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# Harnessing Potential, Overcoming Challenges: A Blueprint for Sustainable Shipbuilding in Bangladesh

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*ABSTRACT*

In the shipbuilding industry, fluctuations occur much like the ebb and flow of ocean waves. Great Britain held the position of global shipbuilding market leader before World War II, but the United States assumed this role during and after the war. Subsequently, in the 1960s, Japan emerged as the dominant shipbuilding nation, only to gradually cede its competitive advantage to the promising industrial nation of South Korea. South Korea benefited from various advantages, including cost-effective labor, a well-suited shipbuilding strategy, robust government support, and a favorable currency exchange rate. Finally, in 2009, China ascended to the pinnacle of the shipbuilding market. Bangladesh, with its substantial and youthful population, possesses vast potential for development in labor-intensive heavy industries such as shipbuilding. The local shipbuilding sector in Bangladesh holds tremendous promise and vast opportunities. However, Bangladesh has struggled to keep pace with the technological advancements in global shipbuilding. Furthermore, a range of typical challenges and issues have impeded the growth of shipbuilding within the country. Local shipyards must strive to elevate themselves to meet global standards. It is anticipated that if the local shipbuilding industry can harness its potential by surmounting these challenges and capturing even a small fraction of this vast market, Bangladesh could evolve into a sustainable shipbuilding nation and a viable ship-exporting nation once local demands are met. This analytical paper seeks to outline a path toward establishing a sustainable shipbuilding industry in Bangladesh by drawing upon lessons learned from successful global shipbuilding nations and by analyzing the prospects and challenges specific to local shipbuilding.



## 1. Introduction.

Globally, sea transport handles 90% of goods due to cost-effectiveness, convenience, and capacity (Lixing, 2009). Over the past decade, the growth rate of global trade has consistently reached double digits. This surge can be attributed to rising consumer demands and a substantial increase in global imports, particularly in many developing nations, spanning the last two decades (Hossain, 2023a&b). Consequently, the demand for commercial ships is on the rise, making shipbuilding an inherently appealing industry for developing countries.

Historically, the shipbuilding industry has grappled with a lack of global oversight, leading to a propensity for excessive investment. This is primarily because shipbuilding encompasses a wide array of technologies, contributes to the development of various smaller industries, employs a substantial workforce, generates significant income, and operates on a global scale. This pattern and tendency have been observed in all leading and successful shipbuilding nations (Hossain et al., 2017; Hossain, 2023n).

As of 2021, the global shipbuilding market was valued at

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USD 132.52 billion, and it is projected to reach USD 175.98 billion by 2027, assuming an average growth rate of 4.84% (Mordor Intelligence, 2022). Typically, shipbuilding is considered a slow-moving industry that grapples with challenges stemming from volatile market growth, economic fluctuations, and environmental shifts. Moreover, the recent COVID-19 pandemic and the current geopolitical landscape have injected further uncertainty into the shipbuilding market (OECD, 2021).

Historically, shipbuilding has been recognized as a primitive and labor-intensive industry. Traditional shipbuilding was characterized by low-tech methods (Hossain, 2023c&m). The introduction of arc welding technology led to the use of normal steel, which unfortunately lacked sufficient fracture toughness. This resulted in catastrophic brittle fractures and structural failures of ships. It wasn't until the 1950s that specialized high-tensile-strength and tough steels with favorable physical and chemical properties were adopted in the shipbuilding industry (Hossain, 2023e&f). The advancement of steel production subsequently yielded quality steels with minimal brittle fracture, which are now standard in modern shipbuilding (Stopford, 2009). Modern shipbuilding is characterized by distinct aesthetics and workmanship. Today's shipbuilding industry heavily relies on automation and employs line production manufacturing processes, necessitating a technologically skilled workforce. Ship design, often referred to as naval architecture, involves finalizing ship drawings after subjecting ship models to tests, either in towing tanks or through computational fluid dynamics (CFD) analysis (Hossain, 2023g&o).

Modern shipbuilding also embraces the use of prefabricated blocks or modules. Entire multi-deck segments of a ship's hull are constructed off-site, transported to the building dock or slipway, and then lifted into place and assembled according to the guidance of naval architects. This construction method is known as block or module construction. Consequently, modern shipyards require pre-installed machinery, equipment, pipes, electrical cables, and all other necessary components within the blocks to minimize the effort needed to assemble the hull once it's welded together (Hossain, 2018a; 2023g&d). Furthermore, the advent of the Fourth Industrial Revolution (4IR), or Industry 4.0, is expected to significantly impact the entire maritime sector, leading to transformative changes within the shipbuilding industry (Noordstrand, 2018). Shipbuilding 4.0 aims for intelligent shipyards characterized by adaptability, resource efficiency, ergonomic practices, and close integration among ship owners, shipbuilders, suppliers, and other stakeholders involved in both industry and value processes (Hossain, 2023h&p).

