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A review on blue economy in Bangladesh: prospects and challenges

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ABSTRACT

Blue Economy more precisely "ocean-based economies" is now being considered as an auspicious sector in Bangladesh which refers to the proper utilizations of oceanic resources for sustainable economic growth of a region or country. The current review paper has focused on the development of ocean economy by means of enhancing social inclusion, environmental sustainability and innovative, dynamic business models. Bangladesh is blessed with 710 km long coastlines with 200 nautical miles of resourceful Exclusive Economic Zone (EEZ) in the Bay of Bengal, creating huge opportunities to bring out a sustainable output through the utilization and optimization of ocean-based resources. Because of being large delta in the world, Bangladesh is enriched with enormous range of marine biodiversity including fishes, shrimps, mollusks, crabs, mammals, seaweeds and creation of employment opportunities. Blue Economy has also opened a new window of opportunities including commerce and trades, tourism, biotechnology, pharmaceuticals, use of deep sea port, foreign trade and so forth. But we have some challenges to the perspective of Blue Economy such as frequent floods, marine pollution including Ocean acidification and blue carbon, lack of trained personnel, harmonizing sectoral policies, plans and laws, poor ocean governance and political support etc. Some potential solutions need to be adopted by collaborating different sectors for the development of Blue Economy in Bangladesh.

INTRODUCTION

Blue economy is the economy of ocean Blue Economy which is a commonly usable word that eventually have no universally accepted definition (Bollmann, 2010). Thefirst idea received huge attention in recent RIO+20 United Nation (UN) Conference on sustainable development, which was held in Rio de Janeiro, Brazil in June 2012 (Smith-Godfrey, 2016). Some certain oceanic activities are considered as the integral parts of Blue Economy (Pauli, 2010). But not only oceanic activities but also all kinds of oceanic activities are considered as Blue Economy. A total of 26 marine economic functions including fishery, maritime trade and shipping, energy, tourism, coastal protection, maritime monitoring and surveillance etc. can be recognized as the integral parts of Blue Economy (Islam et al., 2018). The objective of blue economy is to make the appropriate use of marine assets containing all economic exercises which are related with seas, ports, coastal zone and other ocean-based exercises to entirely reduce ecological hazard and enhance human prosperity. Blue Economy primarily targets on establishing organic recycling processes to find out making various anthropogenic wastage re-useable innovatively. This economy helps to utilize marine assets not only nationally but also universally. In this way, Blue Economy contributes both deeply in the improvement of economic development and social welfare.

The sustainable utilization of oceanic resources helps Blue Economy to stimulate economic growth with technological inputs without hampering the ocean ecosystems. This helps to improve livelihoods and meet the demands for jobs (Sarkar et al., 2018). An estimation said that ocean-based businesses contribute more than 500 billion USD to the world's economy (Ocean, 2017). According to a report of OECD,'s in the year of 2010, the estimated economic value of ocean outputs was $ 1.5 trillion which is

