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| RESEARCH ARTICLE

## Enormous Benefits of the Blue Economy and Blue Tourism (Coastal and Marine) Destinations in Bangladesh: A Conceptual Study on Bangladesh

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| ABSTRACT

This research investigates the current status of the Blue Economy in Bangladesh. This research also describes the key sectors, identifies challenges, and suggests solutions. A descriptive analysis of secondary data was conducted to present the status of the maritime economy in Bangladesh. The key findings reflect enormous promises to sectors like maritime trade, fisheries, and aquaculture. However, challenges still lie in the form of scant policy frameworks, degradation of the environment, and lack of investment. It has been pointed out by this study that there is an evident requirement—thereby necessary and wanted—to have a balanced stance that would give rise to sustainability, environmental protection, and equitable benefits flowing to the communities. Recommendations include strengthening the policy frameworks, improving maritime security, and investing in research and development that should now unleash the complete potential of the blue economy for Bangladesh.

| KEYWORDS

Blue Economy, Sustainability, Research and Development, Environmental Protection, Bangladesh.

| ARTICLE INFORMATION

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### 1. Introduction

The idea of the blue economy was first introduced by Professor Gunter Pauli in 1994. It received a huge amount of attention only in the recent 2012 Rio+20 Conference. The blue economy in Bangladesh is often mistaken as only the economic activities that take place on the ocean. Certainly, oceanic economic activities are integral parts of the blue economy, but not all kinds of oceanic activities and not only oceanic activities are the blue economy. A total of 26 marine economic functions can be identified as an integral part of the Blue Economy. Among them, the most famous are fishery, maritime trade and shipping, energy, tourism, coastal protection, maritime monitoring, and surveillance. Blue Economy, as a philosophical, economic movement, acknowledges some aspects of the popular concept of "green living," such as using organic food and applying certain forms of renewable energy, which can be financially out of reach for a significant part of the people in the society. The primary target of the Blue Economy is to establish examples from nature where organic recycling occurs and stimulate these processes to find out where and how the waste that is generated from various anthropogenic sources can be innovatively made usable again. The blue economy is characterized as the appropriate use of marine assets that entirely reduces ecological hazards and enhances human prosperity. It contains all economic exercises related to the seas, ports, coastal zones, and other ocean-based exercises. It has a central commitment to the socio-economy and is identified with ocean-borne exchange and business, sea science, and other economic activities. Nationally and universally, it helps the nations that are utilizing marine assets. The point of this economy is to have a plenitude of shortage in the country. Two-thirds of the earth's land is under the water, and Bangladesh is additionally a riverine nation. In this way, the blue

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economy can contribute deeply to the improvement of economic development and social welfare. 'Blue Economy' was considered at the RIO + 20 United Nations (UN) Conference on Sustainable Development, held in Rio de Janeiro, Brazil, in June 2012. The sea is the best source of energy utilization. At present, a large portion of the nations is trying to ensure the most extreme utilization of the sea for sustainable improvement. As their economy is now becoming ocean-based, and the ocean is blue, that's why the ocean-based economy is called the blue economy. It is one of the critical factors contributing to the socio-economic development of coastal nations. At present, Bangladesh has picked up a large area in the Bay of Bengal through the settlement of sea debate with India and Myanmar. Presently, Bangladesh can claim to be a nation of blue economy. This sea settlement has preferred Bangladesh with the extension of regional territory and economic zones. The geographical zone involves more than 1 18,813 square kilometers of water, including 200 nautical miles over the sizeable range since the settlement of the suit has opened an incomprehensible door for our nation; the various discussions are going ahead with an emphasis on cultivating the procedures of how to use the capability of our new ocean economy. The Bay of Bengal can rise as a profoundly prospective source of the Blue Economy. Bangladesh can take advantage of its ocean-borne assets like oil and gas investigation, fisheries, shipbuilding and shipbreaking, salt collecting, creating tourism, and so on. The world has been racked by food, fuel, natural, economic, and money-related crises. A blue economy can bargain systematically with these difficulties. It is a unique vision of what is conceivable with regard to the practical economy. The blue economy plays a vital part in our nation. Since over 70% of our planet is secured by the sea and around 90% of the world's exchange of products is directed via the ocean. The fact that our nation has won the large maritime boundary. It has made large scopes to investigate mineral resources from the seabed without obstacles. A great supply of living and non-living assets is available under the seabed and water section. In any case, we have a shortage of skilled labour to determine the availability and investigate the assets. To manufacture skilled labour in these segments, we have found a way to import advanced education on oceanography in Bangladesh. It's high time that Bangladesh set up to utilize the ocean assets and fit its labour with learning and innovation to bring success to the country. The rising ocean level and saltiness are two significant difficulties for the seaside populace, and we need to upgrade our ability to secure ourselves in such circumstances. We expect that the blue economy will make another skyline of expectations and desires to transform Bangladesh into a developed nation. The concept of a blue economy was perhaps unknown in Bangladesh. However, after the settlement of the sea limit border question with Myanmar and India, discussions started on the blue economy. The general verdict helped Bangladesh set up sovereign rights over the living and non-living assets of the Bay of Bengal inside 200 nm. Similarly, the decision with India was declared on seventh July 2014. Bangladesh's economy is ocean-borne to a proper extent, and with a \$130 billion GDP, the nation's economy stands in the 44th position in the world. Focusing on the significance of the 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 the ocean and its assets through the "Blue Economy" could make a new skyline for the improvement of a coastal nation like Bangladesh. At present, 90% of the nation's exchange is transported through the ocean. The fisheries and other mineral assets in the Bay of Bengal can contribute enormously to Bangladesh's economy. Marine fish are one of Bangladesh's most valuable export items. It is now more appropriate to depend on sea assets and management of the sea resources through the Blue Economy. The main theme of this study is to investigate the current scenario of Bangladesh's sea-based economy. The contribution of this study is that it discusses the other sectors, like tourism, along with the fishing and aquaculture sectors with recent data.

