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Retaining competitive advantage in ship recycling under the new regulatory framework: a case study of Bangladesh

Wahidul Sheikh

WORLD MARITIME UNIVERSITY

Malmö, Sweden

Retaining Competitive Advantage in Ship Recycling under the New Regulatory Framework: A Case Study of Bangladesh

By

WAHIDUL SHEIKH

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the university.

(Signature) : 
……...
(Wahidul Sheikh)

(Date) : 21.09.2021

Supervised by : Dr. Shuo Ma
Supervisor's affiliation : Professor, Shipping Management and Logistics
World Maritime University, Malmo, Sweden

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ABSTRACT

Title of Dissertation: **Retaining Competitive Advantage in Ship Recycling under the New Regulatory Framework: A Case Study of Bangladesh**

Degree: **Master of Science**

Ship recycling is an important sub-sector of the global shipping industry that plays a significant role by equalizing the supply of international shipping fleet with its demand. India, Bangladesh, Pakistan, China and Turkey are the major five ship recycling countries while Bangladesh recycles the highest volume of ships in gross tonnage since 2014. The contribution of the ship recycling industry to the economy of Bangladesh is very significant. However, the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships-2009 is about to enter into force. The convention has multi-dimensional impacts on the ship recycling industry. Having said that, this study aims at developing strategic policy guideline for Bangladesh to retain its competitive position in the global ship recycling industry under the new regulatory framework of the Hong Kong Convention. This study has adopted the 'Policy Gap Analysis' to identify the discrepancies between the existing and the desired situations, and to develop the strategic policy guideline for achieving the desired goal. The study analyzes the present market situation, the existing competitive advantage of Bangladesh and the probable future impacts of the new regulation on the competitive advantage. The findings indicate that the competitive advantage of Bangladesh depends on cheap labor cost, low tax rate, high internal demand of scrap steep and flexible regulatory framework. Based on the findings, the study proposes required policy guidelines for retaining the competitive position of Bangladesh in ship recycling.

KEY WORDS: Ship Recycling, Hong Kong Convention, Competitive Advantage, Strategic Policy Framework, Ship Recycling in Bangladesh

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List of Abbreviations

BIMCO	Baltic and International Maritime Council
DWT	Dead Weight Ton / Tonnage
EOL	End of Life
GDP	Gross Domestic Product.
GT	Gross Tonnage
HKC	Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
ILO	International Labor Organization.
IMO	International Maritime Organization.
ISO	International Organization for Standardization.
LDT	Lightship Displacement Tonnage
MEPC	Marine Environment Protection Committee
OECD	Organization for Economic Co-operation and Development
P & I Club	Protection and Indemnity Club
RO-RO	Roll on- Roll off
U. K.	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
U.S.A.	United States of America
VLCC	Very Large Crude Carrier

Chapter-1: Introduction

1.1 Background of the Study

Shipping is almost as old as the history of human civilization. Historically, ships have been used for transporting cargoes and people, and also for protecting the geopolitical interests of coastal state. Today shipping carries more than 80% of total international trade by volume and around 70% by value. Now the world commercial shipping fleet comprises of 1,00,038 ships (each of 100+ GT) making a total of 1450.60 million GT or 2144.34 DWT (Clarkson, 2021). However, a ship has an average lifetime of around 25-30 years although the time varies based on different commercial and technical factors (Stopford, 2002; Yin & Fan, 2018).

At the end of life, most of the ships are recycled in ship recycling yards, and few ships are used for artificial reefs, museums, hotels, or tourist attractions. However, recycling is the best option for the end-of-life (EOL) ships considering their high economic value and the environmental consequences if they are left underwater without recycling (Stopford, 2002; Ahuja, 2012). Moreover, the ship recycling industry equalizes the demand and supply of ships in the international shipping market by removing the old ships from the market (Stopford, 2002; Jain & Pruijn, 2017). Ship recycling is also a good avenue of cash-in-flow for shipowners during recessions (Solakivi et. al., 2021).

On the contrary, ship recycling substantially pollutes the environment as well as poses serious health and safety hazards for the workers (Du et. al., 2018). Realizing the issue, IMO adopted the Hong Kong International Convention (HKC) for ensuring the Safe and Environmentally Sound Recycling of Ships in May 2009. Although the convention has not entered into force yet, it is very close to meet the enforcement requirements (Ali & Pearce, 2020). Compliance of the convention will surely increase costs (both operational and capital) for the existing ship-recycling facilities and hence, it will reduce the offer price for EOL ships ((Jain et. al., 2013; Jain & Pruijn, 2017). However, the impact of the convention is not that simple and straight forward. It has diverse economic impacts on the shipping recycling industry (Jain et. al., 2013).

The five major ship recycling countries- Bangladesh, India, Pakistan, Turkey and China presently possess around 98% market share (in gross tonnage) of the global ship recycling industry, and Bangladesh is the highest ship recycling country since 2015 (UNCTAD STAT, 2020). However, the convention may change the market scenario and Bangladesh may lose its competitive advantage under the new legal framework. Moreover, the environmental

degradation and miserable worker's condition in the ship recycling yards in the South Asia has attracted the attention of global communities. Several NGOs, ship-owner associations and international bodies are consistently pursuing to make the ship recycling industry more environment friendly (Hougee, 2013). As a result, the industry is heading towards 'Green ship recycling' (Urano, 2012; Jain, 2017). The European Regulation on Ship Recycling (EU SRR) is the testimony of the aforesaid concern (Solakivi et. al. 2021). It is high time for Bangladesh to adopt and implement proper policies and strategies on national level to retain its competitiveness in this industry. Hence, this study aims at exploring the strategic policy guidelines for Bangladesh to retain its competitive advantage under the new regulatory framework of the HKC. This study will propose an overall policy framework and required policy guidelines to achieve the above-mentioned research objective.

1.2 Objective of the Study:

It is expected that the HKC will possibly enter into force by 2025 (Ali & Pearce, 2020). Two of the five major ship recycling countries (Turkey and India) have already ratified the convention. The HKC will surely have a significant impact on the global ship recycling industry. Having said that, this study aims at exploring the best strategic policy guidelines for Bangladesh to retain its competitiveness while safeguarding the environment and the worker's health. The main research question of this dissertation is- how can Bangladesh retain its competitive advantage in ship recycling industry under the new regulatory framework?

The research objective and the primary research question led to the following key research questions-

a) What is the present situation of the global ship recycling industry?

b) What is the present regulatory framework governing the industry?

c) What will be the impact of HKC on the existing market scenario?

d) What are the existing national strategies and policies in Bangladesh for the industry?

e) What should be the strategic policy attempts of Bangladesh to retain its competitiveness in the industry while ensuring environmental safety and worker's health?

1.3 Methodology:

To achieve the research objectives, a mixed research methodology has been used. **Policy Gap analysis** has been used to formulate strategic policy guidelines for Bangladesh by comparing the present and expected future scenarios under the new regulatory framework. Gap analysis is powerful tool to achieve any desired goals. It compares the present condition with expected scenario, and identifies the discrepancies or gaps. Then, actions are taken to correct those

discrepancies or fill the gaps (Gomm, 2009; Dongol & Heinen, 2012). The analysis in this study incorporates both the existing market and policy scenarios of the ship recycling industry in national and international levels. This policy gap analysis will provide policy direction to retain competitive advantage in the industry. Gomm, (2009) suggested a five-step ***policy gap analysis*** that has been used in this study as shown in Figure-1.1.

1.3.1 Data Collection:

Both qualitative and quantitative data from secondary sources have been used in several stages of the Gap Analysis. Qualitative data have been collected from interviews with relevant shareholders that has been published in national and international online portals during January, 2020 to June, 2021 as shown in Appendix-iv.

Secondary quantitative data have been collected from several databases such as- Clarkson SIN, Lloyd's List Intelligence, UNCTAD STAT, etc. from 1976 to 2021 although more emphasis has been given on the recent data from January, 2016 to June, 2021 so that the analysis depicts the current market condition. Besides, websites of government and non-government organizations, as well as relevant research articles have been used to collect both qualitative and quantitative data.

1.3.2 Data Analysis:

Several statistical tools have been used to analyze the primary and secondary data under different steps of the Gap Analysis. The detailed data processing techniques have been discussed below.

- **Selecting a specific problem area:** A systematic literature review has been used to identify the impacts of the new regulations. Primarily 58 *'studies'* were identified that have been published from January, 2008 to June, 2021 on ship recycling regulations and which are available in Google Scholar, ResearchGate, and other online portals. Here, studies include journal articles, book chapters, theses, and conference proceedings. After excluding the articles that do not have open-access or written in other languages, 51 studies were methodically examined and finally 39 relevant studies have been selected for the review in this study as shown in Table-1.1 and Appendix-i.

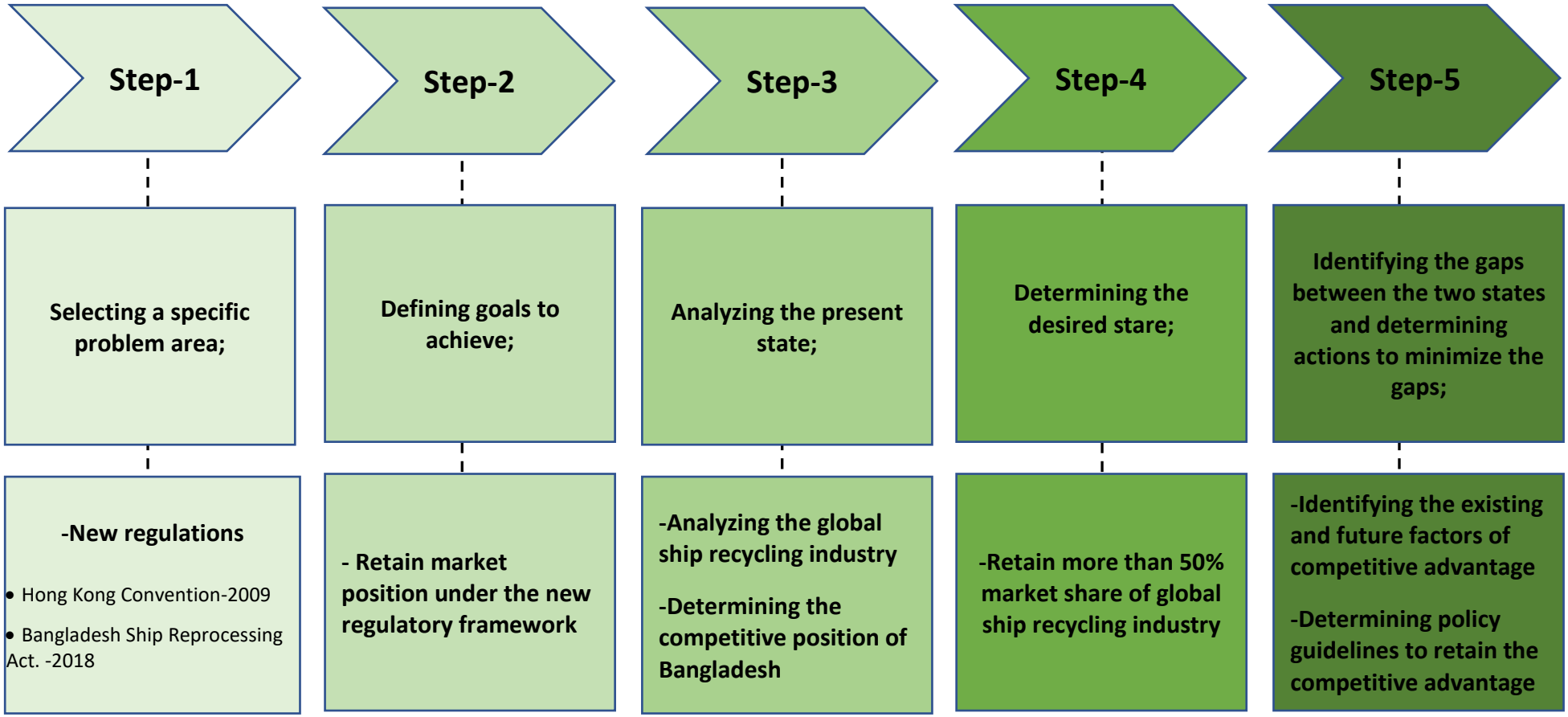

Figure-1.1: Research Framework Based on Gap Analysis

Table-1.1: Types of Studies Used in Systematic Literature Review

(*List of the 58 studies has been shown in Appendix-i)*

Types of Study	No	No (after excluding articles without open-access)	No (after excluding the studies that do not fall under the scope of this study)
Journal Article	39	32	25
Book Chapter	4	4	3
Thesis	9	9	6
Conference Proceeding & Slide	6	6	5
Total	**58**	**51**	**39**

