Evaluation of Prospects and Challenges of Local Ship Recycling Industry in Contest of Global

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Abstract

The ship recycling industry refers to the process of dismantling and recycling End of Life (EOL) ships and it's globally accepted. Basically, ship recycling is a significant and green industry, with an average of 1000 obsolete ships being recycled annually. At present global ship recycling industry is dominated by three South Asian countries, including India, Bangladesh, and Pakistan. In Bangladesh, the industry started with the dismantling of stranded ships and has since become a large and profitable industry. The industry creates huge employment opportunities for thousands of semi-skilled workers in poverty-prone areas of the country. Such an industry has both opportunities and challenges for coastal zone management, as there are environmental, law enforcement, and worker safety issues. Perfect green ship recycling as per European standards is always a costly affair. But, viable and almost green ship recycling with the integration of the present usual practice (beaching method) in Asian countries is very much possible. Despite the limitations and challenges the industry has considerable contribution to the GDP and the overall socio-economic sphere of Bangladesh. Presently, there have been visible reductions in Bangladesh's market share due to strict environmental regulations, while the competitors have experienced increases. It is an analytical study with considerable effort of research work to evaluate the present global ship recycling situation along with the potential and challenges of the local ship recycling industry.

Key wards
Ship recycling, compliance, beaching, viable practice, HKC

1. Introduction
Ship dismantling, commonly known as ship recycling, is a naturally sustainable activity, the repayment of which is felt at the global level. Ship recycling is a reverse engineering process (Hossain 2015) of dismantling obsolete ships to recover reusable materials in a safe and environmentally friendly way (Hossain 2017a&b). If we look last twenty years, ships are beaches mainly in a few South Asian countries like Bangladesh, India, China, and Pakistan allowing local yards to dismantle the vessels with moderate prevention measures with more manpower involvement (Nikos 2017). Those South Asian Countries are doing a great job as they are recycling obsolete old and EOL ships with good efficiency, but in a less professional manner (Hossain 2023a&c). For the last two decades, ship recycling yards in Bangladesh, India, Pakistan, China, and Turkey have recycled globally 95% of EOL ships in tonnage. The increase in demand for ship recycling has rightly led to an increase in regulatory pressure at both national and international levels. However, beaching as a ship recycling method is mainly used in Southeast Asia due to geographical advantage and tidal conditions. Whereas, constructing and running dry docks is quite expensive, though dry-docking is the safest method. More environmentally concerned countries like the USA and EU usually adopt the dry-dock technique (Hossain 2023n&o). However, a few countries in Asia and Europe have adopted the alongside or pier-breaking approach instead of beaching like Turkey or China. Right now, Aliaga in Turkey and a few other places in the EU are the most vocal against the slipway or landing recycling technique with the highest environment-friendly technique (Hossain and Mohiuddin 2023b).

In South Asian countries like Bangladesh, India, China, and Pakistan, EOL ships are beaches for dismantling and recycling the vessel while taking advantage of the high tidal surge. However, those countries are doing a great job of saving the environment by recycling obsolete and unused ships with good efficiency, which were earlier buried at the deep sea as we have learned from history (Banglapedia 2011). Currently, 35% of the shipping tonnage recycled annually occurs on the beaches of Bangladesh, employing around 200 thousand workers in the recycling process. Moreover, it is estimated that the ship recycling industry generates around US$ 1 billion for the national economy.

On the other hand, it is estimated that as of today, globally around 20,000 ships over 500 Gross Tonnage are around 25-30 years old and will shortly be sent for recycling (Hossain and Mohiuddin 2023b). IMO introduced Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships in 2009 (HKC 2009). However, the HKC has not been ratified yet by the important and related countries involved with it. Significant decisions have been made in 2017 as per EU ship recycling regulation and that is going to alter the global ship recycling industry significantly (Hossain 2017c, 2023c&e). If the EU approves and allows the Statement of Compliance (SOC) standards it could be a huge boost to the booming investment in improving standards in Alang as well as other yards of South Asia countries (Hossain et al. 2023). In this way, viable ship recycling processes and practices will continue to progress and achieve standard ship recycling at HKC-certified yards and that will become the custom for all ship owners, not the omission. To make viable and sustainable ship recycling standards, all three Asian ship recycling major players need to work together jointly and effectively to continue the ship recycling beaching method as it is practicable for this area. It is an analytical study with adequate research work to evaluate the present global ship recycling situation along with the potential and challenges of the local ship recycling industry in contest of global.

2. Global Major Ship Recycling Locations

The ship recycling global industry dismantles around 1,000 ocean-going EOL vessels annually. Those EOL ships are container ships, cargo ships, bulkers, oil tankers, LNG, LPG, and cruise ship. for recovering steel and other valuable metals as well as recyclable items. At present, almost all ship recycling activities are concentrated in five countries. From those, four are South Asia (like India, Bangladesh, China, Pakistan), and Turkey. Further ship recycling capacity are available in a few North American countries (like the US, Canada, Mexico) and a few within the European Union (like Denmark, Belgium, and the UK). At present, Southeast Asia is certainly the global center for the ship recycling industry and business. South Asian countries are contributing around 90% of global ship recycling activities (Hossain 2018f). In February 2016, the NGO Ship Recycling Platform Secretariat in Brussels published a report detailing shipbreaking and recycling data by countries.

The statistics show that in one year, 768 large ships were dismantled globally, while 469 vessels ran aground on the coasts of India, Pakistan, and Bangladesh (Hossain, 2018g, Hossain, et al. 2023). The number, percentage, and gross tonnage of EOL ships dismantled around the globe (by countries) in between 2012-2022 have been shown in figures 1, 2 and 3 respectively below. Ship recycling comparison and statistics around the globe by major vessel types in 2021 has been shown in Figure 4 and Table 1 below **(**Hossain, et al. 2023; Hossain, 2023n). Beaching as a ship recycling method is usually followed in all Southeast Asian countries except China. Ship recycling becomes economically viable in the LDC and developing countries where the actual operation has been carried out in beaches due to geographical advantages. There are several guidelines in ship recycling and when those are followed strictly then the whole industry becomes safe and environment-friendly (Mambra S. 2017).