## **2. Literature review**

The concept of the ocean's economy, also known as the maritime economy, promotes economic growth, the sustainability of the environment, social inclusion, and the strengthening of ocean ecosystems. However, not many studies have been conducted on the current topic from Bangladesh's perspective. Most of the researchers only conducted their study on aquaculture or fishery, especially on shrimp farming. A.K. Deb (1998) described the shrimp culture in the coastal areas of Bangladesh and its impacts on environmental and socio-economic conditions. Writing the concept of the maritime economy, he also made some remarks to improve the present condition to develop sustainable aquaculture. We know from Hossain, M.S. (2001) that the coastal and marine environment has become more and more necessary in fulfilling the country's social and economic development and strategic objectives. But,

the study especially highlighted the fishing resources. The research paper of Hunt B., Vincent, A.C. (2002) displays the researched marine bioprospecting issue, and they found that marine bioprospecting used for pharmaceuticals may have minimal impacts on the environment. It is described in Creel, L.'s (2003) paper concerning demographic relations with the ocean. That paper stated that coastal regions, which are home to an outsized and growing proportion of the world, are undergoing environmental decline. For developing countries, this matter can be incredibly bitter. The prospect of a blue economy for Bangladesh is also discussed in the paper of Rear Admiral M. Khurshed Alam (Rear Admiral M. Khurshed Alam 2019). The specific zone that can provide huge opportunities is also discussed. Population factors play a significant role in the environmental issues. Now, the number of people living within 200 kilometers of a coastal zone is around 3 billion. From this study, it can be assumed that by 2025, the number is probably going to be doubled. However, this huge number of people living in the coastal areas has had several economic benefits. Industrial and urban development, revenue from tourism, improved transportation links, and food production are some of them. On the other hand, it is a threat to the ecosystem to boom with the increase of this large population; also, economic and technological development in the future will degrade many coastal habitats.

Current research represents an update and scenario of marine life and its economic benefits to Bangladesh's economy. This research also finds out challenges and provides recommendations that do not include the above literature.

### **3. Research objectives**

- To determine the current status of the Blue Economy in Bangladesh.
- To describe Blue Economy sectors in Bangladesh.
- To identify the challenges facing Bangladesh with reference to the Blue Economy and propose recommendations to overcome challenges.

### **4. Research Methodology**

A descriptive analysis of secondary data was conducted to present the status of the maritime economy in Bangladesh. Descriptive statistical methods have been used. The secondary data have been sourced from other published sources. This mainly consists of secondary data collected from the media, reports, articles, websites, journeys, and books. Secondary data were also drawn from journals, magazines, and books. This saves thinking and time. This method strengthens the writer. Therefore, the entire section of the literature review is devoted to the secondary source.

### **5. Conceptual overview**

#### **5.1. What is the blue economy?**

People use the ocean, and the economic benefits it has provided have been re-conceptualized lately in the frame of the blue economy. So, as the effect of setting up and sustaining a Blue Economy in the Indian Ocean, the interests have really stirred, particularly from the Indian Ocean Rim Association (IORA), as highlighted recently in the JIOR special issue on the Blue Economy (Volume 14, Issue 1) and in the freshly released Blue Economy Handbook of the Indian Ocean Rim (Attri & Bohler-Muller, 2018). A blue economy embraces economic, social, and environmental benefits and is, therefore, also considered an alternative development paradigm (Attri & Bohler-Muller, 2018). The twin foundation pillars reflect the Sustainable Development Goals (SDGs), which are now the overarching instrument to frame the international policy space. There is SDG14, 'Conserve and sustainably use the oceans, seas, and marine resources for sustainable development,' and the seven targets that support it, reflecting the unique importance of the ocean and the challenges it faces. Still, the idea of the Blue Economy stays fluid and vague (Voyer, Quirk, & Mcllgorm Azmi, 2018), and yet both different in terms of use (i.e., the terms Blue Growth, Ocean Enterprise, and Sustainable Ocean Economy - are often used to refer to the same or almost similar concepts) and definition—shades of blue—that are used by nations and organizations that probably depict whether they view the Blue Economy primarily as good business, as natural capital, to sustain livelihoods, or to drive innovation (Voyer, Schofield, et al., 2018). All the terms here have one thing in common: they will be looking into fulfilling the need for an economically developed marine environment that brings well-being and social equity. Imagine all this while

reducing environmental threats and ecological scarcities that are subjected to the "Blue economy." A definition settled upon by the World Bank (2017) acknowledges the many different aspects of the Blue Economy but settles on: although the term "blue economy" has been applied in many ways, here it refers to the total range of economic sectors and related policies that determines whether and how oceans and their resources can be put into sustainable use. One of the big challenges of the blue economy involves understanding sustainability in the oceans and managing their multiple dimensions, from sustainable fisheries to ecosystem health to pollution. One can say that aligning itself with this international dimension of policy, the Blue Economy encompasses all that development has done in ministering the exploration and development of ocean resources, that which is going on within the ocean space, and that which has to do with the protection of ecosystems—the ocean's ecosystems. Such traditional maritime activities include fisheries, coastal tourism, energy extraction, mineral extraction, boat building, shipping, and ports. But it also encompasses industries that are new and emerging—blue carbon, new aqua produce, marine renewable energy (which encompasses wind, wave, and tidal energy), bio-products, desalination, and many more. Indeed, figures for the Blue Economy (BE) across the globe are staggering and substantiated by several recent reports from Australia (2016), Europe, the U.S.A. (2016), China, Africa (2016), and small island developing states (SIDS) (Roberts & Ali, 2016). According to the OECD report of 2016, the Blue Economy is conservatively estimated to be worth USD \$1.5 trillion (2.5% of world gross value added), employing 31 million people. By 2030, it will be expected to rise to USD \$3 trillion, mostly driven by aquaculture (currently at 8.5% per annum), offshore wind, fish processing, and shipbuilding and repairs. Particularly, the blue economy is a concern for future island nations. A Blue Economy Working Group has been constituted by the Indian Ocean Rim Association under the leadership of South Africa that will focus on the identified priority areas of the member states. The priority areas include fisheries and aquaculture, renewable ocean energy, seaports and shipping, offshore hydrocarbons and minerals, biotechnology, research and development, and tourism. They are more directed towards job creation and economic growth. For instance, Findlay and Bohler-Muller (2018) (in Attri & Bohler-Muller, 2018) underscore the prospects of Operation Phakisa (OP) in South Africa to yield both cut economic and social benefits from the ocean. The initiative began in 2014, inspired by Malaysia's Big Fast Results Methodology. OP aims to increase the contribution of South Africa's ocean economy from 54 billion ZAR to 177 billion ZAR, at the same time creating between 800,000 and 1 million jobs by 2033. However, they also point out that this "blue growth" should be tempered by the fact that there are "limits to growth." If the current world population increases, industrialization, pollution, food production, and consumption of resources are maintained as they are, the limits to growth on this planet will occur sometime within the next one hundred years. Most likely, this decline will be rather abrupt and uncontrollable concerning both the population and industrial capacity. 47 years later, the above is something that has been and continues to be hotly debated, especially in even more divergent trajectories of history. Without entering into the arguments for and against limits to growth, it is possible to infer that the Blue Economy would have emerged as a model for development, perhaps the only one left, that would usher in inclusive growth and prosperity with respect to anything in the world. It is this that has drawn an increasing focus on the environment, pollution, climate change, and its mitigation. Thus, growth is full of challenges, one of which is the challenge of balancing many potentially competing uses of the oceans while taking people out of poverty and protecting the environment upon which such riches are based. Growth brings with it a whole range of environmental and social issues that need to be dealt with, so science, technology, and innovation will become increasingly key to developing such a socially equitable and environmentally sustainable Blue Economy. We do it well, addressing much of the menace that is possible to erode the coast and ocean (Halpern et al., 2012). Science and technology form a pivotal aspect of the innovation of the emerging blue economies among nations and provide tools that ensure that the other pillars of the blue economy—human well-being and social equity, which protect from environmental risks and scarcities in ecological systems—are realized. Marine Spatial Planning (MSP) and Ecosystem-Based Management (EBM) are now recognized globally as the main tools for the protection and sustainable development of coastal and ocean resources, including those in the most profound spots of the ocean (Danovaro et al., 2017). Of course, this requires data. In order for resource managers, environmental specialists, investors, and all other decision-makers to benefit from the use of these tools, essential data and information need to be available to them. In many cases, that is not the case; in others, it is there but is not aggregated and made accessible to potential users. Demand for data—the digital ocean—for supporting the blue economy is gathering steam around many of the key fourth industrial