Bangladesh boasts around a hundred indigenous dockyards and shipyards situated in various locations. Most of these shipyards operate under individual management, with the exception of three public shipyards run by the Bangladesh Navy. Many local private shipyards rely on materials, plates, fittings, engines, components, and machinery salvaged from old merchant ships, often sourced from the Bhatiary ship recycling industry in Chottogram (Banglapedia, 2003; Hossain, 2015). These local shipyards construct a variety of ship types and sizes, with some capable of building ships of up to 10,000 Dead Weight Tons (DWT). Consequently, Bangladesh has the potential to enhance its shipbuilding capacity, quality, technology, and find suitable markets for local shipbuilding.

To foster a sustainable shipbuilding industry, Bangladesh must address the challenges with a well-defined strategy. Considering the size of local shipyards, it's apparent that building small and medium-sized container, tanker, cargo, multipurpose, and specialized ships ranging from 3,000 to 10,000 DWT is well-suited for the country. Bangladesh possesses all the necessary resources and capacity to capture this niche market competitively by 2030. This market niche represents approximately 2% of the global shipbuilding market share, with an estimated annual value of USD 4.00 billion. By taking advantage of present opportunities, addressing future challenges, and implementing suggested measures, Bangladesh can formulate and adopt a robust policy and associated strategies to capture this targeted market while optimizing its shipbuilding capacity. This approach offers a sustainable means to revive Bangladesh's illustrious shipbuilding heritage.

This comprehensive study aims to focus on the path to achieve sustainable shipbuilding in Bangladesh by drawing lessons from successful global shipbuilding nations and assessing the actual potential, prospects, and challenges within the local shipbuilding sector. The study relies on a blend of primary and secondary data, incorporating valuable input from relevant stakeholders and resource experts within the domestic and international maritime sector.

## 2. Trend of Global Shipbuilding History.

In Europe, Britain held a prominent position in the world economy since the industrial revolution, excelling in industrial production. By 1902, British-owned tonnage accounted for 45% of the global merchant fleet, and the shipbuilding industry had 58% of the global market. However, after peaking, Britain's global market share in both shipping and shipbuilding sharply declined, falling below 1% and 3%, respectively, by 1982.

During the same period, other European countries like Germany, France, and the Netherlands entered the shipbuilding industry, collectively holding 20% to 40% of the global market until 1945. Scandinavian shipbuilders captured 21% of the market in 1931. However, both the UK and European countries gradually lost their market shares in tandem. After 1986, the entire European maritime industry saw a significant decline.

The decline of British shipbuilding began during World War I (WWI). The USA became the world's shipbuilding hub during WWI and WWII, reaching a peak of 85% to 90% of the global market share. However, after WWII, the US market share plummeted to 10% by 1950. Political intervention played a crucial

role in the US shipbuilding industry during the war, but the removal of government subsidies and higher costs led to its decline post-WWII.

Japan underwent an industrial revolution post-WWII, focusing on heavy industry, including shipbuilding. The Japanese government played a central role in planning and resource allocation, supporting shipowners with favorable loans. Japan's integrated production technology, domestic orders, and open registration under flags of convenience propelled its shipbuilding industry to a 50% global market share by the 1960s.

By the 1980s, South Korea emerged as a significant player, with rapid growth, capturing a 22% global market share. Japan retained its position with 43%, and China entered the scene with a 2.3% share. The shipbuilding centers shifted entirely from the Western world to Asia by the end of the 1980s.

## 3. Trend of Local Shipbuilding History.

Indigenous shipbuilding in this region has a rich history, dating back to the traditional craft of boat building in Bengal (Alam, 2004). Ibn Battuta visited Bengal in the 14th century and returned with a wooden ship built in Sonargoan, Dhaka, which is now preserved in European museums. Chottogram was a hub for ocean-going ship construction in the mid-15th century, as observed by European traveler Mr. Caesar Frederick (Hossain et al., 2010a). During the Mughal period, Chottogram manufactured warships for their Naval Force, and the British Navy used wooden-hulled warships from Chottogram, notably in the Battle of Trafalgar in 1805. One example is the frigate Deutschland (1000 DWT), constructed in Chottogram for the German Navy in 1818 (Hossain, 2023b&i).

The indigenous shipbuilding history of Bengal is illustrious. In the early 19th century, Chottogram shipyards could build 1000 DWT ships. During Bangladesh's time as part of Pakistan, public shipyards dominated, but today, the private sector is the primary player, with around a hundred shipyards constructing inland, coastal, and fishing vessels. In 1979, FAO funded the construction of food grain-carrying vessels by High-speed Shipbuilding and Engineering Company (HSEC) Ltd in Narayanganj. Mitsui Engineering and Shipbuilding Industry (MESI) of Japan entered a shipbuilding joint venture with HSEC, resulting in the construction of deep-sea fishing trawlers. Recently, shipbuilding industries like Ananda Shipyard and Slipways Ltd (ASSL) in Dhaka and Western Marine Shipyard Ltd (WMSL) in Chottogram have upgraded facilities and secured export orders. In 2008, ASSL exported ocean-going cargo ships, ferries, and boats to Denmark and Mozambique, placing Bangladesh on the list of ship-exporting nations (MSc Thesis, 2010).