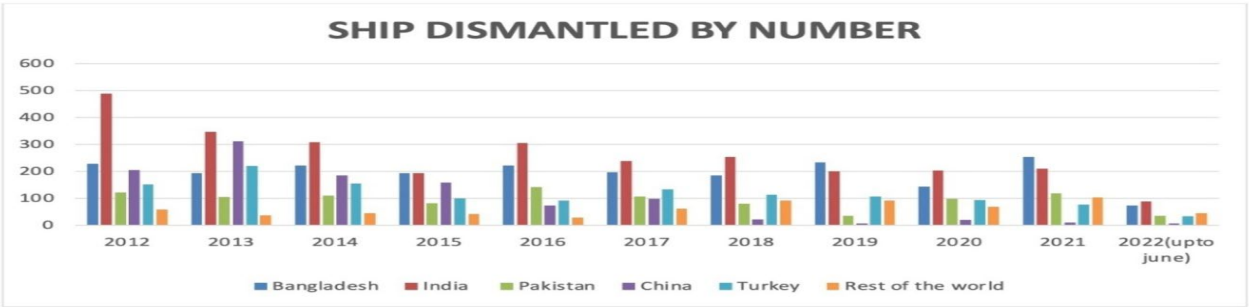

Figure 1. Number of EOL ships dismantled around the globe between 2012- to 2022 (Hossain, 2023n

Considering careful operations in the beaching method with the guidelines from IMO, a set of viable roles and procedures can be formulated for the recycling industry. If these viable roles and procedures could be implemented through a user-friendly knowledgebase system and good monitoring, it is possible to make this method useful and sustainable, competent, and viable as a ship recycling method for South Asian countries (Hossain, et al. 2023).

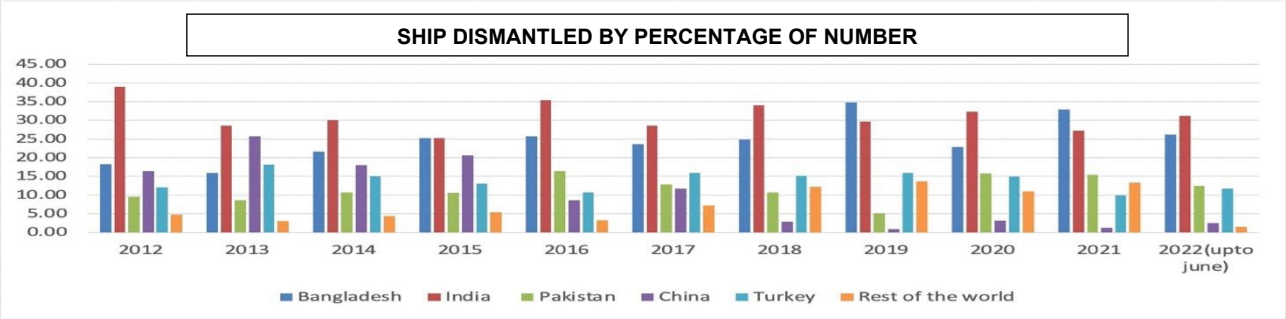

Figure 2. Percentage of EOL shipsin number dismantled around the world in between 2012 to 2022(Hossain, 2023n)

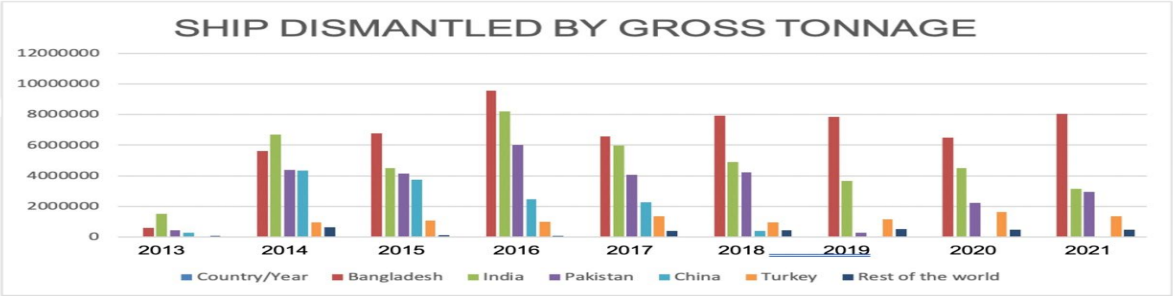

Figure 3. Comparison among major ship recycling nations based on Gross Tonnage (Mohiuddin and Hossain, 2023a; Hossain, et al 2023).

3. Present Status of Global Ship Recycling Industry

Ship recycling is a rapidly developing global industry that involves dismantling and recycling ships when they reach EOL. Approximately a thousand old ships are recycled across the globe every year (Hossain, 2018c). This process helps to recover steel and other valuable metals along with household items and equipment from these EOL ships. Currently, most of the ship recycling activities around the world are conducted in five countries: India, Bangladesh, Pakistan, China, and Turkey and those have become hubs for all ship recycling activities due to their geographic advantages, cheap workforce, tradition, and availability of resources. North America (the United States, Canada, and Mexico) and the European Union (Denmark, Belgium, and the United Kingdom, among others) have the recycling capacity; but those are very expensive. As a result, ship recycling activities have become a booming business in South Asia. Big players in ship recycling like India, Bangladesh, and Pakistan, have their yards where they perform such activities. In Bangladesh around 200 EOL ships are recycled in local yards at the port city of Chattogram (Hossain and Mohiuddin 2023b). This has been a hub for recycling old, obsolete ships for many years. According to research, about 2 million LDT of different types of ships are recycled in Bangladeshi yards in each year. However, Pakistan and India have seen the highest rise in share, with 14.7% and 3.2% respectively in FY 2020-21. On the other hand, Bangladesh and China found as a reduction by 15% and 2%, respectively. Such a decrease in market share of China is likely due to their ban on international ships recycling. Whereas, Bangladesh's market share has been on the decline because of government regulations (Hossain, et al. 2023).

