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Transforming Maritime Education for a Maritime Bangladesh

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Abstract

Bangladesh, with its significant coastline, aims to become a developed nation with a robust maritime sector. However, our research finds that current maritime education faces challenges such as outdated curricula, inadequate infrastructure, and limited international collaboration. This research investigates how to transform maritime education by integrating blue economy principles, incorporating modern technologies like AI and IoT, and fostering strong industry-academia partnerships. It aims to create a skilled workforce, develop high-quality programs, achieve international recognition for Bangladeshi institutions, and provide policy recommendations to stakeholders. The findings of this research provides a comprehensive roadmap for policymakers, academicians, and industry stakeholders to implement necessary reforms. This roadmap includes measures such as curriculum reform to align with industry demands, investment in modern training facilities, establishing international collaborations, fostering industry-academia partnerships, and advocating for government policies that support the development of a strong maritime sector. By addressing these challenges and implementing these roadmaps, Bangladesh can develop a world-class maritime education system that contributes to economic growth, sustainable development, and global competitiveness within the maritime sector.

Keywords: Maritime Education and Training, Developed Bangladesh, Blue Economy, Marine Resources, Smart Technology

Introduction

Bangladesh is transforming to be a developed nation (Saleh, 2022). A key part of this transformation is the development of Bangladesh's maritime sector, a natural resource as it has one of the unique lines and is positioned in a strategic location on the Bay. Blue economy, due to the country's salient nature, and maritime sector have a pivotal role in the economy. The ocean space has vast

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potential for development and sustainable exploitation of resources as economic growth. Key to this potential is the notion of a blue economy, which seeks sustainable development in specific maritime territory by managing ocean resources for economic growth, enhancing livelihoods and promoting an ecosystem approach to enhance overall health factors.

In the case of Bangladesh, sectors that are expected to witness these developments with a higher potential include marine fisheries and aquaculture; offshore energy (hydrocarbon production); port logistics such as ship bunkering services integrated with strong hinterland connections both for imports and exports out from countries like India, covering different types and ranges along coastal lines (The Financial Express, 2024). Investments in education and training provide the basic groundwork to take advantage of these opportunities with a population that is skilled, technically competent and business ready. It is essential that the maritime education and training system be strengthened in keeping with such relevant requirement of a nation.

The maritime education and training in Bangladesh have been analysed under this paper to get the most beneficial way that would conform to advanced Bangladesh. More important than the scope is not just to improve quality of education alone but also policy, infrastructure and collaborations internationally for bridging strategic gaps. This study aims to provide an in-depth roadmap for maritime education and training, by tracing the long evolution of the standards and challenges as well as opportunities seen when it comes longsighted through that target.

This is when the various academic institutions, governmental agencies and private sectors come into play. All of these stakeholders have a role to play in germane to maritime education for the future and befitting to meet all facets demanded from the global maritime industry. Maritime education is still far from becoming a globalised field; for that, changes in ocean development strategies are needed to integrate modern technology applications and sustainable development approaches with international best practices. The approach in this paper is to undertake a Strengths, Weaknesses, Opportunities and Threat (SWOT) analysis which will provide useful information for maritime sector on how the education system needs improvement with regard to connectivity of training programmes. It will lead towards employment in order to get involved so as to bring drastic change for good especially on matching more effectively job openings requirements available versus candidate supply versus demand historically since year 2000 until now!

The above statement is very important to reach the desired results that we want given Bangladesh marches toward achieving the status of a prosperous maritime nation. This is particularly true of maritime education and training because it has a direct bearing not just on the development of man power required to drive economic growth but also for sustainable exploitation of marine resources. To set the stage for this consideration, the paper addresses a core research question that how can maritime education and training in Bangladesh be improved to contribute effectively to the development aspiration of Bangladesh, overcoming existing challenges as well as taking advantage of opportunities for sustainable development? Based on this research question, a comprehensive review of maritime education is conducted to understand major challenges and solutions for alignment with national development goals. This research is expected to offer a direction map for maritime education and training in light of a standard maritime nation. As part of the study, entries have been made for improvements in the maritime education sector at international standards and integration with technological innovation taking more than usual sustainable development practices. The main objective of the project is to assure creating a qualified workforce or roadmap that promotes strengthening economic growth, sustainable natural resources and competitiveness in international markets within the maritime industry.