Local private shipyards can construct steel ships for inland and coastal waters, ranging from 1500 to 4500 DWT to meet local needs. They operate independently, often sourcing materials from the Bhatiary shipbreaking yards. These shipyards would benefit from guidance and support to become more robust establishments. Some private shipyards have demonstrated the capacity to manufacture high-quality small and medium-sized ships, meeting both local and foreign demands (MSc Thesis, 2010). Additionally, three public shipyards managed by the Bangladesh Navy and four private shipyards, namely ASSL, WMSL, KSSL, and KSYL, can build ships around 10,000 DWT. ASSL and WMSL have already exported merchant ships to Europe, Africa, and Asia. Foreign shipowners are increasingly turning to Bangladesh, boosting shipbuilding quality and capacity to global standards (Hossain K, 2021).

## 4. Structural Characteristics of Shipbuilding Industry.

The economic interconnection among global trading partners continues to expand, and the shipbuilding and shipping industries play pivotal roles in the production and operation of merchant ships. Shipping is widely regarded as the lifeblood of international trade and commerce. Shipbuilding, by its very nature, is a complex and diverse industry, characterized by a considerable heterogeneity of ship types and uses. These include bulkers, tankers, container ships, offshore vessels, passenger ferries, cruise ships, yachts, warships, and more. The price range for these vessels varies significantly, with large cruise ships commanding prices around USD 1 billion, while smaller Handy-size bulk ships cost approximately USD 25 million (Clarksons Research, 2015; 2021a&b). Key drivers of the shipbuilding market encompass the growth of seaborne trade, demand for end-of-life ships, and the diverse applications of ships, among others. Conversely, imbalances in the shipbuilding market stem from factors such as oversupply of ships, inflation, and shipyard overcapacity (Hossain, 2023k&o). The structural characteristics and business dynamics of the shipbuilding industry are presented in Table 1.

## 5. Present Global Structure of Shipbuilding Industry.

In 2021, China, Korea, and Japan collectively produced 85% of the world's merchant ships, measured by compensated gross tonnage (CGT) (IHS Fairplay, 2022). The shipbuilding industry can be viewed as an assembly-focused sector where a significant portion of the value is added by the marine equipment industry. Europe is a major contributor, supplying approximately 50% of the world's marine equipment (IHS Fairplay, 2022). Leading shipbuilding economies often differ across various market segments. For instance, the production of cruise ships is concentrated in four European countries: Germany, Italy, France, and Finland. This represents a niche market where differentiation among producers primarily hinges on factors such as quality, technology, services, pricing, and sustainability. Table 2 highlights the top ten shipyards and crude steel producers globally in 2020. The value chain directly correlates with achieving competitive advantages, emphasizing the importance of adhering to schedules in the shipbuilding production process.

Furthermore, a shipyard's competitiveness is greatly influenced by its supplier relationships and goodwill.

Table 1: Structural characteristics and business nature of the shipbuilding Industry.

| Sl. No | Subjects or Characteristics | Situation of shipbuilding Industry |
|---|---|---|
| 1 | Production pattern | Unit and specialized production |
| 2 | Delivery time | Naturally long (2-3 years) |
| 3 | Production factor intensity | Usually labor-intensive industry. |
| 4 | Trade ability | Very high and diversified<br>Play large role of ship finance in the exports<br>Multiplier of other business as connected with back-word and foreword linkage |
| 5 | Possible change areas in future | Offshore business and it involves high risks<br>Repair and maintenance of ships<br>Steel construction and fabrication business |
| 6 | Product heterogeneity | Very high as wide variation of ships types |
| 7 | Demand accelerate | Expansion of seaborne trade<br>Replacement of ships<br>Changes of regulations<br>Changes of owner requirement |
| 8 | Challenges | Eco-system or environment friendly product<br>Automation and digitalization<br>Impose regulation<br>Design as unit production<br>Overcapacity<br>Trade fluctuation |
| 9 | Uses | Versatile<br>EOL ships also have value |

Source: Author.

Shipyards must maintain close cooperation with their maritime and general goods suppliers, encompassing plates, materials, equipment, machinery, spares, cables, paints, furniture, and more. These suppliers constitute the backward and forward linkages of the shipbuilding industry. Typically, the strong bargaining power of these suppliers is limited, and they foster mutually beneficial relationships with shipbuilders and shipyards. In any industry, under capacity is a temporary issue that tends to attract new investments. In contrast, prolonged overcapacity leads to adverse consequences, including oversupply, which exerts pressure on prices and negatively impacts companies' economic health.