3.1 Bangladesh.

Chattogram is the major ship recycling location in Bangladesh. At Fauzdarhat, a city 16 km Southwest of Chittagong with 8 square kilometers area covers recycling-related activities. Due to high tidal differences local yards are suitable for dismantling of big merchant ships (TERA, 2004, Hossain, 2023a,b&c). Few local yards follow recommended ship recycling practices given by leading international ship recycling agencies. The Ship Breaking and Recycling Rules or SBRR, 2011 issued by the MoI encompasses the overall administrative and legal framework for safe and environmentally sound ship recycling in Bangladesh (Jobaidet al. 2014). Again, Section 15 of SBRR orders local

yards to obtain approval of Ship Recycling Facility Plan (SRFP) from the MoI. Each yard must have an authorization for handling hazardous waste generated from ship recycling activities issued by the DoE under MOI. As a result Bangladesh is closing to viable ship recycling process by improving its dismantling activities in the local yards.

3.2 India.

Major ship dismantling centers in India are located at Alang in Gujarat. Alang has around 150 potential plots for use as ship recycling facilities by using beaching method. The modes operating remains the same as other neighboring countries like Pakistan and Bangladesh. Gujarath (Alang) Maritime Board has an exclusive wing for monitoring ship recycling in Gujarath region. Currently, there are around 132 registered recycling yards at Alang, 17 have been awarded Statements of Compliance (SoC) with the Hong Kong Convention, a further 26 are expected to receive SoCs shortly, and another 20 are expected to apply (Hiremath 2016).

3.3 Pakistan.

In Pakistan main ship recycling yards are located at Gaddani near Karachi. The yards are under the control of Baluchistan Development Authority situated in Gaddani. These yards use mainly beaching methods to position the obsolete ships arriving at Gaddani (Hossain 2017b). The yards have the capacity to dismantle more than 50 large ships at a time. The recycling yards are underdeveloped and they are using a combination of manual and mechanical method for dismantling activities (ILPI Paper 2016). There is limited inspection and control over the downstream industries which collect the waste and pre-used items from the dismantled ships. The government with few agencies control over ship dismantling is effective. Recently government formulated and implement ship recycling rules for safe and environmentally sound ship recycling in Pakistan. Pakistan will also achieve viable ship recycling process soon.

3.4 China.

China has accelerated its ship recycling capability. Chinese ship recycling yards are located in Jiangmen and Jiangsu provinces beside in Pearl and Yangtse river deltas. In these provinces, there are more than 50 ship recycling yards located. There are a few inland recycling yards which are operating exclusively for inland vessels. Beaching is banned in China and ship recycling is undertaken alongside slipway method. In this method dismantling is done by using vertical lift off with concrete support base. And the process is controlled from ship to landfill. Chinese recycling yards are relatively and strongly regulated by the government and can also be subject to intense scrutiny from the local authorities (Hiremath, et al., 2015). Those yards developed asbestos treatment and ballast water treatment facilities. Advanced dismantling facilities, futuristic vision based recycling policy, stringent laws and regulations which formed "stakeholders' cooperative working model are consider the four pillars of enterprising ship recycling industry in China (Hossain and Mohiuddin, 2023b). Lloyd's Register has visited the yards in Shanghai and Guangzhou, and they found safety, welfare and environmental awareness was excellent. China takes pride in their membership of the International Ship Recycling Association (ISRA).

3.5 Turkey.

Ship recycling industry in Turkey was established in Aliaga and Itmir regions early in early stage. The industry got recognition and the ship recycling was declared as a legal industrial activity in 1986. Now, the Turkish government allows ship recycling at Aliaga, near Izmir, on the west coast. As Mediterranean has very small tidal range, Turkish yards at Aliaga are using slipway approach by controlling the inter-tidal zone. Hard standing has been permanently provided in large areas of the yards with permanent drainage systems to control the sea pollution (Hossain, et al., 2023). Environmental and occupational safety has been ensured rigorously by the concerned government authorities. Turkey is placed 5th in the current ranking of world ship recycling output. Lloyd's Register has visited all the yards in Turkey and has satisfied to their activities.

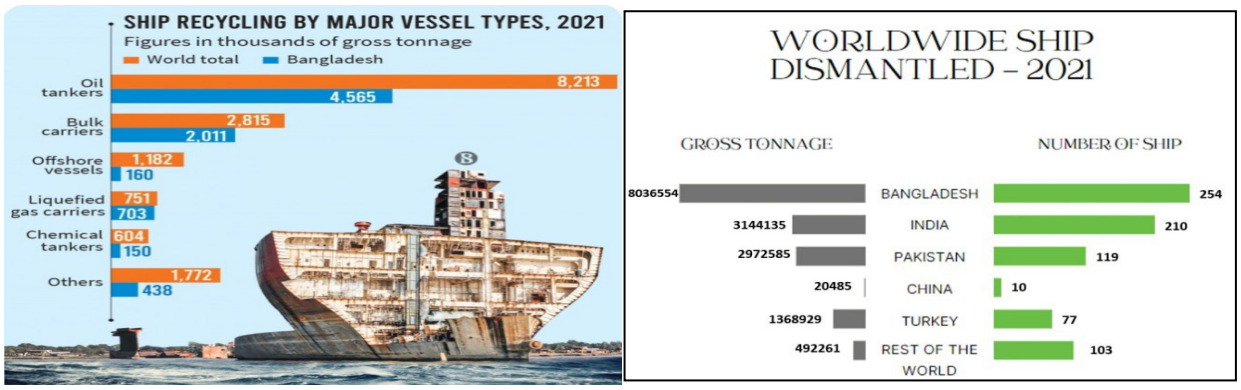

Figure 4. Ship recycling comparison and statistics around the globe by major vessel types in 2021(Hossain, et al., 2023; Hossain 2023n)