- **Analyzing the present state:** The data have been processed using Microsoft Excel and the results have been presented in line charts, pie charts and tabular formats. For determining the competitive position of ship recycling countries, a competitive analysis has been conducted using the unitary and reverse-unitary method in Chapter-4. Unitary method has been used for the competitive factors where higher national value indicates higher competitive advantages such as- national steel demand, price of scrap steel in the internal market etc. The following unitary equitation has been used for those factors-

Competitive Score of a recycling country **= $(\boldsymbol{x} * \boldsymbol{w})/\boldsymbol{k}$** [where, Country score <= w]

Here, **k** = value of the highest country

w = weight

$\boldsymbol{x}$ = value of other evaluating country where $x > 0$

Reverse-unitary method has been used for the competitive factors where higher national value indicates lower competitive advantages such as- labor cost, tax rate etc. The following equitation has been used for those factors-

Competitive Score of a recycling country **= $(\boldsymbol{k} * \boldsymbol{w})/\boldsymbol{x}$** [where, Country score <= w]

Here, **k** = value of the lowest paying country

w = weight

$\boldsymbol{x}$ = the value of other evaluating country where $x > 0$

Based on the result of the competitive analysis, a **SWOT analysis** has been conducted for determining the specific areas of competitive advantage of Bangladesh.

1.4 Significance of the Study:

The ship recycling industry supply more than 60% of the raw material of steel production and more than 2,00,000 people are employed in this industry in Bangladesh (BSMA, 2020). The ship recycling industry contributes around $2 billion to the national economy (Ahammad & Sujauddin, 2017). Moreover, the supply of steel from the industry is particularly important for the current infrastructural development in Bangladesh while the government itself has an annual demand of around 3 million MT for the ongoing mega projects such as the Padma bridge, metro-rail, and several others (Ahammad & Sujauddin, 2017). Deficiency in supply of the scrap steel from ship recycling industry increases the price of steel products and consequently disrupts the infrastructural development (Rahman & Kim, 2020). Hence, the sustainable development of industry is very crucial for the government of Bangladesh.

But the ship recycling industry is also severely polluting the environment and damaging the eco-system in the coast areas of Bangladesh (Soner et. al., 2021). Bangladesh government has adopted the *Bangladesh Ship Reprocessing Act-2018* for the sustainable development of the industry and also expressed the intention of ratifying the Hong Kong Convention-2009 immediately after 2023. As a result, this study will provide significant policy guidelines to the policy makers to adopt the appropriate strategies that will not only retain the competitiveness of Bangladesh in ship recycling but also protect the environment and ensure the workers' safety. This study will help to bring necessary changes in the existing policies and to develop future strategies.

1.5 Limitations of the Study:

Ship recycling is a broad area of study comprising several interrelated aspects, such as- policy aspects, market and economic aspects, as well as environmental aspects (Mikelis, 2019). However, this study focuses only on the competitiveness of the industry under the new regulatory framework based on secondary data. One of the limitations of the study is that it has not used any primary data sources. Collecting field data could have improved the analysis. Physical interviews with related stakeholders could have improved the recommended policy guidelines of the study. Due to COVID-19 pandemic and the limitations of funds, collecting field data has not been possible.

Chapter-2: An Overview of the Ship Recycling Industry

2.0 Introduction

Ship recycling is an important sub-sector of the global shipping industry. The ship recycling industry acts as an equalizer of the demand and supply of the shipping industry by removing obsolete ships from the market. This chapter provides an historical overview of ship recycling industry and thus, establishes a robust conceptual background for the study. This chapter shows the movement of the ship recycling industry from one part of the world to another, and highlights the countries who dominated the industry at different period of time during the last 46 years (from 1976 to 2020). It shows the present scenario of the global ship recycling industry and the major ship recycling countries along with their present market share. It also sheds light to the possible future direction of this industry. This chapter also illustrates the business process and methods of ship recycling. The discussion of this chapter will help to understand the critical analysis of the regulations and the market-competition in the subsequent chapters.

2.1 An Overview of the Ship Recycling Industry

Ship recycling has emerged as an industry only in the recent past. It took an industry shape just in middle of 20th century when the steel made ships started to reach at the end of their service life (Mikelis, 2019). Cambridge Dictionary (2021) defines an industry as *"the people and activities involved in one type of business; or the companies and activities involved in the process of producing goods/services for sale and make a lot of money"*. Let's examine whether ship recycling meets the above criteria of being an industry. Firstly, all over the world there are more than 1000 ship recycling yards where more than one million people work directly (Jain, et. al., 2017). Secondly, the EOL ships have a high residual value, for example- the scrapping price of an Aframax vessel of 105k DWT is 9.37 million USD on May, 2021 (Clarksons, 2021). Moreover, around 95% of the ships mass are valuable steel and they are completely recyclable (Mikelis, 2019). Thus, Ship recycling is an '***industry'*** in its own virtues.

Ship Recycling is a mobile industry that has experienced several geographical shifts over the time in pursuit for low labor cost and high demand for scrap steel (Jain, et. al., 2017). The industry primarily started its journey in the industrially developed countries. After the second world war, the industry first developed in United Kingdom and United States to dismantled the damaged war ships (Kagkarakis et at., 2016). But soon the industry was heavily discouraged

in those countries because of its harmful environmental impacts on the coastal ecosystem. In 1970s, the industry shifted to semi-industrialized Asian and Mediterranean countries such as- Japan, Taiwan, South Korea, Spain, China, etc. because of the availability of cheap labor and the growing demand of re-rolled steel in these courtiers (Buxton, 1991; Stopford, 2002;).

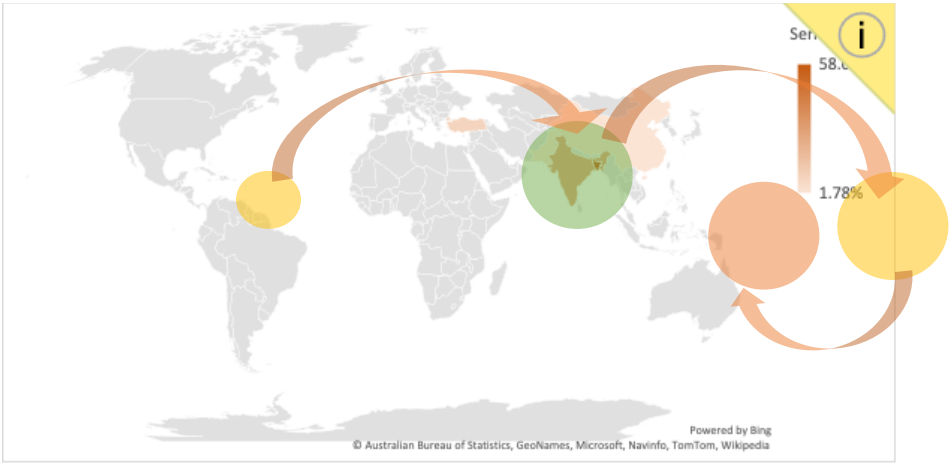

Figure-2.1: Geographical Movement of Ship Recycling Industry

During 1980s when the ship recycling was very high, Taiwan, South Korea, China and Japan led the industry. However, the industry started to decline in South Korea and Taiwan in the late 1980s when their economy grew, wage rate increased and other industries became more attractive, especially the ship building industry (Stopford, 2002). On the other hand, China continued recycling ships albeit with a gradually declining market share because of environmental regulations and internal policy changes (Mikelis, 2019). However, China still remains one of the major five ship recycling countries in the world (UNCTAD, 2020). Now the three South Asian countries are dominating the industry- Bangladesh, India, Pakistan (Figure-2.7).

During the last 20 years, the major five ship recycling countries - Bangladesh, India, Pakistan, Turkey and China have been recycling around 96% to 98% of the total volume of global ship recycling in gross tonnage. More interestingly, the three South Asian countries have been invariably recycling at lest two-thirds of the global ship recycling since 2014 as shown in Figure 2.3.