## 6. Investment and Government Support.

The global shipbuilding industry faced significant challenges from 2008 to 2015, primarily due to the effects of the Great Depression. During this period, three South-East Asian countries, along with a few Western nations, emerged as new production hubs. The investment trends in local shipbuilding by their respective countries are depicted in Fig. 1. Countries such as Japan, China, Singapore, the United States, and South Korea strategically invested in their domestic sectors, thereby strengthening their local industries and enabling them to thrive in the global market. Despite substantial fluctuations in prices and demand during the Great Depression of 2008-2015, China, Japan, and South Korea maintained their positions as leaders in the global shipbuilding and ship-repair industry. Several compelling factors contributed to the growth of their shipbuilding markets, including robust financial backing from governments, domestic investments, foreign direct investment (FDI), cost-effective labor, well-developed infrastructure, and business - friendly regulations (Hossain, 2018b, 2023e&p).

Table 2: Top ten shipbuilding companies in the world in 2020.

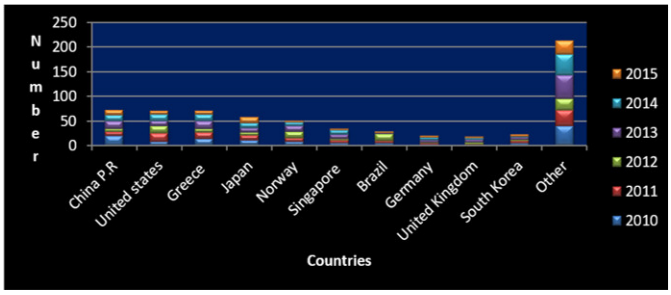
| Rank | Shipbuilding Companies | Revenue (USD billions) | Location of Main Office |
|---|---|---|---|
| 1 | Hyundai Heavy Industries | 39.33 | Ulsan, South Korea |
| 2 | STX Offshore & Shipbuilding | 16.96 | Changwon, South Korea |
| 3 | DSME | 12.76 | South Gyeongsang, South Korea |
| 4 | Samsung Heavy Industries | 8.58 | Samsung Town, Seoul, South Korea |
| 5 | Sumitomo Heavy Industries | 6.59 | Tokyo, Japan |
| 6 | Fincantieri | 5.17 | Trieste, Italy |
| 7 | United Shipbuilding Corporation | 5.1 | Moscow and Saint Petersburg, Russia |
| 8 | CSSC | 29.79 | Haidian District, Beijing, China |
| 9 | Sembcorp Marine | 1.18 | Tanjong Kling Road, Singapore |
| 10 | Tsuneishi Shipbuilding | 1.55 | Hiroshima, Japan |

Source: Bizvibe Blog, 2022.

Shipbuilding, despite its long history, remains an open and fiercely competitive global market. The shipbuilding industry has accumulated extensive experience in weathering economic ups and downs, with past global crises typically impacting shipbuilding quite severely. Shipbuilding production follows a gradual decline and recovery pattern, often influenced by slow economic growth, market fluctuations, and imbalances between supply and demand for ships. Additionally, an increase in production costs can weaken ship demand. Given that shipbuilding is a highly capital-intensive industry, it heavily relies on strong government support and political stability for long-

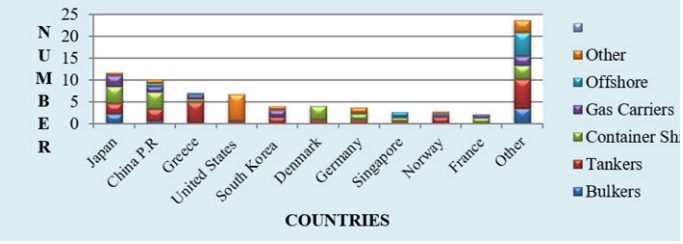
term sustainability. As depicted in Fig. 2, it is evident that government support and domestic investment are vital for the shipbuilding industry's survival during global crises. Countries such as Japan, South Korea, and China have bolstered local shipbuilding through increased domestic demand, investments in research and development (R&D), and government subsidies, all of which make their shipbuilding sectors attractive to the global market. Therefore, government support and domestic investment are essential elements for achieving sustainable growth (Hossain, 2023c&e).

Figure 1: Trend of investment in local shipbuilding by own countries in 2010-2015.




Source: Hossain, 2018b.

Figure 2: Trend of government investment and shipbuilding trend from 2010 in 2015.




Source: Hossain, 2018b.

