Offshore Industry in Bangladesh: Present Status and Future Prospect to Contribute for National Economy

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Abstract

The blue economy concept has been an integral focus for the economic solvency of Bangladesh and has gained huge momentum since its inaugural journey into the national foray around 2013. In the past few years the term "Maritime Economy" has become infamous in Bangladesh while formulating national economy policies and became integral to the fiscal budgets and forecasts for global investment opportunities throughout the past decade. The deltaic nature, depositional history and sediment criterion, proclaims the existence of oil and gas resources in the deep offshore and adjacent areas. The emphasis on the oil and gas exploration is still lacking behind compared to the other leading countries in Asia at this sector. This article provides an in-depth look into the current state and possible development of offshore industry in Bangladesh while identifying the factors that are essentially to be addressed for ensuring contribution of the sector into national economy. and make the delta plan 2100 successful. In order to meet current electricity demand, offshore renewable energy sources can be a major alternative. The investment policies are to be updated and extensive research works are to be carried out in this sector to attract the major foreign investors in this field.

Key Words: Oil and gas extraction, Offshore Industry, Marine Renewable Energy, Bangladesh,

1. Introduction

Statistically Bangladesh economy mainly relies on global trade where seaports and marine establishments play the key roles. 94% of the international trade is carried by sea causing the average Maritime Dependency Factor (MDF) that is nearly 35%. The major annual revenue of the government is generated from the import, export and value added taxes from this sector (Begum, 2013). Agriculture sector is significantly

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dependent to Maritime transportation for the import of essentials such as grains, edible oils, seeds and some vital fertilizers and so on. In case of the readymade garment sector, raw materials and machineries are solely import dependent and more than three-fourth of export are transported through the seaports. Oil and gas, civil, infrastructure, shipbuilding all these sectors are highly dependent on Petroleum Oil on this sector for the import. A large number of industries and the majority of the EPZ's are established to the places that are easily accessible from the two seaports' (Chittagong and Mongla). The Dhaka-Mongla and Dhaka-Chittagong corridor thus become the key to the GDP contributing 30% alone (Monir, 2017).

Now a days Bangladesh, being among the top twenty natural gas producing countries in Asia, is solely reliant on the onshore extraction sites as the only offshore extraction site, Sangu gas field has been abandoned at 2013. The primary onshore production base is located at the northeastern part of Sylhet Division and then followed by Chittagong, Dhaka and Barisal Division. The quality of the extracted natural gas is of superior quality as it contains 95% and above Methane with nearly zero Sulphur content. (*Alam*, 2003). The gain of huge ocean territory of Bangladesh in the last decade potentially encouraged global investment opportunity for the quest of new offshore oil and gas field. Offshore structure and relevant amenities are to be developed to facilitate the extraction and transferring process of oil, gas, electricity, and other resources have salient techno economic features. The vast coastal and ocean territory and the geophysical condition of the sedimentation indicate it as a huge source of untapped energy. In recent years, Bangladesh government continued to support the offshore sector by taking numerous initiatives including delta plan 2100 for the sustainable growth. The review of the industry condition aids to detect the possible threats/ shortcomings essential to address.

The present study analysed the status of the offshore sector in Bangladesh linking its influence to blue economy. The industry associated key challenges are portrayed and recommended actions are discussed to overcome the situation ensuring sustainable financial and economic growth conserving environment.

2.0 Offshore Industry in Bangladesh

2.1 Offshore Blocks

The term offshore block referred as the certain pieces property in water body to facilitate mineral exploration. The win of Bangladesh in securing maritime territory from Myanmar in the Bay of Bengal has amplified the quantity of the exploratory blocks in the Exclusive Economic Zone (*Anjum & Kozera-Kowalska, 2021; Khan & Yousufe ,2012*).

Bangladesh has placed total 26 blocks in the Bay of Bengal including 15 deep-sea and 11 shallow water blocks. The shallow blocks are placed to the water depth ranging

from 20 m to 200 m having each exploration coverage between 4500 and 7700 square kilometer area. The deep-sea blocks are placed to the water depth ranging from 200 m to 2000 m having vast exploration area coverage ranging from 3200 to 12453 square kilometer. The location of these offshore blocks are presented in Figure 1.

