from Europe and North America are significant to enhance salt production. Moreover, shipping industry needs to embrace and adopt clean fuel, clean air and noise reduction technologies, e.g., blue technology and biotechnology.

Besides, comprehensive technological and technical knowhow is required for exploration and exploitation of natural resources specially exploring the petroleum and natural gas in the BoB as well as utilizing renewable energy including wind power, wave energy, tidal energy, Ocean Thermal Energy Conversion (OTEC) and biofuel from marine algae and sea grasses. Thus, Bangladesh needs to acquire sophisticated ocean technology like electronics; miniaturization of equipment; acoustic techniques; earth orbiting satellites; marine propulsion system; imaging and physical sensors; advanced materials (i.e., metallic, ceramic, polymeric and composite materials); information and communication technologies; big data analytics; autonomous systems; biotechnology; nanotechnology; subsea engineering; new technologies for deep seabed mining Vessel Traffic Management Information System (VTMIS) and ocean observing systems.

4. The Role of Public Actors in Bangladesh

Sustainable development of blue economy requires active participation and decisions by a wide range of public actors with common objectives. For Bangladesh's blue economy major public actors can be categorized into six groups — coordinating bodies, regulatory bodies, academic institutions, research institutions, training institution and security agencies based on their nature and scope of activities. Prime Minister's Office (PMO), Planning Commission (PC) and Blue Economy Cell (BEC) are the most important public coordinating bodies of blue economy. After the settlement of the maritime dispute, PMO started to give the utmost focus for the development of blue economy. With the guidance of PC, PMO established BEC

[43] "Norwegian research vessel arrives in Ctg for acoustic survey", *banglanews24.com*, 31 July 2018, available at https://www.banglanews24.com/english/business/article/69936/Norwegian-research-vessel-arrives-in-CtgforacousticCtg foracoustic-survey, accessed on 25 March 2019.

in 2017 with the mandate to coordinate blue economy initiatives across sectoral ministries.[44]

Given the breadth of economic activity in Bangladesh's ocean space, the government's objective is to promote a blue economy touches upon the responsibilities of regulatory bodies. Around 29 ministries and divisions are involved with blue economy.[45] The Ministry of Environment, Forest and Climate Change (MoEFCC) focuses on protecting the marine environment and resources. The Ministry of Power, Energy and Mineral Resources (MoPEMR) with Sustainable and Renewable Energy Development Authority (SREDA) and Bangladesh Power Development Board (BPDB) is concerned with the exploration and exploitation of marine mineral and renewable energy. The Ministry of Fisheries and Livestock (MoFL) with the Department of Fisheries (DoF) and Bangladesh Fisheries Development Corporations (BFDC) looks over marine capture of fish and aquaculture. The Ministry of Civil Aviation and Tourism (MoCAT) with Bangladesh Tourism Board (BTB) and Bangladesh Parjatan Corporation (BPC) is responsible for the expansion of marine tourism. The Ministry of Shipping (MoS) with Bangladesh Shipping Corporation (BSC), Department of Shipping (DoS) and Bangladesh's port authorities like Chittagong Port Authority (CPA), Mongla Port Authority (MPA) and Payra Port Authority (PPA) concentrates on providing maritime services for trade and shipbuilding activities. The Maritime Affairs Unit (MAU) of the Ministry of Foreign Affairs (MoFA) is consulting nationally and internationally to promote the concept of blue economy in the context of Bangladesh. Though each ministry focuses on specific priority sectors, sometimes ministries collaborate with each other in formulating, reviewing and consulting laws, policies and action plans. The MoCAT, BPC and MoS are jointly reviewing National Tourism Policy 2009. Again, the MoFL in collaboration with BCG and BN is consulting National Marine Fisheries Policy.[46]

For the enforcement of different policies, regulations and laws, the tasks of security agencies are immense. BN and BCG are not only responsible to maintain the safety and security of seagoing vessels, fishing fleet and all seafarers but also are entrusted with the task of providing surveillance.