Table 1. Number of ships dismantled globally between years 2012 to 2022 (Hossain 2023n)

Country/ Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bangladesh	229	193	222	194	222	197	185	234	144	254
India	488	347	309	194	305	239	253	200	203	210
Pakistan	121	105	110	81	141	107	80	35	99	119
China	205	312	185	158	74	98	22	6	20	10
Turkey	151	220	155	100	92	133	113	107	94	77
Rest of the world	59	36	45	41	28	61	91	92	69	103
Total ship dismantled	1253	1213	1026	768	862	835	744	674	629	773

4. Recent Trend of Bangladesh Ship Recycling in Contest of Global

During the last decade in local ship recycling very steady growth has been observed in Bangladesh. Local ship recycling industry of Bangladesh has started its journey accidentally from Chattogram through 'the dismantling of a Greek ship M D Alpine which was brought to shore near Fauzdarhat by the 1960's cyclone. The abundant ship was dismantled in 1965 by Chittagong Steel House.' (Hossain, et al., 2010a&b) Subsequently, ;the Pakistani ship Al Abbas was salvaged, beached at Fauzdarhat and dismantled in 1974 by Karnafully Metal Works.'(Hossain, 2015a&b) These incidents draw the attention of a few entrepreneurs on the suitability of the coastline near Fauzdarhat for beaching. Over the years, 'the ship recycling industry in Chattogram has gone through lean and boom periods, to become the world's largest ship recycling industry and now the ship breaking and recycling industry (SBRI) spans over 20 km coast of the Bhatiary- Fauzdarhat-Baroiyawlia area.' (Hossain 2017a&b) The local ship recycling organization is Ship Breaking and Recycling Industry (SBRI) consists of more than a hundred ship recycling yards in the register. 'From where few dozen are in regular operation and the industry directly employs over 200,000 laborers and accounts for the supply more than half of all the steel products in Bangladesh.' (Hossain, et al. 2012) Around one million people are indirectly earning their bread and butter from this industry. In 2021, Bangladesh has once again become the top ship recycling country with more than half of the world's ships recycled here, according to a report of the United Nations Conference on Trade and Development (UNCTAD 2023). As per the report of 'Review of Maritime Transport 2022' published on 29 Nov 2022 in the period of 2021-2022, Bangladesh recycled 8.02 million tons of EOL ships accounting for 52.4% of the world total, where nearly 57% were oil tankers, 25% bulk carriers and 9% liquefied gas carriers. Again, as per the annual flagship report, in the previous year (2020-2021), around 54% of the world's oil tankers, 18.4% of bulk carriers, and 5% of liquefied gas carriers were recycled in Bangladesh (Mohiuddin and Hossain, 2023a).

In 2021, the ship recycling sector in Bangladesh saw a sharp increase, from 144 in 2020 to 254 in 2021, representing a growth of almost 56.69%. In the first three quarters of 2021, 582 ships were scrapped worldwide, of which 197in number (about 34%) were in Bangladesh, and it becomes top in the ranking of ship recycling in contest to Globe. Bangladesh has continued to be the top ship recycling country in 2021 according to the latest report from NGO Ship breaking Platform. However, in 2022, EOL ships imports have drastically dropped for dollar scarcity and demand-side problems in Bangladesh. The number of imported ships for dismantling has drastically fallen during the first half of 2022. Bangladesh has imported only 64 ships during the January-June 2022 of the calendar year and which is about 59% lower than that of the same period of last year (2021) and which has been shown in figure 5 below (TBS, 2021; Sohel, 2022). Again, according to data available with NGO Ship-breaking Platform (NSP) during the January-June period of 2022, India has also imported a lower number of 88 EOL ships and that is less from 124 in the January-June 2021 of the same period in previous year (Mohiuddin and Hossain, 2023b). Percentage trend of ship recycle of Bangladesh in between 2013 to 2021 has been shown in figure 6 below (Hossain and Mohiuddin, 2023a; Mohiuddin and Hossain 2023b).

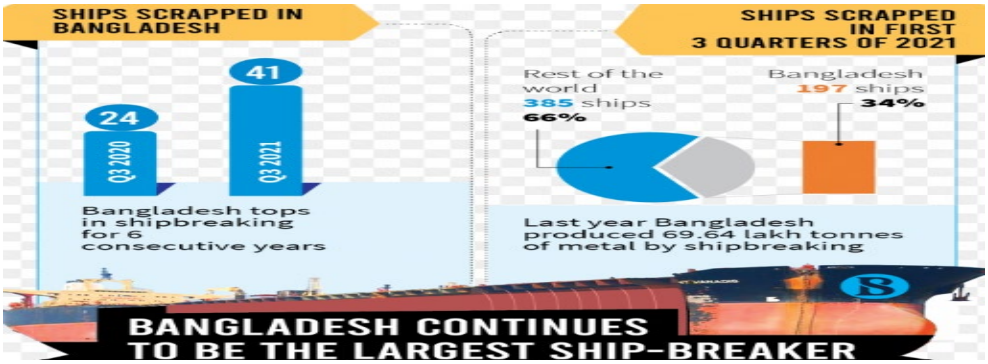

Figure 5. Local ship recycling position and statistics of Bangladesh (TBS, 2021; Mohiuddin and Hossain, 2023b)