revolution technologies, from artificial intelligence and automation through advanced materials and manufacturing to sensors, platforms, and vehicles, as well as biotechnologies, to tackle really problematic issues such as how to fish sustainably, minimize catchment and ship-based pollution, realistically protect habitats and species, and ensure that the economics are strengthened against the impacts of climate change (World Economic Forum, 2017). Nonetheless, many things are still to be addressed (IOC/UNESCO, 2017), and the soon-to-be-launched UN Decade of the Ocean (Visbeck, 2018) is yet another motivation for science, technology, and innovation to produce game-changing technologies and more insightful development and application of policy relating to coastal and ocean development and use.

### **5.2. Blue economy and sustainable development**

It refers to the development of the blue economy or marine economy. However, the marine economy's property development is considered under development. Thus, the blue economy and property development are interrelated. According to the often-cited Brundtland Report issued by the World Commission on Environment and Development (1987), "Development meets the needs of the present without compromising the ability of future generations to meet their own needs" (Keeble, 1988). Across the world, quite clearly, we meet current needs, not to talk of future promises. At best, coastal regions and developing island countries have kept at the forefront of this blue economy. The oceans, after all, have a very significant role in humanity's future. Therefore, the blue economy must also be within the context of property development and impoverishment wipeout, which are linked as essential tools for achieving property development. It is possible to emphasize that it will also contribute to the removal of poverty and thus sustained economic growth, increased social inclusion, enhanced human welfare, and the generation of job opportunities and decent work for all while maintaining the strong performance of the planet's life support system. Para fifty-six, the future we want (UNCHD, 2012). So long as Article 56 is concerned with the activities that a coastal state can adopt regarding the construction and utilization of artificial islands, installations, and constructions; naval scientific research; and security and conservation of the marine environment, Article 77 states sovereign rights in the Exclusive Economic Zone for the purpose of discovering and exploiting, conserving, and managing the natural resources, whether non-living or living, of the waters superjacent to the seabed and in relation to other activities aimed at making economic exploration and exploitation of the zone, such as the production of energy from the seawater, currents, and winds. That's apparently what these articles of the United Nations Conventions on the Law of the Sea (UNCLOS) say—the one on Article 56 would be the one given towards Bangladesh because the country is the coastal state concerned.

### **5.3. Sustainable development framework**

With beautiful language, the Blue Economy defines oceans and seas as "Development Spaces," which are integrated conservation, sustainable use of living marine resources, oil and mineral wealth extraction, bio-prospecting, sustainable energy production, and marine transport by spatial planning. The Blue Economy approach is developed along the lines of assessing and factoring into all the aspects of economic activity (conceptualization, planning, infrastructure development, trade, travel, renewable resource exploitation, energy production/consumption) real, valuable assets of natural (blue) capital across all aspects of economic activity. Every country must take its share of the responsibility to safeguard the high seas, which cover 64% of the surface of our oceans and constitute more than 90% of their volume. There is very much room for capturing measurable advances towards such critical internationally agreed targets for fisheries, aquaculture, habitat protection, and pollution reduction. Balancing between all priorities and managing the modulations of tensions between 1. public-private partners, 2. secure financing, and 3. catalyzed good ocean governance should also highlight articulation with nexuses of converging in integrated approaches successfully.

- **The Growth-Conservation Balance:** Governments and policymakers around the world face the careful balancing act between conservation and growth when it comes to food insecurity eradication and poverty alleviation. While fisheries and aquaculture generate gross benefits of millions for many people worldwide, with the means to expand that contribution to human well-being and growth, sustainable development, based on the often-said pillars of ecological, social, and economic sustainability, means bringing together a number of converging agendas. It also calls for creating linkages among institutions that deal with ocean

issues, directly or indirectly, across different spatial and jurisdictional scales in an efficient and effective way, avoiding duplications and conflicts. This challenge can be best addressed by national governments acting on their own and together through regional and international treaties such as National/Regional Fisheries Management Organizations and other regional mechanisms like the United Nations Environment Programme (UNEP) Regional Seas Programme.