Preservation of the marine environment, effective management of coastal zone and formulation of a sound ocean policy as well as the right strategy to address pertinent issues of blue economy require proper maritime research and development. In this regard, the Government of Bangladesh (GoB) has set up Bangladesh Fisheries Research Institute (BFRI), Bangladesh Oceanographic Research Institute (BORI)

[44] Rezaul Karim, "Ministries dragging their feet over tapping blue economy", *The Financial Express*, 28 July 2018.
[45] Ibid.
[46] Pawan G. Patil et al., op. cit.

and Bangladesh Institute of Maritime Research and Development (BIMRAD). BORI conducts research on physical, geological, chemical and biological oceanography and climate change. BFRI carries out basic and adaptive research for the optimum utilization of all living aquatic resources and coordinates fisheries research activities.[47]

A thrust in blue economic growth comes from a large number of skilled coastal and offshore engineers, navigators, merchant mariners, fisheries technologists and legal experts, etc. In this respect, the role of public academic institutions like Bangladesh University of Engineering and Technology *(*BUET), University of Dhaka (DU) and Military Institute of Science and Technology (MIST) as well as training institutions is essential. In due course of time, several public universities have started to offer programmes, training and courses on marine affairs. But none of them are fully marine based in nature and remain unable to encompass the maritime domain as a whole. To fill this vacuum, Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU) was set up in 2012 to be a centre of excellence in maritime education. The university has seven faculties and thirty-eight departments.[48] In addition, two training institutes, Bangladesh Maritime Academy (BMA) and Bangladesh Marine Fisheries Academy (BMFA) of BSMRMU as well as Bangladesh Institute of Marine Technology (BIMT) and National Maritime Institute (NMI) also play a vital role to create skilled manpower for judicious exploitation and exploration of marine resources through arranging on-board practical training.

Table 1 shows the role of six groups of public actors in different priority sectors of Bangladesh's blue economy. Although the role should be based on short, medium and long term, this paper divides it into two categories: (a) major activities so far and (b) expecting to do for a visionary future.

Table 1: Roles of Public Actors in Blue Economy of Bangladesh

Public Actors	Major activities so far	Expecting to do
PMO	Forming a high-level committee and BEC and signing a MoU in 2015 with India for blue economy development.	Formulation of Maritime Spatial Planning (MSP) and promoting and facilitating the development of marine industries as a core element of the economy.

[47] Ibid.

[48] M Ziauddin Alamgir and M Mojahid Hossain Chowdhury, "Maritime Education and National Economic Growth: Bangladesh Perspective", *Bangladesh Maritime Journal*, Vol. 3, No. 1, 2019, p. 37.

PC	Incorporating concept of blue economy as a potential driver of growth in Seventh Five Year Plan and identifying 12 actions to undertake for sustainable blue economy	Monitoring implementation status of 12 actions, setting a target to increase share in GDP and guiding relevant ministries, especially BEC to work in accordance with action plans
BEC	Working as a supporting body in organizing seminars and discussion meetings, providing support to state-owned Geological Survey of Bangladesh for purchasing the ship and preparing a road map for five years for the priority ministries and divisions to provide guidelines for blue economy development.	Preparing a comprehensive strategic action plan on blue economy; reviewing work plan and latest reports; drafting national maritime policy and strategy; making integrated coastal management; improving policy and regulatory transparency and creating incentives to encourage transformation of economy from 'brown' to 'green and blue' growth.
MoEFCC	Undertaking National Adaptation Programme of Action, Bangladesh Climate Change Strategy and Action Plan, Climate Change Resilience Action Plan to govern and protect marine resources; identifying and declaring ecologically critical coastal and sea area and formulating and implementing marine pollution (control) act, oil pollution (control) act, marine vessel air pollution (control) act and sea dumping (control) act.	Addressing externalities from industrial and agricultural pollution; creating marine dead zones; promoting biomitigation of climate change by blue carbon sequestrations and by restoring coastal ecosystems and habitats; creating green forest belt in coastal areas; conserving marine biological diversity, environment and resources and ensuring sustainable use of ocean.
MoPEMR, SREDA and BPDB	Exploring oil and gas; conducting non-exclusive 2D/3D seismic survey in designated blocks; extracting and commercializing heavy minerals from beach sands of coastal region; undertaking plan for constructing pipeline for LNG to national grid and project for collecting geological and oceanographic data; procuring multirole oceanographic research vessel for geological survey, seismic survey, seabed mapping and database creation and reviewing Renewable Energy Policy 2008 as well as National Energy Policy 2004.	Developing a strong renewable energy sector in coastal areas and offshore islands to generate electricity; encouraging PPP to share data and information; monitoring and best practices; ensuring no offshore drilling near marine protected area; formulating detailed and effective regulation for offshore drilling; having logical plan; multi-client survey and framework for harnessing and identifying potential oil and gas reserves and working with industries to reduce environmental impacts and improve energy efficiencies.

