ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

Bangladesh and the Blue Economy: Harnessing Marine Resources for Sustainable Growth

Tamal Chakrobortty[1]; Sabrina Alam[2]; A. K. M. Ashiqur Rahman[3]; Md. Sirajum Monir Proteek[4]; Gopal Karmakar[5]

[1;2;3;4;5]Varendra University, Rajshahi, Bangladesh.

Publication Date: 2025/12/03

Abstract: Bangladesh's connection to the Bay of Bengal runs deep—its waves have long sustained coastal families, powered busy fishing fleets, and supported thriving maritime trade. Yet for many years, these waters were used without clear rules or long-term vision, leaving parts of the marine environment strained and vulnerable. Today, Bangladesh stands at a turning point. The nation is increasingly aware of the vast promise held within its blue frontier and is taking early steps toward a more sustainable and forward-looking blue economy. Still, progress is uneven. Management efforts remain scattered, pollution continues to threaten fragile ecosystems, and many communities feel the benefits of marine resources are not shared fairly. Even so, the path ahead is full of possibility. By embracing ecosystem-based planning, strengthening inclusive and transparent governance, and aligning with global commitments such as SDG 14, Bangladesh can reshape how it stewards its marine wealth. With science-guided decisions, meaningful community participation, and strong regional cooperation, the country has the opportunity to transform its coastal and marine sectors into a resilient, equitable, and environmentally secure foundation for future growth.

Keywords: *Ecosystem, Marine Resources, Climate Resilience, Sustainability.*

How to Cite: Tamal Chakrobortty; Sabrina Alam; A. K. M. Ashiqur Rahman; Md. Sirajum Monir Proteek; Gopal Karmakar (2025) Bangladesh and the Blue Economy: Harnessing Marine Resources for Sustainable Growth.
International Journal of Innovative Science and Research Technology, 10(11), 2415-2432.
https://doi.org/10.38124/ijisrt/25nov1498

I. INTRODUCTION

In the context of escalating environmental challenges and increasing resource scarcity, the Blue Economy has emerged as a critical paradigm for sustainable development. This concept is predicated on the responsible utilization of oceanic and coastal resources to foster economic advancement, enhance social well-being, and ensure ecosystem health, all while rigorously preserving the integrity of marine environments (Elegbede et al., 2023). It encompasses a diverse array of sectors—including sustainable fisheries, maritime transportation, renewable ocean energy, coastal tourism, and marine biotechnology—presenting significant opportunities for both developed and developing nations (Midlen, 2021). For the People's Republic of Bangladesh, the principles of the Blue Economy transcend theoretical discourse and represent a strategic national imperative. The nation's geographical endowment, characterized by a coastline exceeding 121,110 square kilometers and a substantial Exclusive Economic Zone (EEZ) in the Bay of Bengal, provides a formidable foundation for this initiative (Patil et al., 2018; Hasan et al., 2018). This potential was substantially augmented following the peaceful resolution of maritime boundary disputes with neighboring Myanmar and India in 2012 (Ahmed, 2023; M. R. Rahman, 2017). This diplomatic achievement secured Bangladesh's sovereign rights over an extensive marine territory of approximately 118,813 square kilometers (Hussain et al., 2018; Sarker et al., 2019). Consequently, this demarcation has unlocked a new frontier of economic opportunity, positioning the Blue Economy as a cornerstone for the nation's future growth. The responsible exploitation of this domain presents avenues for development across multiple sectors, including but not limited to sustainable fisheries management, deep-sea mineral exploration, advancements in marine biotechnology, and the strategic expansion of port and shipping infrastructure.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

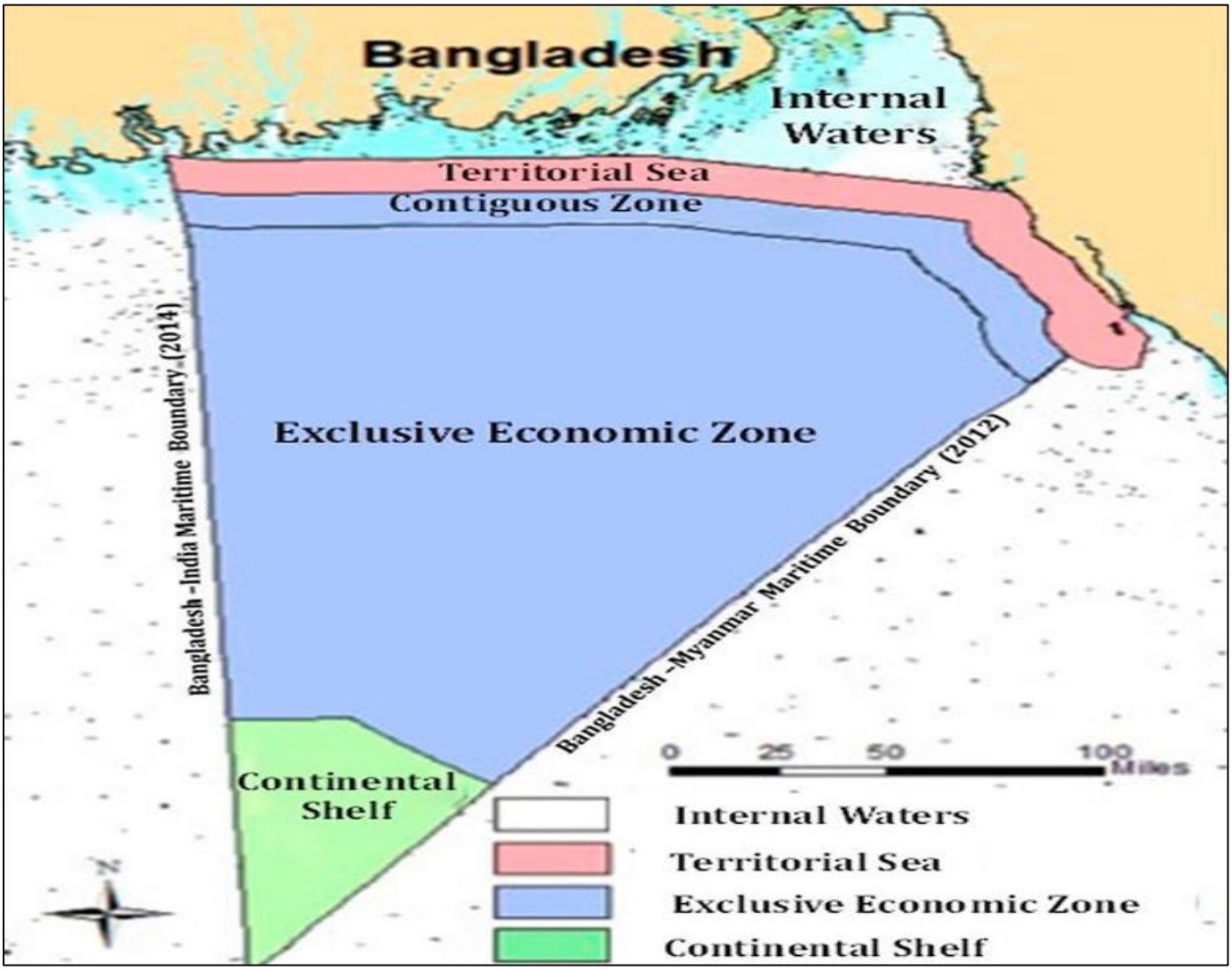

Fig 1 Bangladesh's Exclusive Economic Zone
Source: Maritime Area of Bangladesh (MoFA, 2014c).

Emerging from the depths of global discourse, the Blue Economy —covering over 70% of the Earth's surface— is a revolutionary tide reimagining our relationship with the planet's final frontier: the ocean (Sumaila et al., 2021). As land-based resources dwindle under the pressure of a changing climate and a growing population, our gaze shifts to the vast, liquid heart of our planet—a realm of untapped potential for sustainable innovation, economic resilience, and profound ecological harmony (Farmery et al., 2021). This new paradigm surges far beyond the familiar shores of fishing and shipping, diving into the uncharted waters of marine genetic discovery, the boundless energy of waves and wind, and the mindful exploration of the deep sea. Its core is a trinity of interdependent forces—economic dynamism, environmental stewardship, and social equity—working in concert to ensure that prosperity flows from the sea without draining its vitality, protecting fragile ecosystems while empowering the coastal communities who call its edges home. Yet for all its promise, the Blue Economy remains a concept as fluid and varied as the ocean itself, with its definition shifting like the tides from one nation to another. This very lack of clarity is both a source of vibrant debate and a formidable barrier, underscoring a critical need for a shared compass to navigate this blue future together. By 2030, the Blue Economy is poised to become a US$3 trillion tide of innovation, lifted by humanity's growing hunger for sustainable seafood, the relentless pulse of global shipping, and the bright surge of ocean-based renewable power, making the standardization of methods and definitions for valuing the coasts and ocean essential, as the world's population depends on them for climate regulation, oxygen, food, and income (Spalding, 2016). Navigating this complex seascape demands new maps: countries are increasingly turning to Marine Spatial Planning—a kind of oceanic zoning—to harmonize competing uses, ease tensions between industries, and weave climate resilience into the very fabric of marine governance. On the horizon, nations like Vietnam, Brazil, and India are harnessing the wind and tides, anchoring ambitious offshore energy projects, while the shipping sector charts a greener course, experimenting with hydrogen and ammonia to power the vessels of tomorrow (Abdelghany & Soares, 2025; C et al., 2021). Blue bonds are also rising, unlocking waves of public and private capital to fund lasting ocean health (Mathew & Robertson, 2021). Yet this voyage is through

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

contested waters. Fractured governance and shifting definitions create treacherous currents that stall international collaboration, leaving policies adrift and potential untapped. All the while, the ocean is sounding an alarm—acidification, rising seas, and coastal erosion, fueled by climate change, threaten to undermine both ecosystems and economies (Martínez-Vázquez et al., 2021). Small island nations and coastal communities, though deeply tied to the sea's fate, often find themselves stranded by limited resources and fragile institutions, struggling to claim their place in this blue renaissance (Zhu et al., 2025; Evans et al., 2023). Truly riding this wave of promise will require more than technology and investment—it calls for inclusive leadership, bold cooperation, and a compass aligned toward a shared future. The Blue Economy is increasingly conceptualized as a critical paradigm for sustainable development, representing a fundamental shift from terrestrial-based economic models to a framework centered on the sustainable utilization of marine and coastal capital. This emergent paradigm posits the ocean not merely as a resource repository but as a pivotal driver for catalyzing macroeconomic growth, generating multidimensional employment, and advancing long-term ecological resilience (Narwal et al., 2024). By harnessing the vast, and largely underexploited, potential of oceanic resources, nations can diversify economic portfolios and transition towards more sustainable and inclusive growth trajectories (Mumtaz, 2025). Core sectors—including sustainable fisheries and aquaculture, maritime transportation, coastal and marine tourism, ocean renewable energy, and marine biotechnology—serve as primary conduits for enhancing national output and creating extensive direct and indirect livelihood opportunities, particularly for coastal communities often characterized by higher vulnerability (Campbell et al., 2020; Dimitrovski et al., 2021). A defining feature of the Blue Economy is its intrinsic operationalization of sustainability principles; it is predicated on ecological stewardship, circular resource efficiency, and the enhancement of climate adaptation capacities (Okafor-Yarwood et al., 2020). This ensures that economic expansion is intrinsically coupled with environmental preservation.

This study embarks on an intellectual voyage into the blue frontier of the Bay of Bengal, examining how Bangladesh might harness its vast marine endowments to advance sustainable economic growth, foster inclusive livelihoods, and strengthen resilience against escalating climate shocks. Anchored in the principles of ecological integrity, it seeks to map a developmental trajectory where prosperity is interwoven with preservation, ensuring that coastal and marine ecosystems remain both productive and resilient, and safeguarding national well-being for generations yet to come.

➢ *Relevance of the Research*

The Bay of Bengal constitutes a critical geostrategic and economic domain for Bangladesh, representing a significant, though presently underexploited, frontier for national development (M. K. Islam et al., 2018). This research addresses the urgent imperative to harness this marine potential amidst escalating anthropogenic and climatic pressures, including overexploitation, pollution, and environmental hazards. The study is grounded in the necessity of aligning national economic ambitions with the principles of ecological sustainability to ensure the integrity of fragile coastal and marine ecosystems.