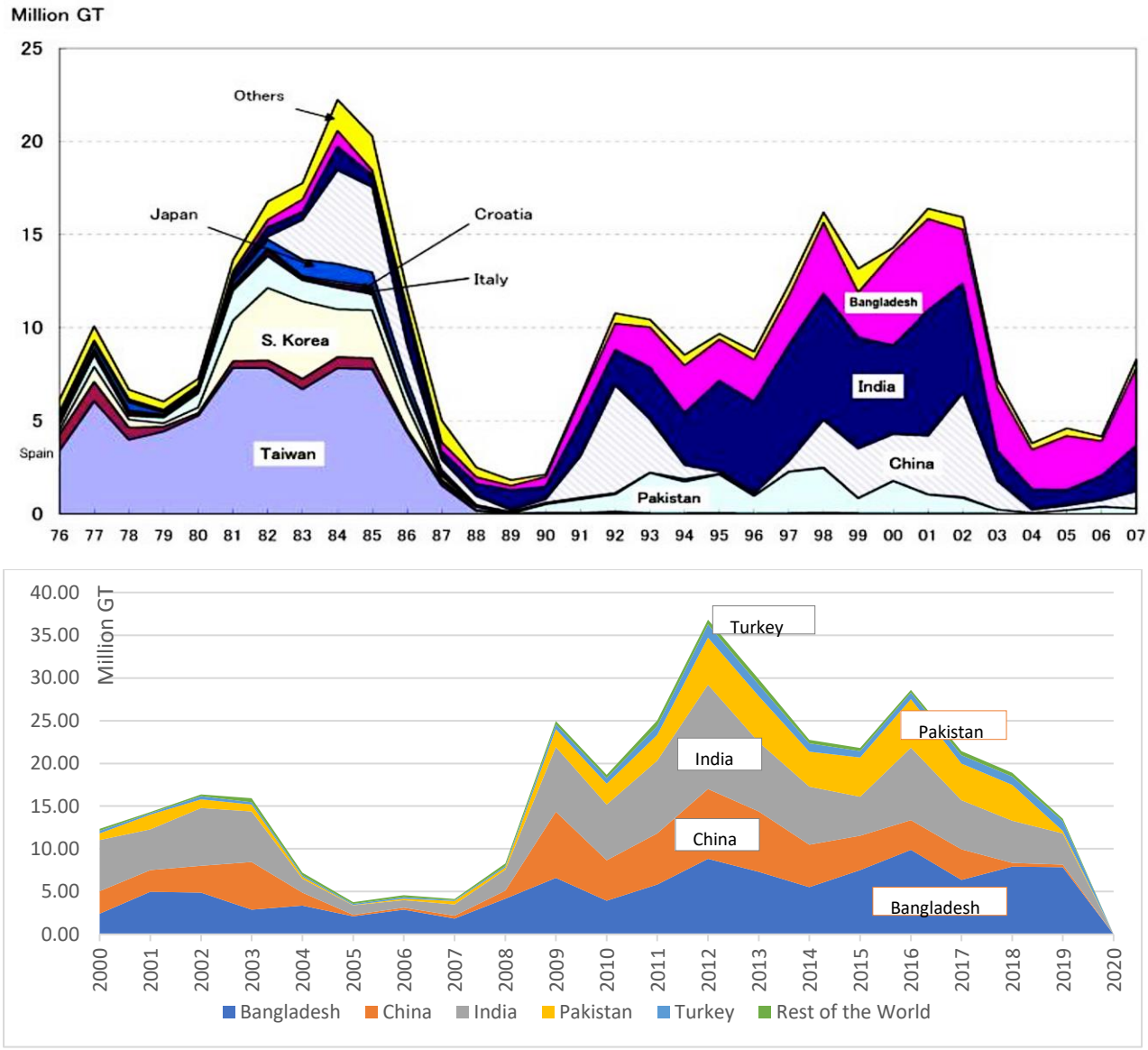

Figure-2.2: The development of ship recycling industry over time from 1976 to 2020 (Source: data from Clarkson SIN & Lloyd List Intelegence)

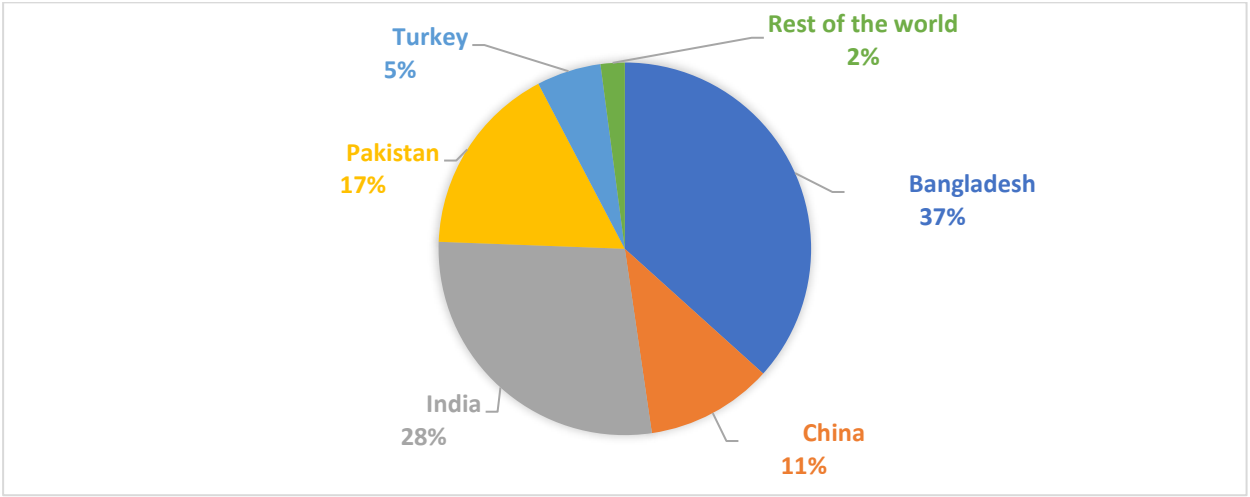

Figure-2.3: Average Market Shares of Major Ship Recycling Countries (DWT) (Source: data from UNCTAD STAT, 2014 to 2020)

In Bangladesh, the recycling sites are situated at Sitakunda located on the northern part of Chittagong port. In India, sites are located at Alang in Gujarat province while the Pakistani sites are mainly located at Gadani Beach in Balochistan (Platform, 2017). The Turkish recycling sites are concentrated at Aliaga on the Aegean Sea and around 60 km north of Izmir port. The Chinese sites are mainly located in two sites- long the Pearl River in South, in Guangdong province, and along the Yangtze River in North, in Shanghai. Some sites in China are also located near Tianjin (Table-).

Table-2.1: Overview of the recycling facilities in major ship recycling countries

	India	**Bangladesh**	**Pakistan**	**Turkey**	**China**
Main Location of Ship Recycling Facilities	*Alang, Gujarat*	Sitakunda, Chittagong	Gadani, Balochistan	Aliaga, Izmir	Guangdong, Shanghai, & Tianjin
No of Yards (Approximately)	50 Companies 170 Yards	145 Companies 160 Yards	40 Companies 130 Yards	25 Companies	60 Companies (Not all of which have an import license)
Average Capacity of Yards	20,000 to 150,000 LDT	20,000 to 150,000 LDT	20,000 to 150,000 LDT	50,000 to 100,000 LDT	30,000 to 1.2 millior LDT
No of Workers	Avg.-15,000 Pick- 40,000	Avg.-20,000 Pick-50,000	Avg.-8,000 Pick-20,000	900-1200	No Data
Recycling Method	Beaching	Beaching	Beaching	Landing	Slip ways or Dry docks

Source- Author own elaboration based on data NGO Shipbreaking Platform report-2017; ClassNK report-2021

The above table shows that the yards in Turkey and Indian subcontinent are small to medium in size while yards in China are medium to large. However, there are still some ship recycling facilities in USA, UK, Canada, Spain, Belgium, Netherlands, etc. who mainly recycle war ships, fishing vessels, and other high value ships (Mikelis, 2019). The yards in these developed countries does not pose any significant competition to the Asian yards as their target markets are different. Moreover, the South-Asian yards have competitive advantage in labor cost, high market demand of recycled material and lax environmental regulations. But the Chine government banned importing EOL ships for recycling since 2018 due to internal policy changes (Mikelis, 2019). Hence, a vacuum has been created for the new entry in the industry.

2.2 Future Direction of the Industry

Ship recycling is a complex and hazardous industry involving numerous environmental and health safety issues (Jain et. al., 2018). Hence, along with the increase of environmental and safety standards in the developed countries, the industry migrated to developing and least developed countries. It is very interesting and significant to analyze the movement of ship recycling industry over the last century and to determine the factors influencing the movement

of the industry to predict the next destination. This is a phenomenal research gap and provides future research direction for further study.

Jain & Pruijn (2017), Mikelis (2019) and Sunaryo et. al., (2021) suggested four drivers of ship recycling industry–

a) Favourable Coastline for ship recycling.

b) Sufficient supply of Cheap Labour Force

c) Flexibility in Environmental Regulation

d) High Internal Demand of Steel

Ship recycling industry can develop in any country that has the above-mentioned characteristics. However, the awareness regarding the environmental impact of the ship recycling industry and the lack of entrepreneurship in this sector may outrun the possibility. Ship recycling is a profitable business where the owners of the recycling yards enjoy high profit margin but the environment pays the cost (Gourdon, 2019). Here, I am mentioning the development opportunities of the industry in some of countries based on existing literature.

Vietnam and Indonesia have great prospects for ship recycling. Vietnam is opening its economy and several international production centers have been shifted from saturated Chinese market to Vietnam (Malesky, 2014). As a result, the demand of cheap sources of steel has increased in Vietnam. Pham (2019) assessed the development opportunities of ship recycling industry in Vietnam, and using a case study of *'Pha Rung shipbuilding yard'* the study found strong evidence of development opportunities in the existing ship building facilities. Hitachi has started a joint venture with Hong Kong firms to established a ship breaking yards in Da Nang (To & Kato, 2017). IHI and Jurong Shipyard of Singapore bid to establish a breaking yard in Vietnam as well. Indonesia is already breaking ships in small quantity, especially tanker, general cargo and offshore (Clarksons, 2021). However, there is another possibility that the industry may shift to West African developing countries, such as Nigeria and Ghana that are currently recycling small number of tankers and offshore facilities (Mikelis, 2019; Adekola & Rizvi, 2020).

2.3 Business Process of Ship Recycling:

To recycle a ship, a shipowner can either sell the ship directly to the recycler or to a cash buyer. The cash buyer buys the ship from the owner at a lump sum amount in cash in advance, and charges a certain percent of commission (usually around 3%) to close the deal (Engels, 2013; Alcaidea et. al., 2016). Cash-buyers pay in advance to shipowners and get paid after delivering

ships to recycling yards. Thus, shipowners get a financial security, contrary to dealing with the '*letter of credit (LC)'* in direct sales. Moreover, ship owners prefer this process for avoiding the legal bindings and taking higher price by reflagging the vessels. Hence, approximately 80% of recycling transections follow the cash-buyer process (Alcaidea et. al., 2016).

When a cash buyer purchases a ship on "*as is where is*" basis, he takes over the ship from its last port of call, changes the crew, re-flags the ship and later delivers the ship at his risk to the recycling yard. On the other hand, when a cash buyer purchases a ship on "*on delivery*" basis, the ship owner is responsible to deliver the ship to the yards at his own risk (Engels, 2013). The first approach is more popular as the ship owners usually do not want to take the extra hassles of re-flagging and other formalities required for EOL ships (Alcaidea et. al., 2016). In practice, a ship broker works on behalf of the ship owner to negotiate and manage the deal. The price set in the deal is always in terms of USD per LTD (Alcaidea et. al., 2016). The cash-buyer and broker select their own contract format although BIMCO has a standard format known as DEMOLISHCON (BIMCO, 2016) for buying and selling of EOL ships.

On the other hand, understanding the cost and revenue generating factors is more important to a ship recycler. Ship recyclers consider both fixed capital costs (such as- yard cost, ship purchasing cost, etc.), and associated variable costs (such as- govt. taxes and duties, labor cost, utility costs, waste disposal costs, etc.) for each deal (Sarraf, 2010). The revenue of ship recyclers depends on what types and how much recyclable material can be extracted from the ship. The internal demand and present market price of the material are also crucial factors (Khalili, 2008).