MoFL, DoF and BFDC	Undertaken action plans-Marine Fisheries Management: Plan of Action and Implementation, National Fishery Act 2017; reviewing policies-National Marine Fisheries Policy 2015, National Shrimp Policy, National Aquaculture Development Strategy and Action Plan; implementing projects related to aquaculture and exploration of economically important marine flora; location monitoring and surveillance of commercial fishing vessel by installing VMS and organizing blue economy dialogue on fisheries and mariculture.	Developing mechanisms for effective implementation of Monitoring Control and Surveillance (MCS) for artisanal and industrial fisheries; creating infrastructure and production facilities for coastal belt fisheries; standardizing techniques for maximizing production and better management of living aquatic resources and for aquaculture in case of domestic fish farming in the open sea; initiating seaweed, marine algae, shellfish breeding and culture; developing system to send real-time fishing survey information to the fishing community and developing region-wide standards for processing, certification, labeling and marketing of fish products.
MoCAT, BTB and BPC	Providing basic services, e.g., hotels, resorts and guest houses in coastal areas; promoting sustainable tourism to protect marine resources; formulating Tourism Board Act 2010, Bangladesh Tourism Protected Areas and Special Tourism Zone Act 2010 and reviewing National Tourism Policy 2009.	Formulating plan and vision for marine, eco, lighthouse and cruise tourism; promoting eco-diving, surfing, recreational fishing, boating, tour to Swatch of No Ground, evening live concerts and floating hotels; expanding tourism in 75 outer-islands as well as creating and increasing size of MPAs.
MoFA	Undertaking consultations to elaborate blue economy concept in Bangladesh's context; identifying 26 sectors of blue economy; hosting workshops at national level and third IORA Blue Economy Ministerial Conference in Dhaka to properly manage, exploit and fully utilize maritime resources; formulating policy guidelines on blue economy and going to enact Bangladesh Maritime Zones Act 2019 to establish Bangladesh's right over maritime area in line with UNCLOS 1982.	Pursuing blue diplomacy; using conference and conclave on blue economy to reach out to the international community; engaging with IORA, BIMSTEC and Indian Ocean Naval Symposium (IONS) to address Bangladesh's blue economy priorities and taking initiatives to engage bilaterally and multilaterally with neighbours for information sharing, joint management, surveillance and disaster management.