Its primary contribution is a strategic framework designed to inform policymakers, development planners, and stakeholders in the coastal sector. The framework aims to operationalize a sustainable blue economy paradigm that concurrently fosters inclusive economic growth, enhances community resilience, and mitigates socio-economic vulnerabilities. Furthermore, this inquiry contributes to broader regional and global discourses on sustainable ocean governance, positioning Bangladesh as a conscientious actor in the stewardship of marine resources. Ultimately, the findings of this study are intended to guide evidence-based policy for the sustainable management of marine resources. The objective is to ensure that socio-economic development and environmental preservation are synergistically advanced, thereby safeguarding ecological and human well-being for both present and future generations.

➢ *Research Aim*

This study aims to investigate strategic frameworks for Bangladesh to leverage the economic, social, and ecological potential of the Bay of Bengal to foster sustainable and inclusive growth. Concurrently, it addresses the critical imperative of safeguarding marine and coastal ecosystems from the escalating threats posed by climate change. Grounded in the principles of ecological integrity and sustainable development, this research seeks to delineate a synergistic pathway that interlinks economic advancement with environmental stewardship. The primary objectives include proposing evidence-based strategies to enhance resilient livelihoods, bolster adaptive capacity, and ensure long-term socio-ecological well-being for present and future generations.

➢ *Research Queries*

- What is the current state of exploitation and management of the principal marine and coastal resources available to Bangladesh in the Bay of Bengal?
- What strategies can be implemented to harness these marine resources for economic growth without compromising ecological integrity?
- How can the development of a blue economy in Bangladesh create equitable and inclusive livelihood opportunities for coastal and marginalized communities?
- To what extent can sustainable marine resource management contribute to enhancing national resilience against climate change impacts, specifically sea-level rise, cyclonic events, and coastal erosion?
- What policy frameworks, institutional mechanisms, and governance structures are most critical for ensuring the long-term sustainability of Bangladesh's blue economy?
- How can Bangladesh's national blue economy strategy be effectively aligned with global and regional commitments, such as the UN Sustainable Development

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

Goals (SDG 14) and prevailing regional ocean governance initiatives?

➢ *Research Gap*

Although Bangladesh's blue economy is gaining policy attention, existing research remains fragmented and lacks an integrated understanding of how ecological sustainability, governance effectiveness, and equitable coastal livelihoods can be jointly achieved. The absence of comprehensive, ecosystem-based assessments and limited evidence on cross-sector coordination create a clear gap in guiding long-term, SDG-aligned marine resource management.

II. LITERATURE REVIEW

The concept of the Blue Economy has evolved significantly over the past decade. Basically, it is driven by global concerns about climate change, marine ecosystem degradation, and the rising demand for sustainable resource management (Ahmed & Tamim, 2025; Ahammed et al., 2025; Østergaard et al., 2022; Lee et al., 2020; Lam et al., 2020). The study highlights the Blue Economy as a multidimensional framework that integrates economic growth with environmental stewardship and social inclusion (Das, 2023; Lee et al., 2021). The blue economy is primarily considered as an extension of ocean industries. It has gradually come to encompass broader ecological and social dimensions. Blue Economy emphasises long-term resilience, ecosystem restoration, and inclusive development (Spalding, 2016). Several studies affirm that sustainable ocean governance is indispensable for countries with extensive coastlines and vulnerable marine environments. Bangladesh is a country that is highly exposed to climate-induced hazards and faces several challenges regarding its ocean resources (Seddiky et al., 2024). Researchers identify a wide range of sectors regarding fisheries, aquaculture, maritime trade, marine tourism, renewable ocean energy, and marine biotechnology as influencing factors of the Blue Economy (Martínez-Vázquez et al., 2021; Alharthi & Hanif, 2020; Yuan & Failler, 2025). The World Bank (Islam & Hossen, 2025) emphasises that for countries like Bangladesh, with a sizable Exclusive Economic Zone (EEZ). The Blue Economy will present transformative opportunities to diversify the economic activities of Bangladesh. It will help the country to go beyond land-based sectors. Empirical studies further reveal that the Blue Economy can contribute significantly to job creation, export earnings, and food security, especially for coastal populations (Febrina et al., 2025; Bhuyan et al., 2022; Islam et al., 2024). Another significant factor involves the governance and institutional dynamics of marine resource management. Scholars place emphasis on the persistent challenge of fragmented marine governance. Effective ocean resource utilisation can be hindered due to the lack of standardised measurement frameworks and weak coordination (Narayanan et al., 2023; Kumar et al., 2024).

Marine Spatial Planning (MSP) is a popular topic emerged in global discourse. It is considered a key tool for resolving user conflicts, optimising resource allocation, and enhancing ecosystem-based management approaches (Iglesias-Campos et al., 2021; Gacutan et al., 2022). Countries like Brazil, Vietnam, and India demonstrate successful examples of integrating MSP to streamline renewable energy development, offshore fisheries, and maritime logistics. For Bangladesh, strengthening institutional frameworks, data availability, and regulatory mechanisms remains central to unlocking Blue Economy opportunities. A growing body of literature also critiques the inequitable distribution of benefits from ocean-based development. Coastal communities in developing nations face high vulnerability, limited livelihood diversification options, and inadequate adaptive capacity to climate shocks (Le, 2020). Bangladesh is in a significant position among the world's most climate-vulnerable countries. A strong Blue Economy strategy is essential for integrating community resilience, inclusive livelihood planning, and capacity development (Liza et al., 2025). Moreover, several authors highlight the substantial ecological risks associated with the unregulated exploitation of marine resources. Overfishing, coastal erosion, rising sea levels, salinity intrusion, and ocean acidification pose severe threats to both biodiversity and human livelihoods (Longo et al., 2021). The literature highlights an urgent transition toward ecosystem-based management of the Blue Economy. It will facilitate conservation, biodiversity protection, circular resource efficiency, and low-carbon development pathways (Kaluvala, 2024; Barroso et al., 2022; Ha, 2024; Yao et al., 2023). As the coastal ecosystems of Bangladesh are highly fragile, prioritising environmental sustainability is not optional but necessary for the country. In summary, the literature reveals a convergence of global and regional perspectives. The Blue Economy holds immense promise, but realising this potential requires an integrated approach. The approach should combine strong governance, technological advancement, environmental stewardship, and community empowerment. These scholarly discussions provide the foundation for evaluating how Bangladesh can effectively manage and harness its marine resources to achieve sustainable growth.

➢ *Theoretical Background*

The theoretical foundation of the Blue Economy is rooted in three overarching frameworks: Sustainable Development Theory, the Triple Bottom Line (TBL) Framework, and Ecosystem-Based Management (EBM). Together, these theories provide the conceptual lens through which the Blue Economy is analyzed in contemporary research.

- *Sustainable Development Theory*

Sustainable Development Theory includes that the economic progress must occur without compromising ecological integrity or future generations' ability to meet their needs (Hariram et al., 2023). The Blue Economy aligns closely with the principles of sustainable development as laid out in the Brundtland Report and operationalized through the United Nations Sustainable Development Goals (Hajian & Kashani, 2021). It also emphasize particularly on SDG 14 which focuses on Life below Water. The literature stresses that sustainability in ocean governance requires balancing ecological protection with economic expansion and social equity (Crosman et al., 2022). Bangladesh's Blue Economy

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

strategy similarly aims to link national economic ambitions with long-term ecological preservation (Islam et al., 2024).

- *Triple Bottom Line (TBL) Framework*

The TBL framework focuses on People, Planet, and Profit. These three elements serve as another foundational theoretical model. According to Pratama & Farida, 2025, a sustainable Blue Economy must integrate Economic viability (profit), Environmental conservation (planet), and Community well-being and social equity (people). This framework is widely used to evaluate the performance of Blue Economy sectors such as fisheries, aquaculture, and coastal tourism. Applying the TBL in the Bangladesh context highlights the importance of inclusive development, as coastal communities remain central to marine resource stewardship (Fasoulis & Kurt, 2019).

- *Ecosystem-Based Management (EBM)*

Ecosystem-Based Management is a holistic framework that emphasize on maintaining the structure, function, and resilience of entire ecosystems rather than focusing on single-sector objectives (Delacámara et al., 2020). Blue Economy's long-term success depends on managing ecological interdependencies and cumulative human impacts. It includes pollution, climate change, and habitat loss. EBM provides the theoretical basis for spatial tools such as Marine Spatial Planning. It helps countries to coordinate multiple marine activities while minimizing ecological disruption (Manea et al., 2023).

- *Ocean Governance Theory*

Ocean Governance Theory examines the role of institutions, policies, and regulatory structures in managing marine resources (Evans et al., 2023). The effectiveness of Blue Economy initiatives depends on integrated governance systems. Such types of systems need to be capable of harmonizing diverse interests, enforcing regulations, and coordinating across sectors and borders. For Bangladesh, governance challenges such as limited institutional capacity and regulatory fragmentation are critical constraints that must be addressed.

- *Climate Resilience and Vulnerability Frameworks*

Given Bangladesh's extreme vulnerability to cyclones, sea-level rise, and salinity intrusion, climate resilience frameworks are essential for understanding Blue Economy strategies (Haque et al., 2025). These frameworks highlight the need to strengthen adaptive capacity, diversify livelihoods, and integrate climate risk assessment into marine resource management.

➢ *Research Methodology*

This study uses a qualitative and descriptive research approach to explore how Bangladesh's Blue Economy has developed over time, where it stands today, and what opportunities it may hold for the future. The analysis relies mainly on secondary information gathered from reliable sources such as government reports, national policies, academic publications, institutional studies, and international datasets. To understand the historical background, the study reviews major developments in Bangladesh's maritime governance and the evolution of different blue economy sectors. The current situation is examined by analyzing existing statistics and research on fisheries, shipping, coastal tourism, marine energy, biotechnology, and other ocean-based activities. Looking toward the future, the study draws on trend-based insights and expert opinions found in earlier research to identify potential growth areas and upcoming opportunities. In addition, a SWOT perspective is used where useful to highlight Bangladesh's strengths, weaknesses, opportunities, and challenges within the blue economy. By bringing together information from diverse secondary sources and interpreting them through qualitative methods, this research offers a clear and connected view of the Blue Economy's past progress, present dynamics, and future possibilities in Bangladesh.

III. BLUE ECONOMY OF BANGLADESH AND SUSTAINABLE GROWTH

Following the peaceful resolution of maritime boundary delimitations with Myanmar (2012) and India (2014), Bangladesh has secured sovereign rights over a significant maritime territory in the northern Bay of Bengal, encompassing approximately 118,813 square kilometers (Bir et al., 2020; M. Islam & Mostaque, 2018). This expansive maritime domain presents substantial opportunities for a range of sectors, including fisheries, aquaculture, maritime transportation, marine tourism, offshore renewable energy, and the exploitation of seabed resources (M. S. Islam et al., 2024).

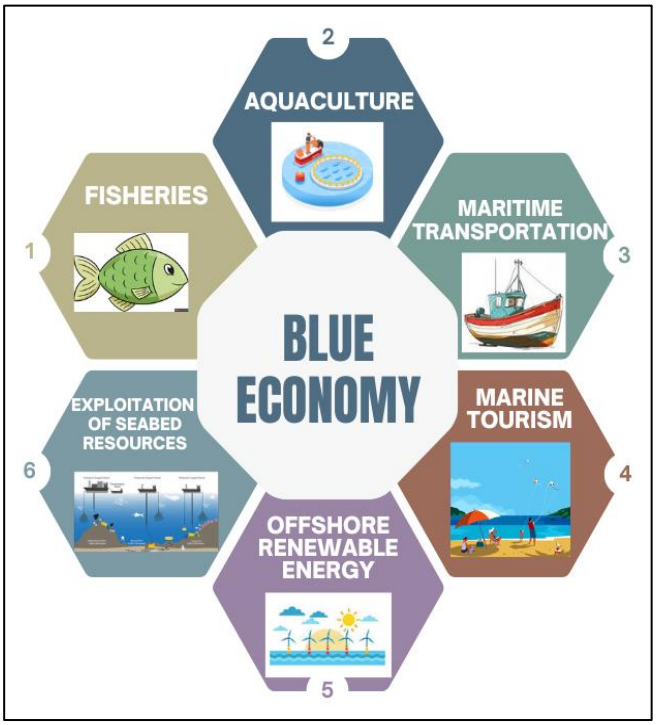

Fig 2 Branches of Blue Economy
Source: Author's Own Illustration

In this context, the paradigm of the 'blue economy'—conceptualized as the sustainable utilization of ocean resources for economic advancement, improved livelihoods,

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

and the maintenance of ocean ecosystem health—has emerged as a critical strategic framework for national development (Ovchynnykova et al., 2024). This approach facilitates the integration of ecological conservation with economic objectives and demonstrates strong alignment with numerous global sustainability benchmarks, notably supporting the attainment of 12 of the 17 United Nations Sustainable Development Goals (SDGs) pertinent to the Bangladeshi context (M. M. Rahman, 2021; A.M. Nasrullah, 2021; Sarker et al., 2019).