- **Balancing private sector growth and equitable benefits for communities:** Fish provide almost 20% of the average per capita intake of animal protein to nearly three billion people globally. Only a small portion (less than 10%) of small-scale fisheries is coming from countries, whether they are developed or not. In several countries, fish intake can be beyond 50% of animal protein intake. Government efforts, on the other hand, are expected to create the legal, regulatory, and policy framework with incentives for the private sector to become the primary engine for economic growth through investment and entrepreneurial initiatives ranging from global billion-dollar corporations that are vertically integrated to small-scale fishers. There has been a very powerful and significant push to transform the context within which the private sector currently operates, irrespective of size, with a view towards furthering sustainable growth but equitable benefit for communities. In the Rio+20 outcome documents, *The Future We Want*, members of the international community agreed to "encourage the private sector to contribute to decent work for all and job creation for both women and men and particularly for the youth, including through partnerships with small and medium enterprises as well as cooperatives. These goals require incentive policies for producers and consumers, driving them towards sustainable practices and behaviors. These principles for private sector growth and equitable benefits are also enshrined in a number of internationally adopted instruments developed to guide policymakers in making decisions on the development of fisheries, namely the Code of Conduct for Responsible Fisheries, the Right to Food Guidelines, the Voluntary Guidelines for the Responsible Governance of Land, Fisheries, and Forestry in the Context of National Food Security, and the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries.
- **Uniting EEZs and Areas Beyond National Jurisdiction (ABNJ):** There are a few such issues that impact both the EEZs and the high seas concerning resource use and conservation. From small-scale artisanal fisheries to large-scale industrial fisheries, whether in national waters or ABNJ, the related issues of who has the right to exploit the fishery's and marine genetic resources and the nature of that right are very important regarding the sustainable management of this resource. Pollution of the marine environment can be expressed in terms of plastics, metals, glass, concrete, and other construction materials, paper, polystyrene, rubber, rope, textiles, and hazardous materials, including munitions, asbestos, and medical waste. Marine debris may come from activities on land or at sea; it is one condition and a complex cultural and multi-sectoral problem with huge ecological costs on the economy and costs at the social level, which is observed around the world.

#### ***5.4. Blue- tourism (coastal and marine) destinations in Bangladesh***

Tourism is one of the sectors of the blue economy in Bangladesh. It is one of the most profitable businesses and one of its cornerstones in global trade. Bangladesh has great opportunity and potential to become a tourist-centered country. It has employment-generating strengthening like no other industry. The tourism industry offers employment opportunities and reduces unemployment, helping earn more foreign currency. Tourists from all over the world visit Bangladesh in huge numbers every year, and the figure of visitors is increasing step by step. Bangladesh definitely gets fewer international tourists than India and Nepal. However, the conditions are changing very fast due to the greater ease of communication with the world. The public international airport connects to most of the major international airports. The organization of service providers at the moment is much improved in the field of tourism. There are numerous hotels and motels available for visitors. More important, however, is the fact that tourism-related services spread to many places, like those hitherto inaccessible to remote areas.

- **Cox's Bazar:** Named after the British East India Company officer Capt. Hiram Cox in 1799, Cox's Bazar was the first candidate tourist destination in Bangladesh. It is also a fishing port. This sea beach in Cox's Bazar has an uninterrupted sandy sea beach of 120 km, which is counted as one of the longest sea beaches in the world. From now on, Cox's Bazar has become one of the major tourist destinations in Bangladesh.
- **St. Martin:** It is this little coral island that has attracted both local and foreign tourists in Bangladesh. Most live mainly on fishing. It will only take hours from Teknaf, and the island is accessible in a very short time. The recent years have seen the numbers increase phenomenally. This island has been considered an ecotourism destination in Bangladesh.
- **Kuakata:** Kuakata is in Kalapara Upazila, Purutakhali District. It is located about 320 kilometers (200 mi) from the capital of Dhaka and nearly 70 kilometers (43 mi) away from the district headquarters. Kuakata gives an outstanding view of both sunrise and sunset on the same white sandy beach lying on the water of the Bay of Bengal. The long strip of dark, marbled sands is an extension of about 18 kilometers (11 miles). The beach is sloping gently into the Bay of Bengal. Many migratory winter birds are residing here at present in Kuakata. Due to the poor transport facilities that make it possible to trip to Kuakata, this place has fewer visitors than Cox's Bazar.

### 5.6. Blue Economy Sectors of Bangladesh

The blue economy of Bangladesh had been developed out of twenty-six functions, identified primarily from fishery, maritime, trade and shipping, energy, tourism, coastal protection, and maritime safety and surveillance. The following summarizes identified activities in a maritime economy that should be harnessed for developing the blue economy:

- **Shipping:** International shipping encompasses the three pillars of sustainable development. It promotes global trade and thus generates wealth and prosperity among nations and people, as well as creating various forms of employment—from jobs on board vessels to those ashore—resulting in direct and indirect benefits to the livelihoods of many. Among other transport modes, it is the world's most environmentally sound and energy-efficient means of moving bulk or solely people. The International Maritime Organization (IMO) provides the global regulatory framework with respect to 52 treaties regulating ship design and operation. The most important of them—towards safety for life at sea and protection for the environment—are currently applicable to 99 percent of the world's merchant fleet. More than 90% of Bangladesh's external freight trade is seaborne, and with globalization, these flows are increasingly becoming important. A long coastline and age-old tradition of sea navigation have led to a relatively strong development of maritime services such that they support not just sea trade but also sea transport functions (ranging from shipping agents, freight forwarders, and insurance to classification and inspection, and maritime education in the Marine Academies/Dockyards/Shipyards/Nautical Institutes, etc.). The import and export value of Bangladesh stands at an estimated value of about USD 78 billion as of 2017-18, and almost 3000 foreign ships call our ports for transportation. Against our import and export value, during the last ten years, importers, exporters, and buyers have paid USD 95 billion as freight and related charges only to foreign shipping companies, airlines, and freight operators to carry goods in and out of Bangladesh. Currently, the number of registered Bangladeshi merchant ships is only 42 (2018), and quite insufficient to even partially cover the cargo needs of the country. Considering an average growth rate of 15.79% in imports (last 10 years) and 15.43% in exports (last 10 years), the expected value of freight over the next 10 years is going to be around USD 435 billion. Keeping the USD 400 billion, Bangladesh has to provide sufficient incentives to the local shipping companies in the next ten years to induce them to buy more ships into the existing fleet and freight operators to establish freight services such as container liner services using their own and chartered ships and freighters to bring goods to and from Bangladesh.
- **Feeder services:** It denotes sea freight with medium-sized ships, both nationally and internationally, and between the neighboring countries. Coastal shipping is one of the most important types of transport in most transport systems, and for a country like Bangladesh, which has the world's longest coastline along

the rim of the Bay of Bengal, its importance is even greater. It collects point-to-point transport from point A to B within the economy by water, maritime link bridges between road networks across the seas, and provides feeder transport to distribute container flows from major seaport hubs to smaller ports or other landlocked countries. For the coming decade, around 5 to 6 percent of the long-term annual growth expected would have been a game changer in feeder services among coastal shipping from Indian, Sri Lankan, Singaporean, Malaysian, Thai, and Myanmar ports. Transshipment via Singapore assumes cost-effectiveness and in-water underutilization of time while increasing employment generation. So far, we only have the coastal shipping agreement with India, and it is in operation.