corresponding to 2.5% of world's gross economic worth (OECD, 2016). Blue Economy also contributed around 31 million direct full-time jobs (around 1% of global workforces) in 2010 (OECD, 2016). The contribution of ocean on global fisheries production is about 81.5 metric ton annually (FAO, 2016). The livelihood of 8% world's population is directly or indirectly supported by marine fisheries sectors and it also contributes 230 billion USD to the global economy (Sumaila et al., 2011). About 80% of global trade's transportation i.e. goods are transported by sea routes depend on the oceans (Corbett and Winebrake, 2017). The global marine and coastal tourism also contribute about 161 billion USD annually (FAO, 2016).
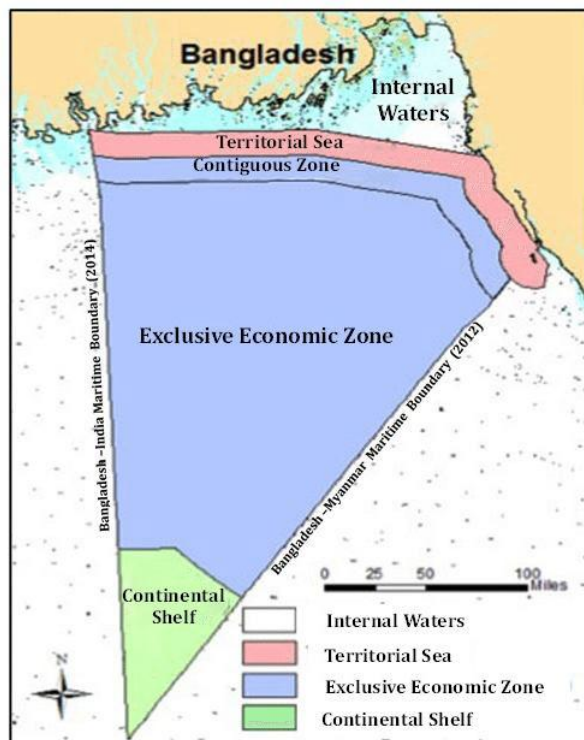
Figure 1: Maritime boundary of Bangladesh. Figure adopted from Hussain et al. (2019)

Context of Blue Economy: Where we are?

The concept of Blue Economy was perhaps unknown in Bangladesh. The importance of Blue Economy in Bangladesh has rapidly started after the achievement of maritime boundary (Figure 1) delimitation dispute with Myanmar (2012) and India (2014). Bangladesh possesses 710 km long

coastlines with 200 nautical miles of an Exclusive Economic Zone (EEZ) in the Bay of Bengal.So, the government has recently started to adopt the concept of Blue Economy with the stakeholders by relevant policies and plans(Bari, 2017). Since 2015, the Government of Bangladesh (GoB) has been undertaking several Consultations and workshops on Blue Economy.

In 2017, the GoB has established the "Blue Economy Cell' with the mandate to coordinate Blue Economy initiatives across sectoral ministries. Focusing the significance of blue economy, Prime Minister Sheikh Hasina (on first September 2014 in the global workshop on the blue economy in Dhaka) said that marine-based economic activities and administration of ocean and its assets through 'Blue Economy' could make new skyline for the improvement of a coastal nation like Bangladesh (Islam et al., 2018). According to a World Bank report, the gross value added to Bangladesh in 2014-15 from ocean economy was US$ 6,192.98 million which was around 3.33 per cent of the Bangladesh economy Again, ecosystem services from the coastal and marine ecosystem creates livelihoods and income of millions of people living in the coastal region of Bangladesh (Islam and Shamsuddoha,2018). Considering the importance of Blue Economy, the government of Bangladesh has recently emphasized on enhancing Blue Growth and achieving sustainable development goals (SDGs) (Sarker et al., 2018).

Potential opportunities of Blue economy of Bangladesh

The coastal areas and the Bay of Bengal are the heart of blue economy in Bangladesh. Most of theocean economic activities including marine fishing, tourism, research based on the Bay of Bengal consequently change the livelihoods and social status of millions of people inhabiting across the coastal areas (Sarker et al., 2018; Hussain et al., 2017). There are several sectors of the blue economy that offer potentials for development to achieve food security and economic development objectives. The potential highlighted sectors for the development of ocean economics in Bangladesh including Fisheries, Marine Biotechnology, marine tourism, marine

commerce, shipping and navigations, salt productions, oil and gas mining, bio fueling, and extraction of ocean energy (Rahman, 2017; Hussain et al., 2017; Islam and Shamsuddoha, 2018).