2.4 Methods of Ship Recycling

The ships recycling methods may be classified based on their docking process and based on the level of mechanization used in recycling process (Gourdon, 2019). There are four methods of docking a ship for recycling (Figure-2.4). Beaching is the most popular (more than 65%) as well as the most environmentally harmful process used in the intertidal area of beach (Soner et. al., 2021). All three South Asian countries- Bangladesh India and Pakistan mostly use the beaching method (Platform, 2017). Slipway is slightly modified version of beaching used in areas with the low tidal difference. This method is very popular in Turkey although some European yards such as- Inverkeithing, also use the method (Yujuico, 2014). The slipway method is relatively safe and environment friendly then the beaching methods (Hougee, 2013; Gourdon, 2019). The alongside methods is a top-down approach where ships are afloat and

moored offshore. The superstructure and upper pieces are removed first, then the work continues along the ship into the engine room until only the double bottom is left (Chang et. al., 2010). This method is mainly popular in China, Belgium, and the USA (LR, 2021). Among these four methods, drydock is the safest and most environment friendly methods where ships are recycled in floating-dock or dry-dock (Gourdon, 2019). However, this is also the costliest method of ship recycling. Some of the prominent drydock recycling facilities are Leavesley International's facility in Liverpool, Able UK Limited, Harland and Wolff Heavy Industries Limited, Swansea Drydock Limited, etc. (LR, 2021).

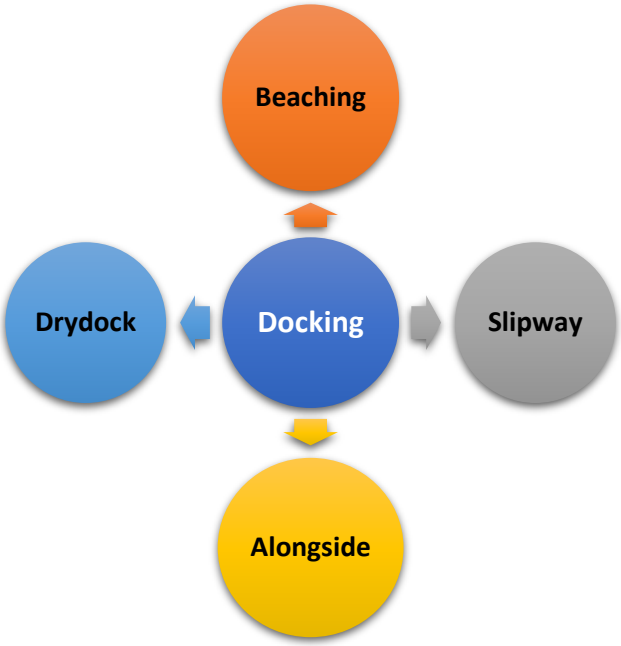

Figure-2.4: Docking Methods for Recycling.

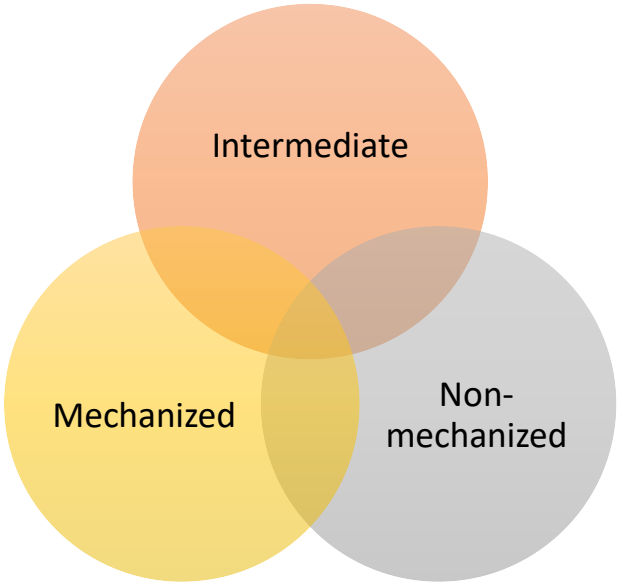

Figure-2.5: Levels of Recycling Mechanism

Based on the level of mechanization used in the process, ship recycling can be classified into three categories (Figure-2.5). In Indian subcontinent, ships are mostly recycled through non-mechanized process where a team of workers cut the ship using the gas torches (Platform, 2017; Gourdon, 2019). This the most labor intensive and hazardous process with minimum worker's safety (Hougee, 2013). On the contrary, most of the European ship recycling yards are highly mechanized where most of the recycling functions are performed with the machines (cranes, semi-automatic robots, etc.) to reduce labor requirement, and also to protect the environment (Hiremath et. al., 2016). The intermediate process is somewhere between these two extremes, and it is very popular in Turkey, China and some yards in the USA (Hiremath et. al., 2016). It is a combined process of labor and machine, i.e., cutting is done by labor using gas torches but lifting is performed using cranes.

2.4 Conclusion:

Ship recycling activities has moved from the developed countries to the South-Asian developing countries after 1990. Three neighboring countries- India, Bangladesh and Pakistan are dominating the industry with a market share of more than 75% as shown in Figure-2.7. These three countries use the beaching and non-mechanized methods as mention above. The industry is seriously polluting the coastlines and a significant number of workers are dying every year in the recycling yards of these countries (Ozturkoglu et. al., 2019; Soner et. al., 2021). This has drawn the attention of the international community and the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships has been adopted. The convention has significant implications on the industry. In the next chapter, the regulatory framework of the global ship recycling industry will be analyzed to identify the impact of the Hong Kong Convention on the existing market scenario.

Chapter-3: Critical Analysis of the Regulatory Framework of Ship Recycling

3.0 Introduction:

What will happen to ships at the end of their lives? It is an issue of paramount importance as it has substantial consequences on the environment. The concern grows further when the world fleet increases on an average rate of around 3.5% annually (UNCTAD, 2020). These ships must be recycled properly so that they do not create any severe environmental consequences. A robust regulatory regime is required for positive changes in the existing ship recycling practices as suggested by Matz-Lück (2010) & Samiotis et. al. (2013). In this chapter, the major legal instruments that govern the ship recycling industry have been discussed. Puthucherril (2010) and Molenda (2010) considered the Basel Convention-1989 and the Hong Kong Convention-2009 as the main legal instruments while Moncayo (2016), Hui & Yuxian (2017), Thakur (2019) and Mikelis (2013 & 2019) have also included the EU Ship Recycling Regulation-2013 in their studies. Special emphasis has been given on the Hong Kong Convention (HKC) in this study as it is the main legal instrument especially designed for the industry. A systematic literature review (see Chapter-1, Section-1.3.2) and quantitative data from secondary sources have been used to analyze the enter-into-force criteria, the present status, and the impact of those legal instruments on the industry. The findings of this chapter will help to understand the impacts of these regulations, especially the HKC, on the industry and market competition.

3.1 The Basel Convention, 1989

The Basel Convention (1989) on the control of transboundary movements of hazardous wastes and their disposal aims at protecting human health and the environment by reducing the movement of harmful materials and preventing the transfer of hazardous material from *developed countries to under-developed countries*. The convention was adopted on 22 March, 1989 and it entered into force on 5 May 1992. There are 53 signatories and 188 party states of the convention (UNEP, 2021). The main obligations of the treaty include- reducing the amount of waste at source; managing waste within the producing country; reducing the transboundary movement of hazardous material; controlling waste trade; and managing the waste in an environment friendly manner. On 5 December 2019, the Basel Ban Amendment entered into force that prohibits the OECD, EU member states and Liechtenstein from exporting hazardous material to developing countries.

This convention is particularly relevant to the shipping industry because *around 90% of the world merchant fleet is owned by the developed countries of Europe and Asia while on the other hand, more than 95% of the ships are recycled in developing countries in the South-East Asia* (Moen, 2008; UNCTAD, 2020; CAMERON-DOW, 2020). However, there are some underlying limitations of the convention in its applicability to the ship recycling industry. The applicability of the convention in ship recycling industry rests upon three key elements-

- The EOL ships must be considered as waste;
- The ships have to subject to transboundary movement; and
- Both the importing and exporting countries have to be the parties of the Basel Convention.

The 188 party states include all most all the major ship owning and recycling nations that satisfy the third element. The second element regarding the transboundary movement is a self-evident in purchase and sale transaction of a ship. The only remaining and probably the most important question to answer is whether an EOL ship can be regarded as 'waste' or not.

Moen (2008), Bhattacharjee (2009), Engels (2013), Zhou (2013) and several other scholars have argued that an EOL ship which carries hazardous materials in its structure should be considered as 'hazardous waste'. Thus, an EOL ship which is meant to export for recycling falls under the Basel Convention. But the existing practices of selling an EOL ship for recycling and the global nature of the ship recycling industry make the application of the Basel Convention ineffective in this aspect. Most of the ship owners try to circumvent the convention because the price of an EOL ship is several millions dollar (Bhattacharjee, 2009). Moen (2008) and Bhattacharjee (2009) have mentioned two main challenges for the effective application of the Basel Convention in ship recycling- firstly the challenge of identifying the time when a ship becomes waste, and secondly the challenge of identifying the 'country of export' under the convention. These limitations and the challenges lead to the need for a separate international legal regime which can meet the unique requirements of the ship recycling industry. This phenomenon led to the development of the Hong Kong Convention by the IMO.

3.2 The Hong Kong Convention, 2009

3.2.1 Background and Objectives:

The ambiguity in Basel Convention over the above-mentioned issues led to the adoption of the Hong Kong Convention (Bhattacharjee, 2009). The Hong Kong International Convention for the safe and environmentally sound ship recycling was adopted on the 15th May 2009 at a diplomatic conference in Hong Kong (Mikelis, July 2009; Rossi, 2010). The aim of the convention is to ensure that EOL ships do not pose any unnecessary risk to the environment or to the human health and safety (Tsimplis, 2010). To ensure the objective, the convention covers not only the operation and maintenance of ships, but also covers the design and construction of ships so that they can be properly recycled at the end of their lives (Sivaprasad & Nandakumar, 2013). The convention has not entered into force yet. However, it is very close to meet the criteria (Boviatsis et. al., 2019). With the help of secondary quantitative data from Lloyd's List, UNCTAD and Clarkson Shipping Intelligence Network, the present status of the criteria has been analyzed. The analysis helps to realize how proximate the convention is to enter into force. Then, the responsibilities that the convention puts on major stakeholders- ship owners and recycling yards, have been examined. An economic analysis of those responsibilities has been conducted to find out the exact financial impact of the convention on the ship recycling industry. Finally, the major drawbacks of the convention have been highlighted that will help to develop the strategic policy for a ship recycling country.

3.2.2 Structure & Key Elements of the Convention:

The convention has 21 articles, 25 regulations and 7 appendices. The articles ascertain the main legal framework for safe and environment friendly ship recycling and the regulations describe the obligations of the related parties ((Mikelis, 2010a) (Appendix-ii). The 25 regulations are divided into four chapters- general requirements (regulations 1-3), requirements for ships (regulations 4-14), obligations for ship recycling facilities (regulations 15-23), and common reporting obligations for shipowners, recyclers and competent authorities (regulations 24-25) (Mikelis, 2010b). In addition to these, there are 6 guidelines for the clear interpretations of the issues and uniform technical procedure of the convention.