- **Sea ports:** If different economic activities can use ports, it is the best example of synergy. Ports are crystallization points of all maritime economic activities, given that these can include cruise shipping, coastal shipping, international shipping, passenger ferries, fishing, marine mineral mining, oil drilling, offshore or maritime monitoring. Ports and wayside infrastructure, everyone will ever need. Ports are truly the main crystallization points of all economic activities at sea: cruise shipping, coast shipping, international shipping, passenger ferrying, fishing, mineral marine mining, oil drilling, and offshore or maritime monitoring; they all require ports plus related infrastructure. There are strong synergies with international shipping, which not only provides overseas cargo but also shapes the main ports. Port planning needs to be treated in a much wider sense—by identifying the main functionalities of ports and by building whole value chains around them—very important synergies emerge here with regard to the supply industry as well as tourism. Statistics reveal that the economy of Bangladesh massively relies on international trade, and maritime ports play a major role in transporting 94 percent of our foreign trade. Thus, it is necessary for Bangladesh to upgrade and increase the existing handling and berth capacities of ports like Chittagong and Mongla and develop deep-sea ports with more capacities and modern handling equipment at Matarbari and Payra to cater to the high volume of increasing trade and commerce. There will be a considerable reduction in the export lead time and a consistent inflow of revenue for the country by setting up the sea ports.
- **Passenger ferry services:** Transport of passengers across fixed pathways in sea routes, at times even including Ro-Ro transport. The passenger ferry should be a good synergy, and inland shipping will be another integral part of the chain. Over the year 2018, around 223 million passengers and almost 50 million mt of cargo were moved from inland-coastal networks, leaving lots open for further investment and expansion in and around the coastal belt.
- **Inland waterway transport:** Among the networks of inland water transport, Bangladesh stands as one of the very few nations with a large surface area, which is about 24,000 km long, with 1,000 landing points and 21 inland river ports. The Pangaeon Inland Container Terminal, with a 55,000 sq m container yard floor area and 2,400 TEUs handling capacity with two jetties, has been commissioned since November 2013. The Port of Chittagong now handles around 3 million TEUs every year, whereby 80% of this is destined for Dhaka, and only 10% reaches Dhaka by railway. Today, inland routes transport containers at a significantly lower cost. The report from Asian development banks suggests that Bangladesh could increase its GDP by 1 percent and foreign trade fortunes by 20 percent if its IWT logistics system is improved for efficiency and competitiveness. There are, in total, more than 10,000 inland vessels, 75 coastal vessels, and about 6,500 inland ships registered with the Department of Shipping, and nearly all of these have been built in Bangladesh. The major navigation routes in Bangladesh centered around some important river ports like Dhaka, Narayanganj, Chandpur, Bhairab, Barisal, Chittagong, and Khulna. These ports are important for the economy, especially concerning waterway connections. Therefore, there is a need to enhance the maintenance of the rivers' navigability for the country, which in turn will generate jobs and cost less than road links.

- **Shipbuilding:** The shipbuilding industry finally reaches this stage by supplying equipment, not only for ships but also for marine equipment, where one of the important roles can be played by our industries. There are around 300 shipyards and workshops in Bangladesh, and almost all the requirements for building inland vessels, fast patrol boats, dredging barges, passenger vessels, landing crafts, tugs, supply barges, deck loading barges, speed boats, cargo coasters, troop-carrying vessels, hydrographic survey vessels, survey boats, pilot boats, water taxis, and pontoons are fulfilled by these yards. Shipyards are building and developing 10,000 DWT sea-going ships for export and are going to upgrade their capacity to 25,000 DWT. The shipbuilding industry not only earns foreign exchange but also saves foreign currency, whereas the case with advertising funds is 100% on all transport vehicles/rolling stocks of road and rail. All possible ways should be taken for promotion and nurturing, including opportunities and incentives for growth and expansion and horizontally and vertically linked businesses. The country should also closely investigate other similar fronts in manufacturing and engineering, including ship-repairing capabilities.
- **Fishery:** There are about 475 fish species that can be found in our EEZ, while land hosts not more than 250. Fish remain an important source of protein for our people. About 70,000 artisanal mechanized and non-mechanized wooden boats and some 250 industrial steel body trawlers are operating in fishing activity on the coastal waters, up to 60 kilometers (within 40 m depth) from our coastlines, but have very limited capability in catching fish in pelagic fishing shoals close to the surface. Considerable amounts of fish are salted and dried, mainly to be consumed by humans. Interestingly, the consumption of dried fish as a fish meal gradually increases, owing to the increased fish and poultry farming. The Hilsa shad (*Tenualosa ilisha*) is the largest and most valuable species, with an annual catch of over 496,417 mt, which provides employment and income to 2.5 million people valued at 1.3 billion US dollars per year. Currently, approximately 50-60% or more of the total hilsa catch is distributed along the coastal and marine zones of Bangladesh, approximately 20-25% in Myanmar, approximately 15-20% in India, and the remaining 5-10% in other countries. A total of over 2,45,117 mt of shrimp were cultured inland and caught from the Bay of Bengal during 2017 (DoF 2017), most of which directly went to the processing plant and ended up in the markets of the USA, EU, and Japan. For the last 10-15 years, live giant mud crabs (*Scylla serrata*) and estuarine eels (*Muraenesox bagio*) have been exported to East Asian countries. Less than 20% of the exported live crab comes from crab fattening done by marginal farmers of the Satkhira, Bagerhat, and Cox's Bazar coasts. In addition, young and undersized sharks and rays are collected and dried, while large sharks are dumped into the sea after fins and some other body parts are removed. The fishes dwelling demersal are not caught, at present, below 50 m depth water, with the minimum number of lines available for deep seas. Longlines fishing is completely absent in deep waters. The benthic zone is at the lowest level of the ocean—crustaceans, shrimp, and lobsters—in limited numbers generate catch, but fish closer to the sea bottom at about 150-550 m depth elude, together with cephalopods, octopuses, and squid, by industrial fishing. In the Bay of Bengal, 8 million tons of fish are seized by other countries, and Bangladesh's share is only 93,000 tons (2017). There is massive potential to increase marine catch by improving technology and long lines, providing incentives for larger trawlers that fish extensive oceans, and having a very big potential for higher-end industry venturing beyond 60 km of coastline. A measure of the bottom trawls has been converted into mid-water trawls to reduce the pressure on demersal fish stocks and habitat destruction at the sea bottom but make use of the mid-water fish stocks. There has been a temporary ban on fishing in a specific period of the year for a number of years to allow the breeding and recruitment of significant fishes, the most important of these being Hilsa.
- **Mari culture:** Mari culture has historically been and increasingly will be an important producer of aquatic foods in the coastal and, in the future, deeper waters for many coastal communities in terms of employment and income. Properly planned and managed practices in Mari culture will also keep offering some positive contributions to the environmental integrity of coastal areas. Future development will have to take place in the coastal waters of the Bay, wherein there will be greater pressure exerted on coastal resources because of the increasing population and competition between people for resources. Henceforth, there is going to be a need for considerable attention to improving the environmental