## 7. Important Lessons Learn from Successful Shipbuilding Nations.

To enhance our local shipbuilding industry, we must focus on key lessons learned from successful shipbuilding nations (Hossain, 2023a,b&e). These lessons include:

a. Adopting Modern Technology: Embracing cutting-edge technology and a skilled workforce will greatly enhance local shipbuilding. Japan's efficiency, productivity, and cost-effectiveness in shipbuilding are a testament to the benefits of modern technology adoption.
b. Effective Management and Innovation: Promoting technical innovation, skilled management, and good governance are vital for sustainability and workmanship improvement. South Korea's success in shipbuilding stems from its commitment to innovation and effective management.
c. Industrialization as a Prerequisite: Sustainable shipbuilding is closely linked to industrialization. South Korea and China's shipbuilding growth resulted from domestic demand driven by industrialization efforts, including the import of raw materials and energy while exporting heavy industry products.
d. Government Support and Regulations: Government financial support and favorable regulations are essential for local shipbuilding growth. Japan's Program Shipbuilding Scheme in the 1950s and its support for low-interest loans to foreign ship-owning companies are models that have benefited the industry. South Korea and China have followed suit.
e. Cooperation Among Shipyards: Collaboration among local shipyards is crucial for national shipbuilding success. Japanese and Chinese shipbuilding industries restructured for continuous cooperation among shipbuilders, enhancing overall competitiveness.
f. Strong Backward Linkage and Supply Chain: Sustainable shipbuilding relies on robust backward linkage industries and stable supply chains. Japanese and Korean shipbuilding industries thrive due to their strong backward linkages and stable supply chains. In Korea, major suppliers are part of the Korean Marine Equipment Association, meeting over 85% of local demand. China has effectively supported local demand through strategic planning and support.

By incorporating these lessons and strategies, we can revitalize and strengthen our local shipbuilding industry.

## 8. Capability of Local Shipbuilding.

Bangladesh's shipbuilding industry comprises over a hundred indigenous shipyards, workshops, and builders, with many registered under the Department of Shipping (DOS). Approximately 70% of these facilities are situated around Dhaka and Narayanganj, 20% in Chittagong, and 10% in Khulna and Barishal, supporting the construction and repair of inland and coastal ships (Hossain, 2010; Hossain 2023e&o). The main three public shipyards are:

1. Dockyard and Engineering Works (DEW) Ltd: Established in 1926, DEW is the region's oldest shipyard. After various transitions in ownership, it was taken over by the Bangladesh Navy in 2006. Since then, it has successfully built numerous ships for various customers, becoming profitable and a major contributor to Narayanganj's economy.
2. Khulna Shipyard (KSY) Ltd: Founded in 1957, KSY struggled until the Bangladesh Navy assumed control in 1999. The shipyard has versatile dock facilities, enabling it to build and repair a wide range of vessels, including naval ships, merchant ships, tugs, and workboats. It is currently profitable and a significant economic contributor to Khulna.

3. Chittagong Dry Dock Limited (CDDL): CDDL, located within Chattogram Port, was handed over to the Bangladesh Navy in 2015. It boasts a large dry dock and has repaired numerous merchant and naval ships. CDDL is currently profitable and has plans to build Frigates and Offshore Patrol Vessels (OPV) for the Bangladesh Navy.

In addition to these public shipyards, there are numerous private shipbuilding and repair yards across Bangladesh, many with a rich history and strong reputation. Some have reached international standards and produce small to medium-sized ships for the global market. ASSL, WMSL, KSY Ltd, and KSSL are among the private shipyards that have received orders from foreign ship owners and successfully delivered new ships.

Local shipyards in Bangladesh construct various types and sizes of vessels, catering to the country's extensive inland and coastal water transport needs. While many ships are built, a significant portion remains unregistered in official records. Table 3 provides essential data for common ship types and sizes in local shipyards.

Table 3: Top ten shipbuilding companies in the world in 2020.

| Types of Vessels (Inland & Coastal) | Dwt or no of passenger | Length (m) | Draught (m) |
|---|---|---|---|
| Multipurpose ship or Coaster | 1500- 4000 | 60- 120 | 3.5- 6.0 |
| Cargo | 1000- 3500 | 50- 100 | 3.0- 5.0 |
| Passenger ship or Launch | 300- 1500 Passenger | 60- 110 | 3.0- 4.0 |
| Tanker | 1000- 4000 | 50- 120 | 3.0- 6.0 |
| Sand Carrier | 200- 500 | 20- 40 | 2.0- 3.0 |
| Barge | 200- 1000 | 20- 60 | 2.5- 3.5 |
| Dredger | 30-100 | 10-30 | 2.0-3.0 |

Source: Authors.

However, there is room for improvement in ship design knowledge within the industry. Basic and technical ship designs often come from international design houses, and while some shipyards invest in high-quality designs, others lack adequate ship design knowledge, leading to safety concerns. Bangladesh has the potential to participate in the lucrative ship design industry, but a shortage of qualified naval architects and technical personnel poses challenges to fully realizing this opportunity.