Table 1 Features of the Bay of Bengal Blue Economy

Area	
Total Maritime Area	6.2 million sq. km
Total Area of exclusive economic zones	12% of the world's coral reefs
Combined length of Coastline	14000 km
Fisheries	
Number of Fishers	3.7 million
Number of Fishing Boats	415000
Annual Fisheries Production	6 million tonnes
Value of Fisheries Production	USD 4 billion
Population	
Total population of nations	2000 million
Coastal population	185 million
Environment	
8% of the World's Mangroves	
12% of the World's Coral Reefs	
Some of the largest estuaries of the World	

Source: FAO

However, the realization of this blue economy potential is contingent upon addressing significant constraints. Key challenges include inadequate maritime infrastructure, limited technological and human capacity, ongoing environmental degradation, and the multifaceted threats posed by climate change, which collectively represent formidable barriers to sustainable and equitable ocean-based development (Narwal et al., 2024; Bhuyan et al., 2022; Hoerterer et al., 2020; M. K. Islam et al., 2018).

- *Marine Fisheries & Aquaculture*

Marine fisheries and aquaculture constitute a vital pillar of Bangladesh's economy, food security, and export base. In 2023–24, the fisheries sector contributed 2.53% to national GDP, 22.26% to agricultural GDP, and 0.91% of foreign exchange earnings, reflecting its significant macroeconomic role. A summary of fish production trends from the last five years is outlined in the table that follows.

Table 2 Five-Year Fish Production Trend

Year	Sector Wise Production (Lakh MT)			Total	Growth Rate
	Inland Open	Closed	Marine		
2023-2024	14.11	29.78	6.29	50.18	2.12%
2022-2023	13.83	28.52	6.79	49.14	3.26%
2021-2022	13.22	27.31	7.06	47.59	2.99%
2020-2021	13.01	26.39	6.81	46.21	2.62%
2019-2020	12.48	25.84	6.71	45.03	-

Source: Department of Fisheries (Dof), Bangladesh.

Fish remains the primary source of nutrition for the population, supplying 60% of national animal protein intake. The country hosts 100 fish processing plants, and of the 107 evaluated, the European Commission approved 77, supported by the adoption of HACCP standards that have strengthened product safety and competitiveness (Shamsuzzaman et al., 2017). Bangladesh exports 98% of its fish and fish products mainly to Europe, the USA, and Japan, while the rest are shipped to Southeast Asia and the Middle East. Crab fattening has also emerged as a lucrative subsector, producing 10,781.71 MT in 2023–24, of which 7,988.72 MT were exported, generating Tk 699.98 crore (S. J. Hasan et al., 2025). Aquaculture has become one of the country's fastest-growing industries, with the market projected to expand at a CAGR of 8.96% between 2023 and 2028. The seafood industry alone generated USD 17.38 billion in 2023, underscoring its rising global demand and export potential (S. J. Hasan et al., 2025). These trends indicate strong future prospects, particularly through technological upgrading, value-addition, sustainable mariculture, and compliance with international standards.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

Table 3 Aquaculture Production Rankings of South Asian Countries in 2021

Country	Aquaculture Production		GDP Contribution per Capita	
	Tonnes	Share of World Total (%)	Current USD	Ratio to World Average (%)
India	9,408,300	7.4648	2,238	18.12
Bangladesh	2,638,745	2.0937	2,458	19.90
Iran	478,737	0.3798	3,290	26.64
Pakistan	164,527	0.1305	1,505	12.18
Nepal	100,854	0.0800	1,208	9.78
Sri Lanka	50,977	0.0404	4,087	33.09
Afghanistan	11,107	0.0088	n/a	n/a
Bhutan	193	0.0002	3,138	25.41

Source: Food and Agriculture Organization (FAO)

The advancement of marine fisheries and aquaculture directly supports several Sustainable Development Goals (SDGs)—notably SDG 1 (No Poverty) through livelihood creation for coastal communities, SDG 2 (Zero Hunger) by ensuring affordable protein supply, SDG 8 (Decent Work and Economic Growth) via export earnings and enterprise growth, and SDG 14 (Life Below Water) through improved resource management and safety standards. With continued investment, ecological stewardship, and expanded global market integration, Bangladesh's blue economy is poised to play an even more transformative role in sustainable national development.

- *Shipping & Maritime Trade*

Bangladesh occupies a significant position in the global maritime economy, contributing over one-third of global ship recycling, although total recycled tonnage declined from 8.02 million tonnes to 2.8 million tonnes in the twelve months preceding January 2023. Oil tankers accounted for 50.4% of all vessels recycled, followed by bulk carriers (41%), ferries and passenger ships (2%), chemical tankers (1.9%), and general cargo ships (1.1%) (Siddique et al., 2019). The shipbuilding industry, second only to garments in its contribution to national GDP, has expanded since the late 2000s, particularly after Bangladesh began exporting multipurpose cargo ships to European buyers in 2008 (Hossain & Islam, 2019). With an estimated USD 650.83 billion expected to be spent globally on new ship procurement in 2026 and rising demand for small vessels between 3,000–15,000 DWT, Bangladesh is strategically positioned to capture market share, especially as major shipbuilding nations such as China, Japan, and South Korea remain fully booked for large-vessel orders. The global shipbuilding market size is valued at USD 1.6 trillion, with the small-vessel segment projected to grow to USD 400 billion annually, offering Bangladesh the potential to earn USD 4 billion per year by securing even 1% of this segment (Hussain et al., 2019). However, logistical inefficiencies persist, as Bangladesh spends nearly 16% of its GDP on domestic goods transport—substantially higher than the global average of 10%—which undermines trade competitiveness (World Bank, 2023). The sector's development intersects with the Sustainable Development Goals, particularly SDG 8 (economic growth and employment generation), SDG 9 (industrialisation and infrastructure improvement), SDG 12 (responsible production through safer ship recycling practices), SDG 13 (strengthening climate action via environmental compliance), and SDG 14 (marine ecosystem protection). Overall, the sustainable advancement of Bangladesh's maritime sector demonstrates strong potential to enhance industrial capacity, expand export earnings, and support national progress toward achieving the SDGs.

- *Energy Resources*

The resolution of Bangladesh's maritime boundary disputes has unlocked an Exclusive Economic Zone (EEZ) of approximately 118,813 square kilometers in the Bay of Bengal, marking a transformative milestone for national energy security. Central to this blue economy is the presence of substantial offshore natural gas, with an estimated 26 to 32 TCF of untapped, recoverable reserves in basins like Sangu and Kutubdia (M. S. Islam et al., 2024; Patil et al., 2019). These are critical for offsetting declining onshore production. Beyond conventional gas, the zone holds transformative potential. Preliminary assessments indicate a massive 17-103 TCF of gas-in-place within marine gas hydrates, representing a potential long-term energy revolution (M. S. Islam et al., 2024; Patil et al., 2019). Furthermore, according to IRENA, the coastal region possesses an estimated 5 GW capacity for offshore wind power (Ashraful Islam et al., 2024). Together, these resources—from immediate gas to future renewables and hydrates—form a multi-layered energy portfolio fundamental for powering Bangladesh's sustainable economic growth.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

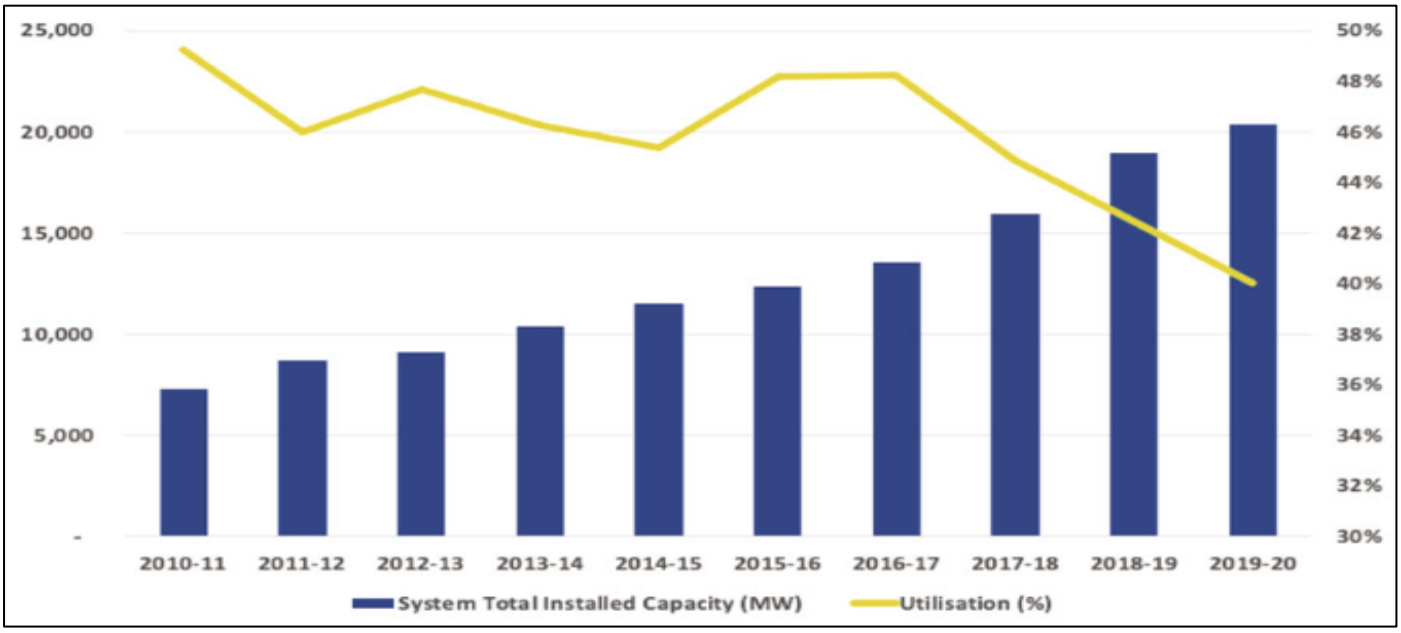

Fig 3 Bangladesh Power Capacity (MW) and Overall Capacity Utilization (%)
Source: Bangladesh Power Development Board (BPDB)

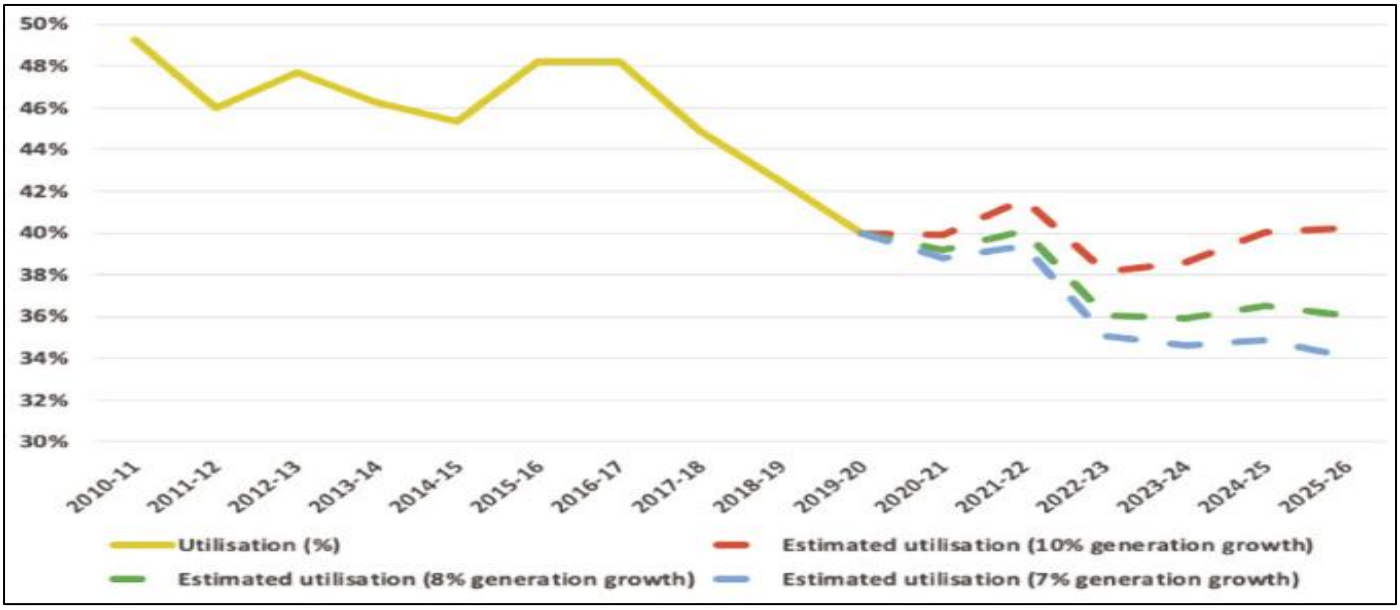

Fig 4 Actual and Estimated Future Total System Capacity Utilization (%)
Source: Bangladesh Power Development Board (BPDB)