Table-3.1: Guidelines for Hong Kong Convention

Year	Guidelines
2011	Guidelines for the development of the ship recycling plan
2012	Guidelines for the inspection of ships under the Hong Kong Convention

2012	Guidelines for the survey and certification of ships under the Hong Kong Convention
2012	Guidelines for safe and environmentally sound ship recycling
2012	Guidelines for the authorization of ship recycling facilities
2015	guidelines for the development of the inventory of hazardous materials

Source: IMO

The convention is applicable to international merchant ships, the flag states and ship recycling states who are the parties of the convention. It does not include warships, non-merchant government ships, domestic merchant ships and ships less than 500GT (Jain et. al., 2013).

3.2.3 Enter into Force Criteria and Present Status:

Article-17 of the convention includes three requirements for its entry into force. The convention will enter into force after 24 months of fulfilling these requirements. The requirements are-

- **a)** the convention has to be ratified by at least 15 states[1],
- **b)** the combined merchant fleet of the states (a) add up-to at least 40% of the world merchant fleet in gross tonnage,
- **c)** and the combined maximum annual ship recycling volume of the states (mentioned above in points a & b) during the last 10 years must constitute not less than 3% of their combined merchant shipping fleet in gross tonnage.

Carey (2012) and Mishra (2018) reported that the convention must be ratified not only by the major flag states (Panama, Marshal Islands, Liberia, etc.) but also by the major ship recycling states (Bangladesh, India, Pakistan, Turkey and China) to meet the above requirements. The convention was open for signature for one year starting from 1 September, 2009 to 31 August, 2010. During this time, 5 countries signed the convention (Carey, 2012). After that, the convention remained open for ratification or accession till now. It has been more than 10 years since the convention was adopted but have not entered into force yet. Nassar & Moursy (2016), Mishra (2018) and Ahmed (2020) reported that the slow progress of the HKC has created a skepticism among the stakeholders regarding the feasibility of the convention. However, the

[1] A country wants to be a Contracting State to an international convention can do that by the accession to the convention or by a two-stage process that involves first signing the convention to become a Party and then ratifying its signature. In this thesis the term ratification is used to mean either method.

recent ratifications of India, Japan, Malta and Germany have added a new momentum to the convention. Table-2 and table-3 show the present status of the criteria-

Table-3.2: Requirements for Entering into Force (From 2009 to June, 2021)

Criteria	Minimum Requirements	Current Status
Number of Parties	15	17
GT of World Merchant Fleet	40%	Approximately 27.72%
Recycling Tonnage in Last 10 Years	3%	Approximately 2.49%

Table-3.3: Current Status of the Requirements (From 2009 to June, 2021)

World Fleet					**1,39,91,00,000**	
40% of World Fleet					**55,96,40,000**	
3% of the 40%					**1,67,89,200**	
SL.	**Country**	**Signature**	**Accession/ Ratification**	**Fleet (GT)**	**Percentage (%) in World Fleet**	**Max. Annual Ship Recycling Valume in last 10 years**
1	France	19-Nov-09	2-Jul-14	40,34,741	0.29%	5,102
2	Netherland	21-Apr-10	20-Feb-19	63,01,478	0.45%	11,288
3	Ghana	2-Aug-10		36,569	0.00%	8,714
4	Turkey	26-Aug-10		48,77,268	0.35%	15,40,800
5	India	27-Aug-10	28-Nov-19	1,04,40,505	0.75%	1,22,10,082
6	Norway		26-Jun-13	29,50,336	0.21%	6,261
7	Congo		19-May-14	4,757	0.00%	0
8	Belgium		7-Mar-16	59,96,510	0.43%	36,441
9	Panama		19-Sep-16	23,03,75,579	16.47%	3,305
10	Denmark		14-Jun-17	1,38,024	0.01%	56,369
11	Malta		4-Mar-19	8,24,55,008	5.89%	947
12	Japan		27-Mar-19	2,92,33,552	2.09%	45,706
13	Germany		16-Jul-19	71,37,495	0.51%	1,534
14	Serbia		-	-	0.00%	0
15	Estonia		-	3,81,850	0.03%	3,593
16	Croatia		16-Feb-21	10,05,370	0.07%	2,814
17	Spain		3-Jun-21	24,38,287	0.17%	16,656
Total				**38,78,07,329**		**1,39,49,612**
Total Percentage (%) of the World Fleet (1,39,91,00,000) Required Rate-40%					27.72%	
Maximum annual recycling volume (all the countries recycled their maximum amount of GT in 2012) Required Rate- 3%						2.49%

Source: Based on data from Clarkson SIN, UNCTADSTAT and Lloyd's List until June, 2021

Ratifications by Panama, Malta and Japan were significant for the 2nd requirement. All the ratifications are important but the ratifications by India and Turkey carry paramount importance for satisfying the 3rd condition. The ratification of Japan in March 2019 is another milestone for the convention not only because of the large GT that flies Japanese flag, but also because of the support and aid Japan has already given to India for the upgrading of recycling yards (Urano, 2012; Ali & Pearce, 2020). Thus, Japan played an important role by pursuing India to ratify the convention.

For the first time, the convention is facing the real prospect of entering into force. To satisfy the second requirement, the convention should be ratified by either Liberia or Marshall Islands that possess around 12% and 11% of the world fleet respectively. For the third condition, ratification by any one of the three major recycling countries will be enough (Bangladesh with present capacity of 9.9 million GT or Pakistan with 5.7 GT or China with 8.2 million GT as reported by UNCTAD-2019). The convention cannot enter into force without the ratification of any one of these three recycling states because the rest of the world altogether (excluding India & Turkey who have already ratified) constitute only 0.6 million GT (Ali & Pearce, 2020). The world fleet is growing at the average rate of 3.5% (UNCTAD-2019), and so the figure presented above may vary in future. However, the conclusion remains same that the ratification by one of the recycling states is a must.

Chinese fleet including the fleet flying the flag of Hong Kong counts 13.4% of the world fleet (UNCTADSTAT, 2020). Hence, if China along with Hong Kong ratify the convention, the convention will satisfy all the three requirements and will enter into force within subsequent 24 months. Among these three countries China's ship recycling industry is relatively more environment friendly in terms of recycling process and infrastructure (Ahmed, 2020). Moreover, there is a growing concern in China regarding the environmental degradation caused by the industry (Hui & Yuxian, 2017) and China has banned importing ships for recycling from December 31, 2018 as mentioned earlier. However, it will continue to have the *'notional'* ship recycling capacity for a few more years because of the 10 years provision in the third requirement. The capacity of 8.2 million GT which was the volume recycled in 2012, will stand until 2023, then reduce to 7.1 million GT until 2024, and then further decline to 5.0 million GT until 2025 (Mikelis, 2019). Therefore, it will be more logical and preferable for the convention to enter into force with the ratifications of the countries with growing ship recycling capacity. The obvious target should be either Bangladesh or Pakistan.

Pakistan has not made enough progress yet towards the ratification and compliance of the HKC (Ali, & Pearce, 2020). Moreover, the ship recycling industry of Pakistan has been suffering adversely from higher taxation, lower foreign-exchange rate and cheaper imports of billets from Iran since 2019 (Mikelis, 2019; Ahmed, 2020). As a result, its volume of ship recycling has also drastically declined in 2019. UNCTAD (2020) reported that the volume of ship recycling in Pakistan dropped 93.3% in 2019 in comparison with the volume of 2018.

On the other hand, Bangladesh is in much better position than Pakistan to ratify the convention (Ahmed, 2020). The administration of Bangladesh is very aware about the importance of the industry for its national economy as well as they are equally aware of the harmful impact of the industry on the environment. A project, named 'Safe and Environmentally Sound Ship Recycling in Bangladesh (SENSREC Phase I, II, & III), has been being implemented since 2015 for capacity building and infrastructure development so that Bangladesh ratify the HKC. The project is funded by the Norwegian Agency for Development Cooperation (Norad) and implemented by the IMO (IMO, 2020). The agreement of Phase-III of the project was signed on 24 July 2020 following the successful implementation of Phase-I (2015-2017) and Phase-II (2018-2020). Besides, PHP Ship Breaking and Recycling Industries Limited which is a leading ship recycling company in Bangladesh, has transformed itself into a model recycling facility. It is the first recycling facilities that has been awarded the Statement of Compliance (SoC) to the HKC by an IACS classification society. A few more yards are also on the way to be awarded the same (Ahmed, 2020). The Ministry of Industries of Bangladesh has expressed its intention in a press briefing in January 2020 to ratify the HKC by 2023. However, the ratification also depends on the intention of the yard-owners as they have a strong lobby in the government (Fang & Mejia, 2012; Tao, 2015). Hence, it is significant to understand how the HKC will impact on the business margin of those yard-owners.

3.2.4 Economic Implications of the Convention:

There are some misperceptions regarding the economic impact of the convention among the related parties (Nassar & Moursy, 2016). One of the most common perceptions is that if the convention enters into force, it will restrict the party states to recycle non-party (who have not rectified/accepted the convention) ships. But the Article-3.4, Article-4.2 and Regulation 17.2 suggest that the ship recycling facilities of the party states can accept any ships that satisfy the convention both from party states and non-party states. However, the compliance will require

additional costs. Let's examine the economic and business impact of the HKC from both a ship owner's and a ship recycler's perspective-

Ship Owner's Perspective: A little information is available regarding the exact additional cost for recycling a ship in compliance with the convention. There are several issues that need to consider, such as the type of vessel (bulker vs tanker), the size of the vessel (Panamax vs VLCC), vessel age, flag state, excreta (Thakur, 2019). However, Nikos Mikelis (2010) showed that it will cost only ***USD 3 per LDT*** for a non-party ship to comply the requirements of the convention (based on an estimation of USD 30,000 for a Panamax of 10,000 LDT). Thakur (2019) showed that the costs can be ***USD 3.75 to 4.00 per LDT*** for a non-party ship to comply with requirements of the HKC. Thakur (2019) includes the cost of $12000-$15000 for flag state survey and class society certificate.

The average price per LDT of a Panamax vessel is USD 403 although the present price is UDS 575 per LDT in July 2021 as shown below (Clarkson SIN, 2021). If we consider the average price of $403 per LDT, the maximum compliance cost of the HKC accounts only $4/LDT or around 1% of the revenue of a shipowner. Hence, we can conclude that the compliance cost is not very significant amount for a reputable shipowner. However, the total amount of compliance cost is significant to cash-buyers who are considered as the final shipowners under the HKC. This issue becomes clearer if we analyze the Regulation-8 of the HKC.

Table-3.4: Compliance Cost for Ship Owner

Compliance Cost per LDT	***4***	
	Price per LDT	**Compliance cost as % of Revenue**
Average (Weekly Price of 2019-21)	$402.81	0.99%
Minimum (Weekly Price of 2019-21)	$285.00	1.40%
Maximum (Weekly Price of 2019-21)	$575.00	0.70%

Source: Authors' own elaboration based on data from Clarkson SIN

According to Regulation-8 of the Hong Kong Convention, party ships can only be recycled at party recycling facilities. However, there is no legal restriction for selling; deregistering; and changing flag of a merchant ship. Therefore, a party ship can easily become non-Party ship, and then it can be recycled at a non-Party facility, or vice-versa. The cost for a ship to change flag for a Panamax ship is around **USD 10,000** or approximately **USD 1 per LDT**, representing a negligible cost to its owner (Thakur, 2019). Therefore, changing flag is much more economically beneficial rather than complying the HKC (Alcaidea et. al., 2016). Hence,

although the compliance cost is not very significant, the shipowners take advantage of the loopholes of the regulatory framework.