In conclusion, Bangladesh's shipbuilding industry is diverse and growing, with public and private shipyards contributing significantly to the local economy. Ensuring safety through proper ship design and investing in qualified personnel can further boost the industry's potential.

## 9. Overall Prospect, Potential and Strength of Local Shipbuilding.

Bangladesh possesses all the essential components to emerge as a prominent player in the global shipbuilding industry by leveraging its rich shipbuilding heritage and cost-effective labor force in the maritime sector. The presence of indigenous shipyards, a long history of shipbuilding, and a sizable pool of young workers are the primary strengths of the local shipbuilding industry. Here are the potential and strengths of Bangladesh's shipbuilding sector:

a. Cost-Efficient Shipbuilding Labor: The local shipbuilding industry benefits from having the world's most affordable workforce. Bangladesh boasts manual welding quality that surpasses that of China, Vietnam, and the Philippines.
b. Supporting Industries: Local shipyards currently enjoy substantial support from complementary industries, creating a robust network of backward and forward linkage industries. Re-rolling factories, utilizing materials from Bhatiary break-yards, produce various ship accessories at competitive prices.
c. Rich Maritime History: As a maritime nation with a rich shipbuilding history, Bangladesh attracts both local and foreign entrepreneurs to invest in the sector. Its coastal and riverside locations provide geographical convenience for shipbuilding and other maritime activities.
d. Skilled Manpower: Bangladesh possesses a wealth of white-collar semi-skilled manpower, including naval architects, marine engineers, electronics and IT engineers, and management professionals in the maritime field. A modest investment in training and skill development can transform them into valuable human resources.
e. Cost-Effective Workforce: Bangladesh has a substantial pool of cost-effective labor resources, including skilled workers employed overseas who have earned a reputation for discipline, diligence, hard work, obedience, and quick learning in international settings.
f. Technical Institutes and Vocational Training Centers: Numerous technical institutes and vocational training centers produce skilled laborers for heavy industries, with several shipyards generating thousands of skilled workers each year across various trades.
g. Contribution of SMEs: A multitude of Small and Medium Enterprises (SMEs) actively contributes to heavy industries, such as shipbuilding, serving as both backward and forward linkage industries.
h. Classification Society Support: Classification societies extend support by guiding the development of class-certified shipbuilding and certifying materials lists for export-oriented shipbuilding.
i. Cost Competitiveness: Bangladesh offers competitive shipbuilding costs compared to China, whose prices have risen due to improved living standards. Continuous improvement is crucial to prevent order cancellations during economic downturns.
j. Policy Support: Tax-free activities for export-oriented shipyards, simplified shipbuilding rules, taxes on imported ships, development strategies for the local industry, river dredging, and collaboration with related sectors can enhance the local shipbuilding industry.

k. Export Diversification: The emerging shipbuilding industry aligns with the export diversification strategy. The government has drafted a shipbuilding policy to improve the shipping and shipbuilding sector as a whole.
l. Global Market Share: Local shipbuilding has the potential to capture a share of the global market, earning significant foreign currency by constructing and exporting quality ships. This growth can extend to backup industries that support local shipbuilding, fostering collaboration with foreign counterparts.
m. Low-Cost Ship Demand: Current geopolitical conditions and financial crises may increase demand for low-cost ships, creating opportunities favorable to local shipbuilding. This sector could become a dominant foreign currency earner for Bangladesh, addressing its export-import imbalance.
n. FDI Opportunities: Foreign Direct Investment (FDI) opportunities exist in the shipbuilding sector, with countries like China, Turkey, and the Netherlands expressing interest. Western countries are exploring new markets and imposing specific requirements, potentially benefiting Bangladesh and similar developing nations.
o. Small and Medium Shipbuilding: Bangladesh is well-suited for small and medium-sized shipbuilding and can target the market for 3,000-20,000 DWT multipurpose, container, tanker, and cargo ships, ensuring continued growth in these niche segments.
p. Recognized Potential: Government entities, investors, shipbuilders, ship owners, and stakeholders recognize shipbuilding as a promising sector and a viable alternative to resource-based industries in the near future.

These strengths and opportunities position Bangladesh favorably for growth and prominence in the global shipbuilding industry.

## 10. Present Challenges and Limitations of Local Shipbuilding.

Local shipbuilding holds immense potential for expansion and securing a small but noteworthy global market share. However, several distinct weaknesses must be acknowledged and transformed into strengths to foster growth in this sector. Bangladesh's shipbuilding industry has faced challenges stemming from a lack of effective government, stakeholder, and private sector initiatives, resulting in sluggish progress and a struggle to penetrate the international shipbuilding market. While cheap labor has traditionally been a key advantage, it alone cannot sustain the industry in an era where advanced technology can offer cost-saving benefits. Therefore, Bangladesh has the opportunity to make significant economic strides by nurturing and optimizing its export-oriented shipbuilding industry.