Bangladesh attempts to conduct investigation using its own resources in some shallow water blocks. The deep-water blocks are sited for the international bidding to economic stagnation and trade amenities. The bidding for exploration was conducted in 1993, 1997, 2008 and lastly 2012. In 2012, the government declared the offshore oil and gas exploration tenders inviting offers from the international oil companies (IOC) to explore hydrocarbons in 12 blocks in the Bay of Bengal which includes 9 shallow and 3 deep water blocks (*Gomes ,2013*). Afterwards, joint venture of ONGC Videsh Limited (OVL) & OIL India Limited (OIL) signed the product sharing contract (PSC) of the Blocks SS-04 and SS-09 with Bangladesh government, PETROBANGLA and BAPEX in 2014. KrisEnergy and Santos Sangu Field was jointly awarded SS-11 block for exploration in the same year. A South Korean IOC, Posco Daewoo Corporation was awarded offshore block DS-12 in 2017. All this companies had to perform extensive survey at initial stage for the confirmation of the existence of mineral resources.

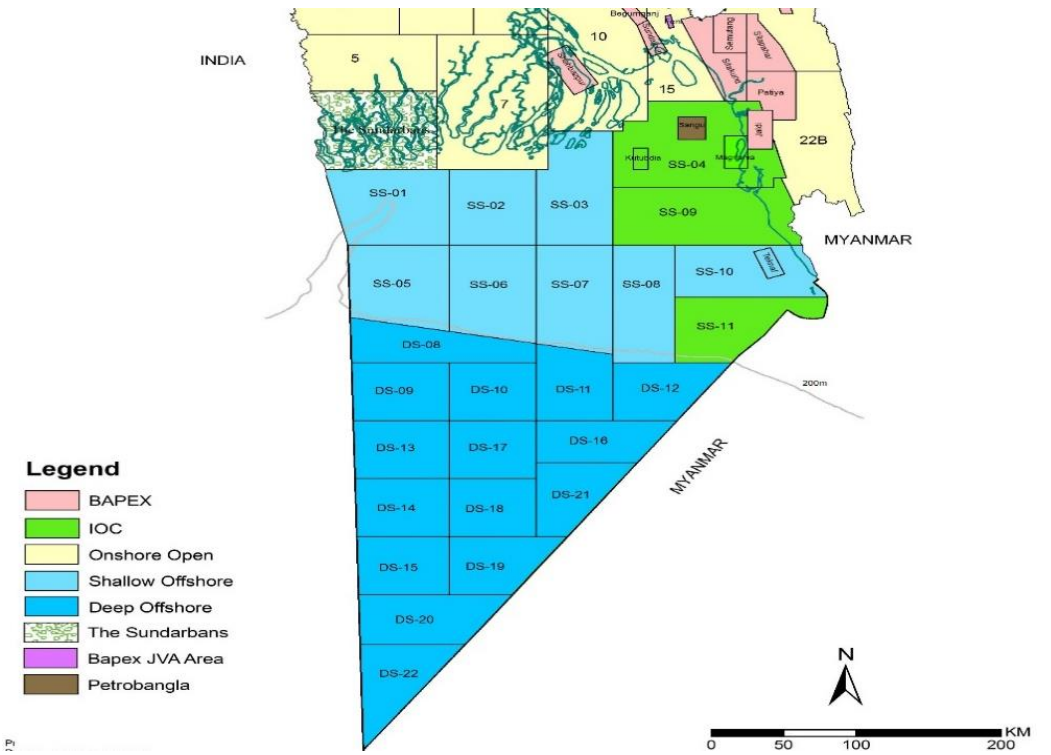

Figure 1: Offshore Blocks in Bangladesh (PETROBANGLA, 2020)