- *Offshore Oil and Gas Exploration*

The northern offshore region of the Bay of Bengal, within Bangladesh's territorial waters, is geologically dominated by the Hatia Trough, a proven petroleum province. Despite this promise, exploration has been incomplete; not all anticlinal and stratigraphic traps within the system have been systematically investigated, and the western sector remains entirely unexplored. Offshore exploration activities commenced in the early 1970s, with the first project initiated in 1974 (Hussain et al., 2018). While several International Oil Companies (IOCs) were initially engaged, a period of disinvestment followed after the discovery of only minor gas accumulations. This led to IOCs abandoning their blocks by 1978, halting offshore exploration for several decades. To date, only two offshore gas fields have been discovered, both located in the eastern shallow-water region: Kutubdia (1976) and Sangu (1996) (Siswanto & Rosdaniah, 2023). By the end of 2020, a total of 21 exploratory wells had been drilled offshore, all confined to shallow waters and operated by IOCs. Kutubdia Gas Field: Situated in shallow-water block SS-04, this field holds an estimated 45.50 Billion Cubic Feet (BCF) of recoverable reserves (Akter et al., 2024). At the time of its discovery, insufficient domestic gas demand rendered development uneconomical, and the field remains undeveloped. Sangu Gas Field: Also in block SS-04, Sangu is the first and only offshore field to achieve production. Characterized as a large-scale anticlinal trap complicated by multiple channels and canyons, its initial Gas Initially In Place (GIIP) was estimated at 1,612 BCF (Chowdhury et al., 2022). Production commenced in 1998 but was prematurely

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

terminated in 2013 after extracting approximately 487 BCF, primarily due to an unexpected decline in reservoir pressure (Bhuyan et al., 2022). Recent reinterpretation of exploration data has revitalized interest in the Sangu field. Analyses indicate that approximately 358 BCF of recoverable reserves may remain accessible through advanced hydrocarbon recovery techniques.

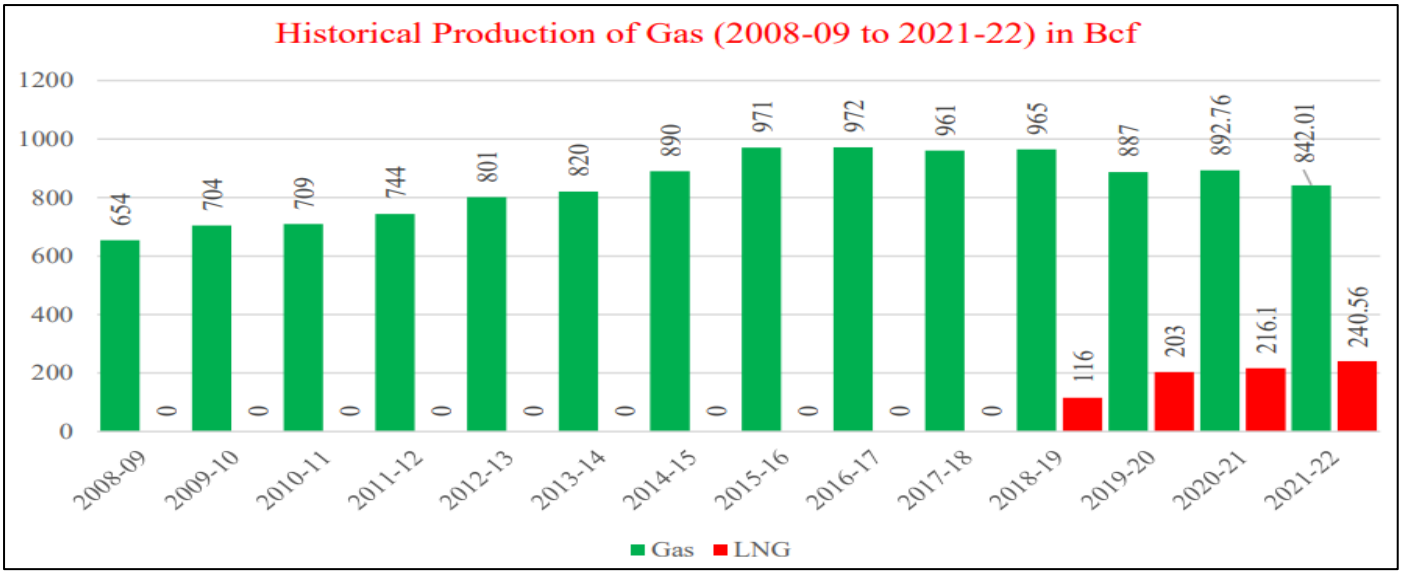

Fig 5 Historical Gas Production in Bangladesh
Source: PETROBANGLA, HCU Data Bank

Evidence suggests the reservoirs are likely compartmentalized by channels or faulting, which previously constrained drainage efficiency. Consequently, acquiring a three-dimensional seismic survey is recommended to accurately delineate the reservoir architecture and optimize future well placement. Beyond production, the Government of Bangladesh has proposed repurposing the depleted Sangu field as an underground gas storage (UGS) facility for imported Liquefied Natural Gas (LNG). Estimates indicate a potential storage capacity of 487.91 BCF, a strategic initiative that would significantly enhance national energy security (Abdullah-Al-Mahbub & Islam, 2023).

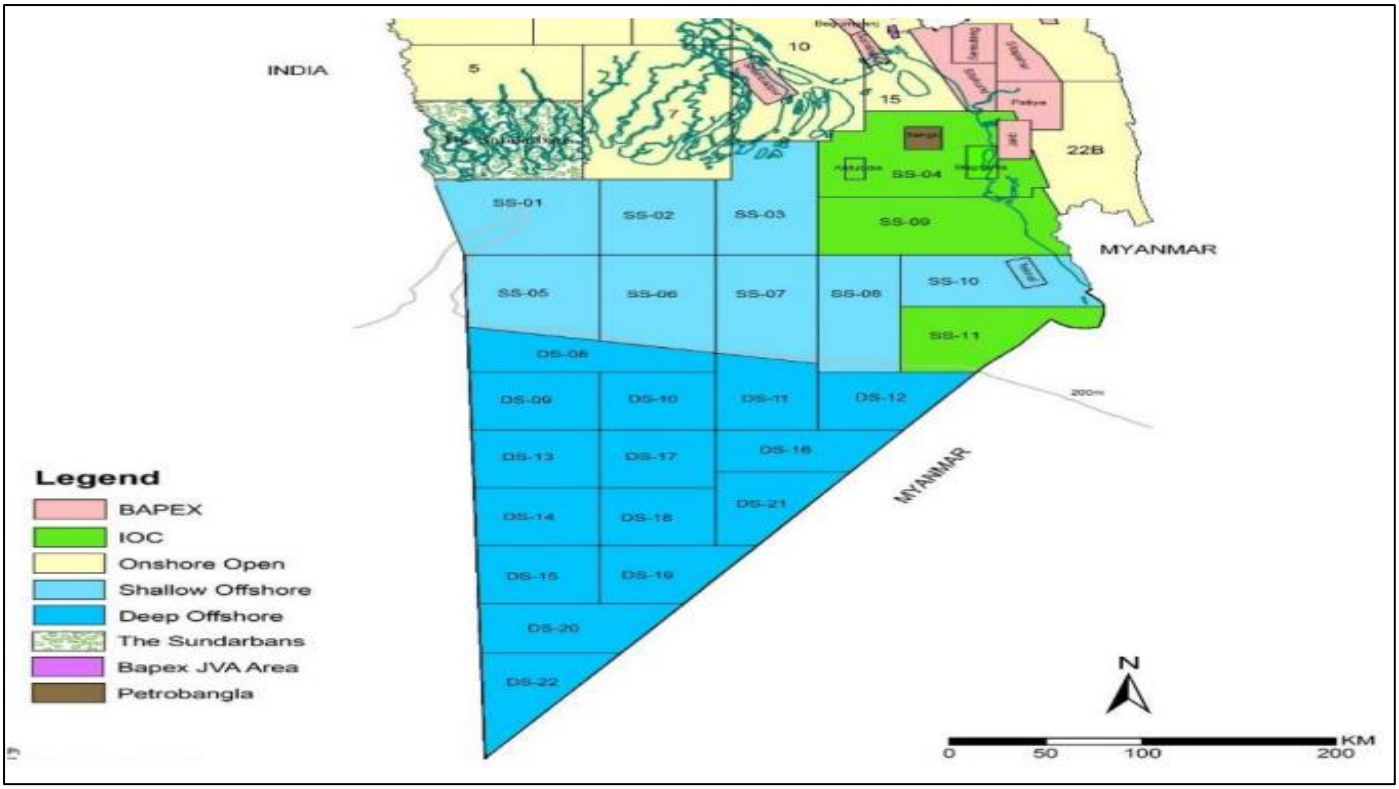

Fig 6 Offshore Blocks in Bangladesh
Source: PETROBANGLA (2020)

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

Both thermogenic and biogenic gases are present in the offshore region of Bangladesh, indicating an active petroleum system. Oil seeps on St. Martin's Island and gas chimneys identified in seismic surveys further support this interpretation (Shamsuddin, 2022). Recent studies also suggest the presence of gas hydrates at depths of 250–440 m below the seafloor in water depths of 1,300–1,900 m (Monteleone et al., 2022). Further research is required to delineate hydrate reservoirs, assess their distribution, and estimate total reserves within Bangladesh's maritime boundary. Given declining conventional reserves, limited new discoveries, and rising energy demand, gas hydrates represent a potential future energy resource. In response, the Government of Bangladesh has begun awarding deep-water blocks to international oil companies to accelerate offshore exploration and production.

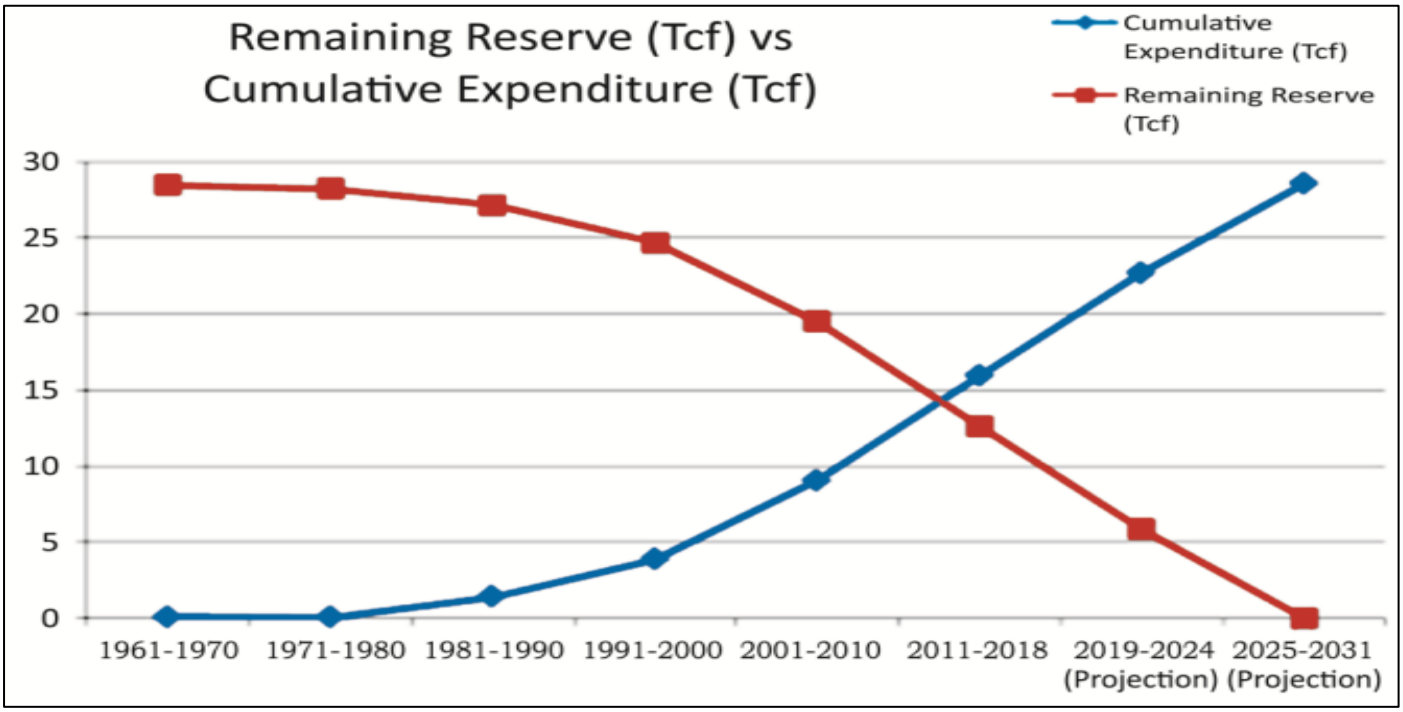

Fig 7 Projected Gas Reserve vs. Expenditure (Up to 2031)