Ship Recycler's Perspective: Let's examine the economic impact of the HKC on a ship recycling facility (SRF). Regulation-15-23 of the HKC describe the obligations of an SRF. These obligations can be divided into two parts- general requirements and ship specific requirements. The general requirements mainly include-

- Every SRF must be authorized by the competent authority of the state. The authorization is subject to inspection and renewal after each 5 years.
- The authorized SRFs will accept only those ships that comply with the HKC.
- The SRFs will develop a Ship Recycling Facility Plan (SRFP) incorporating worker safety and training; protection of human health and the environment; etc. and implement the plan. The renewal of the authorization of SRF will depend on the implementation of the SRFP.

The general requirements will increase ***the investment cost and labor cost*** for an SRF because SRF must invest more to implement the SRFP and to ensure labor safety. Ship specific requirements includes-

- A ship-specific Ship Recycling Plan (SRP) for each ship shall be developed before recycling the ship. The plan must take into account the information provided by the shipowner (i.e., IHM, ICIHM, etc.). The SRP along with the details of the ship (i.e., flag State and its particulars; owner and company; classification society; etc.) must be sent to the competent authority before physically receiving the ship.
- The SRP must be approved by the competent authority and then shall be made available to the ship for its final survey;
- When the ship will receive the International Ready for Recycling Certificate (IRRC) from the flag state, the SRF will notify its competent authority, and can start the planned recycling.
- After the completion of recycling, a Statement of Completion shall be issued by the SRF to its competent authority who will further send a copy of it to the flag state.

All these ship-specific requirements will increase the operational costs of an SRF. *Appendix-iii* shows a revenues and costs breakdown of a Bangladeshi ship breaking yard. This shows the

major cost items of recycling a ship and help to analyze the probable impact of the requirements of the HKC on them. Preparing the documents and collecting permits may increase red-tap leading to longer period for recycling. The longer recycling time will further increase the labor cost and financial cost.

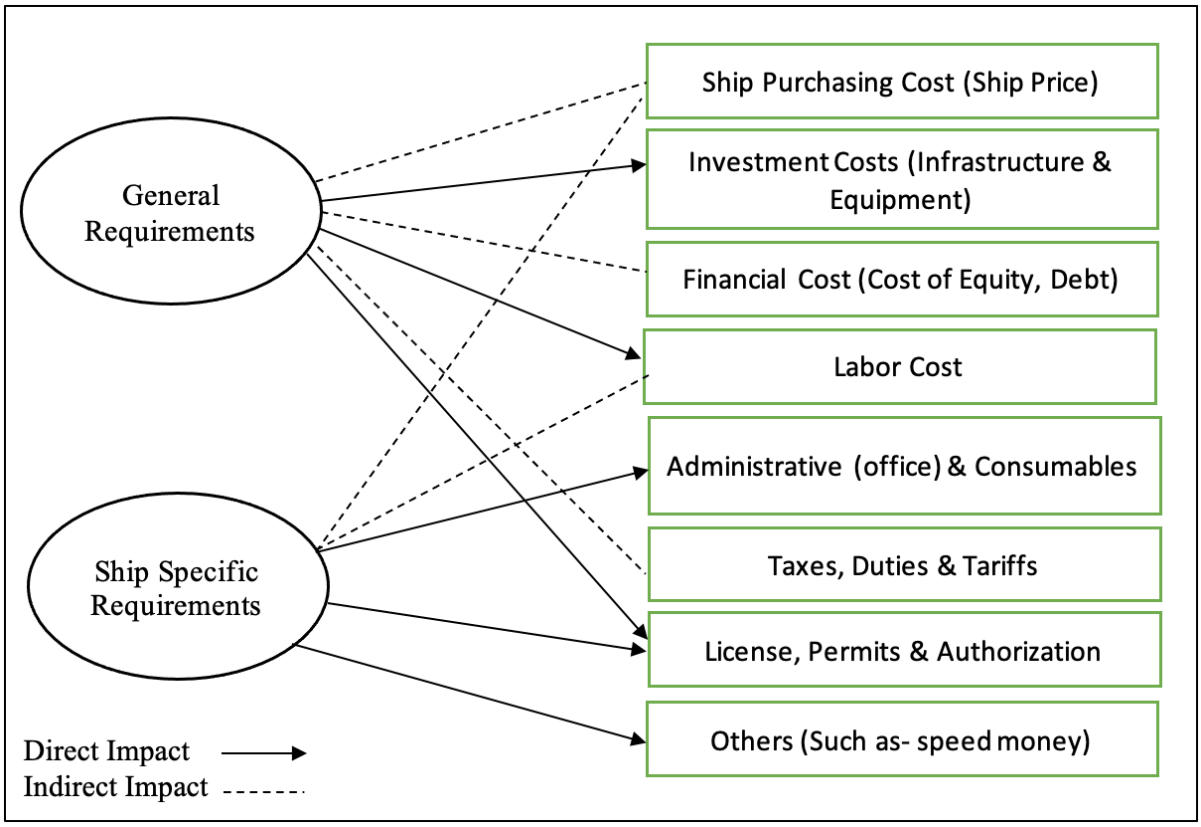

Figure-3.1: Impact of Requirements of the HKC on the Cost Items of an SRF

Moreover, the bureaucratic process of collecting permits and approvals may require *'speed-money or bribe'***.** But appropriate government policy can make the entire process of documentation easier and more transparent. Digitalization of the documentation process can be an appropriate strategic tool in this respect.

3.2.5 Drawbacks of the Convention:

a) Lack of Incentives for Ship Recycling Facilities: Implementing SRFP in accordance to the HKC requires substantial capital investments but the convention does not provide any solution to it. Moreover, the compliance requirements will increase significant amount of cost for an SRF that has been shown above. Besides, re-flagging of ships and recycling to a non-party state justify the indifference of the major recycling states to ratify the convention. Yujuico, E. (2014). Choudhary, G. K. (2011).

b) Unfair Advantage to Ship Owners: The economic analysis makes it clear that the obligations of a ship owner is only limited to arranging a couple of certificates such as ICIHM and IRRC that costs only around 1% of the final vessel price (Regulation 8(3)). The Convention does not restrict re-flagging the vessel or any other responsibility on the ship owner to ensure sustainable recycling of the ship (Tao, 2015). On the contrary, the amount of costs to comply with the required standards of the HKC for recycling facilities creates an unfair imbalance between the obligations of the ship owners and the ship recycling facilities.

c) Possibility of Re-flagging: As mentioned before, reflagging just before the last voyage has become a common trend in shipping industry because of the cost advantage (Fang & Mejia, 2012). This is a major lacuna of the HKC. As a result, party flag ships after re-flagging to a non-party flag can be sent to an SRF in a non-party recycling state. That means a recycling state may be able to get ships for recycling without ratifying the Convention. This short coming is not only delaying the convention to enter into force but also eroding the possibility of achieving the its desired objectives in future.

d) Notification Difficulties: There are certain practical difficulties in the notification process of the convention. For example, there is no notification from flag state to the recycling state. Only the SRF notify the competent authority regarding its intention to recycle a ship. In this situation, the SRF may notify the authority at the last minute when the recycling state authority will have little time take appropriate actions. Moreover, ship recycling facilities may face practical difficulties while preparing SRP based on incomplete information or incorrect IHM given by the ship owners. There is no way of holding the ship owners responsible in this case.

Hong Kong Convention is the main international legal instrument dealing with sustainable ship recycling. Although the convention has not entered into force, the convention may enter into force in next 3-5 years with the ratification of either Bangladesh or China. Indicating the above-mentioned shortcomings, several studies have concluded that the convention will not contribute much to sustainable ship recycling; rather it will increase reporting, documentation, operational costs and investments (Chang, 2010; Jain, 2013; Moncayo, 2016). The shortcomings of the HKC have led to the development of the EU Ship Recycling Regulation.

3.3 EU Effort towards Sustainable Ship Recycling

Acknowledging the limitations and uncertain adoption process of the Hong Kong Convention, the European Union (EU) has been establishing its own rigorous regulatory framework for sustainable ship recycling (Devaux & Nicolaï, 2020). The EU Green Paper on Better Ship Dismantling-2007 was the first initiative followed by the EU Ship Recycling Regulation (SRR) in 2013 (Tsimplis, 2014; Pastorelli, 2014). According to the Article 16 of the EU SRR, a list of certified shipyards where EU-flagged vessels can only be recycled, has been established. The first list containing 18 European shipyards with a capacity of around 1.1 million LDT, was published in 2016. The latest edition (7^{th}) of the list contains 43 yards with a recycling capacity of approximately 3 million LDT.

Table-3.5: The European list of ship recycling facilities

Date	Edition of List	EU Yards	Turkish Yards	USA Yards	Others	Total
Dec, 2018	4th	23	2	1	0	**26**
Jun, 2029	5th	30	3	1	0	**34**
Jan, 2020	6th	34	6	1	0	**41**
Nov, 2020	*7th*	*34*	*8*	*1*	*0*	***43***

Source: based on data from EUR-Lex;

Another important contribution of the EU is that all ships that intend to call EU ports, must have the IHMs since December, 2020 (Solakivi et. al., 2021). Maintaining the IHMs is an obligatory requirement for the HKC, and it is a significant document for sustainable ship recycling. Besides, EU constantly pursuing the concept of ***"design for ship recycling"*** which implies that ships should be designed and built in a way that they can be recycled sustainably at the end of their life (Sivaprasad & Nandakumar, 2013; Alcaide et.al., 2017).

In spite of the good intentions of the European Union, the SRR is not being fully effective. Firstly, the SRR mostly includes the EU ship recycling yards with limited capacity. The 7^{th} edition of the EU SRR list represents even less than 1% of the world's capacity (Solakivi et. al., 2021). Secondly, the EU is the world's largest exporter of scrap steel to India, Pakistan, China, Turkey, and Egypt (WTO, 2021). Hence, it will not be economically profitable to recycle large ships in Europe and then again export the steel to those ship recycling countries. Moreover, the yards in Europe cannot accommodate large ships for recycling (Solakivi et. al., 2021). Alcaide (2017) and Devaux & Nicolaï (2020) suggested the SRR list must include a significant number of South-Asian yards to make the desired impact. Pastorelli (2014) and

Yujuico (2014) recommended that the EU should also provide financial assistance to improve the yards in Indian subcontinent.

Yujuico (2014) and Solakivi et. al., (2021) commended that the ship owning nations should play more responsible role in sustainable ship recycling. The studies suggest that major ship owning nations should provide financial and technical support to the South Asian recycling yards for upgrading their sustainability standards. This sheds light to an important issue of clustering the ship owning nations to determine which cluster should help which recycling state. After identifying the cluster-relationship, international organizations, NGOs, and media should pressurize those clusters to provide support to the recycling nations. Here, I have taken top 10 ship owing nations and top 5 recycling nations according to UNCTAD (2020) to identify the cluster-relationship. The following table shows the preferred demolition locations of the major ship-owning nation. The top ten ship-owing nations have recycled 1449 ships which have been demolished since 2016 to May, 2021 (Clarksons, 2021). The table suggests that India recycles the biggest portion of the fleet owned by Japan, Greece, Norway, U.S.A., Germany and UK while Bangladesh recycles more than half of the total number of demolitions of Singapore and South Korean fleet. On the contrary, China has recycled 61% of its own fleet and 30% of Danish fleet. Pakistan and Turkey do not recycle substantial number of ships owned by any particular country rather they possess a mixed portfolio. However, many European countries (Greece, Norway, U.K and Denmark) prefer Turkey to recycle their ships because of the EU SRR.