MoS, BSC, DoS, CPA, MPA, PPA	Developing shipbuilding industries; expanding domestic fleets, transshipments and transit provisions to increase revenue from shipping and commerce; ensuring licensing, registration and implementation of colour code for fishing trawlers/boats for safety and prevention of illegal fishing and also developing maritime services to support sea trade and transport function.	Following application of global market regulations for environmental standards; linking neighbours to seaports; turning ship recycling into a modern industry with eco-friendly infrastructure and compliance of international convention; increasing shipbuilding capacity of yards and capacity of dry docks and enhancing handling capacities of ports.
BSMRMU, BUET, MIST and DU	Conducting undergraduate and postgraduate programmes on maritime affairs, naval architecture, marine engineering and oceanography; developing competent maritime human resources and bringing all types of marine professionals on a common platform to share knowledge and perform research for the advancement of Bangladesh's maritime sector.	Promoting public awareness to make people ocean-oriented instead of ocean-blind; developing a marine science and technology plan to improve monitoring and understanding of the global ocean process; linking education and training to green and blue growth strategies and collaborating with universities and organizations both at home and abroad to enhance maritime education.
BFRI, BORI and BIM-RAD	Focusing on marine scientific research, physical, chemical and geological attributes, weather and climate services and oceanographic research; providing suggestions to relevant public agencies regarding management of marine resources and collaborating at national and international level in the area of maritime research.	Conducting multilevel research, workshops, seminars and hydrographic and oceanographic survey for sustainable development of maritime sector; enhancing research consciousness in maritime sector to address new dimensions with upcoming challenges and generating scientific understanding of marine ecosystem and resources to underpin their conservation and sustainable uses.
BMA, NMI, BMFA and BIMT	Conducting pre-sea training for ships ratings and seafarer in nautical and engineering discipline, creating skilled manpower for judicious exploitation and harvesting of maritime fisheries resources and conducting courses on marine and shipbuilding technology, marine diesel, fabrication shipbuilding welding and mechanical draftsman.	Training for personnel in coastal security, navigation, engineering, naval warfare, marine law, strategy and logistics management; developing training courses, seminars, symposium on integrated marine management and transferring advanced technologies to relevant users, e.g., fish farmers.

BN and BCG	Maintaining strategic control, surveillance and safeguard of SLOC for commercial trade; protecting illegal fishery, smuggling, human trafficking; conducting hydrographic and oceanographic survey; developing shipbuilding and repair industry; coordinating with relevant government organs, maritime agencies and organizations; ensuring law and order in EEZ; procuring maritime patrol aircraft and helicopter for maritime surveillance, rescue and salvage ship and conducting courses on basic hydrographic and survey recorder.	Conducting bilateral and multilateral exercise with regional nations to enhance interoperability; developing integrated system to provide continuous, real-time, all-weather detection and identification of intruding ships; establishing effective maritime rescue coordination centre to coordinate with search and rescue activities; arranging compulsory ship reporting system and differential global positioning system along the coasts for enhancing security and safety measures at sea and developing preventive and protective measures against infringement of maritime boundaries, security incidents affecting ships, offshore resources, crews, cargoes and port facilities.

Public actors are to examine justifiably whether existing rules and regulations meet and facilitate the priority sectors. Despite having several coordinating bodies, maritime interests and resources of Bangladesh are not well managed, neither the maritime activities are well-coordinated. There is a lot of duplication of efforts among the public maritime actors. Besides, till now BEC remains confined to holding occasional meetings due to lack of its adequate administrative setup and permanent manpower. Essentially, the government's move to tap the blue economy has hardly made any progress over the past three years mainly due to the dilly-dallying attitude of the ministries concerned and lack of proper coordination among the implementing ministries, divisions and agencies. A comprehensive plan on blue economy that is to be conducted by 25-member high-powered committee at PMO is yet to be prepared. Of the 60 decisions taken by the committee in different meetings, only some have been implemented by the concerned ministries and divisions.[49] Additionally, concerned 17 ministries and 12 divisions are yet to submit an interim report on development of the blue economy to PMO.[50] Furthermore, research organizations, training institutions and universities are also lacking standards because of the shortage of faculty.

Different public actors have undertaken various initiatives to facilitate the priority sectors of Bangladesh's blue economy to promote sustainable and inclusive growth and employment opportunities in Bangladesh's maritime economic activities in the short, medium and long-term time frames. However, these initiatives are not adequate to harness the full potential of 26 sectors of blue economy as identified by

[49] Rezaul Karim, op. cit.
[50] Ibid.