To attain this aim, the research includes assessing the current maritime education status and system in Bangladesh, including identifying strengths and challenges within ocean literacy. The study intends to evaluate the current curricula, infrastructure, a capacity of faculty and student outcomes in relation with international standards and demands for modern Bangladesh. The main objective is discovering not only major but also key hurdles and barriers on efficient maritime training. These hurdles encompass obsolete syllabus, the confinements of both training venues and prevailing technological accessibilities along with not so frequent international affiliations as well inadequate policy backing. The study also sets out to zero in on the obstacles creating bottlenecks as well identify some of them that need urgent remedy and reform.

In the era where world is transitioning to Fourth Industrial Revolution (4IR), it requires revolutionizing education system especially when new technologies prevailing such as AI, IoT, robotics and big data analytics etc., (Ally & Wark, 2020). This aspect is assessed to measure the extent of technologies that can be imbibed in training programs such that graduates are equipped to cater modern day marine needs. Despite this, one of the main purposes of presenting the results on which academic institutions should work in tandem with maritime

industry. It also looks at private sector participation to facilitate research, innovation and entrepreneurship in the maritime domain.

Strategic Importance of the Research

This study has strategic significance for a number of reasons; it tackles a critical gap in the development strategy of Bangladesh by emphasising on maritime education comparing the standard of the globally recognized nations to ensure the sustainable growth of blue economy. Positive Alignment with national priorities, recommendations in this research provide practical directions for reforming maritime education. Finally, it highlights the economic potential of the blue economy to support sustainable development as foreseen in global initiatives such as Sustainable Development Goals (SDGs) and especially SDG 14: Life below Water (Friess et al., 2019). In this way, the research provides roadmap to both domestic and global initiatives for sustainable development by reframing international best practices and targets at a national scale on what constitutes responsible ocean resource management.

The study is useful for both policymakers and academicians, as well the industry that need to reform maritime education. This study will develop a gateway to understanding the factors influencing this competitiveness and offers some useful suggestions for what Bangladesh might need to do in relation not only further investments on education, infrastructure and technological development but also adding other strategies required aiming at becoming one of five global maritime lead players. The research also shows the requirement for robust policy support, international partnerships and private sector involvement in influencing outcomes of maritime education.

It covers key features of maritime education such as policy analysis, curriculum design and development, faculty capacity building and infrastructure improvement just to provide ample opportunity for industry participation. It also discusses the wide implication of conforming maritime education to develop Bangladesh, which includes economic growth, resource management sustainably and competitiveness internationally.

The study considers the MU, marine academies, and other affiliated institutions in maritime education as one! It also examines the function of international organizations, such as IMO and United Nations Conference on Trade and Development (UNCTAD), in establishing global limits for maritime teaching.

It also examines how global trends like the 4IR are impacting maritime education. The study analyses the way new technologies are integrated into teaching curricula to better equip graduates for serving in today's maritime world. This could involve identifying new areas such as, for example in the autonomous ship navigation, smart ports and oceanographic data analysis etc., wherein the students are educated accordingly.

Methodology

This is a mixed method study with both qualitative and quantitative research approach. The methodology includes:

Review of literature. To examine relevant maritime education policies, historical documents and research-based literature; as well as international standards. Review of IMO, UNCTAD data, as well/data from national maritime statistics to evaluate how performance currently looks like/ where the opportunity areas are.

Interviews. This involves conducting interviews on a structured format with the maritime professionals, policy-makers and educators as well students to get to know their problems and expectations in terms of the sector.

Competitive Survey. Bangladesh vs. world's top ranked maritime education countries like Philippines, India and China.