Entrepreneurs also express confidence in the bright prospects of the local shipbuilding industry, leveraging Bangladesh's rich maritime history, favorable geographic location, and the availability of cost-effective labor. Notably, ships produced in Bangladesh are often 10% to 30% less expensive than those manufactured in Japan, Korea, China, Vietnam, or India.

Yet, existing and potential weaknesses and challenges remain, including:

a. Technological Lag: Despite the availability of cheap labor, shipbuilders have been slow to adopt advanced technology. Additionally, a significant gap exists between industrial needs and the curriculum of the mass education system, necessitating a stronger focus on technical education.
b. Lack of Awareness and High Costs: Policymakers, bureaucrats, bankers, and other stakeholders often underestimate the potential of local shipbuilding. To stimulate progress in this sector, Bangladesh needs to prioritize shipbuilding similarly to Ready-Made Garments (RGM) and address high local bank interest rates and service charges. Furthermore, the industry's reliance on bank guarantees from foreign banks adds extra costs.
c. Family-Run Shipyards: Many private shipyards lack a corporate culture as they are managed by family members who occupy key positions. This creates an unhealthy work environment, leading to a disconnect between shipyard owners and employees. Dishonest practices and fraud also pose challenges.
d. Infrastructure and Location: Most local shipyards are situated around Dhaka, far from coastal areas, limiting the size of ships that can be produced. Weak infrastructure, energy shortages, limited land, and poor Ease of Doing Business (EODB) hinder rapid development.
e. Dependence on Imported Materials: Prime raw materials essential for shipbuilding, such as class-approved MS plates, frames, girders, stiffeners, and longitudinals, are imported. This dependence on foreign suppliers adds to costs.
f. Technical Expertise and Investment: The local shipbuilding industry lacks technical expertise in modern technology, which hampers its ability to meet the demands of the Fourth Industrial Revolution (4IR). Inefficiencies, limited technological, managerial, and labor skills, and a shortage of modern shipbuilding tools and machinery are prevalent. Bangladesh also relies on foreign support for ship design.
g. Banking Challenges: Local commercial banks require counter guarantees from foreign banks for shipbuilding, leading to additional costs. This limits competitiveness against rivals such as China, Korea, Japan, Vietnam, the Philippines, India, and Australia. Furthermore, a lack of required capital and sound investment hampers productivity expansion and export promotion.
h. Poor Management Practices: In many local shipyards, family members dominate management, alienating employees and fostering an unfriendly work environment. This leads to poor job satisfaction, motivation, and discipline, along with high absenteeism and turnover.
i. Limited Understanding and Support: Shipbuilding is not well understood by local investors and policymakers, resulting in lukewarm responses to investment proposals.

The banking support received by the shipbuilding sector is deemed insufficient, and the sector carries inherent business risks for entrepreneurs and bankers.

j. Technological Shortcomings: The technology employed in local shipbuilding remains rudimentary, lacking efficiency, technological advancement, managerial expertise, and skilled labor. The shortage of expert machine operators and digital/AI professionals is evident. Additionally, Bangladesh does not engage in ship design, creating dependency on foreign assistance.

k. Global Competition: Competition from other countries, such as Vietnam, the Philippines, Indonesia, India, and Brazil, also poses a threat to the local shipbuilding sector. The global market for new ships has a Compound Annual Growth Rate (CAGR) of approximately 4%, presenting challenges and risks for newcomers and investors.

l. Image Crisis and Investment Challenges: An image crisis and obstacles in Ease of Doing Business discourage Foreign Direct Investment (FDI) in shipbuilding. The performance of local export-oriented shipyards needs improvement, and ambassadors in foreign missions should play a more active role in promoting business opportunities. Addressing integrity issues and fostering a positive attitude toward heavy industries like shipbuilding is essential.

m. Economic Recession and Geopolitical Crisis: The world is currently experiencing an economic recession due to the post-COVID-19 situation and geopolitical crises, such as the Russia-Ukraine conflict. These factors have impacted global shipping and shipbuilding, leading to order cancellations and a slowdown in global business.

n. Draught Limitations: The limited draught in rivers (maximum 4m) constrains the size of ships that can be built in local shipyards. Maintaining navigable drafts in rivers and channels is challenging due to significant siltation, bridges, and overhead cables, further restricting ship sizes.

o. Import Challenges: Shipbuilding requires a vast array of machinery, equipment, components, spare parts, and accessories, leading to emergency imports during the construction process. Current import policies and foreign currency regulations create complications and delays in obtaining shipbuilding materials, hampering production and demoralizing foreign buyers.

p. Inadequate Training Facilities: Technical personnel in most local shipyards receive inadequate training, with some shipyard owners viewing human resource development programs as financial drains rather than investments. Moreover, there is a lack of mechanisms for formulating, implementing, monitoring, and updating export-oriented shipbuilding policies and strategies.