It has been observed that different economic sectors contributed to the blue economy of Bangladesh with increasing trend (Table 1)

Table 1: Financial evaluation of major blue economics sectors in Bangladesh from 2010 to 2015 (million US$)

Economic Sector	2010	2011	2012	2013	2014	2015
Marine fisheries	843.75	949.48	1107.42	1231.06	1384.77	1475.66
Oil	21.90	23.84	26.82	28.77	29.35	34.05
Gas	948.35	956.30	1041.35	1127.73	1158.13	1,305.42
Sea salt	119.25	123.48	160.90	206.00	212.35	214.84
Sand, Mineral and Coals	735.18	944.39	1183.79	1452.46	1644.08	1893.14
Water Transport	1,215.14	1330.36	1450.21	1606.10	1682.31	1,816.67
Trade & Shipping	31,390.15	36,178.04	41,728.94	47,156.44	52,078.80	58,466.90

Sources: Data adopted from Bangladesh Bureau of Statistics (BBS, 2017, Hussain et al., 2017)

Potentialities of fisheries and coastal

Aquaculture

Global food security is very closely related to the sustainable use of marine biodiversity particularly to the exploitation of wild fisheries. One billion people in developing countries depend on seafood for their primary source of protein. The most important areas of the national economy of Bangladesh are the Bay of Bengal and adjacent coastal areas which areenriched with very wide ranges of diverse flora and fauna including fishes, shrimps, mollusks, crabs, mammals, seaweeds etc. The current total fish production is 3.68 million tons, contributing to the 3.69% GDP. The capture fishery contributes to 1.0 million tons (28%), aquaculture 2.2 million tons (56%) and marine fisheries 0.6 million tons (16%) of total fish production (Shamsuzzaman et al., 2020). The single fish species, *Tenualosa ilisha*, accounts nearly about 42% of total marine catches and 10.5% of the total fish production of the country (Asaduzzaman et al., 2020). In fact, marine aquaculture is mainly based extensively with tiger shrimp (*Penaeus monodon*) culture (Chowdhury et al., 2019) and at limited scale with soft shell crab (*Scylla serrata*) culture and major export is being presently dominated by frozen shrimp and live mud crab and contribution of fin fishes as export

items are scanty (Rouf et al., 2016, Sarwer et al., 2017, Bir et al., 2020). In the year 2015, total shell fish and fin fish exported from Bangladesh about US$ 582 million (DoF, 2016).

Capture and culture fisheries in Bangladesh

Fisheries sectors including culture and capture fisheries greatly contribute the economic development of Bangladesh. Artisanal small-scale fishery contributes 0.51 million tones (86.8%) of the total marine catch (DoF, 2016) including gill nets, set bag net, seine net, push net, hook and line, trammel net etc. are mostly used for fishing within 10-30 meters water depth where trawl fishery contributes only 0.084 million toneswhich is 14.2% of total marine production (DoF, 2016). Large trawlers are used for mostly penaeid shrimps and finfish fishing within the depth of 40-100 meters (Hussain et al, 2017, Rahman, 2017). In case of marine capture fisheries, still depending on traditional fishing practices beyond the standing fishing grounds within 200 nm of EEZ (Shamsuzzaman et al., 2020). Another important task is rehabilitation of hilsa fishery. At present 50-60% of global hilsa catch takes place in the coastal and marine waters of Bangladesh, 20-25% in Myanmar, 15-20% in India and the remaining 5-10% in other countries (Hossain et al., 2014, Asaduzzaman et al., 2020). Hilsa is a

transboundary species of Bay of Bengal and Bangladesh, India and Myanmar might be effective to prevent the harvest of hilsa juveniles (Asaduzzaman et al., 2020). The government of Bangladesh has already taken initiatives to protect the mature brood stock during the banning period and being successful in this issue. Similarly, some regulation measure can be addressed on indiscriminate harvesting of mature mother shrimp, *P. monodon* by trawling at the depth of 10-40 meters of inshore marine waters and it will certainly conserve the tiger shrimp brood stocks (Hossain et al., 2014, Rahman, 2017, Chowdhury et al., 2019).