Results and Discussion

The Maritime Education in Bangladesh a Brief Historical Perspective

The maritime heritage of Bangladesh indeed very rich. The special skill in ship building, fishing and maritime trade of this area is known from around 2300 BC, when navigation in the world was commenced. In 17th century, the shipyards of Chattogram were reported to have built an entire fleet of warships for Ottoman Navy. During the Mughal Empire, Bengal was the leading producer of ships in the sub-continent.

We know about the fact of "Frigate Deutschland," which was built in Chattogram in 1818 (The Daily Star, 2023). The German Maritime Museum has the remains of the ship stored for hundred years. Shipbuilding and maritime activities of this area continued during the British colonial period also. By the end of World War-1, sailors consisted of 20% of the British maritime forces were from

this subcontinent, among which substantial number was from Bengal. They were known as "Lascars" i.e. seaman and sailors who would help the British trade ships also. A lot of those sailors were from Eastern India i.e. present Bangladesh who fought during both the world wars.

Sacrifice of valiant Bengali sailors was recognized by naming a British corvette as HMIS BENGAL. It is worth mentionable that, during our great Liberation War the main logistic supply line of Pakistani occupation force was broken by the "Operation Jackpot" at several ports where dozens of Pakistani ships were destroyed. This actually brought our liberation faster and could draw attention to international community.

Bangladesh enacted "The Territorial Waters and Maritime Zones Act 1974" considering the importance of sea even when the international community could not draw any convention in this regard. The third United Nation Convention on the Law of the Sea came into light in 1982.

This reflects the foresight/ providence of our country in maritime sector. Moreover, one of the points of "Six Point Movement" was "Navy headquarters should be in East Pakistan," reflects the country's concern in maritime sector.

The war-torn country was left with only destroyed infrastructures in every sector after our independence. The Mercantile Marine Academy, which was established in 1962 at Chattogram, was abandoned by Pakistani administration (Bangladesh Merchant Marine Academy, n.d.). In 1973, the country founded, Bangladesh Marine Academy with British Technical Cooperation at Juldia, Chattogram. The academy earned IMO-UN white list in 2000 and blessed with around 5000 highly skilled seafarers and maritime experts around the world (Bangladesh Marine Academy, n.d.). Bangladesh started National Maritime Institute and Bangladesh Institute of Marine Technology. Bangladesh Marine Fisheries Academy was established in 1973 to produce skilled human resources for marine fishing in our waters (Bangladesh Marine Fisheries Academy [BMFA], n.d.). All these initiatives were conceived to boost the maritime activities of Bangladesh. Already four more marine academies have been established in Barishal, Pabna, Rangpur and Sylhet to generate more maritime professionals.

Bangladesh initiated/ launched the arbitral process in respect of Myanmar and India under the UNCLOS III in 2009 to claim our due share in the Bay of Bengal (Balaram, 2012). The Arbitral Tribunal in The Hague sustained Bangladesh's claim of equitable solution to a full 200 nautical miles exclusive

economic zone (Suarez, 2016). Bangladesh won more than 1,18,813 square kilometres of waters comprising of territorial sea, exclusive economic zone etc. extending out to 200 nautical miles across sizable area (Mostofa, Al-Amin, & Bint-E-Basar, 2018). This has opened a new era for our development, economic growth generating employment and tap resources. The country has shortage of resources on land, so the nation has to source from the sea. The country has to maintain the marine environment pollution free to get the benefits from the Bay of Bengal and beyond.

An advance nation is conceptualized as, harnessing emerging technologies, networks, and data to create technology enabled solutions that contribute to nation building. To achieve the status of a developed nation, every citizens of the country will require to have adequate digital knowledge and know how to empower themselves to make positive change in nation building and creation of modern citizens will only be possible when they will be provided smart education. Government services will be reachable to every citizen with least cost, time and effort by using advanced modern technology under a smart Government. Bangladesh needs to develop human resource with technology-oriented education who would have expertise in AI and other modern technology that will enable to adopt 4IR, development of smart solutions and systems, innovation and business entrepreneurship. Increment of research and development seems the key.