2.2 Remarkable Offshore Structures in Bangladesh

2.2.1 Sangu Gas Field

Sangu Gas Field, the first commercial offshore gas field in Bangladesh explored in 1996, is situated in east of the Bay of Bengal at offshore Block SS 04 shown in Figure 2 (previously named as Block 16). An Australian company, Santos, took charge of its operations and transferred rights to the helm 2 years later to a British oil company, Cairn Energy in 1998. The initial estimated capacity of production was about 1612 BCF (Cairn Energy, 1998). The gas field primarily continued to extract about 50 MCF of gas daily which later amplified up to 180 MCF per day (*Imam, 2002*). Everything seemed to be smooth but production level abruptly started reducing from 2009 that leaded it to be declared abandoned at the end of the 2013 aftertotal extraction of 487 BCF gas. The government of Bangladesh later intended to convert the offshore field into an storage of the imported LNG. (FinancialExpress, 2018) However, a recent study reassessed the total capacity 1056 billoin cubic feet among which 847 BCF is identified recoverable. Therefore, 358 BCF is yet to extract which is recommended to be extracted via application of advance technology (Haque et al., 2020).

Figure 2: Sangu Gas Field (Rezac, 2005)

2.2.2 Moheshkhali FLNG Terminal

Moheshkhali FLNG Terminal (see Figure 3) termed as MFLNG is a liquefied natural gas (LNG) terminal with floating storage regasification unit (FSRU) and located off the coast of southwest Chittagong, Bangladesh. It is Bangladesh's first import LNG terminal and cost an estimated $179.5m; featuring a base-load capacity of 500 million standard cubic feet of gas a day. The project jointly developed by Excelerate Energy, US and PETROBANGLA on a build, own and operate basis. The terminal includes a floating storage and regasification unit (FSRU) with about 500 Mscf/d regasification

capacity and 138,000 cubic meter storage capacity, a subsea buoy and pipeline system that links it to the onshore pipeline system. The offshore subsea buoy system is used to provide mooring facility and also serve as a channel to transport natural gas onshore.

Figure 3: State of art view of Moheshkhali Floating LNG terminal (Excelerate Energy, 2022)

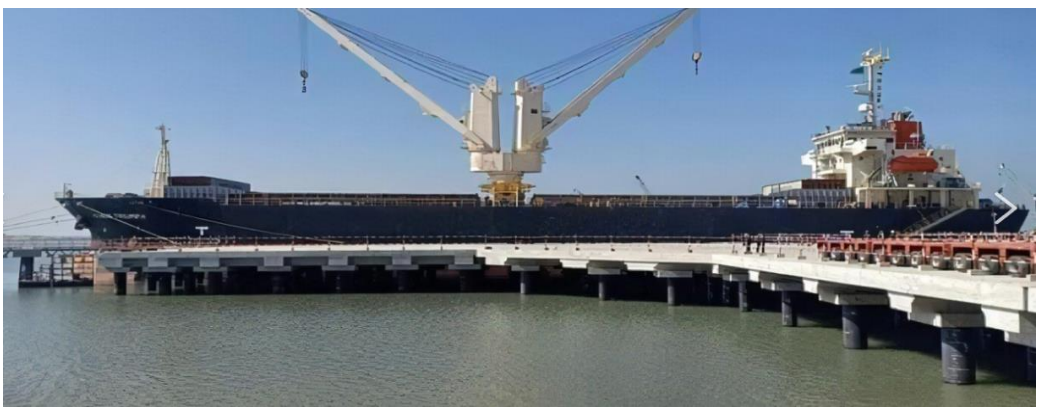

Figure 4: Matarbari Deep Sea Port (Dhaka Tribune, 2020)

2.2.3 Matarbari Deep Sea Port

The deep-sea port in Bangladesh namely Matarbari Port (see Figure 4) is constructed in Maheshkhali, Cox's Bazar started operation since 2020 (*Bangla Tribune, 2020*). The prime focus of the construction project is to import coal and other facilities for the 1200 MW coal power plant. In the initial stage, one multipurpose terminal for coal power plant is built and one 460-meter container terminal will be constructed by 2026. The navigational channel confirms the facility to dock container vessels of capacity 8,000 TEU and vessels with draft more than 9 meters *(Ferdous & Islam, 2020),* thereby

contribute to the advancement of global trade in Bangladesh (*Sato, 2021; Sato, 2019; JICA, 2018*) In future, the container terminal is planned to expand in 70 hectares area with a

berth of 1850 meters with 2.8-million-tonne capacity. According to JICA, the multi-purpose terminal, will be built on 17 hectares with a 300-meter berth facility having the capacity to accommodate vessels upto 70000 DWT ensuring 2.25 million tonnes annual capacity. The port is anticipated to contribute notably in national economy. (*Tareq et al, 2021*).