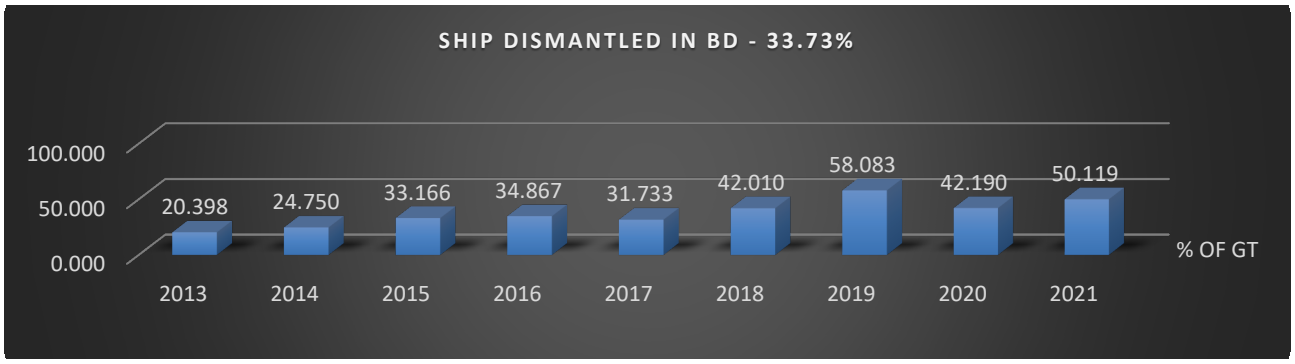

Figure 6. Percentage trend of ship recycleof Bangladesh in between 2013 to 2021(Hossain and Mohiuddin, 2023a; Mohiuddin and Hossain 2023b)

5. Assessment of Bangladesh Ship Recycling Industry

A number of factors have pushed the growth of this sector over time in this region. Those important factors are "the favorable beaching condition which is God gifted, the closeness of the beach to the industrial hub of Chattogram, mainly the steel rerolling mills which consume most of the output from the industry, availability of risk-taking entrepreneurs, access to abundant labor from the northern districts of Bangladesh, the favorable legislative framework allowing the operation of the industry for decades even without it being considered as an industry. The high demand in the local market for scrap ferrous and non-ferrous metals and other cheaper items recovered from the industry, access to finance from formal financial institutions, and informal money lenders. Again, the growth of upstream and downstream industries has formed an informal industrial symbiotic and interdependent network. An interesting point is that almost every output from the EOL ships is sold in the local market and consumed or process by the forward

and backward linkage industries closer to the recycling yards (Hossain, 2023e&f). At present, the SBRI is bound by the Ship Breaking and Ship Recycling Rules 2011 under the MOI along with Environmental Protection Act 1995, and Environmental Protection Rules 1997 of the supervision of DoE under the Ministry of Environment and Forest (MOEF). Presently the labor safety and the environmental management standards in the local yards have been shown signs of distinct improvement after the implementing those roles and regulation and taking those measures (Hossain, 2019a&b).

Now, "Bangladesh Government has established Ship Building and Ship Recycling Board (SBSRB) as the one-stop service provider under the MOI (Hossain, 2023e&o). It is providing integrated services including granting required permissions and certificates for Ship breaking, recycling and other related activities in cooperation with other responsible departments and ministries. DoE is working to ensure sustainable environmental governance for pollution control. This department is solely responsible for issuing an ECC prior to the establishment of any industrial unit in Bangladesh and thus ship recycling yards as well. It also issues authorizations for handling hazardous wastes generated from ship recycling activities (Hossain, 2023n). At present major recycling yards of Bangladesh is following a viable recycling technique and almost at the door of achieving international standards for Health Safety and Environment (HSE) aspect (Hossain, 2023n; Mohiuddin and Hossain, 2023a).

6. Ship Recycling Demand and Market Forecasting

Forecasting involves using past and present data to predict future events, serving as a valuable planning tool for businesses to manage uncertainty. Ship recycling demand refers to the number of EOL ships available for dismantling within a particular time frame. Factors that impact ship recycling demand forecasting can be grouped into cost and regulatory aspects (Hossain 2019a&b). Cost-related factors include scrap steel prices, freight market conditions, dismantling costs, fuel prices, labor Cost and shipbuilding costs. Regulatory factors include the implementation of rules and regulations, as well as options for conversion (Hossain 2023e&o). The market forecasting of ship recycling in Bangladesh has been done by linear regression method based upon a possible number of ships that might be scrapped, amount of earnings that could be reached and finally the demand factors that actually influence the market. This method will be used by taking account into the past and present data with some other parameters (Hossain 2023n). To get all the probable values of the future we have used the forecasting function in Microsoft Excel. Possible number of EOL ships, estimated iron and steel materials from scrapped ship has been shown in figures 7, and 8 respectably below.