Strategic Options for Maritime Bangladesh

One of the advanced ones in this field is Maritime University (MU), the nation's first maritime university which offers a variety of programs (Tahera, 2023). MU has inaugurated the first maritime business incubator, Startup BLUE. Startup BLUE is a collaborative program designed to help new startups, especially in blue economy to succeed. Here BLUE stands for 'Building Leaders to Uphold the Economy'. It is the only Blue Economy Business incubator in the whole world. This incubator creates leaders to harness the blue economy by proactively engaging in the startup's journey from inception to exit, to empower and enable founders to contribute significantly to a better world. At Startup BLUE, Bangladesh nurtures and build Blue Economy startups through innovation that can be launched and scaled up. A Business Plan Competition organized by Business Incubator took place that was aimed to foster entrepreneurship and innovation, saw the presence of distinguished guests and showcased the creative business ideas of aspiring entrepreneurs. Relation between academia and business leaders is required to continue developing our effort to maritime related business.

Presently there are three institutes running at MU. The Institute of Bay of Bengal and Bangladesh Studies (IBBBS) focuses on the research activities in maritime sectors of Bangladesh (Institute of Bay of Bengal and Bangladesh Studies (IBBBS) - BSMRMU, n.d.). After acquiring a vast area in maritime sector, Bangladesh has a scope to contribute herself in the national economy, education, and research arena. In MU, IBBBS boasts an academic environment that is highly competitive and conducive to research. The institute deals with the postgraduate students as well as faculty members for different research purposes. It has also access to the undergraduate students who are involved in different research activities with the concerned departments. The aim is to provide a research environment that stimulates intellectual curiosity, critical thinking, and independent problem-solving skills. It also organizes short certificate course like "Port and Shipping Studies" for the professionals of government and non-government organizations, who wants to enrich their knowledge through partnership and sharing with networking provided by the institute. Other two institutes – Institute of Renewable Energy and Marine Resources and Institute of Disaster Management are also conducting similar activities in respective fields.

MU has collaboration and cooperation with several world renowned and reputed maritime universities, research organizations and institutes both in home and abroad. They conduct seminars, joint research, project work, visits and experiment with them. The faculties and students of MU conduct numerous research works in maritime sector such as ship breaking and recycling, marine environment and pollution control, marine biotechnology, marine employment, port and shipping management, maritime business, marine fisheries etc. MU publishes Bangladesh Maritime Journal regularly where different writings on maritime issues are covered. As a university, MU conducts international seminars on contemporary maritime issues frequently where maritime professionals around the world take part and exchange their ideas.

Bangladesh has a huge opportunity for employment in marine profession. Having 2.15% of world population, we have only 0.272% of mariners in service worldwide as per UNCTAD (Islam et al., n.d.). Whereas the Philippines have 13.34%, China 7.09%, India 5.99%, even Pakistan and Sri Lanka have larger ratios of mariners serving worldwide (WorldData. Info). This shows that Bangladesh's mariners are less preferable and we are generating fewer mariners. The employer always chooses the best available human resource for their business. Now, it is

evident that the country has to increase the demand of native mariners by enhancing their professional quality. World-class standard training and education can develop the quality of our mariners both officers and ratings.

One of the many reasons of lesser demand of Bangladeshi seafarers is – lower standards of human resource for this profession. It was found by the contemporary researchers that there are other causes such as – shortage of national flag vessel to complete 12 months sea training of cadets on completion of 02 years training from marine academies and reputation of our mariners in the global market (Islam, Alamgir, Shaheen, & Mahmud, 2021). There are separate government authorities to look after these two issues.

However, in the case of maritime education and training, to enhance the quality of our mariners MU can contribute a lot. Bangladesh needs to do the following activities:

a. Assessing the demand of employer.

b. Enhancing quality of education and training – modern simulator-based training.

c. Standardization of training and education.

d. Periodic review of syllabus.

e. Networking with employer.

Furthermore, the structured education at many of these institutes has not acclimated quickly enough to our advancing technology. For example, several courses do not cover the bleeding-edge topics such as AI, IoT, robotics and other 4IR technologies which is becoming a part of maritime sector. In the absence of exposure to these trending issues which challenge technology, graduates are often unprepared for technological advancements in a highly digital maritime world.