2.3 Offshore Renewable Energy Sources

In the quest of attaining the target of zero net carbon emission, the countries worldwide have to shift their focus on fossil fuel to renewable energy sources to meet the ever-increasing energy demand. An annual report prepared by hydrocarbon unit of Power, Energy and Mineral resources ministry on gas production and supply for the fiscal years 2019 to 2020 specified a rapid scarcity of gas reserve to meet the future requirements as shown in Figure 5. In that case, the use of renewable sources to produce electricity is of significant importance from the recent context of Bangladesh as electricity production is now greatly reliant on imported LNG. Biogas, hydropower, solar power and wind power are the major renewable energy sources.

Offshore wind harnessing mechanisms off the coast of Bay of Bengal hold the best source of wind energy which can be tapped into to guarantee a diversified portfolio for renewable energy sources. The unique structure of the Bay can be utilized to our advantage for anchoring offshore wind farms. The technology is mature enough to be deployed with minimum risk and maximum efficiency in Bangladesh. Additionally, highly predictable tidal and wave energy can be considered major sources of harnessing offshore renewable energy.

2.3.1 Tidal Energy

Considering general tidal wave height, duration, water depth, cost and durability, Bay of Bengal has excellent prospects for large scale electricity production using tidal energy extractor. Bangladesh has long coastal areas (More than 800 km) with 4~5 m tidal height with a large number of rivers passing through the country. The Bay of Bengal offers a huge tidal opportunity in the Sandwip channel and it endures from Teknaf region to the Pussur River in Sundarban. It has many large tidal sites and many channels of low tidal range within a large number of deltaic islands, where barrages and sluice gates already exist. Thus, the tidal power harnessing potential is significant as the barrages setups are necessary for creating controlled flow through turbines (tapping tidal power) which is also required for flood control (*Uqaili & Harijan ,2011*). This abolishes the issue of high capital cost needed for cyclone protection. In Bangladesh,

Sandwip is recognized as one of the most prospective site for tidal energy extraction *(Ahmad & Hasan, 2021; Haque & Khatun, 2017)* because of its location which is fairly distant from the Chittagong mainland with inhabitants around 330,000 on an area of 240 km (*Khan & Rasel , 2021; Sikder et al, 2014).* A barrage for flood control with 28 sluice gates is constructed around the whole island facilitating a small electricity grid to link the main commercial parts of the island. More suitable sites are yet to be explored by future projects through private, government and foreign investments.