Table-3.6: Preferred Demolition Locations of Top-10 Ship-owning Nations

Country	India	Bangladesh	Pakistan	Turkey	China P.R.	Other
Japan	51%	22%	1%	6%	10%	9%
Greece	32%	27%	22%	19%	0%	0%
China	12%	19%	8%	0%	61%	1%
Singapore	33%	53%	10%	1%	1%	2%
Norway	38%	9%	2%	19%	9%	23%
South Korea	13%	52%	26%	1%	5%	3%
U.S.A.	48%	6%	1%	12%	1%	33%
Germany	49%	31%	9%	5%	3%	2%
U.K.	25%	25%	8%	17%	0%	25%
Denmark	25%	8%	0%	25%	30%	13%

(Source: Author based on data from Clarksons Research Ltd.)

Urano (2012) reported Japan has been providing technical and business support to Indian ship recycling yards since 2010. Consequently, around 50% of Indian ship recycling yards have

now got the compliant certificate of the HKC and recently India has also ratified the convention. Turkey is getting the support from most of the European ship owning countries because Turkey has rectified both the HKC and the EU SRR. This has given a competitive advantage of recycling the European flag ships. On the contrary, Chinese recycling industry is self-dependent as Chine itself is a major ship owning nation. Thus, China has both internal buyers and sellers of EOL ships. This situation poses a major threat for Bangladesh and Pakistan. How can Bangladesh and Pakistan create resilience against the threat?

3.4 Conclusion

The above discussion and analysis lead to the conclusion that the international regulatory framework is not yet considerably effective. Among the three main legal instruments, only the Basel convention includes significant number of member states. But the Basel convention remains ineffective in dealing with the global nature of the ship recycling industry. This led to the development of the Hong Kong Convention that has not entered into force even after a decade. Moreover, there are some underlying shortcomings of the HKC as mentioned above. To compensate the shortcomings and to ensure sustainable ship recycling, the EU has developed its own rigorous regulatory framework, such as the EU SRR. The EU SRR has little practical impact as it covers mainly EU ship recycling yards which accounts not even 1% of the global ship recycling capacity. However, my analysis on the present status of the HKC indicates that it will enter into force in next 3-5 years. The analysis of the economic impact of the HKC has shown that the convention will surely increase operating costs and capital investments, especially for ship recycling facilities. This conclusion leads to an important question that how the HKC along with the increased costs and investments requirements will influence the market competition. In the next chapter, this study analyzes the impact of the HKC on the market competition in general, and particularly on the competitiveness of Bangladesh.

Chapter- 4: Competitive Analysis of the Ship Recycling Industry

4.0 Introduction

This chapter aims at analyzing the competitive nature of the ship recycling industry. Competition among the major five ship recycling countries- Bangladesh, India, Pakistan, Turkey and China has been analyzed under different segments of the market. The primary market competition exists among India, Bangladesh and Pakistan possessing more than 75% market share as shown in Chapter-2. Hence, a competitive analysis has been performed to identify the core competencies of those countries. The analysis helps to identify the competitive advantage of Bangladesh by comparing several competitive factors with India that has ratified the Hong Kong Convention (HKC), and also with Pakistan that has not ratified the convention. Finally, a SWOT analysis has been conducted to synchronize the findings of the competitive analysis and the economic impacts of the HKC. Based on the findings of this chapter, the strategic policy will be formulated in the next chapter.

4.1 Market Segmentation

As indicated in Figure-2.7, the five major ship recycling countries hold approximately 98% market share. Here, the ship recycling market has been segmented in 6 categories based on the type of vessels. The market shares of each of the major recycling countries in those segments have been highlighted. Figure 4.1 shows the segments and their relative size based on number of ships recycled from January, 2018 to June, 2021[2].

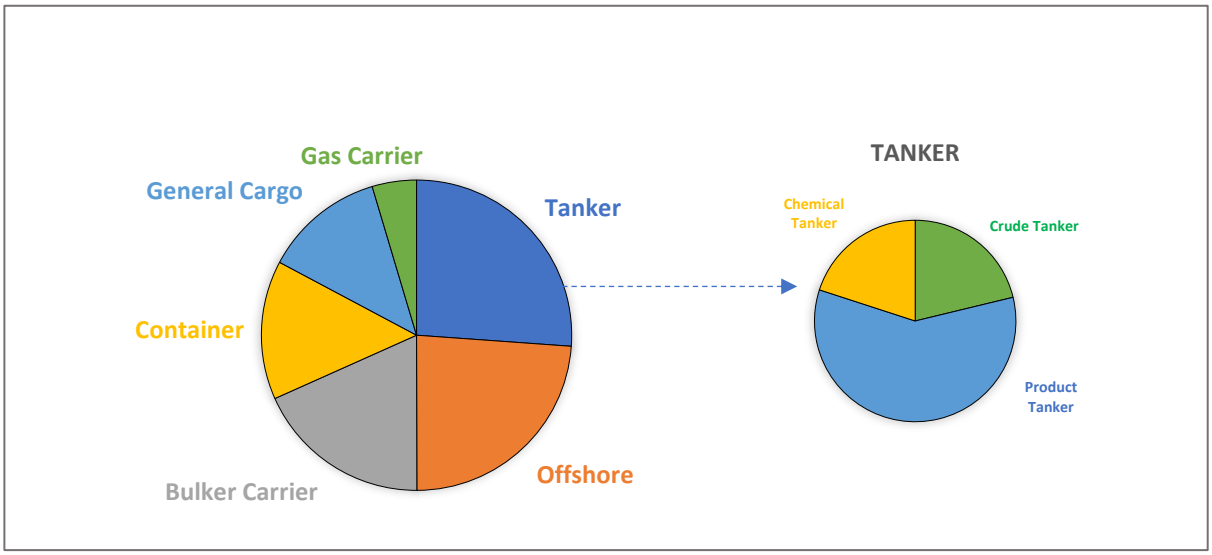

Figure-4.2: Segmentations of Ship-recycling Market (Source: Authors' own elaboration based on data from Clarkson SIN, Jan, 2018 - June, 2021)

[2] The figure excludes some other types of vessels such as reefer, ro-ro & passenger, multipurpose vessels, survey units, etc. because their total number is too small to form a separate segment.

The major ship recycling nations compete with each other in those segments. Frey (2013) and Mathew (2021) showed that Indian yard-owners traditionally prefer small size vessels. Knapp et. al., (2008) and Mathew (2021) suggests that there is limited risk of credit exposer in dealing with small ships. They argue that recycling small ships creates a portfolio and reduce the risk of price fluctuation in the national steel market. Rahman & Kim (2020) show that small ships contain more stainless steel than large ships. Frey (2013) and Mathew (2021). suggests that the scrap market of stainless steel in India is more attractive than re-rollable steel. Hence, Indian recyclers are particularly interested in vessels that are small in size but contain high amount of stainless such as- chemical carriers. Thus, we can explain how India recycles a higher number of ships than Bangladesh but less amount of tonnage (UNCTAD, 2019).

Bangladesh has been traditionally concentrating on medium to large size tankers and bulkers (Sujauddin, 2015). Bangladesh is very active in the VLCC market because the large ships produce cheaper re-rollable steel than small ships (Ahammad & Sujauddin, 2017). In addition to that, Bangladesh possesses second largest market share in container and LNG segments as shown in Figure-4.3. China mainly recycled large ships that produced flat steel plates (Du et. al., 2017). The Chinese government has banned importing vessels for scrapping in 2018 that has pushed up the recycling of large tankers and bulkers towards Bangladesh (Mikelis, 2019; IDLC, 2020).

Table-4.1 shows the number of ships recycled during January, 2018 to June, 2021 under different market segments. Here, number of ships has been used instead of GT as the GT of each vessel recycled during the period is not available. Figure-4.2 shows the recycling profile of the major recycling nations based on the table. Figure-4.3 shows the relative market share of the five major recycling states under the six market segments. Bangladesh possesses the largest market share of tanker and bulker segments while India has the largest market share of gas carrier, container and offshore segments. Turkey has the largest market share of general cargo segment. On the other hand, Pakistan and Chine do not possess the highest market share of any segments but they have substantial market shares in tanker, bulker and offshore segments.

Table-4.1: Number of Types of Ships Recycled from January, 2018- June, 2021

Country	Tanker	Bulker	LNG/Gas Carrier	Container	Gen. Cargo	Offshore	Total
India	103	50	28	107	15	142	445
Bangladesh	156	157	20	86	21	37	477
Pakistan	75	56	0	15	18	22	186
China P.R.	35	15	2	3	1	13	69
Turkey	7	14	8	10	95	54	188
Others	43	2	16	11	52	114	238
Total	419	294	74	232	202	382	**1603**

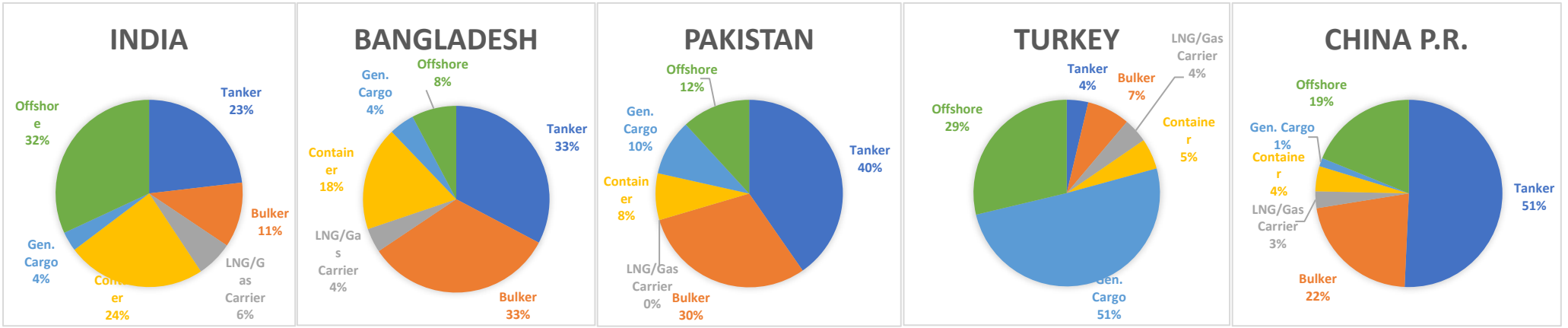

Figure-4.3: Market Shares of 5 Major Ship Recycling Nations (Source: Authors' own elaboration based on data Clarkson SIN, January,2018 – June, 2021)