Addressing these challenges and transforming them into strengths is essential for the sustainable growth and competitiveness of Bangladesh's shipbuilding sector.

## 11. Suitable Shipbuilding Market for Bangladesh.

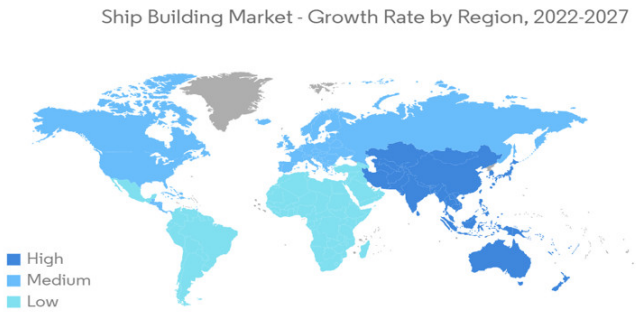
The productivity of local shipbuilding labor is low, despite the world's most affordable hourly wage. To maximize the benefits of the government's shipbuilding policy, equitable prioritization is essential for public and private shipyards.

China, previously offering lower shipbuilding costs, is experiencing rising labor wages. This presents an opportunity for small shipbuilding nations like Bangladesh, as the demand for container ships remains high in various sizes.

Historically, high labor costs led high-income countries to lose global shipbuilding market share. Today, relying solely on cheap labor is insufficient; advanced technology is crucial for sustainable shipbuilding.

The global shipbuilding market was valued at USD 132.52 billion in 2021, with a projected CAGR of 4.84% to reach USD 175.98 billion by 2027. COVID-19 disruptions and delays may impact growth initially, but factors like increasing seaborne trade, economic growth, and automation will contribute to industry growth.

Figure 3: Prediction of global shipbuilding growth by region from 2022 to 2027.




Source: Mordor Intelligence, 2022.

The global shipbuilding market's tentative size is approximately USD 200 billion, with a USD 20 billion small shipbuilding market. The demand for small to medium-sized merchant ships, including container ships, tankers, cargo vessels, and special ship types with 3,000-10,000 DWT, aligns well with local shipyards' capabilities.

Bangladesh's strategic sea area is crucial for connectivity and economic interests. The presence of the Bangladesh Navy and Bangladesh Coast Guard creates a market niche suitable for publicly-operated BN shipyards.

## 12. Future Challenges and Viable Suggestions for Local Shipbuilding.

Local shipbuilding has significant potential but faces challenges, including slow technological development and a lack of

awareness among stakeholders. The workforce often lacks job satisfaction and industrial benefits, leading to a high turnover rate.

Most shipyards are located far from the coast, limiting ship size, and rely on imported materials. An image crisis, high bank interest rates, and service charges hinder development. Family-oriented management cultures and resistance to quality improvements are common issues.

Addressing these challenges and embracing technology, especially in the context of the Fourth Industrial Revolution (4IR), is essential. The maritime industry is evolving with AI, IoT, and automation. Preparing for the 4IR requires policy alignment, skill development, attitude changes, and adapting to new work styles.

The 4IR will revolutionize industries through digitization and technologies like AI, IoT, and 3D printing (Wikipedia, 2022). Creating intelligent shipyards with resource efficiency and stakeholder integration is a goal for the maritime industry.

## Conclusions.

Local private shipyards lack a corporate culture as they are predominantly managed by family members who occupy all key and top positions, creating an unhealthy business environment. These shipyards are driven by the desires and aspirations of their owners, which often results in employees feeling disconnected from the organization. The technology employed in local shipbuilding remains rudimentary, characterized by inefficiencies and deficiencies in technological, managerial, and labor skills. Most local shipyards lack modern shipbuilding tools and machinery, and there is a shortage of expert machine and digital/AI operators. Furthermore, Bangladesh relies on foreign support for ship design expertise and lacks the technical capabilities to meet the demands of the incoming Fourth Industrial Revolution (4IR), posing a significant obstacle to sustainable development.

The government has drafted a shipbuilding policy, but it needs careful evaluation and uniform prioritization. Foreign Direct Investment (FDI) opportunities exist, and establishing an export shipyard zone could boost the industry.

Bangladesh is well-suited for small to medium-sized ships from 3,000 to 10,000 DWT, offering competitive pricing.

The shipbuilding sector has potential but needs comprehensive government and private sector initiatives to enter the international market effectively. Bangladeshi-made ships are cost-competitive, and FDI opportunities can be harnessed through export shipyard zones. Achieving 2% of the global market share by 2030, worth USD 4 billion, is possible.

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