On the other hand, Aquaculture is rapidly increasing sector in coastal area. Shrimp and prawn together are the second major exportable items contributing to overseas exchange incomes of Bangladesh (Ghosh et al., 2016; Azad et al. 2019; Chowdhury et al. 2019). In Bangladesh, the export of frozen shrimp was 15,023 tonnes in 1988, which tripled to about 49,907 tonnes just after two decades later in the year of 2008 (Chowdhury et al., 2019). Over 80% was exported to the EU market in 2017, especially to the Netherlands, Germany and Belgium. According to FAO statistics, Bangladesh is ranked 5th in world aquaculture production (DoF, 2017). The leading freshwater aquaculture species are carps, tilapias, catfishes (Pangasius and Asian catfish) and climbing perch in Bangladesh. But in marine aquaculture Bangladesh is still lagging behind the other South East Asian countries like China, Myanmar, Philippines and Vietnam (Ghosh et al., 2016). Another potential coastal species is of sea bass, *Lates calcarifer*, which is nutritious and attaining importance as a high value aquaculture species. Along with sea bass, tilapia, mud crab and mullets have a great potentiality for coastal mari-culture and pen culture (Monwar et al., 2013, Haque et al., 2019, Bir et al., 2016).

Culture of nontraditional fauna

There are also many existing opportunities for mari-culture of some nontraditional species. These nontraditional species include not only seaweeds but also some other macro algae, mussels, oysters and other shellfishes like edible oysters, Crassostrea sp., Saccostrea sp., pearl oyster,

Anadrasp., green mussel, Pernaviridis, clam, *Meretrix meretrix*, *Marcia opima*, sea snails etc. Lesson, for adopting innovative technologies, can be learned from the other countries to initiate mari-culture of above-mentioned species and also for sea urchin, sea cucumber, etc. (Ahmed et al., 2013, Failler et al., 2017, Hussain et al, 2017).

Production of rock and sea salt

Bangladesh has huge opportunities of sea salt production because of huge coastal area with favorable environment. Salt production in Bangladesh has been traditionally practiced mostly onshore areas like Chakaria, Cox's Bazar, Bashkhali, Technaf, etc (Hossain et al., 2006, Alam, 2014). In spite of having enormous potentiality, still most of the salt farm remain in small scale just conventionally the farmers lease the landfrom landowners and captive the seawater with a fence (Hossain et al., 2006). There for the production and quality of salt not enough satisfactory level. Here in Bangladesh average crude salt production is about 7000-10,000 kg/ha (Alam, 2014). Moreover, salt industry tremendously affected by sea level rise, degradation of coastal areas and ocean pollutions thus reduces the rate of salt production (Sarwer and Khan, 2007, Miah et al., 2010, Hussain et al., 2017). Recently, some advanced countries in Europe and North America are using modern techniques and collecting and refining common salt by mining. If we can introduce these technologies, salt productions will increase and might be a good renewable resource in Bangladesh.

Marine tourism and recreations

Marine tourism is now very appealing sectors around the world and most often these contribute to economic, social and environmental upliftment of local communities. Tourism sector has a great linked to hospitality, restaurant business and catering activities that globally contributes 5% of world GDP and 6%–7% of global employment (Failler et al., 2017, UNWTO 2019, Bhuiyan et al., 2020). As usual marine tourism has enormous scopes in Bangladesh that already expanded dramatically since last decays and creates livelihood and employments opportunities of

opportunities of people from coastal areas (Nobi and Majumder, 2019, Hossain et al., 2014). The main onshore and offshore tourism activities in this country laying in the southern territory including a distinctive long coastline, the world's longest sea beaches (i.e. Cox's Bazar), the largest continuous mangrove forest of the world, the Sundarbans, and only coral island, the Saint Martin Island (Amin, 2016, Islam et al., 2018, Bhuiyan et al., 2020). In an estimation, about 1.5 million tourists visited these areas in 2015 mostly for surfing, boating, diving, fishing, and tracking (MoFA 2016). Many private organizations nowadays are interested to join and invest their capitals in marine tourism. It is no doubt that, the growth of tourism in Bangladesh is still lagging behind compared to the world therefore the economic contribution of this sector is still below the mark (Nobi and Majumder, 2019, Bhuiyan et al., 2020). Although tourism sectors highly contribute in national economy, inversely having negative effects on the environment and natural resources, such as pollution, excessive tourist load, coastal erosion and proper management of tourist spots (Rahman 2017, Jafrin et al., 2019). So concerned ministry and department of the country should establish effective national strategy for well-planned tourism and to facilitate and attract the foreign visitors.