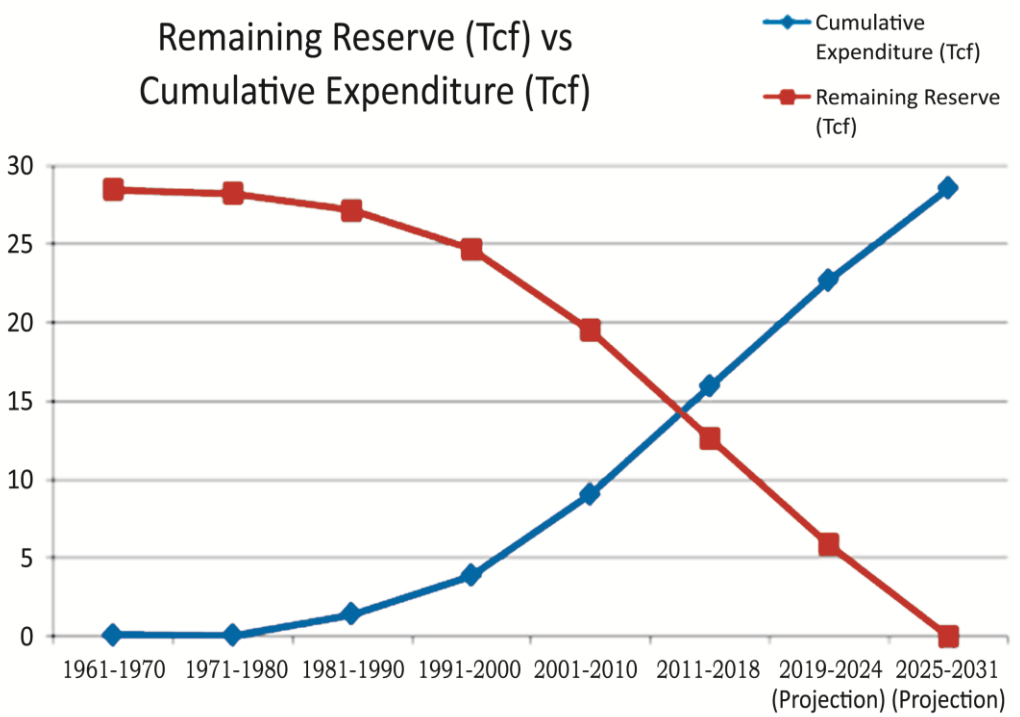

Figure 5: Projected gas reserve vs expenditure up to 2031 (HC Unit, 2021)

2.3.2 Offshore Wind Energy

Researches related to the long-term wind flows in Bangladesh, particularly across islands and along the southern coastal belts specify that the average speed of wind remains within 3.0 to 4.5 m/s within the months March to September and within 1.7 to 2.3 m/s for the rest of the year (*Saifullah ,2016*). Offshore wind mills can be a good option to harness wind energy to generate electricity and improving pumping facilities in the islands and coastal areas (*Amrutha et al., 2017*). Several agencies like Grameen

Shakti, GTZ (a German NGO), BRAC have already installed a number of small wind turbines in different coastal zones adapting the foreign technology. Grameen Shakti has installed wind turbine at Chakaria Shrimp farm while BRAC has installed 11 small turbines at several remote coastal areas to meet the local energy demand.

2.3.3 Offshore Wave Energy

One of the most important renewable energy sources might be the ocean wave and this energy source will able to provide permanent and efficient solution. Promising new wave energy generators have recently started operation in Europe. Coastal environment of Bangladesh is favorable for wave energy during ebb and tide period starting from late March to early October, power generation by using wave from Bay of Bangle within this time is highly effective and result in maximum efficiency (*Aarnes ,2015*). In southwestern regions, the maximum average wave height is recorded over 2 m with an absolute maximum of 2.4 m. The wave periods varied from 3 to 4 seconds for waves of about 0.5 meter and nearly 6 seconds for waves of about 2 meters (*Nandi & Ghosh ,2009*).

A 30MW electrical power plant is proposed which is predicted to be established at a cost of 4 million USD, very little maintenance cost and no fuel cost. The present hypothetical shortage of 1500MW power in Bangladesh can be mitigated using the proposed plant extending only 50 square kilometer offshore area (*Haque et al., 2019*).

3. Blue Economy and Challenges of Offshore Industry

The sustainable usage of offshore and marine resources termed as blue economy has gained much attention worldwide in the twenty first century. Its major strategy is to harness the potential of oceans, seas and coasts for sustainable economic growth and job assurance. Blue economy mainly focuses on the fisheries and aquaculture, natural resources and energy, tourism and shipping sectors. The effective usage of offshore resources and infrastructure development is a must for economic development of the coastal countries like Bangladesh.

Initially government of Bangladesh has adopted delta plan 2100 and acting accordingly to make it fruitful. However, the fluctuating oil and gas price, recent unstable economic condition worldwide affected the interest of potential IOCs to continue exploration. Unavailability of reliable seismic survey data, lack of infrastructure, and local technical experts increased the exploration expense challenging the viability of projects. In addition, the existing foreign investment policies has also failed to attract investors. As a consequence, KrisEnergy, Santos and Posco decided to abandon their interest in the

offshore block SS-11, DS-12 terminating the production share contract between 2019 to 2021. The offshore renewable energy sector is also suffering and the progress in projects is lacking far behind hindering the expected outcome.

4. Recommendation

Bangladesh government need to highlight on the suitable offshore infrastructure development, update foreign investment policies and integrate sustainable green measures to continue smooth economic progress.