- *Marine Renewable Energy*

A consortium made up of Summit Power, Copenhagen Infrastructure Partners (CIP), and Copenhagen Offshore Partners (COP) has been approved by the Bangladeshi government to conduct a feasibility study for the country's first offshore wind power project. An estimated USD 1.3 billion might be invested in the proposed 500 MW project, which would be located off the coast of Cox's Bazar. The consortium has been granted a three-year site exclusivity term to carry out thorough inspections and start the project's initial phase after submitting a foreign direct investment (FDI) request in July 2023. As of the end of 2021, Bangladesh had only 3 MW of active onshore wind power and no offshore wind infrastructure (Abdullah-Al-Mahbub & Islam, 2023). With only 2% of installed capacity and generation coming from renewable sources, the nation's energy generation portfolio is still mostly reliant on gas and oil-based power plants (Hossain et al., 2024). The Sustainable and Renewable Energy Development Authority (SREDA) announced in 2022 its goal to develop 5 GW of combined onshore and offshore wind power by 2030 in response to this inadequate integration of renewable energy (Babu et al., 2022). This announcement marked a significant shift in policy toward a more sustainable and diverse energy sector.

In partnership with Italy's CESI and Bangladesh's Synotech, the Power Division of the Ministry of Power, Energy, and Mineral Resources of Bangladesh has commissioned BLIX to carry out the Pre-Feasibility and Detailed Feasibility Studies for the development of offshore wind farms in the Bay of Bengal (Ahmad et al., 2020). The Sustainable and Renewable Energy Development Authority's (SREDA) 2022 goal of reaching 5 GW of combined onshore and offshore wind capacity by 2030 is in line with this program (Khan et al., 2023). With wind speeds between 5.75 and 7.75 m/s, the study intends to assess 26 identified potential offshore wind blocks. The Pre-Feasibility stage concentrates on technology evaluation, cost assessment, and site selection utilizing GIS-based techniques (Abdullah-Al-Mahbub & Islam, 2023). Two viable locations will go through extensive technical, financial, and grid-integration evaluations during the Detailed Feasibility phase. Additionally, ideal layouts, foundation structures, and an operation and maintenance (O&M) plan will be designed. In addition to applying its internal cost database and Levelized Cost of Energy (LCoE) model for economic assessment, BLIX's role includes offering technical expertise for both phases (Ahmad et al., 2020). The program is anticipated to boost Bangladesh's offshore wind industry, facilitate knowledge transfer, and aid in the creation of workable project and tendering procedures for future renewable energy development in South Asia, according to BLIX Project Manager Bayram Mercan.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

- *Tidal and Wave Energy*

Bangladesh covers 147,570 square kilometers and is located between latitudes 20°34′N and 26°38′N and longitudes 88°01′E and 92°41′E. Its maximum length is 440 km east-west and 760 km north-northwest to south-southeast. In order to ensure access to free waters and prevent being "sea-locked," the nation has established rights over 118,813 square kilometers of territorial sea and maintains a 200-nautical-mile Exclusive Economic Zone (M. K. Islam et al., 2018). The southern coastline, which stretches around 710 km along the Bay of Bengal, has a continental shelf that is up to 50 m deep and covers 37,000 sq km (M. K. Islam et al., 2018; Patil et al., 2018). Tidal changes range from 2 to 8 meters. With an installed capacity of 12,780 MW, Bangladesh's energy infrastructure consists of 18 public sector power plants with 50 units (30 gas-fired, 2 coal-fired, 5 hydroelectric, and the remaining oil-based) and 27 PPP-based plants with 38 units. Nevertheless, this capacity is still insufficient to satisfy demand across the country (Ashraful Islam et al., 2024; Hossain et al., 2024). With 72% of commercial energy use and 81.72% of power generation coming from natural gas, natural gas dominates energy use. One major issue is the quick depletion of gas reserves (Ahmad et al., 2020; Babu et al., 2022). The government has put in place rental power plants as a stopgap measure to deal with the energy shortage. Furthermore, promising locations for tidal power generation may be found in Bangladesh's coastal areas, including Hiron Point, Sundarikota, Mongla, Char Changa, Cox's Bazar, Golachipa, Patuakhali, Sandwip, and Barisal. Bangladesh's vast coastline offers tremendous potential for the development of tidal energy. The Bay of Bengal and two river basins—Karnaphuli (Chittagong) and Possur (Khulna)—have been shown to be potential locations for tidal power generation in recent studies (Haque et al., 2023).

According to data from the Bangladesh Inland Water Transport Authority (BIWTA), these rivers exhibit regular tidal activity despite seasonal fluctuations in water levels and sediment content. Tide gauges run by the Chittagong Port Authority (CPA) and BIWTA systematically monitor tidal data from the Bay of Bengal and the aforementioned rivers for maritime sovereignty, navigation, and fisheries. According to CPA, the Bay's tidal range is generally consistent under typical circumstances. Installing stream-type tidal turbines in succession along appropriate coastal zones might provide a significant amount of energy (Chauhan et al., 2015). However, more investigation is required to evaluate the economic and technological viability. When integrated into Bangladesh's national power infrastructure, tidal energy shows promise as a renewable energy source (Ahmad et al., 2020). In order to alleviate its energy issue, Bangladesh's vast coastline presents excellent prospects for wave energy generation. In the Bay of Bengal, where wave heights normally vary from 0.5 to 3.5 meters—ideal for energy conversion—studies have evaluated the potential for wave power (Haque et al., 2023). Under typical meteorological circumstances, these wave conditions hold true all year round. Four coastal locations—Potenga and Anowara in Chittagong, as well as Cox's Bazar and Saint Martin Island in the Cox's Bazar district—have been determined to be ideal for the development of wave energy (M. S. Islam et al., 2024; Haque et al., 2023). In order to integrate wave power as a renewable energy source into the national system, these places offer feasible choices.

➢ *Tourism*

Blue Tourism—commonly known as Coastal or Maritime Tourism—represents a distinctive dimension of the global tourism industry, utilizing the economic and ecological potential of oceans, seas, and coastal regions (Kabil et al., 2021). Unlike conventional inland tourism, this form of tourism focuses on activities and destinations linked directly to marine and coastal environments. Globally, coastal tourism constitutes the largest segment of the tourism market, accounting for approximately 5% of global GDP and generating 6–7% of total employment (Bhuiyan & Darda, 2021; Roy et al., 2020; Hafsa, 2020). Projections indicate that by 2030, this sector will create an additional 1.5 million jobs worldwide (Bhuyan et al., 2022). Although the concept of Blue Tourism is not entirely new, Bangladesh has only recently begun to recognize its strategic significance. With its extensive coastline and rich marine biodiversity, the country stands to benefit substantially from the development of this sector. Blue Tourism offers a viable pathway for earning substantial foreign exchange, enhancing GDP growth, and accelerating progress toward the Sustainable Development Goals (SDGs) by 2030 (Bhuiyan & Darda, 2021). According to the Asian Development Bank (ADB), coastal and maritime tourism possesses immense potential within Bangladesh's emerging blue economy and could evolve into one of the nation's most lucrative sources of tourism revenue (Ashraful Islam et al., 2024). Supporting this perspective, The Business Standard (2020) reported that the ocean economy contributed approximately USD 6.2 billion in total value addition to Bangladesh's economy in 2015—equivalent to nearly 3% of the national GDP. This underscores the critical role Blue Tourism could play in diversifying Bangladesh's economic base and fostering sustainable coastal development.

Table 4 A Decade of Transformation: The Rise of Bangladesh's Tourism Sector

Year	Number of Tourists	Growth Rate	Receipts	Growth Rate	% of GNP	Growth Rate
2021	135,000	-25.82%	273.00 m $	25.29%	0.066 %	13.79%
2020	182,000	-43.65%	217.90 m $	-44.27%	0.058 %	-47.27%
2019	323,000	20.97%	391.00 m $	9.52%	0.11 %	0.00%
2018	267,000	12.66%	357.00 m $	2.59%	0.11 %	-8.33%
2017	237,000	30.22%	348.00 m $	62.39%	0.12 %	48.15%
2016	182,000	44.44%	214.30 m $	42.58%	0.081 %	5.19%
2015	126,000	-5.97%	150.30 m $	-2.40%	0.077 %	-13.48%

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

2014	134,000	28.85%	154.00 m $	17.56%	0.089 %	2.30%
2013	104,000	-35.00%	131.00 m $	24.76%	0.087 %	10.13%
2012	160,000	N/A	105.00 m $	N/A	0.079 %	N/A

Source: WorldData.info

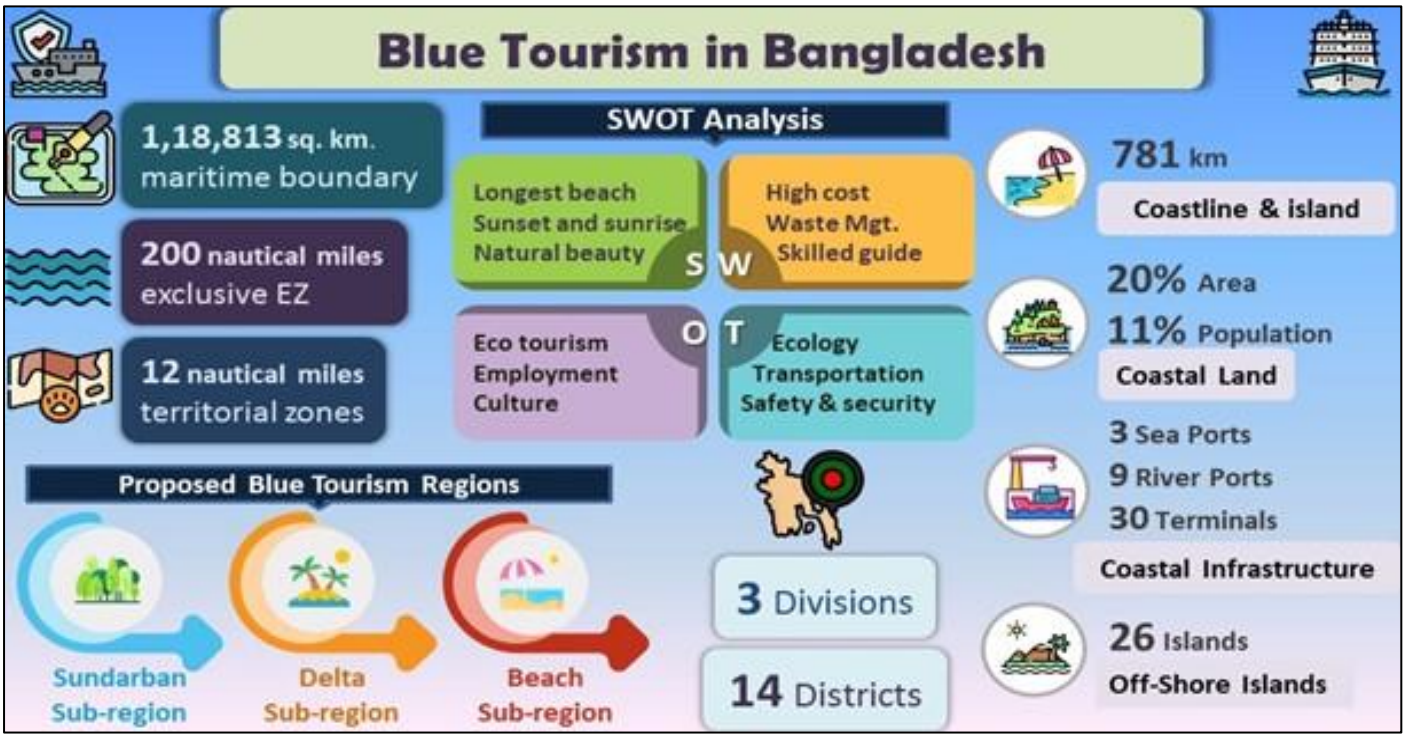

Fig 8 Bangladesh Blue Tourism Insights
Source: United Nation Development Program (UNDP), Bangladesh.