The absence of robust international partnerships is another serious problem to be tackled. Although MU and other institutions like BORI, BIMRAD, and SPARSSO have formed little collaboration with foreign universities or organizations, the scale of these works were restricted. This can be achieved by associating with other research, and improvement in training standards for concurrent faculty student exposure. Institutions can learn from the best practices worldwide while following internationally accepted standards.

It is critical that the country should adopt international best practices which will improve the maritime education standards in Bangladesh. Still another good strategy is Policy Change of Outcome-Based Education (OBE), another government policy requiring the invitation to OBE, built on learning based education principle for graduates that list minimum outcomes expected when over taking any course. OBE prioritizes observable and demonstrable ability, so that students do not only learn content but also know how to use the knowledge effectively in professional contexts. This type of orientation would help to facilitate the graduates in Bangladesh meet international requirements which may increase their employability.

Quality assurance is an additional important ingredient of the harmonisation with international education benchmarks. The first measure to increase the credibility of Bangladesh's maritime education sector is setting up an accreditation system in a way that academic programs will be monitored and improved on continuous basis. International accreditation provided by international organizations — for example, the IMO certificates of competences can be added advantage to ensure that an edge over other sailors or maritime professionals.

UNCTAD's Contribution to Maritime Education and Comparison with Bangladesh

UNCTAD, as a global organization focused on trade and development, has indirectly contributed to maritime education by promoting sustainable maritime practices and advocating for capacity building in developing countries (United Nations Conference on Trade and Development, n.d.). While it doesn't directly provide educational programs, its research and policy recommendations can influence national maritime education strategies. For instance, UNCTAD's work on maritime transport, shipping emissions, and port development can be added to the selected curriculum. These international certifications also help to enhance the employability of Bangladeshi mariners further. Global affiliations and international certifications that are recognised throughout the world can make their students job-ready by enhancing global mobility, an essential requirement given International Coral Reef Initiative (ICRI) has to cater largely to shipping companies overseas (UN Environment Programme, n.d.). Having such certifications will not only grow the career sector but also promote maritime literacy and ocean awareness.

India, with its diverse range of maritime institutions, including the prestigious Indian Maritime University (IMU), has a long-standing tradition of maritime education. The strong industry-academia linkages and international collaborations have contributed to the development of a robust maritime education. However, bureaucratic hurdles and inconsistencies in quality standards across institutions pose challenges to the overall quality of maritime education in India.

China, a global maritime powerhouse, has invested heavily in its maritime education sector. Chinese maritime universities offer a wide range of programs, from undergraduate to postgraduate levels, and have strong partnerships with international institutions. However, language barriers and cultural differences can hinder international collaboration and student exchange.

While Bangladesh has made significant progress in maritime education, it still has a long way to go to catch up with China and India (Rahman et al., 2022). To bridge the gap, Bangladesh needs to prioritize investments in infrastructure, faculty development, and research facilities. Additionally, strengthening international collaborations and promoting student exchange programs can help enhance the global visibility of Bangladeshi maritime institutions. By addressing these challenges and capitalizing on its strategic geographic location, Bangladesh can position itself as a regional hub for maritime education and training.

However, maritime education policy development in Bangladesh must prioritize fostering a deep understanding of the maritime domain and its significance for the nation's future. This requires a multi-sectoral approach, integrating maritime education into formal education at all levels, developing engaging public outreach programs, and leveraging technology to disseminate maritime-related knowledge. By cultivating a society that values and understands the maritime sector, Bangladesh can better protect its marine resources, adapt to climate change, and harness the opportunities presented by the blue economy.