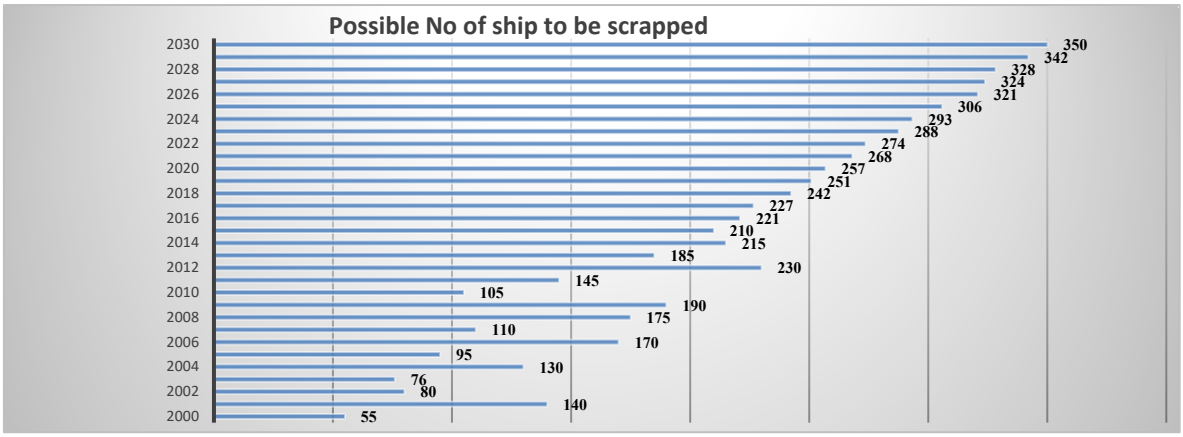

Figure 7. Estimated number of EOL ships to be scrapped in BD within 2030 (Mohiuddin and Hossain, 2023a&b; Hossain, 2023n&o)

7. Contribution of Ship Recycling in Socio-Economic Development in Bangladesh

From the above data it can easily be seen that the earnings from the ship recycling sector is and will be remarkable and that will contribute our national economy distinctly. If, the demand for steel and other scrapped materials and all other parameters that affect the market remains same as observed last couple of years then the prospect of the ship

recycling industry in Bangladesh will enrich the future (as shown in figures 8, 9, and 10 above). Again, despite the ups and downs in the global shipping and ship recycling markets, ship recycling industry makes a considerable contribution to the national economy of Bangladesh and 'managed a respectable growth, estimated at about 14%per annum on average since 1980. At present, the average annual turnover of the ship recycling industry in Bangladesh is more than US$ 1 billion (around 12,750 crore BDT). In addition, the industry is creating employment opportunities for thousands of people in the poverty-prone areas of the country' and nearly 200 thousand people are directly involved to the industry and 1 million indirectly (Mohiuddin and Hossain 2023a). Annual revenue from the industry is more than US$ 130 million per annum. The trend of Iron and Steel material produced from scrapped or EOL ships in Bangladesh has been shown in Figure 10 above. Again, the pattern of the earning curve from the ship recycling industry has been shown in Figure 9 above. More than 60% of materials and machinery for local shipbuilding come from the recycling industry. Ship breaking industry contributes more than US$ 1 billion to the national economy of Bangladesh (Hossain 2023n).

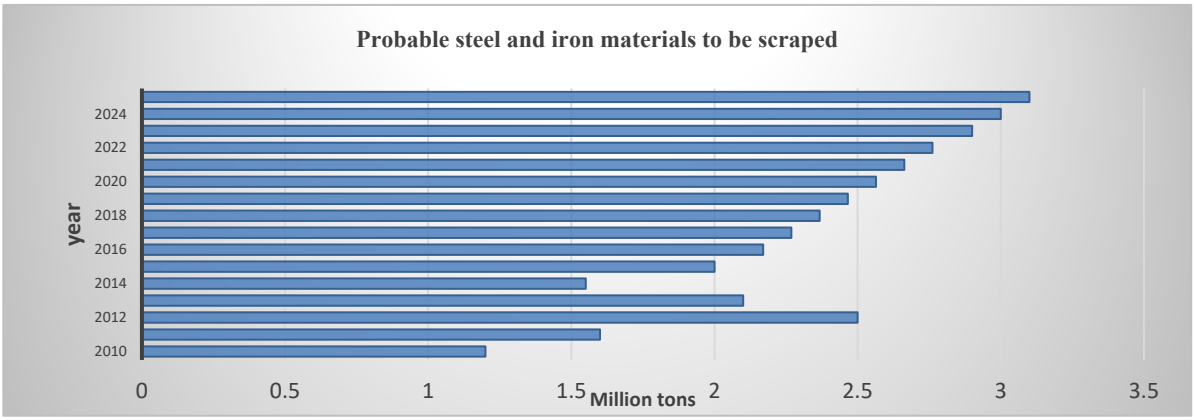

Figure 8. Estimated iron and steel materials produced from scrapped ships within 2025 (Hossain, 2023n&0)

The Bangladesh customs authorities revealed that 250 scrap ships were brought in during the FY 2016 and Taka 8.22 billion was paid as revenue to the government. And it's grown further to 272 ships during FY19 with a revenue collection of Taka 7.92 billion. Custom duties, income taxes, and value-added taxes amount to an average of Taka 5 billion annually by the ship recycling industry. The ship recycling industry pays considerable fees and charges to the ministry of Industry according to the regulations in place. Bangladesh is currently taking major strides in its infrastructure growth, with ambitious megaprojects like the Padma Bridge, Metro Rail, Elevated Expressway, Rooppur Nuclear Power Plant, Karnafuli Tunnel and Bay Terminal etc. These projects provide a tremendous boost to the country's infrastructure needs. There is a strong demand for steel in the country due to rapid economic growth. People are more likely to invest in and build new homes and infrastructure, which has led to a greater need of steel and other construction materials (Hossain 2023n&o). The ever-growing demand for domestic steel has put pressure on local steel mills to secure raw materials from the ship recycling industry and that will continue further.

8. Existing Global Ship Recycling Regulation and Future Challenges

In 2009 IMO adopted the HKC 2009 on ship recycling, to improve safety and environmental protection. Unfortunately, it still has not entered into force after all these years. The EU's Ship Recycling Regulation or EU's SRR No. 1013/2006, which implements the Basel Convention and its Amendment in Europe, forbids the disposal of hazardous waste to non-OECD countries and prohibits any exports of waste outside the EU/EFTA region for disposal. Effective as of December 31, 2018, the European Union Ship Recycling Regulation (EU SRR) has come into effect. The Regulation requires ship recycling activities to satisfy various environmental and occupational health and safety standards that are more stringent than the HKC 2009 (Hossain 2023n&o). All vessels with European Union (EU) flags must be recycled in facilities that have been approved and included in the EU's list of authorized locations worldwide. The EU maintains an up-to-date record of these sites for this purpose (Mohiuddin and Hossain, 2023a). The nations involved in ship recycling make a significant contribution to their nation's economy, so they are not eager to enact any laws that would regulate the sector. Several global laws have been issued and those need to be addressed and practiced across South Asia, to ensure safety, health, security, and environment and safeguard the industry. Taking these changes

into account will help ensure the safety and environment (Mohiuddin and Hossain, 2023b). The EU has decided to take action by itself due to the ineffectiveness of international regulation of ship recycling (Basel Convention) and the non-entry into force of the HKC 2009.