MoFA. Hence, for a sustainable blue economy, public actors need to be inclusive, well-informed, precautionary and adaptive, accountable and transparent, holistic, cross-sectoral and long-term, innovative and proactive.

5. Way Forward

Marine affairs of Bangladesh are characterized by sectoral policies. Recently, public actors of blue economy sectors are reviewing and developing their policies and strategies without taking necessary considerations of inherent interconnections across the sectors that share a common space. It justifies the necessity to come up with a comprehensive multi-sectoral national blue economy policy to guide various sectors through a common policy building on trade-offs and synergies. To formulate such a policy, Bangladesh can follow seven steps, e.g., agenda setting awareness and sensitization; coordination in formulating the blue economy policy; building national ownership of the blue economy policy formulation process; sector identification and prioritization; designing the blue economy policy; policy implementation and monitoring and evaluation .[51] To implement the national blue economy policy, it also requires to formulate and strengthen legal frameworks like enacting 'Bangladesh Maritime Zone Acts' to help protect rights in the maritime resources and to ensure the security of the maritime boundaries.

Formulation and implementation of a multi-sectoral national blue economy policy also require institutional harmonization at each level of governance and consistency in the agreed goals and objectives of blue economy. Setting up a coordinating institution would inevitably be a positive step in the direction. With respect to institution building, the most critical point perhaps is to ensure that all the concerned stakeholders and their interests are represented. In building institution, Bangladesh can consider different options to coordinate different organizations and agencies. ***First,*** it can build up several institutions to coordinate all the maritime activities. Like Department of Ocean Development for marine research and development agenda; National Ocean Ministerial Board to oversee the implementation, prioritization, budgetary allocation, regional cooperation and the further development of ocean policy; National Ocean Advisory Committee to advise the ministerial board on cross-sectoral ocean issues and National Ocean Office to do the main administrative coordination between government organizations and commercial operator.[52] ***Second,*** Bangladesh can follow the examples of Mauritius

[51] United Nations Economic Commission for Africa, *Africa's Blue Economy: A Policy Handbook*, Addis Ababa, Ethiopia: Economic Commission for Africa, 2016, pp. 67-84.

[52] M Khaled Iqbal, "Ocean Policy for Bangladesh—A Comprehensive Roadmap", *Bangladesh Maritime Journal*, Vol. 3, No. 1, 2019, p. 10.

and Seychelles by establishing a designated Ministry of Blue Economy.[53] ***Third,*** it can also establish a separate department for blue economy through comprising representatives from all other ministries relevant to ocean management.[54] ***Fourth,*** it can also think of building a National Maritime Commission/Council (NMC) as a unifying interagency/ministerial body with monitoring cells to bring together policy and operational agencies with a view to ensure the proper outcome from the overall activities.[55] Whatever options Bangladesh chooses, it needs to ensure that the institution must be endowed with legal powers to reap the benefits of the blue economy.

At the operational level, a multi-sectoral national blue economy policy needs to be pursued through a nationally integrated maritime strategy. Adoption of an integrated strategy will complement the existing sectoral strategies of blue economy. It should be achieved through step by step process. Recently, MSP is gaining attention as a new integrated strategic approach to sustainably manage marine resources by integrating socio-economic and environmental concerns at the same policy.[56] With a growing interest in marine affairs, MSP can provide a strategic framework for achieving blue economy policy goals for Bangladesh. In the planning and development of MSP, it can learn lessons from countries like Australia, Germany, Belgium and Japan which have successfully implemented MSP to boost economic activities in the ocean. For the proper management of marine resources, MSP also needs to develop alternative thinking regarding marine living and non-living resources. For example, it must look for other important uses of fish parts, e.g., fish oil, fish liver residue and fish ensilage, fish maws, fish hydrolysates and peptone. In addition, with the momentum of the fast-increasing aquaculture and huge success in inland aquaculture, MSP should replicate such expertise in sea aquaculture for seaweed, pearl and oyster. Besides, strengthening regional fisheries bodies, national fisheries management agencies, fishing community and fish workers organizations, regulating and controlling harvesting as well as diversifying fishing areas to avert risks associated with overfishing of certain fish stocks are critical for sustainable and equitable use and management of marine resources through MSP.