Marine trade and navigations

Bangladesh has huge opportunity in marine trade and navigations sectors because of its geographic locations. There are three deep seaports which playing very significant contributions in national economy and also considered one of the best business hubs in south Asia. In Bangladesh, almost 90% seaborne trade has been carried through deep seaport. According to Alam (2014), at 2013-2014 fiscal year about 2500 numbers of foreign (merchant and cargo goods) ships anchored in Bangladesh's seaports where the value of exported and imported goods were approximately US$ 67 billion (Hossain et al., 2014, Hussain et al., 2017). To enhance marine trade, shipping and transport related activities the concerned ministry and department should make effective planning and actions to secure jobs for the country's population and to grow foreign exchange earnings (Islam and Shamsuddoha, 2018).

Blue biotechnology

Marine biotechnology opens a new door for the exploration of ocean resources (Hussain et al., 2018). Commonly appropriate application of scientific and engineering principles to the processing of materials by marine biological materials to provide the products and services is the main aspect of biotechnology (Zilinskas et al., 1995). Gene sequencing technologies for living organisms are key indicators to provide input for blue economy for the underwater world which remains mostly unexplored and understudied (MoFA, 2020). It explores the oceans which is helpful to understand such as how organisms that can withstand extremes of heat and pressure and grow with no light could be used to develop novel pharmaceutical drugs, chemical agents, enzymes and other industrial products and processes (Hussain et al., 2017). It provides bio-sourced products such as coating with anti-fouling or anticorrosive properties for maritime transport and shipbuilding (MoFA, 2020). The opportunity for application of marine biotechnology in Bangladesh is extremely encouraging (Hussain et al., 2017). Blue biotechnology can also contribute towards the development of specific biopolymers and bio membranes that enhance the general efficiency of desalination process. Bio stimulation may be used for protecting natural habitats by fostering bioremediation after important pollutions (oil spill hydrocarbon degradation). However, promoting new (bio-) technologies, cross-cutting services and suppliers that can bring about advantages that cannot always be foreseen in maritime sector.

Oil, gas and minerals mining

Within the maritime domain of Bangladesh, there can be several rich oil and gas reserves as India and Myanmar sites, which must be explored and exploited. Bangladesh is yet to assess the complete potential of its offshore oil and gas prospects. Some 26 Tcf (trillion cubic feet) gas reserve has to this point been found in Bangladesh, of which only about 1 Tcf is found within the offshore areas (MoFA, 2020). within the Meantime, Bangladesh drilled 20 wells within the offshore locations of the BoB but just two gas reserves (Sangu and also the Kutubdia) were found (Hossain et al., 2014). Within the country, Bangladesh Petroleum

Exploration & Production Company Limited (BAPEX) is that the only approved company to hold out oil and gas exploration and exploitation. However, a logical plan is critical to hold out multicline survey (using state of art technology) in Bay to spot potential oil and gas fields, and their reserves. Public and personal partnerships are to be encouraged and allowed to share data and data, monitoring, and best practices, moreover as monitoring and assessment protocols and results (Hussain et al., 2017).