Challenges and Suggested Roadmaps

The analysis of the said researches revealed that it is absolutely essential to holistically upgrade long overdue strategic access to Bangladesh Maritime education landscape. This alignment needs to take place not just on policy but also in terms of the infrastructure, international cooperation mechanisms and technology integration for sustainable growth. The following challenges and guidelines address an elaborate framework analysis on how to advance maritime

education to contribute for the prosperity of maritime Bangladesh:

Formulate Clear Policies for Maritime Education. Bangladesh needs to have clear, comprehensive and integrated policies on maritime education. However at the moment policy fragmentation reduces opportunities from growth that is integrated across education, research and employment sectors. Bangladesh needs a standard policy framework, enforced collectively by government ministries and institutions in addition to private sector stakeholders.

Such a framework should focus to maintain the educational jobs-to-the industry pattern with up-to date industrial demand related skill sets for graduates. It should again incorporate carefulness for quality assurance maybe that their instructional programs can contend at a global level. A national accreditation body for maritime education should be set up to standardise and monitor educational standards, enforce curriculum reforms where needed, and inculcate a culture of improvement.

The policy framework should mainstream the maritime higher education with national goals specifically Blue Economy approach and SDG compliant. The policy should introduce incentive framework for research, development and innovation in maritime institutions to make the respective maritime sector as one of knowledge driven global competitors through a planned way.

Bring Maritime Education In Line With Advanced Technology. It is necessary to incorporate modern technology in the maritime education system which would be helpful to produce graduates with more knowledge and ability to fulfil current skills requirement of commercial shipping. A host of innovations including AI, the IoT, robotics, and data analytics are driving the global maritime sector. Though Bangladesh is lacking behind, the introduction of such technologies into the training could offer them real scenario hand on practice over these latest developments and equipment, in order to remain competitive.

Theoretical and practical aspects of training should be provided using modern simulators, AI-based tools and IoT devices. Simulators are a good example of the power and potential for learning through real-time, immersive experiences related to navigation, ship operations or multiple other emergency situations. Through AI based tools the students analyze massive data sets related maritime logistics, port management and vessel performance thereby gaining invaluable insights which is essential for efficient maritime operations.

Maritime ports and logistics more aligned to the current trend towards advanced shipping and logistics using sensors; blue ocean pedagogy allows the use of IoT devices for real-time monitoring. In addition, to dig a little deeper on applied work by developing habits that are instilled in robotics (notably underwater exploration and maintenance) into opportunity for students engagement. With digital transformation at the core, this would revamp many job roles students aspire to, needs to integrate these technologies in their curriculum as they not only add an edge to the skills but also increase employability with a global perspective.

Training of faculty and instructors to catch up with these emerging technologies is also a must when those tools are employed. To guarantee that professional development is in place to ensure the teaching staffs is ready too. If campuses invest in faculty development programs, including training on the use of simulators or AI and IoT systems, it can boost student's quality education levels.

Promote Industry-Institute Interaction. The gap between academia and industry, this still stands as the major drawback for Bangladesh maritime education system. The growing partnership that educational institutions are building with the maritime industry is going to be key for improving practical skills for graduates. Industry-Academia collaborations work well implementing internships, field training and research projects to bring students closer to the real world while bridging that huge gap between theoretical knowledge and practical application.

Collaborative Programs can be developed in ship building, port operations, logistic management etc. For example, students can engage in ship construction, maintenance and repair as part of academic courses carried out through collaborations with the country's existing network of shipyards. Collaborations with the port authorities similarly could be availed to get on job/training on berth scheduling, container loading and unloading logistical operations. In addition to the fact that these experiences make graduates more skilled, they also assist institutions in keeping their curricula up-to-date with respect to contemporary industry needs.

The industry coupled with the academia together can innovate further provided they have taken up research projects in collaboration internships and field training. Now that academic researchers and industry professionals can work together, research areas such as renewable ocean energy systems (integration of wind turbines, power electronics on ships), sustainable fishing practices models

will benefit greatly from the collective expertise. This can also help attract funding of national and international sources in collaborative projects enhancing the research capacity of maritime institutions.

It is also important to involve industry representatives when it comes to curriculum development, so that the educational programs are directly mapped as per market requirements. The creation of advisory boards which include maritime industry representatives can also act as a means to generate a continuous dialogue between academia and the industry to keep educational offerings relevant.