The development of MSP and multi-sectoral ocean policy also require surveying marine resources. Indeed, Bangladesh still does not know how many

[53] Moutusi Islam and Lam-ya Mostaque, "Blue Economy and Bangladesh: Lessons and Policy Implications", *BIISS Journal*, Vol. 39, No. 2, 2018, p. 136; Md Shahidul Hasan, "Maritime Verdicts and Resource Exploration for Bangladesh", *BIISS Journal*, Vol. 35, No. 3, July 2014, p. 227.
[54] Abul Kalam Azad, op. cit.
[55] Moutusi Islam and Lam-ya Mostaque, op. cit.
[56] Kawshik Saha and Afsana Alam, "Planning for Blue Economy: Prospects of Maritime Spatial Planning in Bangladesh", *AIUB Journal of Science and Engineering*, Vol. 17, No. 2, 2018, pp. 59-66; Vijay Sakhuja and Kapil Narula, *Perspective on Blue Economy*, New Delhi, India: Vij Books India Pvt Ltd, 2017, pp. 11-14.

varieties of fish and the exact amount of marine resources exist beneath the BoB as no surveys have been conducted during the last three decades. Before anything, a comprehensive, multi-client, consolidated and pragmatic survey of marine resources is needed which can well unveil the vastness of marine resources, quantity of the exploitable resources, their different industrial benefits and potentiality of exports. In this respect, Energy and Mineral Resources Division's moves towards conducting a multi-client survey, Petro Bangla and the United States Geological Survey (USGS)'s joint survey to identify potentials of oil and gas exploration in the offshore areas[57], the arrival of Norwegian vessel and procurement of RV Meen Sandhani from Malaysia to assess fish stock have been a good start.[58]

For blue economy to be sustainable, the significance of efficient maritime professionals, e.g., legal practitioners, environmentalists, mariners, engineers, oceanographers, hydrographers, researchers and academicians are crucial. Numbers of institutions have offered graduates, postgraduate degrees and training courses related to maritime affairs but these institutions often lack standard education. Consequently, Bangladesh is yet to project itself as a prospective maritime country with vast potentialities. In this regard, the country needs either to establish a central single controlling body like the Indian Institute of Maritime Studies or declare BSMRMU as a central body to maintain maritime education standard. Such a central body needs to foster maritime studies, develop new interdisciplinary and multidisciplinary educational approaches towards the oceans, initiate extensive new training about applicable international law and legislation as well as regional and sub-regional instruments and policies for officials involved in relevant blue economy sectors and ensuring equitable and beneficial collaboration between Bangladesh's newly established institutions and other universities of China, UK, France, Germany, Japan, Australia and the USA to develop high-tech multi-disciplinary education system.

Marine professionalism and development of the blue economy need to be firmly embedded in marine research and development. Thus, Bangladesh should conduct medium and long-term research on preservation, processing and quality control of marine products, fisheries, aquaculture as well as discovery and utilization of off-shore and deep-sea minerals, physical oceanography, ocean currents, waves and interaction between water and atmosphere, offshore wind and tidal industry and prospect of different marine industries like macroalgae, mussels clams oysters, pearly oysters, sea cucumber and sea urchin. In this respect, establishment of a research laboratory solely dedicated to marine research and exploration of ocean

[57] Shaikh Rezanul Haque Manik, "Blue Economy: A New Prospect for Bangladesh", *The Daily Sun*, 20 February 2018.