4.1 Viable Offshore Structures

Bay of Bengal has water depth in between 20m – 200 m in shallow sea blocks and in between 200 – 2000m in deep sea block. Considering the facts, the listed offshore structures in Table 1 are recommended to install for efficient explorations and storage.

Table 1: Suitable Offshore structures for construction consideration near the Bay of Bengal.

Structure	Required Water Depth	Suitability
Jacket	Up to 150 m	✓
Jack-up	Less than 150 meters	✓
Semi-submersible	300m 1500m	✓
TLP	200m -3000 m	✓
GBS	13.7m – 25.9m	✓
Spar	Presently used up to 1000m, although existing technology can extend up to 2500m	✓
FPSO	Up to 2600m	✓

Selection and construction of the suitable offshore structures would be of much importance for ensuring the highly expensive project feasibility. Considering the depth variation, all the above-mentioned categories could all be nominated at the different block sites of the Bay of Bengal for oil and gas exploration.

4.2 Improvement of Foreign Investment Policies

Bangladesh, being the country with emerging economy constantly need to prioritize the foreign direct investment (FDI). FDI is considered as the key source of economic growth and transformation of developing, emerging and transitional economy stated

countries. Foreign investment policies need to be designed in such a way that can attract attention to the potential foreign investors in this sector. The investors will choose Bangladesh for their next for investment destination as the country conducted Double Taxation, Bilateral Investment Agreement, Treaties etc. to protect the interest of foreign investors (Mold, 2003).

Moreover to attract the attention of international oil companies (IOCs), PETROBANGLA already assigned consultant to update the Model product sharing contracts (PSC) (upstream, 2022). Besides, the following measures can be adopted:

- Rigorous study and research to be carried out via quality surveying the geographical aspects, before representing evidence to potential investors.
- Developing skills and expertise of the native workforce who can contribute equally with foreign workers and adapt to foreign working ethics.
- Smart return policies that ensure the benefit of both national and international perspectives.
- Giving projects to suitors who will tone global relationships (*Mahmud & Shahriar ,2022*).
- Providing proper incentives to involved parties.

4.3 Sustainable and Green Focus

Presently, environment conservation has become a key focus among world leaders and evidently the impacts of negligence would affect badly if proper actions are not taken. Countries like Bangladesh formulated the blue economy strategy with the objective to promote smart, sustainable and inclusive growth and employment opportunities through utilization of the drivers of maritime economy such as seas, coasts and other maritime resources. Thus, sustainable and green measures should be integrated to the industry for the advancement in the long run. Proper feasibility study is vital before launching a new project at some specific site in the offshore sector such that installation of tidal, wave and offshore wind energy extractors, launching new offshore blocks, port, terminals, gas fields to evade adverse impact on environment.

5. Conclusion

Cited as one of the most consistently growing and fastest economies in the world, Bangladesh has garnered a massive reputation. By slowly progressing through the ranks among developing nations, it cracked into the Middle-income nation category in 2015 and currently holds the 41st rank in global GDP index in 2022. Due to the climate change, financial and economic uncertainty as well as ever increasing struggle for the scarcity of natural resources, major global challenge of the 21st century is to ensure

food for rapid increasing population by 2050. The numerous challenges require integrated response and immediate transition of the world economy towards a sustainable, inclusive and resource efficient path. The offshore sector provides a window of immense opportunities to procure maximum benefits of its existing resources and in the long run provide stability to sectors which may correlate to its tributaries in Bangladesh.

In this study, present state of the existing offshore structures and energy sources are discussed while challenges are sorted with possible recommendation for further development planning is stated.

The existing development initiatives in offshore sector are acknowledged to add significant contribution to the economic development. Successful mineral exploration through offshore blocks can mitigate the energy scarcity of the country. The import cost is expected to lessen significantly when deep sea port and FLNG terminals will operate at full strength uplifting national GDP. Tidal, wave and offshore wind turbines are able to leave notable trace to the energy sectors.

Bangladesh is struggling to fascinate the IOCs and investors as foreign aid is vital to continue the development initials. The update in investment policies, extensive research and survey are recommended to be carried out to warrant future benefits and environmental viability allowing more pertinent initiatives to be disclosed from both national and international integrity.

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