Bangladesh's vast maritime territory—spanning 207,000 sq. km, with a 580 km coastline, a 200-nautical-mile Exclusive Economic Zone, and 12-nautical-mile territorial waters—offers immense prospects for accelerating blue economy growth (M. Islam & Mostaque, 2018). The presence of 75 islands along its coast, rich in biodiversity and natural beauty, further enhances its potential for sustainable tourism development. The coastal and marine ecosystem features coral reefs, seagrass beds, sandy beaches, sandbars, estuaries, mangroves, and marshes, supporting 17 fish sanctuaries, 5 national parks, and 10 wildlife sanctuaries—all conducive to eco-friendly tourism (Miah et al., 2023). The discovery of new sea beaches has diversified tourism opportunities, reflecting the sector's steady expansion. According to UNDP Bangladesh (2023), to capitalize on this potential, the Bangladesh Tourism Board (BTB) has launched a 25-year Tourism Master Plan (2023–2047), identifying 255 tourist sites across 11 thematic clusters, including eco-tourism, beach and island tourism, pilgrimage, heritage, riverine, adventure, rural, ethno, MICE, and cruise tourism. The plan outlines over 200 strategic interventions, prioritizing the development of 13 coastal islands to strengthen Blue Tourism as a key driver of sustainable economic growth and environmental stewardship.

➢ *Research & Capacity Building*

Established in 2015 under the Ministry of Science and Technology, the Bangladesh Oceanographic Research Institute (BORI) stands as a milestone in the nation's scientific journey—Bangladesh's first and only institution devoted exclusively to oceanographic research. Situated near Cox's Bazar, BORI was founded in the aftermath of Bangladesh's historic maritime triumphs between 2012 and 2014, when the country secured sovereign rights over vast areas of the Bay of Bengal through international boundary settlements with Myanmar and India (Sunny et al., 2023; Khatun & Kumar, 2021). Since its inception, BORI has played a transformative role in unveiling the immense potential of Bangladesh's marine domain and in steering the growth of a sustainable blue economy. Its research and innovation agenda seeks not only to expand scientific understanding of the ocean but also to translate marine resources into tangible economic and environmental gains for the nation. Guided by a forward-looking vision, BORI integrates advanced technologies—such as Artificial Intelligence (AI), Remote Sensing, and data-driven ocean modeling—to establish comprehensive baseline information on the physical and biological characteristics of both coastal and deep-sea environments (Hussain et al., 2018). Through the monitoring of phytoplankton biodiversity, chlorophyll concentrations, and other ecological indicators, the institute contributes to the preservation of marine ecosystem health while enabling the development of predictive regional ocean models. Beyond oceanography, BORI conducts extensive geological and geophysical surveys to explore the seabed for potential mineral resources, with the long-term goal of supporting domestic industries in mineral extraction and metal processing (Sunny et al., 2023). Its research scope

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

further extends to marine biology and food science, encompassing the cataloging of edible marine and non-marine fish species, the assessment of seafood quality, and the promotion of sustainable consumption practices aligned with global environmental goals (Hussain et al., 2018). Energy innovation represents another crucial pillar of BORI's research portfolio. The institute is actively investigating marine renewable energy—including wind and tidal power—to identify optimal sites for offshore wind farms and other energy-harvesting ventures (M. Islam & Mostaque, 2018). Parallel to these efforts, BORI is advancing mariculture technologies to boost fish production and developing improved, technology-based methods for salt extraction, enhancing both efficiency and sustainability in coastal industries (AftabUddin et al., 2021). Through its multidisciplinary research, technological integration, and sustainability-driven agenda, the Bangladesh Oceanographic Research Institute embodies the country's growing commitment to marine science and responsible resource management. As Bangladesh navigates the emerging frontier of the blue economy, BORI stands at the forefront—bridging scientific exploration with national development and reaffirming the nation's position as a rising leader in oceanographic research and innovation.

- *Policy & Finance Contributions*

As a signatory to the Global Agenda for Sustainable Development, Bangladesh has demonstrated a strong commitment to achieving the Sustainable Development Goals (SDGs) by 2030. Actively engaged in global sustainability discourse, the country has aligned its national priorities with international development objectives. To operationalize this vision, the Government of Bangladesh (GoB) has taken two major initiatives (Patil et al., 2018). First, it has integrated the SDGs into national development plans through comprehensive preparatory measures, including the mapping of ministerial responsibilities, establishing a monitoring and evaluation framework, formulating a financing strategy and action plan, and identifying 39+1 national priority indicators. Second, Bangladesh is translating policy into practice by equipping stakeholders with relevant tools and promoting SDG implementation at the local level. This participatory approach ensures that sustainable development becomes a collective national pursuit rather than a centrally imposed agenda. In an era of growing populations and diminishing natural resources, such strategic efforts underscore Bangladesh's pursuit of new, sustainable pathways for economic growth. Among these, the ocean stands out as a vast and largely untapped source of natural wealth. Control over maritime zones not only enhances a country's access to valuable marine resources but also strengthens its position in global trade—ultimately contributing to national growth and Gross Domestic Product (GDP) (M. M. Islam & Shamsuddoha, 2018). In this context, Bangladesh, with its extensive maritime territory in the Bay of Bengal, is no exception. The country has begun to recognize the ocean's potential as a cornerstone for sustainable economic expansion through the development of a blue economy. To realize this vision, Bangladesh requires long-term and sustainable financing mechanisms. Given the nation's resource constraints, the introduction of blue bonds offers a promising solution (Banerjee et al., 2024). Blue bonds, often described as the next generation of sustainable financing instruments, are designed to mobilize capital for projects that support the conservation and sustainable use of ocean resources (Thompson, 2022). Functionally similar to green bonds, these instruments provide funding to issuers who commit to repaying investors with interest, while ensuring that the proceeds are directed toward environmentally and economically beneficial marine initiatives. Recognizing the potential of such innovative financial tools, institutions like the Asian Development Bank (ADB) and the International Finance Corporation (IFC) have recently shown strong interest in supporting Bangladesh's blue economy agenda. Both organizations have proposed investments totaling at least $10 billion over the next decade through bond financing—an initiative aimed at unlocking the vast opportunities of the Bay of Bengal and setting a precedent for sustainable ocean-based development in the region (Business Standard, 2023). Through strategic adoption of blue bonds and partnerships with international financial institutions, Bangladesh stands poised to transform its maritime resources into engines of inclusive growth, environmental stewardship, and long-term economic resilience (Karim et al., 2023; Chakrobortty, 2023).

- *Biotechnology and Medical Technology*

Bangladesh's Blue Economy plays a growing role in biotechnology and medical innovation through the use of marine resources. The Bay of Bengal is home to more than 475 fish species, 36 shrimp species, and 15 crab species, many of which contain bioactive compounds with antimicrobial, antiviral, and anticancer potential (AftabUddin et al., 2021). Marine algae and cyanobacteria from coastal waters are also being investigated for pharmaceutical uses, particularly for their anti-inflammatory and antioxidant properties (Colombo et al., 2023). Additionally, chitosan derived from shrimp shells is applied in wound healing materials and drug delivery systems, while bioactive substances from sea cucumbers and sponges are being studied for cancer treatment. Research institutions such as the Bangladesh Oceanographic Research Institute (BORI), Khulna University, and Chittagong University are advancing marine bioprospecting and genetic studies (Failler et al., 2021). Policy support from the Blue Economy Cell and the National Biotechnology Policy 2023 further encourages the growth of marine biotechnology. Together, these initiatives contribute to progress on SDG 3 and SDG 14 by linking health advancements with sustainable ocean use.

IV. POLICY IMPLICATIONS

To unlock the full potential of Bangladesh's blue economy, policies must strike a thoughtful balance between economic growth, environmental protection, and social inclusion. This means moving beyond siloed approaches and embracing integrated, ecosystem-based governance that brings together fisheries, shipping, energy, and tourism—while safeguarding fragile marine habitats. Sound decision-making should be grounded in strong science. Investing in research, monitoring, and marine spatial planning will help

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

ensure that resources are used wisely and that competing interests are managed fairly. At the same time, innovative financial tools—like green finance and sustainable investment vehicles—can attract capital to low-impact marine industries (Chakrobortty et al., 2025; Chakrobortty et al., 2025). Encouraging private sector involvement through stock market incentives and corporate dividends can further drive environmentally responsible business practices (Ahmed et al., 2023; Chakrobortty & Sultana, 2023). Equity must be at the heart of this transformation. Promoting corporate social responsibility and expanding financial inclusion will help ensure that coastal and marginalized communities are not left behind (Miah et al., 2025). Access to skills training, credit, and diverse livelihood opportunities can empower these communities to thrive in a changing economy. Nature-based solutions, such as restoring mangroves and conserving marine habitats, offer a powerful way to build resilience against climate threats like sea-level rise and cyclones. Finally, aligning national efforts with global goals like SDG 14 and strengthening regional cooperation will not only protect shared marine ecosystems but also open new pathways for sustainable and inclusive prosperity.

V. CONCLUSION

The sustainable advancement of Bangladesh's blue economy requires a balanced integration of economic development and ecological stewardship. Despite the Bay of Bengal's vast potential in fisheries, maritime transport, renewable energy, and tourism, current exploitation remains limited and fragmented. Unlocking this potential necessitates ecosystem-based management, including marine spatial planning, pollution mitigation, and biodiversity conservation. Inclusive growth depends on empowering coastal and marginalized communities through skills training, participatory policymaking, and expanded access to marine livelihoods. Concurrently, sustainable resource management can bolster climate resilience by preserving coastal ecosystems that buffer against sea-level rise, cyclones, and erosion. Achieving long-term sustainability demands robust policy frameworks, transparent governance, inter-agency coordination, and sustained investment in marine science. Aligning national strategies with SDG 14 and regional ocean governance will reinforce international commitments and foster essential transboundary cooperation. Together, these measures can steer Bangladesh toward a resilient, inclusive, and ecologically sound maritime future.

REFERENCES

[1]. Abdelghany, G. A., & Soares, C. G. (2025). Global Trends and Challenges to Offshore Wind Energy in Vietnam. *Lecture Notes in Civil Engineering*, *590*, 21–44. https://doi.org/10.1007/978-981-96-3912-0_3

[2]. Abdullah-Al-Mahbub, M., & Islam, A. R. M. T. (2023). Current status of running renewable energy in Bangladesh and future prospect: A global comparison. *Heliyon*, *9*(3), 1–23. https://doi.org/10.1016/j.heliyon.2023.e14308

[3]. AftabUddin, S., Hussain, M. G., Abdullah Al, M., Failler, P., & Drakeford, B. M. (2021). On the potential and constraints of mariculture development in Bangladesh. *Aquaculture International*, *29*(2), 575–593. https://doi.org/10.1007/s10499-020-00643-9

[4]. Ahammed, S., Rana, M. M., Uddin, H., Majumder, S. C., & Shaha, S. (2025). Impact of blue economy factors on the sustainable economic growth of China. *Environment, Development and Sustainability*, *27*(6), 12625-12652.

[5]. Ahmad, H., Jose, F., Islam, M. S., & Jhara, S. I. (2020). Green Energy, Blue Economy: Integrating Renewable Energy and Sustainable Development for Bangladesh. *Marine Technology Society Journal*, *31*(1), 7–34. https://doi.org/10.25115/EEA.V31I1.3259

[6]. Ahmed, R., & Tamim, M. T. R. (2025). Marine and Coastal Environments: Challenges, Impacts, and Strategies for a Sustainable Future. *International Journal of Science Education and Science*, *2*(1), 53-60.