[58] "Norwegian research vessel arrives in Ctg for acoustic survey", op. cit.

resources in BUET is a welcoming step. Despite this, Bangladesh Institute of Maritime Research and Development (BIMRAD) should focus more on research projects solely dedicated to the blue economy. Sound research in these sectors also requires sufficient funds. With this respect, it needs to undertake two steps. ***Firstly***, in national budget, ensuring enough budgets for maritime research. The government's initiative to fund 1,400 crore projects for strengthening marine research efforts to explore untapped resources from the Bay is a welcoming step.[59] In allocating fund, government can follow Systematic Investment Plan (SIP) where a small amount of funding (e.g., BDT 0.2 million) could be provided to researchers for a year and based on the progress, further funding can be extended. ***Second*** is harnessing the financial support from the international agency. For example, Bangladesh can take the opportunities from the flagship Horizon 2020 programme of the EU which funds blue economy related research and innovation in EU and beyond. Also, Bangladeshis can look for individual research grants and research jobs in Europe using 'Euraxess' portal.[60]

Essentially, exploration and exploitation of marine resources depend on marine technological capacity building.[61] However, it is an expensive affair. Bangladesh can explore two possible options. ***First*** is asking for public finance to enhance the status of Bangladesh in marine technology. ***Second*** is seeking foreign direct investment and going for foreign assistance in the form of loans and grants. But experts opine that efforts should be rendered for creating maximum funds and revenues from public sources.

The development of blue economy also depends on building of marine and coastal construction in seas and coasts. However, such kind of marine affairs become too expensive for a developing country like Bangladesh. Therefore, Bangladesh should make an all-out effort to attract foreign investors in the sectors like port, offshore LNG platforms, coastal energy hubs and special economic zones, climate adaptation and resilient new industrial complexes, infrastructures, buildings and networks of services mushrooming in Cox's Bazar, Kutubdia, Maheshkhali, Patuakhali, Khulna and Mongla areas.

Scholars note that aspects of marine pollution, fisheries management, protection and preservation of marine environment, marine scientific research, marine safety, enforcement responsibilities and disaster management can be

[59] Ahmed Noor Hossain, "How we can manage our marine resources better", *The Daily Star*, 26 February 2017.
[60] "Blue economy: EU invites Bangladesh to take benefit from 'Horizon 2020'", *bdnews24.com*, 25 November 2018, available at https://bdnews24.com/economy/2018/11/25/blue-economy-eu-invites-bangladesh-to-take-benefit-from-horizon-2020, accessed on 25 April 2019.
[61] Md. Jahan Shoieb and Md. Muhibbur Rahman, "Emerging Strategic Landscape in the Bay of Bengal and Maritime Capability Building of Bangladesh", *BIISS Journal*, Vol. 35, No. 1, 2014, p. 31.

addressed through maritime cooperation between and among the littoral states.[62] Considering these issues, through pursuing maritime diplomacy, Bangladesh needs to build partnerships among and between stakeholders across countries, oceans and international systems on blue economy. It should be based on mutual trust and respect, common area of interest, equitable sharing of benefits to secure sustained and beneficial outcomes for all blue economy-centric enterprise. In this respect, Bangladesh must value maritime diplomacy to develop a regional cooperative management regime for straddling and highly migratory fish stocks, quick regional response for jointly protecting regional MPA, joint patrolling for surveillance and exchange of intelligence and joint hydrography and seismic survey for regional maritime scientific research programme. Besides, it needs to arrange dialogues at regional and international levels not only for exchanging information and knowledge but also for sharing legal, policy and institutional expertise among states to achieve objectives of blue economy. In building partnerships, Bangladesh needs to engage actively with institutions like IORA, BIMSTEC, IONS, etc. at regional level and with World Bank, European Development Bank, United Nations Educational, Scientific and Cultural Organization, United Nations Environment Programme and the EU at the international level.