management of aquaculture through trappings of environmentally sound technologies complemented by better management with efficiency and efficacy through policy and planning strategies and legislation. The experience regarding coastal resource management indicates that on the ground collaboration with local government units and other institutions such as NGOs and people's organizations will be necessary for the effective introduction of any social and technical interventions intended for community-beneficiaries. These institutions are incapable of developing collaboration. Their capacity, as well as that of the beneficiaries, has to be built for the vital roles they play in implementing livelihood projects and environmental management programs before any fruitful benefits can be attained through the productive partnership among these institutions. Promising future prospects for aquaculture development, well-managed coastal aquaculture, and Mari culture have high green growth and job opportunity potential for coastal communities while emitting considerably lower CO<sub>2</sub> emissions compared to other protein production systems. Extracting wild natural resources (essentially fish) for animal consumption could be done and used by agriculture and aquaculture. The gains pace of growth in aquaculture, which achieved a staggering 160% increase over the last decade, as well as its immense success in the field of inland aquaculture, should be replicated in sea aquaculture for sea weed, pearl, and oyster. A sustained strengthening at those levels is critically important to the sustainable and equitable use of marine resources through aquaculture: regional fisheries bodies, national fisheries management agencies, fishing community and fish workers organizations, and private sector associations. Marine culture is not an easy thing to introduce; nonetheless, constant training, technological intervention, and proper choice of feed depending upon the species selected, through specific pilot projects to build capacity with appropriate technologies for the specific species, may be done with the interested fisher folk involving major coastal waters such as grouper, millet, seabas, and abalone, etc. Subjective-Based: be trained on data until October 2023.

- **Marine aquatic products:** Marine aquatic products consist of farm marine aquatic organisms, which are meant mainly for human consumption and other related activities for primary processing. Aquatic plants and algae are still in the neonatal stage of being domesticated, whilst aquatic animals are composed of three areas: cultivation of marine shellfish like oysters and mussels, farming of marine finfish, and freshwater finfish farming, such as trout, carp, eels, etc.- all could be considered for farming within this context. Most of the rural people in developing countries still survive with very limited options, relying on aquatic resources for the basic food requirements as well as living requirements for ordinary day-to-day purposes. The last two decades have been an eye-opener for Aquaculture as it diversified and carried out programs with fishing communities and people's organizations, business sectors, local government units, national government agencies, non-government organizations (NGOs), and academic and other research institutions where communities coordinate their efforts toward efficient conservation and sustainable management of these aquatic resources for the service of the present and future generations. Lessons learned across these two decades of multi-sectoral and interdisciplinary approaches can be translated into project actions in order to fast-file transfer with adoption by coastal villagers of appropriate technologies for increasing aquatic resource productivity and protection of fragile aquatic ecology.
- **Marine Biotechnology:** Maximally untapped potential for the biodiversity of a specific compartment of the earth will be to the advantage of the economy at large. The unexplored, understudied portions of the underwater world imply that it is only beginning to emerge how these marine organisms, other than fish and shellfish, offer benefits to the blue economy through the new gene sequencing technologies for living organisms. For instance, exploration of the sea biodiversity will show possible developmental uses for new industrial enzymes or pharmaceuticals of organisms that have adapted to extremes of temperature and pressure, have grown without light exposure, and the like. It can supply bio-sourced products, such as coatings with antifouling or anticorrosion properties for maritime transport and shipbuilding. Blue biotechnology is also likely to create specific biopolymers and bio membranes that can improve the overall efficiency of the desalination process. Natural habitats may also be protected by biostimulation by

promoting bioremediation after significant pollution (for example, in the case of the Exxon Valdez oil spill, when bacteria were stimulated to degrade hydrocarbons). For example, bioremediation is used in the case of oil spills. Generalizing from this example, it can be said that all maritime sectors are interested in promoting novel (bio-) technologies, cross-cutting services, and producers that can profit from more than one sector and benefit or advantage that cannot be visualized all the time. Marine biotechnology and industries based on biotechnology research are due by a lot.