Strengthen International Cooperation. Bangladesh needs help from its international partners to really move the needle. Establishing collaboration with some of the world's best maritime institutions will raise education standards; strengthen research apparatus and global acceptability of Bangladeshi degrees. Collaborations exists but tend to be somewhat sectoral, and limited in their reach. Extending these partnerships would open the door to faculty placements, collaborative research projects and student exchange opportunities.

At the same time, international cooperation allows these best practices to be introduced in maritime education and for institutional compliance with global standards. Collaborating with establishments in major maritime nations like the Philippines, Norway or Singapore can help to know the best practices pertaining to training methodologies technological innovations and the tuning of curriculum standard. An international collaborative project with an organization like the International IMO can provide students and faculties with a window to emerging global trends in maritime safety, sustainability and governance.

Such partnership can open up doors for Bangladeshi students to get exposed to different modes of instructions where they can know about other maritime operations standards and management style through student exchange programs. Faculty exchanges can also help improve teaching quality by exposing Bangladeshi faculty to international perspectives. There is a need for international cooperation to help Bangladesh upgrade the global mobility of her maritime graduates in order to compete on an international level, integrating skilled human resources with effective reciprocity.

International collaboration might also enable to receive financial support on a worldwide scale for the research and development of maritime education. Most of the international organizations provide the opportunity in the form of grants and funding for research cooperation on different matters related to climate

change, marine conservation, resource management etc. If Bangladesh institutions join these projects, they can increase research capability on the Indian Ocean region and have ability for developing sustainable solutions to add more knowledge globally regarding maritime subjects.

Efforts towards Sustainable Operations in Maritime Education. Given increasing international concern to protect marine ecosystems from potential damage and secure sustainable development goals, sustainability should be at the base of maritime education. For immediate release: sustainable practices have to be part of the curricula for training mariners in order to produce future environmentally responsible stewards who will properly manage ocean resources. Also, their educational programs need to address ocean conservation, pollution prevention and climate resilience so that they graduate with a good understanding of the environmental impact of maritime activities.

If navigated and exploited sustainably, the surface of our oceans can provide both food to billions around the world but also a clean water resource. For example, future seafarers could benefit by learning about sustainable fishing such as how to fish properly and responsibly (sustainable and responsible fishing), study of their main food source/fish stock — among other effects on the ecosystem. Courses on marine pollution control also include topics such as oil spill response, waste management and ballast water management systems to help graduates minimize any negative impacts.

This green focus needs to be practiced for maritime institutions in their research and development efforts. Innovative research projects on sustainable wave and tidal energy can promote further innovation in the field while addressing some of Bangladesh's pressing energy requirements. In the same vein, institutions should also promote research in marine biodiversity, coastal resilience and sustainable human adaptation through such programmes that cater for both national as well international sustainability goals.

Incorporation of sustainability in maritime education can be more comprehensive by facilitating collaboration with international organizations on marine conservation such as United Nations Environment Programme (UNEP) and the Global Ocean Forum. So, adopting sustainable solutions will be a key way for Bangladesh to emerge as a responsible maritime nation engaging in economic growth while protecting the environment.

Advocate for Private Sector Involvement in Maritime Education. The maritime sector has been one of the best field to drive economic growth through innovation and entrepreneurship. Establishing incubators and innovation hubs in maritime universities fosters entrepreneurship especially for the Blue Economy These incubators offer a positive environment for students and graduates to innovate, startup their businesses and participate in the maritime ecosystem.

For example incubators may be established to support start-ups that develop sustainable aquaculture businesses, marine tourism ventures or innovative logistics solutions along with those involved in renewable ocean energy development. Innovation hubs, through both funding and mentorship offerings as well their extensive industry networks have been instrumental in helping budding entrepreneurs turn ideas into actual businesses. The underlying principle behind this is to aid economic development while also generating employment.