6. Conclusion

After the settlement of maritime delimitation dispute with the neighbouring countries, adoption and implementation of the blue economy concept, methods and plans for sustainable use of its coastal and ocean spaces have increased in Bangladesh. Hence, this paper aimed at identifying the priority sectors and major public actors for nurturing the concept of blue economy in Bangladesh. Besides, it also suggests major ways to guide Bangladesh's blue economy.

Blue economy concept has ushered in a new horizon for the economic development of coastal countries like Bangladesh. Different scholars have tried to define the concept of blue economy differently because of their different approaches. Similarly, the concept has also sparked interest in Bangladesh. A number of consultations at the national and international levels have been initiated by the government to elaborate on the concept of the blue economy in the context of Bangladesh since 2015. By synthesizing different scholars understanding, the paper proceeds with an analytical framework comprised of two things (a) priority sectors of blue economy and (b) its concerned actors.

[62] Christian Le Miere, *Maritime Diplomacy in the 21st Century: Drivers and Challenges*, London and New York: Routledge, 2014, p. 6; Md. Khairul Islam, Mahbubur Rahaman and Zobayer Ahmed, "Blue Economy of Bangladesh: Opportunities and Challenges for Sustainable Development", *Advances in Social Sciences Research Journal*, Vol. 5, No. 8, 2018, p. 169.

Based on the nature of activities, the paper identifies four groups of priority sectors of Bangladesh's blue economy, e.g., exploration and exploitation of resources, expanding marine activities, protection of resources and technology acquisition. Exploration and exploitation of resources include harnessing the potential of large pelagic fishes, marine aquaculture and other non-living resources like mangrove forests, salt marsh and seagrass beds, oil, gas, polymetallic sulphides, ferromanganese crusts and ferromanganese nodules of the BoB. Marine activities can be structured into two aspects: advancing resources exploration or exploitation activities and increasing maritime-related services like trade through establishing deep sea port, tourism, shipbuilding, shipbreaking and ship recycling. Moreover, due to wide range of marine activities, the country is rigged with the secular depletion of ocean resources. As a result, protection of resources has been the third priority sector. Moreover, regulation of coastal marine environment, MPAs, maritime survey and surveillance also entail multiple-level cooperation, especially for technology acquisition. Thus, technology acquisition is the last priority sector.

Effective operation of the priority sectors depends on the involvement of several concerned actors. However, the paper limits its scope to trace the role of the most important public actors of blue economy as they remain at the forefront of policymaking and implementation. It is found that some 29 ministries and divisions concerned are involved with the blue economy. In this connection, it categorizes the actors into six groups, e.g., Coordinating Bodies, Regulatory Bodies, Academic Institutions, Research Institutions, Training Institutions and Security Agencies. Under the visionary leadership of the current government, these public actors have undertaken a number of initiatives like formulating, reviewing and developing sectoral policies and plans, commissioning research vessels, conducting various programmes, training and courses on maritime affairs and maintaining safety and security at the sea, etc.

Despite these initiatives, Bangladesh is yet to harness the full potential of its marine based economic activities and resources due to the lack of proper coordination, national blue economy policy and management approach, MSP, human capital, institutional arrangement, research, technology, proper monitoring and evaluation frameworks. With this respect, formulating a national blue economy policy along with the development of nationally integrated maritime strategy and legal frameworks like, 'Bangladesh Maritime Zone Act' is need of the hours. Besides, maintaining institutional harmonization at each level of governance and consistency in the agreed goals and objectives of blue economy through proper institution building, like National Maritime Commission/Council (NMC) or Ministry of Blue Economy or Department of Blue Economy or a set of institutions to bring together policy and operational agencies is crucial. Furthermore, making a comprehensive MSP;

surveying of sea resources; marine technological capacity building; maintaining standard maritime education; research and development with marine professionals; allocating adequate public and local funds and attracting foreign investments in blue economy sectors; e.g. in building marine and coastal constructions is also crucial. Besides, for full-fledged development of blue economy also require is to maintain cooperation between and among littoral states and engaging with regional and global platforms through pursuing maritime diplomacy.