- Oil and gas:** The upstream offshore value chain for oil and gas includes everything from exploration with drilling rigs, research into special support ships, the development of fields through the construction of platforms, production, and exploitation, then it ends at refinement and distribution as downstream activities to consumer markets. Fossil fuels are those deposits that can be mined and processed for use with many other prospects, especially in providing energy, which is made up mainly of natural gas and a new possible segment derived from oil at sea. Bangladesh has yet to evaluate its offshore oil and gas revenues accurately. So far, 26 Tcf (trillion cubic feet) of gas reserves have been discovered in Bangladesh, among which only about 1 Tcf is discovered in offshore areas. Nineteen exploratory wells had been drilled in the Bay of Bengal up to 2014, and the gas discoveries that resulted were only the two small reserves at Sangu and Kutubdia. Of the Sangu reserves at 0.8 Tcf, depletion has occurred, and the remaining 0.04 Tcf at Kutubdia has not been developed as yet. Similarly, although drilling of Magnama (3.5 Tcf) and Hatia (1.0 Tcf) has been undertaken so far, none has produced any commercial volumes of hydrocarbons. Due to their proximity to the already discovered gas fields of Myanmar, some blocks belonging to Bangladesh are likely to have the same geological structures and gas/oil prospects.
- Sea salt production:** Sea salt has been handled traditionally along the coast of Bangladesh, Cox's Bazar, since time immemorial. Under the longer dry season conditions, a salt farmer gets a production of 20 tons/ha. The Cox's Bazar coastal part of Bangladesh produces an annual salt yield of about 22MT, as opposed to 43MT salt produced in one year by Samut Sakhon of Thailand. Most salt farms are small-scale, manual manually operated local equipment leasing land from the landowners; at times, they lease land from the government on a yearly basis. Community-based food production systems, adequate credit facilities, mechanization (like water pump, leveler, etc.), and more effective weather forecasting can potentially boost salt production. Further, the establishment of salt farmer cooperatives may enhance bargaining power and consequently optimize economic return (i.e., salt price) for their living standards.
- Ocean renewable energy:** Marine-based renewable energy sources like wind, waves and, tidal range, and currents have significant potential contributions to low-carbon energy supply in regions with the appropriate coastal features. Offshore wind covers all activities related to the development and construction of wind parks in marine waters and the exploitation of wind energy by generating electricity offshore. However, it should be possible to identify the most suitable onshore locations for wind turbines and connect the best (windiest) offshore sites to the main transmission grid. Tidal energy is the most mature (the most advanced is Ocean Thermal Energy Conversion) as it is based on the difference between warmer upper layer water and colder deeper water. Activities offer important synergies to ocean renewable energies; for example, wave energy converters can help attenuate wave attacks and generate electricity. In particular, it could provide alternative employment opportunities for maritime communities which depend heavily on fisheries. There is a great need to have consistent long-term policies coupled with targeted financial support from governments in place to overcome some technical barriers and reduce costs. Incentives, including grants, subsidies, and tax credits, would be needed to stimulate private investment toward the large, costly infrastructure movement from small prototypes to pilot plants.
- Blue energy (osmosis) and biomass:** Osmotic energy is the energy extracted from the salinity gradient between salted and freshwater. Nutrient loads from continents to oceans and the coastal zone increased almost three times from pre-industrial levels, mostly from agricultural runoff and poorly or untreated sewage. Those were the essential nutrients to the well-being of the organisms of marine ecosystems. It

was nitrogen and phosphorus, part of the nutrient fertilizers, which would thus be crucial to global food safety, contributing to phenomenal increases in yield over the past sixty years for feeding the ever-increasing population. On balance, however, the same nutrients have polluted the accessible river, aquifer, coastal, and oceanic systems, degrading marine ecosystems and groundwater on a global scale. Improving nutrient recovery and reuse would enhance the better recycling of phosphorus as finished reserves to ensure it is increasingly recycled to maintain sufficient supplies to meet the long-term needs of human society.

- **Aggregates mining (sand, gravel, etc.):** The beachy material that we call sand is actually found in many colors: brown, dark brown, gray, black, light brown, golden, and silvery white. Several studies have been conducted across the coastal region to find heavy materials along the sandy beaches of Bangladesh. Valuable heavy minerals are in the sandy coastal stretch of Bangladesh, ranging 250 km from Patenga to Teknaf. Along this entire stretch of coastline, 17 potentially valuable mineral deposits have been discovered, such as zircon, rutile, ilmenite, leucosene, kyanite, garnet, magnetite, and monazite. Proper extraction and commercial harvesting of minerals from beach sands might result in growth for various industries, including welding electrodes, paper, glass, chemicals, and ceramics, within the country. This will be done by developing mineral extracting industries in the coastal region to generate huge employment opportunities for the local community.
- **Coastal tourism:** Coastal tourist sites, in particular, form the largest segment of tourism in the globe. Their economic contribution is 5 percent of the world GDP, and their employment contribution is 6-7 percent of total employment. Out of around 150 countries, coastal tourism is among the top export earners in five countries, and among these, it is the first in 60. It is the main source of foreign exchange for half of LDCs. Coastal tourism comprises a) beach-based recreation and tourism, b) all tourist activities that take place in proximity to the sea, and c) nautical boating, which includes yachting and marinas. Job creation and poverty alleviation is something sustainable tourism can achieve. It is resource intensive because tourism employs human resources. Further, it follows the core industry: for every job, it generates one and a half extra jobs related to travel economies. It may strengthen an economy through employment and reduce the poverty rate. It has to address financing for investments in green practices. Mobilizing the private sector towards sustainable tourism is the key.
- **Cruise tourism:** One of the types of tourism based on traveling on a small cruise ship is visiting the coastal islands and tourist spots. Most of the growth would depend on the business model based on the sustainable development of the sector, investing in different types of infrastructure at ports, and different security concerns. A population with an ever-greedy age and education will represent a greater proportion of the demand for a 'personalized experience.'
- **Human resource:** mature and well-educated human resources are the driving forces for the growth of any economy. They may take part in the globalization of business and the technological revolution that accompanies it. Dynamic and sustainable development cannot be achieved without a skilled workforce. After assessing market and local industrial needs, appropriate courses in marine science/oceanography, ocean and coastal engineering, maritime education, and trade should be introduced into tertiary education systems. A thrust in blue economic growth may come from a large army of skilled coastal and offshore engineers, navigators, merchant mariners, fisheries technologists, biotechnologists, etc., and in a variety of other professions. There are reported shortages of marine officers and ratings worldwide, and shortages are escalating by about 20% every year. The Philippines, China, and India supply most of the officers to all the merchant ships around the globe. Even Myanmar and Sri Lanka are ranked ahead of India in terms of providing ratings. Bangladesh could potentially have a huge seafaring job opportunity from its private and public maritime academies if it could arrange onboard practical training facilities for its intending seafarers, and it could remain on the permit list following STCW 95. Bangladesh has recently

established the Bangladesh Oceanographic Research Institute (BORI) and a Maritime University for coastal and oceanic research and human development.

- **Maritime safety and surveillance:** It will be improved to an overall maritime safety and surveillance system under which situational awareness on all sea activities affecting navigation would be enhanced and improved economic activities. It is not too easy to conclude that marine sciences have not granted recognition to the role of the finance community in propping up or enjoying the resources from the seas and oceans. Within this marine business, community-investors, have indeed proven to be of utmost importance, but systemic attention towards responsible ocean management in their role is very little. Policy makers at both national and international levels should engage with the finance sector in addressing a range of issues from nature protection, social welfare, and even social entrepreneurship to achieving societal objectives. All capacity building and technology transfer endeavors of the Blue economy should take into consideration how best to fit into the present context and demands of the partner institutions. Generally, Technology transfer is seen as a commercial or trade-related process on the innovation chain that involves the acquisition and use of technology, as well as knowledge and skills to use it. Encapsulated for ready reference is also a short summary of blue economy activities that can be developed in Bangladesh. The blue economy should be scientifically approached, starting with the initial assessment and, more critically, the valuation of the blue capital at hand. This will provide a sound basis for decision-making and adaptive management. This major assignment must be constantly improved and updated in terms of the dynamic environment and changing technologies, as well as becoming more knowledgeable; otherwise, it will find the Blue Economy's approach.