[7]. Ahmed, A., Afrin, K. H., Karmakar, A., & Chakrobortty, T. (2023). Exploring the Nexus of Domestic Debt and Private Sector Credit in Developing Countries with a Focus on Bangladesh. *International Journal of Finance & Banking Studies (2147-4486)*, *12*(2), 67–75. https://doi.org/10.20525/ijfbs.v12i2.2796

[8]. Alharthi, M., & Hanif, I. (2020). Impact of blue economy factors on economic growth in the SAARC countries. *Maritime Business Review*, *5*(3), 253-269.

[9]. Ashraful Islam, M., Naushad Ali, M. M., Al Mamun, A., Shahadat Hossain, M., Hasan Maruf, M., & Shihavuddin, A. S. M. (2024). Optimizing energy solutions: A techno-economic analysis of solar-wind hybrid power generation in the coastal regions of Bangladesh. *Energy Conversion and Management: X*, *22*(February), 100605. https://doi.org/10.1016/j.ecmx.2024.100605

[10]. Babu, M. T., Nei, H., & Kowser, M. A. (2022). Prospects and Necessity of Wind Energy in Bangladesh for the Forthcoming Future. *Journal of The Institution of Engineers (India): Series C*, *103*(4), 913–929. https://doi.org/10.1007/s40032-022-00834-8

[11]. Banerjee, P. K., Siddique, M. M., Shahid Ullah, M., & Akhtaruzzaman, M. (2024). Long-term financing: a critical assessment of the bond market in Bangladesh and the way forward. *International Journal of Trade and Global Markets*, *20*(3–4), 260–289. https://doi.org/10.1504/IJTGM.2024.145841

[12]. Barroso, S., Pinto, F. R., Silva, A., Silva, F. G., Duarte, A. M., & Gil, M. M. (2022). The circular economy solution to ocean sustainability: Innovative approaches for the blue economy. In *Research Anthology on Ecosystem Conservation and Preserving Biodiversity* (pp. 875-901). IGI Global Scientific Publishing.

[13]. Bhuiyan, M. A. H., & Darda, M. A. (2021). Tourism for sustainable development goals (SDGs) achievement in Bangladesh. *Bangladesh Journal of Public Administration*, *29*(2), 53–63. https://doi.org/10.36609/bjpa.v29i2.224

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

[14]. Bhuyan, M. S., Islam, M. N., Ali, M. M., Rashed-Un-Nabi, M., Alam, M. W., Das, M., Roy, R., Das, M. K., Mojumder, I. A., & Mustary, S. (2022). Blue Economy Prospects, Opportunities, Challenges, Risks, and Sustainable Development Pathways in Bangladesh. In *Global Blue Economy*. https://doi.org/10.1201/9781003184287-6

[15]. Bir, J., Golder, M. R., Zobayer, F. Al, Das, K. K., Chowdhury, S. Z., Das, L. M., & Paul, P. C. (2020). A review on blue economy in Bangladesh : prospects and challenges. *International Journal of Agricultural Research, Innovation and Technology*, *7*(4), 21–29. https://doi.org/10.5281/zenodo.4270719

[16]. C, O. M. H., Shadman, M., Amiri, M. M., Silva, C., Estefen, S. F., & La Rovere, E. (2021). Environmental impacts of offshore wind installation, operation and maintenance, and decommissioning activities: A case study of Brazil. *Renewable and Sustainable Energy Reviews*, *144*(February), 110994. https://doi.org/10.1016/j.rser.2021.110994

[17]. Campbell, L. M., Fairbanks, L., Murray, G., Stoll, J. S., D'Anna, L., & Bingham, J. (2020). *From Blue Economy to Blue Communities: reorienting aquaculture expansion for community wellbeing*. 0–14.

[18]. Chakrobortty, T. (2023). Determining Factors of Share Prices in Bangladesh: An Empirical Study on Cash Dividends and Retained Earnings. *International Journal of Research Publication and Reviews*, *04*(02), 1400–1415. https://doi.org/10.55248/gengpi.2023.4230

[19]. Chakrobortty, T., Banu, M. L. A., Alam, S., & Dobey, D. R. (2025). Green ınvestment and financial efficiency as catalysts for SDG progress_ Evidence from Bangladesh's banking sector.pdf. *Journal of Ekonomi*, *8*(1), 1–15. https://doi.org/https://doi.org/10.58251/ekonomi.1774837

[20]. Chakrobortty, T., Karmakar, A., Rahman, A. K. M. A., & Dobey, D. R. (2025). Bank performance relation with green banking practices: A study on commercial bank in Bangladesh. *Journal of Ekonomi*, *14*(December 2024), 107–118.

[21]. Chakrobortty, T., & Sultana, M. (2023). Financial Inclusion for Rural Community in Bangladesh through Agent Banking. *International Journal For Multidisciplinary Research*, *5*(3), 1–11. https://doi.org/10.36948/ijfmr.2023.v05i03.2747

[22]. Chauhan, P., Patel, P., & Sheth, S. (2015). Tidal Stream Turbine- Introduction, current and future Tidal power stations. *National Conference on Innovative and Emerging Technologies (NCIET-2015)At: SRPEC, UnjhaVolume: 1*, *June*, 285–287. https://doi.org/10.13140/RG.2.1.1823.2489

[23]. Chowdhury, K. R., Hossain, M. S., & Khan, M. S. H. (2022). Introduction to Bangladesh geosciences and resources potential. *Bangladesh Geosciences and Resources Potential*, *December*, 1–23. https://doi.org/10.1201/9781003080817-1

[24]. Colombo, S. M., Roy, K., Mraz, J., Wan, A. H. L., Davies, S. J., Tibbetts, S. M., Øverland, M., Francis, D. S., Rocker, M. M., Gasco, L., Spencer, E., Metian, M., Trushenski, J. T., & Turchini, G. M. (2023). Towards achieving circularity and sustainability in feeds for farmed blue foods. *Reviews in Aquaculture*, *15*(3), 1115–1141. https://doi.org/10.1111/raq.12766

[25]. Crosman, K. M., Allison, E. H., Ota, Y., Cisneros-Montemayor, A. M., Singh, G. G., Swartz, W., ... & Spalding, A. K. (2022). Social equity is key to sustainable ocean governance. *NPJ Ocean Sustainability*, *1*(1), 4.

[26]. Das, J. (2023). Blue economy, blue growth, social equity and small-scale fisheries: a global and national level review. *Studies in Social Science Research*, *4*(1), 38-82.

[27]. Delacámara, G., O'Higgins, T. G., Lago, M., & Langhans, S. (2020). Ecosystem-based management: moving from concept to practice. In *Ecosystem-based management, ecosystem services and aquatic biodiversity: Theory, tools and applications* (pp. 39-60). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-45843-0

[28]. Dimitrovski, D., Lemmetyinen, A., Nieminen, L., & Pohjola, T. (2021). Understanding coastal and marine tourism sustainability - A multi-stakeholder analysis. *Journal of Destination Marketing and Management*, *19*(March), 1–26. https://doi.org/10.1016/j.jdmm.2021.100554

[29]. Elegbede, I. O., Akintola, S. L., Jimoh, A. A. A., Jolaosho, T. L., Smith-Godfrey, S., Oliveira, A., Oladosu, A. O., Ramalho, D. C., Moruf, R. O., Afolabi, S., & Oloko, A. (2023). Blue Economy (Sustainability). *Encyclopedia of Sustainable Management*, 312–320. https://doi.org/10.1007/978-3-031-25984-5_401

[30]. Evans, L. S., Buchan, P. M., Fortnam, M., Honig, M., & Heaps, L. (2023). Corrigendum: Putting coastal communities at the center of a sustainable blue economy: A review of risks, opportunities, and strategies (Frontiers in Political Science, (2023), 4, (1032204), 10.3389/fpos.2022.1032204). *Frontiers in Political Science*, *5*. https://doi.org/10.3389/fpos.2023.1182415

[31]. Evans, T., Fletcher, S., Failler, P., & Potts, J. (2023). Untangling theories of transformation: Reflections for ocean governance. Marine Policy, 155, 105710. https://doi.org/10.1016/j.marpol.2023.105710

[32]. Failler, P., Hussain, M. G., Karim, A. Al, Alam, M. K., Sarker, S., Rouf, M. A., Sharifuzzaman, S., Hossain, M. M., Nobi, M. N., Das, J., Uddin, S. A., Shemon, W. S., & Hassan, D. (2021). The future of the blue economy in Bangladesh. *Bangladesh Mariitime Journal*, *76*(October), 14–28.

[33]. Farmery, A. K., Allison, E. H., Andrew, N. L., Troell, M., Voyer, M., Campbell, B., Eriksson, H., Fabinyi, M., Song, A. M., & Steenbergen, D. (2021). Blind spots in visions of a "blue economy" could undermine the ocean's contribution to eliminating hunger and malnutrition. *One Earth*, *4*(1), 28–38. https://doi.org/10.1016/j.oneear.2020.12.002

[34]. Fasoulis, I., & Kurt, R. E. (2019). Embracing sustainability in shipping: Assessing Industry's

adaptations incited by the, newly, introduced 'triple bottom line'approach to sustainable maritime development. *Social Sciences*, *8*(7), 208. https://doi.org/10.3390/socsci8070208

[35]. Febrina, S., Aimon, H., Kurniadi, A. P., & Marta, J. (2025). Assessing the role of the blue economy in strengthening food security: Evidence from lower-middle-income ASEAN countries. *Challenges in Sustainability*, *13*(1), 110-121.

[36]. Gacutan, J., Galparsoro, I., Pınarbaşı, K., Murillas, A., Adewumi, I. J., Praphotjanaporn, T., ... & Milligan, B. M. (2022). Marine spatial planning and ocean accounting: Synergistic tools enhancing integration in ocean governance. *Marine Policy*, *136*, 104936.

[37]. Ha, L. T. (2024). Achieving a blue economy through the circular initiatives: a path towards sustainable marine living resources. *Environmental Science and Pollution Research*, *31*(9), 13656-13672.

[38]. Hafsa, S. (2020). Economic Contribution of Tourism Industry in Bangladesh: At a Glance. *Global Journal of Management and Business Research*, *20*(1), 29–38. https://doi.org/10.34257/gjmbrfvol20is1pg29

[39]. Hajian, M., & Kashani, S. J. (2021). Evolution of the concept of sustainability. From Brundtland Report to sustainable development goals. In *Sustainable resource management* (pp. 1-24). Elsevier. https://doi.org/10.1016/B978-0-12-824342-8.00018-3

[40]. Haque, M. M., Mahmud, M. N., Ahammad, A. S., Alam, M. M., Bablee, A. L., Hasan, N. A., ... & Hasan, M. M. (2025). Building Climate Resilient Fisheries and Aquaculture in Bangladesh: A Review of Impacts and Adaptation Strategies. Climate, 13(10), 209.https://doi.org/10.3390/cli13100209

[41]. Haque, M. A., Chowdhury, T., & Rashid, M. (2023). Study on wave power regarding Bangladesh. *Journal of Bangladesh Academy of Sciences*, *47*(June), 21–25.

[42]. Hariram, N. P., Mekha, K. B., Suganthan, V., & Sudhakar, K. (2023). Sustainalism: An integrated socio-economic-environmental model to address sustainable development and sustainability. *Sustainability*, *15*(13), 10682. https://doi.org/10.3390/su151310682

[43]. Hasan, M. M., Hossain, B. M. S., Alam, M. J., Chowdhury, K. M. A., Karim, A. Al, & Chowdhury, N. M. K. (2018). The Prospects of Blue Economy to Promote Bangladesh into a Middle-Income Country. *Open Journal of Marine Science*, *08*(03), 355–369. https://doi.org/10.4236/ojms.2018.83019

[44]. Hasan, S. J., Haque, M. M., Aktaruzzaman, M., Kabir, M. M. N. A., & Aziz, M. S. Bin. (2025). Relationship Between Marine Fish Production and Climatic and Oceanographic Factors : Evidence From the Bay of. *Aquaculture, Fish and Fisheries*, *5*(2), 1–17. https://doi.org/10.1002/aff2.70049

[45]. Hoerterer, C., Schupp, M. F., Benkens, A., Nickiewicz, D., Krause, G., & Buck, B. H. (2020). Stakeholder Perspectives on Opportunities and Challenges in Achieving Sustainable Growth of the Blue Economy in a Changing Climate. *Frontiers in Marine Science*, *6*(January), 1–12. https://doi.org/10.3389/fmars.2019.00795

[46]. Hossain, S. M., Biswas, S., & Raihan Uddin, M. (2024). Sustainable energy transition in Bangladesh: Challenges and pathways for the future. *Engineering Reports*, *6*(1), 1–26. https://doi.org/10.1002/eng2.12752

[47]. Hussain, M. G., Failler, P., Karim, A. Al, & Alam, M. K. (2018). Major opportunities of blue economy development in Bangladesh. *Journal of the Indian Ocean Region*, *14*(1), 88–99. https://doi.org/10.1080/19480881.2017.1368250

[48]. Iglesias-Campos, A., Rubeck, J., Sanmiguel-Esteban, D., & Schwarz, G. (2021). *MSPglobal International Guide on Marine/Maritime Spatial Planning*. UNESCO.