Established "Startup BLUE" at MU, is one of the best practices to encourage entrepreneurship in maritime education for Blue Economy startups. These efforts need to be expanded to gain ground with the help of government agencies as well as other stakeholders from private sector. The educational program could also introduce more challenges related to entrepreneurship, allowing students who might find that aspect interesting and create an inspiration to be future owner of businesses.

Generate Jobs for Maritime Graduates. It is important to provide limitless opportunities for the maritime graduates in the maritime sector so that it maximize their employability upon completion. But alongside traditional roles, such as moving ships and fixing them yards a cracking business there too- new fields like maritime logistics, marine tourism, aquaculture management etc., covers in the realm of Maritime Acoustic Environment (MAE).

It is critical to promote the varied career paths involved in maritime work as well. Career guidance in maritime institutions aids students to understand their area of interest and capabilities which help them navigate towards the right career path. By partnering with industry stakeholders, it is also possible to promote the employment of graduates and allow them to transition from academia more effectively toward professional work.

Government support is required to provide maritime graduates with employment opportunities in national institutions, including the Bangladesh Shipping Corporation (BSC), port authorities and marine resource management

agencies. Local-hire mariner priority policies enhance job assurance and student appeal for maritime education.

Conclusion

Maritime sector will play the key role in helping achieve this target through Bangladesh's ambitions to transforming into a developed nation. At the centre of this vision is the Blue Economy that can unleash sustainable growth in many maritime sectors — including fisheries, tourism, port logistics and renewable energy. Still, what will be needed to maximize this opportunity is increased investment in maritime education and training.

The maritime history of Bangladesh is deep and storied, yet also fraught with challenges, as obsolete educational content exist alongside a lack in international exchange programs or supporting infrastructures. In this context, institutions like MU is improving in adding diversification of programs and integrating those to global standards. The challenge still remains around the integration of some emerging technologies Such as AI, IoT and Robotics into curriculums due to lack resources or appropriate training facilities. This is necessary to fill learning gaps and keep pace with the demands of global maritime industry.

For the development of maritime education in Bangladesh, policy reforms are very important. A robust policy framework bridging the education, research and employment sectors is imperative in ensuring its alignment with developed nation. Establish a national accreditation agency for maritime education which could standardize curricula, monitor the standards of educational provision and drive improvements in career support. More funding for research and faculty must accompany the introduction of new technologies available in training.

By improving maritime education that is backed by highly developed technology, this makes graduates more competitive. The use of simulators, AI-driven tools and IoT devices brings more realistic training scenarios to help cadets be better equipped with soft skills. In addition to preparing faculty for teaching with new technologies. Another strategic step is industry-academia collaboration that needs to grow in multiple sectors where students gain practical exposure through internships and field training that will increase their employability.

Collaboration with the global maritime fraternity is crucial for improving maritime education in Bangladesh. Partnering with the leading maritime nations

can enable exchange of best practices, adoption of global standards and lower costs through joint research projects. Such an approach would also expose the students internationally, making them more competitive in reference to global maritime sector. At the same time, international certifications and accreditations make Bangladeshi mariners more employable allowing them to be deployed in a much wider geographic range.

Sustainability as a core-part in the revival of maritime education. Mariners might be environmentally responsible if curricula could adjust to include such practices as ocean conservation, pollution control and resource management. Education programs must incorporate the principles of The Blue Economy to promote sustainable development with conservation and economic growth.

In the maritime sector, entrepreneurship plays a vital role to drive innovation and economic growth. Establishing incubators and innovation hubs within maritime universities could provide a platform for entrepreneurship, pushing students to delve into areas like sustainable aquaculture, marine tourism or the renewable ocean energy.

Finally, the robust maritime sector promotion and skill-enhancement journey holds an important place for Bangladesh to become a prosperous maritime nation. Policy, curriculum, infrastructure and international collaboration need to be innovatively reconstructed towards facilitating the strategic alignment of maritime education to develop Bangladesh and her Blue Economy. This would generate enormous potentials to build a competitive maritime workforce in Bangladesh, not only skilled enough but also smart enough to lead growth in the modern global maritime economy. It is to make Bangladesh a forerunners among the polity of maritime nations.

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