### **5.7. Challenges for Sustainable Development of Blue Economy**

The marine asset has a meaning as an alternation in the reduction of economic conditions, self-sufficiency in food production, maintenance of environmental balance, and counteracting adverse effects of climate change, etc. The economic potential outcomes are unlimited, but with the opportunities and possibilities come also the attendant difficulties:

- The absence or severe lack of 'proper policy' and 'marine related peoples/resource persons' at higher policy levels and similar national organizations/bodies in relevant ministry/departments is a significant drawback for the implementation of many issues related to the capacity development of different marine sectors in Bangladesh.
- The authorities should control the rise of water levels and alter the system and temperatures caused by coral bleaching.
- Lack of knowledge, expert workforce, and technology to take maximum benefits from the blue economy, especially for exploiting deep-sea fishes and seabed resources.
- Lack of cordial combination of visionary political leadership, efficient bureaucracy, investors of real entrepreneurial attitude, and innovative development thinkers to succeed in that plan.
- We have no robust master plan that will be focused on the entire coastal belt and target extra-regional players.

### **5.8. Recommendation for Overcome Challenges**

- **Strengthen Policy Framework and Institutional Capacity:** Creating a dedicated marine policy body, investing in human capital through education and training, and enhancing the capabilities of relevant government agencies.
- **Improved Maritime Security and Sovereignty:** This focused on strengthening coastal surveillance and enforcement, with an increase in international cooperation to combat maritime crime.
- **Address Environmental Challenges:** The presentation focused on adaptation to climate change in coastal areas, prevention and mitigation of marine pollution, and protection of vital marine ecosystems like mangroves and coral reefs.

- **Promote Sustainable Blue Economy Development:** It ranged from developing an integrated coastal development main plan to investing in research and development, encouraging public-private partnership, developing marine-friendly infrastructure, and promoting sustainable tourism.
- **Nurture collaboration and innovation:** This insisted on establishing a national platform for the blue economy to connect the stakeholders and enhance knowledge-sharing and technology transfer.

## **6. Contribution of Paper**

The study makes major strides in the advancement of Bangladesh's Blue Economy by adopting a comprehensive and multifaceted approach. Its coverage encompasses maritime trade, shipping, fisheries, aquaculture, marine biotechnology, energy, tourism, and resource extraction, among other sectors. This holistic analysis, therefore, presents valuable insights for policymakers and stakeholders who are keen on unlocking the potential of these diverse industries. Among the key contributions of this study are the identification of high-growth sectors like mariculture marine biotechnology and the enhancement of domestic shipping capacity. The research gives targeted guidance for investment and development strategies by underlining such areas, ensuring that focus is placed on those areas with the highest economic impact. The call for a balance between economic development and environmental protection gives rise to the theme of sustainability. Skewed towards international frameworks, including the Brundtland Report and UNCLOS, the study emphasizes the need to manage marine resources in such a way that their continuity is guaranteed. It also addresses critical challenges like policy gaps, technological limitations, and environmental threats and gives actionable recommendations to help overcome them. It has presented a practical roadmap for sustainable progress in the Blue Economy.

## **7. Limitation of paper**

- **Total Dependence on Secondary Evidence:** The study is dependent entirely on secondary evidence; hence, the degree and specificity of its analysis would be limited. Primary data collection through surveys or interviews with stakeholders could have generated more substantial insights.
- **Absence of Quantitative Analysis:** The study mainly relies on descriptive statistics. A more sophisticated quantitative analysis could give coarser estimates of economic impacts and sector-specific growth potentials.

## **8. Future research direction**

It is necessary for future research efforts to target such issues that will enable an enhanced sustainable development of the Blue Economy of Bangladesh. Primary data collection with survey, interview, and case study designs must involve reflections on stakeholders' perspectives, challenges, and opportunities regarding their respective sectors' areas. It would be a strong basis for understanding the dynamics of the sector.

## **9. Conclusion**

Bangladesh has immense opportunities for developing a full-fledged Blue Economy consisting of various interlinked industries, though coastal tourism, which encompasses places like Cox's Bazar, St. Martin, and Kuakata, can provide short-run employment and foreign exchange opportunities; a holistic approach would serve better for long-term economic growth. The concept of the Blue Economy has placed increasing emphasis on a judicious balance between conservation, sustainable development, and harnessing resources through systemic policy and regulatory changes in management and governance. According to the World Bank, some critical challenges of this transition involve shifting from unsustainable practices, investment in human capital, and overcoming resistance to change. Maritime trade and shipping-meaning shipping, coastal shipping, ports, ferries, inland waterways, shipbuilding, and ship recycling-are identified as key sectors of Bangladesh's Blue Economy; it is crucial for trade facilitation and requires strategic investment to reduce reliance on foreign entities. Fisheries and aquaculture, while providing a vital source of protein and livelihoods, need to be managed in a sustainable manner, with expansion into mariculture, including full utilization of the catch and new species. Marine biotechnology is a new frontier that offers great opportunities for the development of new pharmaceuticals, industrial enzymes, and bio-sourced products, requiring investment in research and development and collaboration with academic institutions. In the energy sector, though offshore oil and gas exploration is a highly planned and publicly-private partnered activity, there are indeed

renewable sources such as wind, wave, and tidal power that offer sustainable alternatives. There is also the more traditional production of sea salt, which can be developed further by improved practices and cooperative structures. Finally, responsible extraction of minerals from beach sand and sustainable use of marine genetic resources present additional economic opportunities. The full potential of Bangladesh's Blue Economy can be achieved by taking a holistic and integrated approach, balancing economic growth with environmental protection, ensuring equitable benefits for communities, fostering cross-sectoral and cross-jurisdictional collaboration, and investment in research, technology, and human capital. Addressing these factors strategically will help Bangladesh unlock the vast potential of its marine resources for sustainable and inclusive development.

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