[49]. Islam, M. K., Rahaman, M., & Ahmed, Z. (2018). Blue Economy of Bangladesh: Opportunities and Challenges for Sustainable Development. *Advances in Social Sciences Research Journal*, *5*(8), 168–178. https://doi.org/10.14738/assrj.58.4937

[50]. Islam, M. M., & Shamsuddoha, M. (2018). Coastal and marine conservation strategy for Bangladesh in the context of achieving blue growth and sustainable development goals (SDGs). *Environmental Science and Policy*, *87*(May), 45–54. https://doi.org/10.1016/j.envsci.2018.05.014

[51]. Islam, M., & Mostaque, L. (2018). Blue Economy and Bangladesh: Lessons and PolicyImplications. *Biiss Journal*, *39*(2), 135–162.

[52]. Islam, M. R., Akter, T., Hossaın, A., Tora, A. T., Mely, S. S., Hossaın, M. A., & Haque, M. M. (2024). Contribution and prospect of marine fisheries in the economy of Bangladesh and sustainable blue economy challenges: A review. *Marine Science and Technology Bulletin*, *13*(1), 41-55.

[53]. Islam, M. S., Ahmed, Z., Habib, M. A., & Masud, O. (2024). Blue economy of Bangladesh and sustainable development goals (SDGs): a comparative scenario. *Discover Sustainability*, *5*(1). https://doi.org/10.1007/s43621-024-00551-5

[54]. Islam, M. T., & Hossen, M. B. (2025). Contemporary and prospective economic conditions of Bangladesh. In *Economic Diplomacy: Reshaping Bangladesh-Latin American Diplomatic Relations* (pp. 75-100). Cham: Springer Nature Switzerland.

[55]. Kabil, M., Priatmoko, S., Magda, R., & Dávid, L. D. (2021). Blue economy and coastal tourism: A comprehensive visualization bibliometric analysis. *Sustainability (Switzerland)*, *13*(7). https://doi.org/10.3390/su13073650

[56]. Kaluvala, V. (2024). Marine Biodiversity and the blue Economy: A critical Examination of Conservation and sustainable Use. *Frontiers in Health Informatics*, *13*(8).

[57]. Karim, R., Chakrobortty, T., & Bhadra, H. K. (2023). Impact of Firm's Leverage on Financial Performance: Evidence from the Pharmaceuticals Industry of Bangladesh. *Khulna University Business Review*, *2*(December), 1–18. https://doi.org/10.35649/kubr.2022.17.1.2

[58]. Khan, M. Z. H., Bari, E., Siddique, S. N., & Alam, S. (2023). Renewable Energy Finance in Bangladesh –

Risk and De-risk Mechanisms. *SSRN Electronic Journal*, 1–67. https://doi.org/10.2139/ssrn.4573081

[59]. Khatun, F., & Kumar, N. (2021). IMPLEMENTATION OF THE SDGs IN BANGLADESH: DOMESTIC CHALLENGES AND REGIONAL CONSIDERATIONS. *Unescap*, *April*, 17–25.

[60]. Kumar, P., Jose, A. A., & Rajagopal, A. R. (2024). Sustainable Use of Marine Resources Using Ocean Technologies. In *Sustainable Development Goals* (pp. 249-274). CRC Press.

[61]. Lam, V. W., Allison, E. H., Bell, J. D., Blythe, J., Cheung, W. W., Frölicher, T. L., ... & Sumaila, U. R. (2020). Climate change, tropical fisheries and prospects for sustainable development. *Nature Reviews Earth & Environment*, *1*(9), 440-454.

[62]. Le, T. D. N. (2020). Climate change adaptation in coastal cities of developing countries: characterizing types of vulnerability and adaptation options. *Mitigation and Adaptation Strategies for Global Change*, *25*(5), 739-761.

[63]. Lee, K. H., Noh, J., & Khim, J. S. (2020). The Blue Economy and the United Nations' sustainable development goals: Challenges and opportunities. *Environment international*, *137*, 105528.

[64]. Lee, K. H., Noh, J., Lee, J., & Khim, J. S. (2021). Blue economy and the total environment: Mapping the interface. *Environment International*, *157*, 106796.

[65]. Liza, J. I., Majumder, S. C., & Rahman, M. H. (2025). Scrutinizing the impact of blue economy factors on the economic growth in Bangladesh: An empirical study. *Marine Policy*, *173*, 106542.

[66]. Longo, C. S., Buckley, L., Good, S. D., Gorham, T. M., Koerner, L., Lees, S., ... & Currey, R. J. (2021). A perspective on the role of eco-certification in eliminating illegal, unreported and unregulated fishing. *Frontiers in Ecology and Evolution*, *9*, 637228.

[67]. Manea, E., Agardy, T., & Bongiorni, L. (2023). Link marine restoration to marine spatial planning through ecosystem-based management to maximize ocean regeneration. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *33*(11), 1387-1399. https://doi.org/10.1002/aqc.3999

[68]. Martínez-Vázquez, R. M., Milán-García, J., & de Pablo Valenciano, J. (2021). Challenges of the Blue Economy: evidence and research trends. *Environmental Sciences Europe*, *33*(1), 1–17. https://doi.org/10.1186/s12302-021-00502-1

[69]. Mathew, J., & Robertson, C. (2021). Shades of blue in financing: transforming the ocean economy with blue bonds. *Journal of Investment Compliance*, *22*(3), 243–247. https://doi.org/10.1108/JOIC-04-2021-0020

[70]. Miah, M. T., Chakrobortty, T., Afrin, K. H., Dancs, A., & Fekete-Farkas, M. (2025). Does Corporate Social Responsibility Support Progress Toward Achieving Sustainable Development Goals in Bangladesh? *Journal of Public Affairs*, *25*(3), 1–16. https://doi.org/10.1002/pa.70064

[71]. Midlen, A. (2021). What is the Blue Economy? A spatialised governmentality perspective. *Maritime Studies*, *20*(4), 423–448. https://doi.org/10.1007/s40152-021-00240-3

[72]. Mumtaz, M. Z. (2025). Blue finance, investment choice and optimal portfolio allocation. *Journal of Financial Regulation and Compliance*. https://doi.org/10.1108/JFRC-11-2024-0241/1252797/BLUE-FINANCE-INVESTMENT-CHOICE-AND-OPTIMAL

[73]. Narayanan, R., Sreelekshmi, K., & TR, K. (2023). Marine resources and sustainable utilization. In *Conservation and Sustainable Utilization of Bioresources* (pp. 581-596). Singapore: Springer Nature Singapore.

[74]. Narwal, S., Kaur, M., Yadav, D. S., & Bast, F. (2024). Sustainable blue economy: Opportunities and challenges. *Journal of Biosciences*, *49*(1), 1–16. https://doi.org/10.1007/s12038-023-00375-x

[75]. Okafor-Yarwood, I., Kadagi, N. I., Miranda, N. A. F., Uku, J., Elegbede, I. O., & Adewumi, I. J. (2020). The blue economy-cultural livelihood-ecosystem conservation triangle: The African experience. *Frontiers in Marine Science*, *7*(July), 1–18. https://doi.org/10.3389/fmars.2020.00586

[76]. Østergaard, P. A., Duic, N., Noorollahi, Y., & Kalogirou, S. (2022). Renewable energy for sustainable development. *Renewable energy*, *199*, 1145-1152.

[77]. Ovchynnykova, O., Martinkienė, J., & Navickas, V. (2024). Enhancing Global Sustainability: The Role of the Blue Economy in Preserving Natural Capital. *Challenges in Sustainability*, *12*(1), 65–79. https://doi.org/10.56578/cis120105

[78]. Patil, P. G., Virdin, J., Colgan, C. S., Hussain, M. G., & Failler, P. (2019). Initial measures of the economic activity linked to Bangladesh's ocean space, and implications for the country's blue economy policy objectives. *Journal of Ocean and Coastal Economics*, *6*(2). https://doi.org/10.15351/2373-8456.1119

[79]. Patil, P. G., Virdin, J., Colgan, C. S., Hussain, M. G., Failler, P., & Vegh, T. (2018). Toward a Blue Economy: A Pathway for Bangladesh's Sustainable Growth in Bangladesh. *Washington, DC: The World Bank Group*, *May*, 1–94.

[80]. Pratama, D. P. A., & Farida, N. (2025). Unveiling the Interplay of Triple Bottom Line and Blue Economy in Empowering Coastal MSMEs of East Java towards Sustainable Export Capacity (SDGs). *JPEKA: Jurnal* Pendidikan Ekonomi, Manajemen dan Keuangan, 9(2), 145-162. https://doi.org/10.26740/jpeka.v9n2.p145-162

[81]. Rahman, M. M. (2021). Achieving Sustainable Development Goals of Agenda 2030 in Bangladesh: the crossroad of the governance and performance. *Public Administration and Policy*, *24*(2), 195–211. https://doi.org/10.1108/PAP-12-2020-0056

[82]. Rahman, M. R. (2017). Blue economy and maritime cooperation in the bay of bengal: Role of Bangladesh. *Procedia Engineering*, *194*, 356–361. https://doi.org/10.1016/j.proeng.2017.08.157

[83]. Roy, M., Yajing, F., & Biswas, B. (2020). Economic

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25nov1498

contribution of tourism in Bangladesh. *Tourism Marketing in Bangladesh*, *22*, 223–237. https://doi.org/10.4324/9781003007241-22

[84]. Sarker, S., Hussain, F. A., Assaduzzaman, M., & Failler, P. (2019). Blue economy and climate change: Bangladesh perspective. *Journal of Ocean and Coastal Economics*, *6*(2), 1–17. https://doi.org/10.15351/2373-8456.1105

[85]. Seddiky, M. A., Ara, E., & Karim, A. (2024). Climate change-induced hazard risks and migration in Bangladesh: A case study. *Current Research in Environmental Sustainability*, *7*, 100253.

[86]. Siswanto, N., & Rosdaniah, S. (2023). Driving Blue Economy for Sustainable Development: A case of stakeholder collaboration platform development. *IOP Conference Series: Earth and Environmental Science*, *1198*(1), 1–11. https://doi.org/10.1088/1755-1315/1198/1/012013

[87]. Spalding, M. J. (2016). The New Blue Economy: the Future of Sustainability. *Journal of Ocean and Coastal Economics*, *2*(2). https://doi.org/10.15351/2373-8456.1052

[88]. Sumaila, U. R., Walsh, M., Hoareau, K., Cox, A., Teh, L., Abdallah, P., Akpalu, W., Anna, Z., Benzaken, D., Crona, B., Fitzgerald, T., Heaps, L., Issifu, I., Karousakis, K., Lange, G. M., Leland, A., Miller, D., Sack, K., Shahnaz, D., … Zhang, J. (2021). Financing a sustainable ocean economy. *Nature Communications*, *12*(1). https://doi.org/10.1038/s41467-021-23168-y

[89]. Sunny, S. K., Supti, S. T., & Hossion, M. A. (2023). Design of portable A-frame for oceanographic data collection. *Journal of Maritime Research*, *20*(2), 36–41.

[90]. Yao, W., Zhang, W., & Li, W. (2023). Promoting the development of marine low carbon through the digital economy. *Journal of Innovation & Knowledge*, *8*(1), 100285.

[91]. Yuan, H., & Failler, P. (2025). Defining the Blue Economy–in a language functional approach. *Maritime Studies*, *24*(1), 14.

[92]. Zhu, R., Islam, H., Rana, M., Rahman, K., Karim, R., Chakrobortty, T., & Rahman, M. M. (2025). Towards sustainable development: how resource depletion, emissions, and renewable energy shape progress in OECD nations. *Air Quality, Atmosphere and Health*. https://doi.org/10.1007/s11869-025-01774-9