The exploitation and mining of minerals, apart from sand and gravel, from the ocean have just started. According to the EU Commission (2012), 5% of the world's minerals, including cobalt, copper and zinc could come from the ocean floors by 2020. This might rise to 10% by 2030. Besides oil and gas, potential natural resources yet to be explored within the maritime boundaries of BoB. But there might also be promising potentials of deposits of marine minerals from deep sea mining at the seabed areas to explore the weather belonging to the categories like polymetallic sulphides, ferromanganese crusts, ferromanganese nodules and rate earth elements e.g. Yttrium etc(Hussain et al., 2017). They vary in composition, shape and site. If these resources are managed correctly, this natural capital can be converted into jobs, infrastructure, public service improvements and growth within the domestic private sector (Alam, 2004). The whole coastal belt has been explored with the invention of 17 deposits of probably valuable minerals like zircon, rutile, ilmenite, leucoxene, kyanite, garnet, magnetite and monazite etc. (Alam, 2004). For accelerating the mineral mining opportunities under blue economy, it is very important to update the potential evaluation initially that was conducted in 1994 (Hussain et al., 2017). Then proceeded to way forwards for further exploration even to the onshore, offshore and deep-sea minerals mining.

Major challenges of Blue economy in Bangladesh

Sustainable exploitation of the ocean resources is very necessary for maintaining the health of the global ocean to ensure global food security, economic growth, and livelihoods to the coastal communities. The role of marine resources in poverty alleviation, acquiring autarky in food productions, protecting environmental balance, facing adverse impacts of climate change and other economic possibilities are unlimited. Being a productive economic sector of blue economy are emphasized and considered in harnessing the full utilization of ocean-based resources within the present maritime boundary of Bangladesh (Hossain et al., 2014, Hussain et al., 2017). But due to a lack of implementation and enforcement of management measures, in Bangladesh many opportunities in marine resources development remain untapped (Islam et al., 2018).The lack of proper policy and resource persons at national policy level in ministry or department is a major challenge for the sustainable development of blue economy in Bangladesh. Coastal space forces to be guaranteed our sovereignty and maintain safely in commercial area of ocean. We have no robust master plan which will be focused on the entire coastal belt and targeting extra-regional players. The authority should control water level rise and alter in system and temperatures, from coral bleaching, ocean acidification, pollution. Lack of knowledge, expert workforce, and technology to take maximum benefits from the blue economy, especially for exploiting deep-sea fishes and seabed resources.Establishing marine friendly infrastructure for marine tourism, keeping up an investment-friendly environment inthe specific area, economical utilization of biodiversity, safeguarding mangrove and ocean grass, addressing environmental changeand managingcarbondischarge are still big challenges in Bangladesh for the development of blue economy. Resources management planning, inter-sectoral coordination of public-private partnership and entrepreneurs will be the key administer for earnings and economic benefits under the approach of blue economy (Hussain et al., 2017). Still, the country has discovered only a small figure of Blue Economy sectors such as fisheries and aquaculture, shipbuilding, ship breaking, salt generation and port facilities. However, most of these sectors are still operating in outdated methods, so there are huge prospects for introducing innovation and technology for further expansion. Moreover, some other Blue Economy sectors with great economic potential, e.g., seafood processing, ocean energy, blue carbon,

where Bangladesh's exposure is limited or absent. Due to the lack of innovation, efficient and skilled manpower those potential sectors still remain untouchable (Islam et al., 2018). As to achieve sustainable economic growth blue economy can be one of the possible solutions but for this proper plan and policy is required.

CONCLUSION

The Bay of Bengal and the coastal regions provide the backbone of huge resources andopened a new economic frontier for Bangladesh. There are several sectors of the blue economy that offer potential for development to achieve food security and economic development objectives. It can be concluded at this moment at this moment that Bangladesh needs to create more awareness towards utilizing maritime resources and bring about socio-economic changes in the lives of people of Bangladesh. The blue economy can be one of the best possible solutions for Bangladesh to achieve sustainable economic growth. In this study we tried to describe the present situation of blue economy of Bangladesh. From the analysis we found that sea production and aquaculture is increasing that is a good sign. But our blue sector is damaged by frequent floods. We have no well-trained, skilled and educated human resources in different marine industries. The government should take future policy-framework for the success of the Blue Economy. This framework may focus on structural collaboration; translating research in products, holistic approach to the Blue Economy; and also motivating and training young generations.

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