The EU has taken steps to regulate ship recycling and is already implementing parts of the HKC (Hossain, et al., 2023). Regulation No. 1257/2013 on Ship Recycling (EU's SRR) was effectively enforced in December 2013, which has achieved tangible results (Hossain and Mohiuddin 2023a). The HKC does not provide the necessary security criteria for ship recycling making it crucial for yards to be listed in the EU directory. This will guarantee that a yard has adhered to a quality assurance program that meets an acceptable standard. To provide clear legal regulations and reduce administrative complexity, ships specified in the new legislation will be excluded from the scope of the Waste Shipment Regulation. However, non-EU flagged vessels sold for scrapping while in European waters will still be subject to this regulation. The EU's SRR seeks to achieve early ratification of the HKC, thereby promoting a global, rule-based system. All experts have agreed that global regulations should be present for the shipping industry. However, there is disagreement on whether the HKC is an appropriate solution since it does not meet the standards set by the EU's SRR (Hossain 2023n&o). Again, European ships are usually recycled according to the EU's SRR or/or HKC regulations. Otherwise, the BC guidelines come into effect, which can be quite tedious and difficult to manage (Mohiuddin and Hossain, 2023a). From legal point of view, the HKC has yet to be enforced; however, it could still serve as a guideline for non-EU flagged vessels; when practicing due meticulousness. Furthermore, the intentions behind this protocol are accepted and recognized internationally.

The Basel Convention prevents the export of waste ships to non-OECD countries (Basel 2011). However, this is often circumvented by labeling recycling as taking place in international waters, where the Convention's regulations cannot be enforced. Once the HKC Amendment to the Basel Convention (BC) takes effect, ships will no longer be subject to its scope. Additionally, if handled by the EU SRR, these vessels are excluded from the convention's purview. For ships in particular, "exporting state" can refer to either the flag state or the country of origin of its beneficial owner. This alternative interpretation is more suitable and accurate. In response to the need for regulation on ship recycling, the IMO took swift action to create a new convention with legally binding properties. This convention would depend heavily on enforcement from both the flag state and the recycling state (Hossain, 2023l&o). To close all ambiguities of the BC in 2009, the IMO approved the HKC 2009, which holds ship owners responsible for the sustainable recycling of ships. Even after a decade; this convention has not been implemented yet.

The EU's SRR furthers the goals of the 2009 HKC for Safe and Environmentally Sound Recycling of Ships, while introducing higher safety and environmental measures than those outlined in IMO's HKC 2009. Specifically, the EU's SRR contains standards surpassing those set by IMO. As per EU's SRR, the beaching method has been strictly prohibited and strict regulations relating to the management of hazardous materials and labor rights are in place. Again ship dismantling sites listed by the EU are subject to a much stricter level of monitoring, including third-party certification and auditing, as well as complaints from NGOs if they are concerned that facilities are not following the regulations (Mohiuddin and Hossain, 2023a). So, overall situation has become tougher for South Asian countries like Bangladesh.

9. Challenges of Local Ship Recycling Industry of Bangladesh

The government of Bangladesh enacted the Bangladesh ship recycling Act in 2018 and issue order to owners of ship breaking and recycling yards to adopt safe and environmentally friendly recycling methods as per the Hong Kong International Convention 2009 (HKC 2009). However only four yards (PHP, SN Corporation, Kabir Steel, KR) out of around few dozens of active recycling yards have achieved Green Passport. Most yards are reluctant to adopt the green ship recycling standards because of the costs associated with the process. Currently, 87 yards are trying to achieve those standards. Ship recycling yards should be desperate to upgrades themselves and achieve HKC standard. However, local recycling owners found a bit reluctant to build green yards due to high costs, and that need minimum Taka 30 crore to modernize one ship recycling yard, and around Tata 3,500 crore needed to upgrade entire recycling industry to attain all such facilities, and to remain in the competitive business (Hossain, et al. 2023). Whereas recycling business competitors of Bangladesh like India and Pakistan who are fur ahead of us and they already following HKC standard'' India, China and Turkey have already turned their ship recycling facilities green as prescribed by the HKC adopted back in 2009. Bangladesh had set a target to turn all ship-recycling yards into green facilities by end of 2023. But the current situation poses uncertainties as this target is may is not achievable within the deadline (Hossain and Mohiuddin, 2023a). The government had also set the same deadline for modernizing this industry. Some of the major challenges for SBRI in Bangladesh are as follows:

- According to the UNCTAD report, maritime trade in 2022 was more uncertain and riskier than it was in 2021 due to the complex atmosphere created by present geopolitical situation. However, 2021 was a positive year for maritime trade growth as shipments increased 3.2% or 11 billion tones. Whereas, 3.8% decreased in 2020. Again, the current growth rate is 1.4% (2023-2027) and this considerable growth is expected to remain consistent in the coming years, or may increase of 2.1%. This is slightly slower than that was seen in the preceding decades (UNCTAD, 2023).
- In the post-pandemic world demand is surging, and that push to increase the shipping fees. This has created an obstacle for owners of old or EOL ships to send them to recycling yards. Moreover new ship construction orders are descending due to increase of price (Mohiuddin and Hossain, 2023a).
- The current geopolitical situation, with the lingering effects of Ukraine-Russia conflict and the effect of COVID-19 pandemic, has significantly impacted global businesses. Inflation has risen and pervasive uncertainty has created a challenging environment for global business including ship recycling industry (Hossain and Mohiuddin, 2023a).
- Today, it become essential for local ship recycling yards to change their attitude and implement a corporate culture in order to reach their objectives like other global competetors. By taking inspiration from highly efficient industrial nations and implementing suitable strategies and practices, local yards can be successful in business and remain competitive in global recycling business (Hossain and Mohiuddin, 2023a).
- Local recycling yards need to take necessary steps to maintain health, hygiene and safety standard as per ILO and IMO regulations (Mohiuddin and Hossain, 2023b).
- As an essential part of being HKC compliant, local recycling yards must have Ship Recycling Facilities Plan (SRFP). Local yards need to prepare themselves to ratify HKC and some sort of EU RRC within shortest time, otherwise it will be more challenging and complicating to continue with local recycling business in future (Mohiuddin and Hossain, 2023b).

Again, according to the number of vessels and amount of LDT scrapped from the year 2015 to 2022, it observed that there are around sixty local yards (in 20 groups) have actively participated in ship recycling activities. Evaluating their continuity of contribution to the ship recycling industry over those years, different statuses has been discovered for the groups. Considering the record and quantity of ship recycling from 2015 to 2022, the yards have been stated in three categories as active, idle, and inactive. Besides, the SRFP status of the yards has been identified by the Ministry of Industry (MoI) letter on dated 04 Nov 2020. Hence, the top twenty group names have been tabulated according to their quantity of LDT scrapped/production and stated as their continuity of ship breaking over the last decade. Here it needs to be mentioned that Active means the yards were continuous in the ship recycling activities in the last 5 years or more; Idle means the yards were not continuous but participated in the ship recycling activities in the last 3-5 years; and Inactive means the yards were neither continuous nor participated in the ship recycling activities in last 3 years. (Mohiuddin and Hossain, 2023a).

So, there are around 150 ship recycling yards in the country; of them, around 60 are still active and only 4 of them have achieved the Safety and Operation Compliance (SOC) standard. Others could not achieve the SOC standard due to the high capital investment needed and lack of proper initiatives. Moreover, currently, local ship recycling yards are incurring losses due to the rise of US dollar prices. According to the Bangladesh Ship Breakers and Recyclers Association (BSBRA)'s report, scrap vessel imports declined in 2022-2023 due to the appreciation/crisis of USD and LC issues. For example, there were only 114 vessels imported from January to September 2022, and that indicates a huge deficiency in business (Hossain, 2023n).

10. Conclusion

Ship recycling is a global industry limited to a few South Asian countries and developed rapidly by dismantling and recycling EOL ships. Around thousands of obsolete vessels, like container ships, cargo, bulkers, oil and gas tankers, and cruise ships, are recycled in every year. This process helps to recover steel and other precious metals along with recyclable items and equipment from EOL ships. Currently, ship recycling activities around the world are conducted in five countries India, Bangladesh, Pakistan, China, and Turkey. South Asian countries have become hubs for ship recycling business due to their geographical advantages, cheap and plenty workforce, tradition, and resource capabilities. However, 90% of ship-recycling activities take place in three locations in South Asia Chattogram (Bangladesh), Alang (India), and Gadani (Pakistan). Bangladesh has become a hub for recycling EOL ships traditionally with a cheap and huge labor force. Ship breaking industry has made notable contributions to the economy of Bangladesh and is of paramount importance to the macro and micro economies to reduce poverty. In every year,

some 200 EOL ships are recycled in local yards at the port city of Chattogram. According to research, about 2 million LDT of different types of ships are recycled in Bangladeshi yards in each year. In FY 2020-21, Pakistan and India have seen a rise in market share, with 14.7% and 3.2% respectively. On the other hand, Bangladesh and China have seen a fall by 15% and 2% respectively. This decrease in market share of China is due to their ban on international ship recycling.

One of the mandates of HKC is that an approved ship recycling facility has to create a SRFP. The SRFP provides crucial information regarding a ship recycling facility, including its layout, water depth, accessibility, routine maintenance, dredging, etc. South Asian recycling yards/plants largely employ the open beaching method/system. While this method has been profitable, it can also release hazardous materials into the coastal region. As of recently, the EU's SRR is in effect. This law states that all ships registered under the EU flag must be recycled in a facility from the European List and forbids beaching as a valid recycling method. Countries such as China, Turkey and India are vigorously competing to bring their ship recycling facilities in line with global standards. Bangladesh's ship recycling yards need to strengthen their operations to maintain global standards and remain competitive in the world. The Bangladesh Ship Recycling Act was implemented in 2018. Local ship recycling yards need to abide by the HKC 2009 guidelines by 2023. As of now, only very few of the active recycling yards have achieved Green Passport certification. Meanwhile, around 80 yards are striving to meet these criteria to get certified. Those local yards are in dire need of renovation and up-gradation. However, the owners are not willing to invest the substantial amount of money needed (around Taka 20-30 crore for each recycling yard). Upgrading all such yards may cost around Taka 2500 crore as a whole. In comparison, India and Pakistan have already implemented the HKC standard. Bangladesh is one of the active players in the HKC initiative, alongside India and Turkey who have already accessed it. China has already achieved the standard. Bangladesh has set a goal to achieve the standard and ratify HKC by 2023. Despite the current situation, there are still uncertainties to accomplish the target within the given time frame. Necessary improvements must be made in order to ensure compliance with international regulations. It is very urgent for the local ship recycling industry to succeed by improving existing ship recycling facilities and ensuring SRFP as per global standards (both HKC along with EU's SRR); otherwise it will be very challenging to survive in the global competition.

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