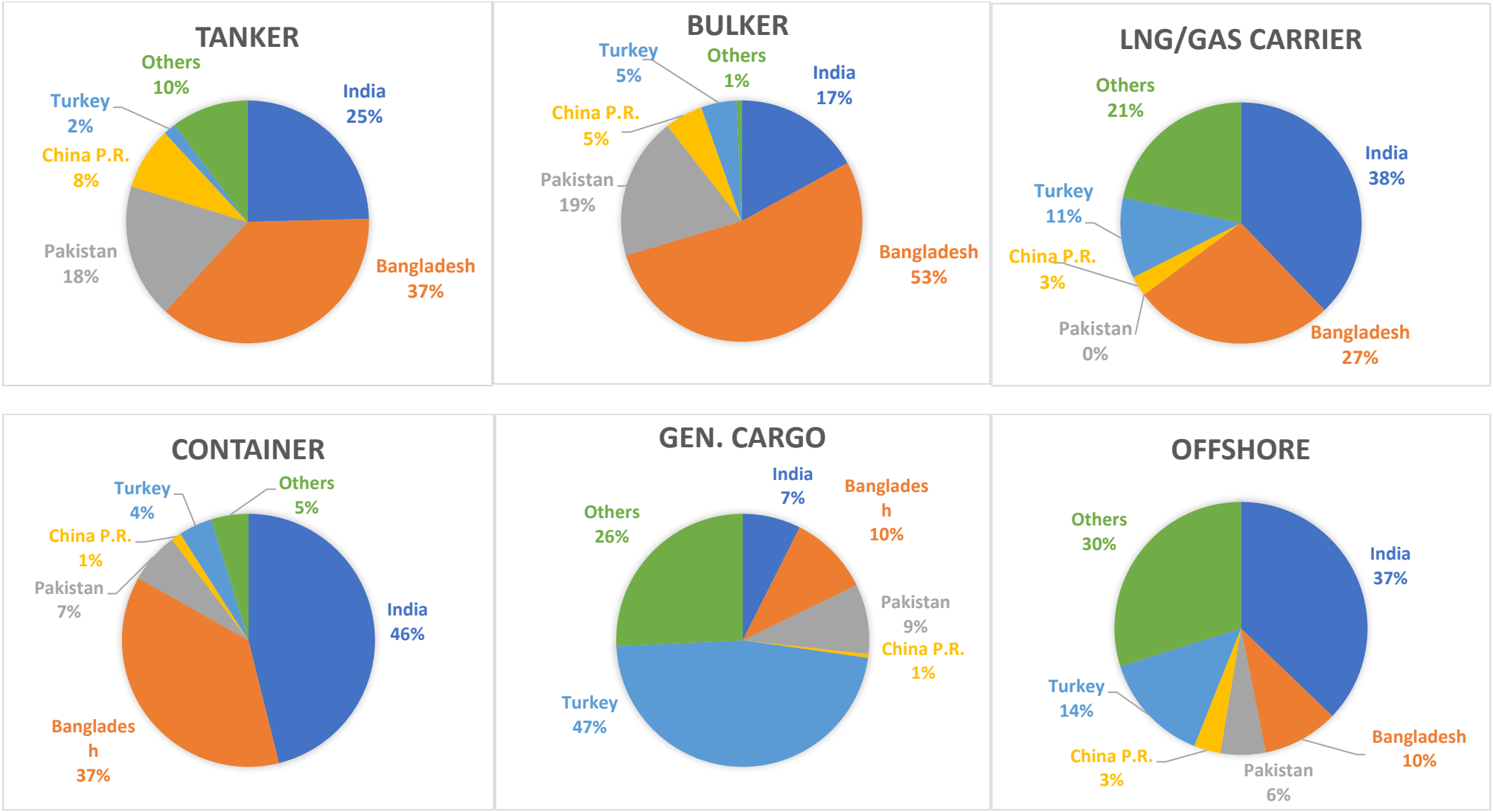

Figure-4.4: Market Shares of 5 Major Ship Recycling Nations in Different Segments (Source: Authors' own elaboration based on data from Clarkson SIN, January,2018 – June, 2021)

4.2 Analyzing Industry Competition:

Market segmentation and the shares of major ship recycling countries in those segments suggest that Bangladesh dominates the tanker and bulker segments where Pakistan and India are the major competitors. Besides, Bangladesh possesses second largest market share in the gas carrier and container segments where India is historically more vigilant. Turkey is trying to create its monopoly in the European market by complying the HKC and EU SRR (Mikelis, 2019). Eight yards of Turkey have already been included in the EU SRR list as shown in Table-3.5 while there is no yard in the list from Bangladesh, India or Pakistan. As a result, Turkey has become more attractive to the European flagged vessels. Turkey possesses the largest market share in the general cargo segment and it is developing its competitive strategy based on sustainable ship recycling. On the other hand, China is recycling only its own flagged vessels due to internal policy changes as mentioned earlier. Hence, Turkey and China do not pose any substantial threat for Bangladesh. The core industry competition exists among Bangladesh, India and Pakistan.

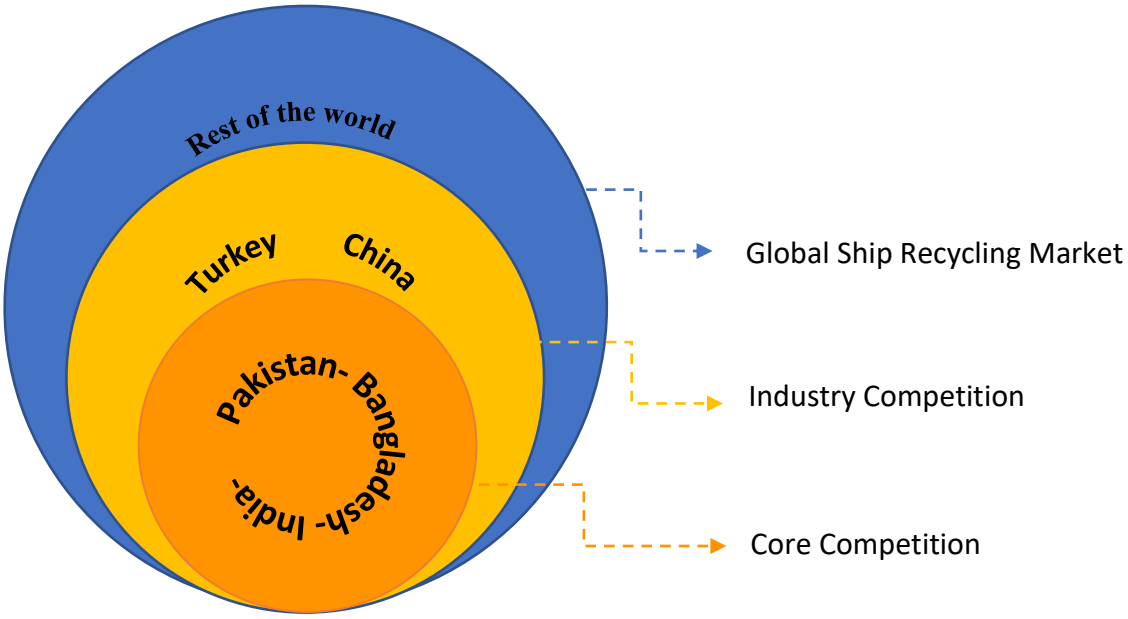

Figure 4.5: Competitive Overview of the Global Ship Recycling Market

Recently India has ratified the HKC while Pakistan has not. The strategic policy decision of Bangladesh regarding the HKC will change the existing field of competition. If Bangladesh ratifies the convention, India will be its biggest competitor because both of them will target the same ships that comply the rules of the HKC according to Regulation-17.2 of the HKC. On the contrary, if Bangladesh does ratify the convention, it will compete with Pakistan for the ships that do not comply the HKC.

4.3 Competitive Analysis

4.3.1 Identifying the Factors of Competitiveness

The above discussion concludes that Bangladesh competes primarily with Pakistan and India in the global ship recycling market. India, Bangladesh & Pakistan recycle more than 75% of the total volume of global ship recycling as shown in Figure-2.7. Here, I present a comparative analysis of the ship recycling industries of these three countries based on several factors that have been suggested in the literature.

Jain & Pruijn (2017), Mikelis (2019) and Sunaryo et. al., (2021) suggested four key factors for the development and the growth of the ship recycling industry-

- **a)** Favourable Geographical Condition
- **b)** Sufficient supply of Cheap Labour Force
- **c)** Flexibility in Environmental Regulation
- **d)** Sufficient In-house Demand of Steel

Favorable geographic condition, i.e., gently slopy and rocky seabed with favorable level of tide, is a mandatory requirement for the development of the ship recycling industry. The seabed with the abovementioned qualities is particularly suitable for beaching method of ship recycling. Gadani of Pakistan, Sitakunda of Bangladesh and Alang of India have almost the same favorable coastlines and tide level for recycling ships using the beaching methods (SRIA, 2006, ICRA, 2012). The small variation that exists, is very difficult to model it mathematically. Hence, this driver has been excluded from this analysis.

Lax regulatory framework is an advantage for a recycling state as stringent regulation increases recycling cost. However, the ratification of international regulations can also be an advantage for a recycling state. For example, according to the Regulation 17.2 of the HKC, a ship of a party state of the HKC can be recycled only in another party state (such as-Turkey or India). There are more than 80 yards in India that have got the Statement of Compliance (SoCs) as mention in the previous chapter. Thus, the convention provides a competitive advantage to India over Bangladesh and Pakistan to recycle the ships of the party states.

India always offers higher price than Turkey because of the lower labor cost (Mathew, 2021). Thus, India is becoming the first choice for the ship owners who want to recycle their ships in a green yard. But re-flagging is a challenge to this advantage. Usually, ship owners sell their ship to cash buyers who reflag the vessels and sell non-party countries such as Bangladesh and Pakistan at a higher price. Hence, whether ratification of major conventions is an advantage or

not that depends on how many ship owners are willing to take less amount of money for recycling their ships in a green yard, and how many ship owners will reflag their vessel for higher price. There is no precise statistical data related to the this. Moreover, *flexibility in environmental regulation is not a clear-cut criterion: it is a disadvantage for those who do care about the environment, but an advantage for the other who do not care.* Because of this ambiguity, it has been also excluded from this analysis to measure the competitive advantage.

Comparing the profitability of the major competitors is a more reliable method of measuring the competitiveness of an industry as suggested by Jiang, et. al. (2013) and Jain (2017). National competitiveness of an industry depends on the average competitiveness the firms of the industry (Cetindamar & Kilitcioglu, 2013). Hence, the average profit rates of the yards of a recycling sate comprise its competitiveness in relation to its major competitors. Sarraf et. al., (2010) conducted a study on the profitability of the ship recycling industry of Bangladesh and Pakistan using a case study of a Panamax vessel. The study showed that the profitability of Bangladesh (15%) is much higher than that of Pakistan (3%). The higher profitability depends on two broad factors- higher revenue and/or lower cost. Sarraf et. al., (2010) shows that the competitiveness in revenue generation derives from the steel price in a recycling country as re-rollable steel accounts 85% of the revenue. On the other hand, competitiveness in cost minimization depends on two main factors- labor cost and tax & tariffs. Sarraf et. al., (2010) concluded that advantages in these factors enable a recycling country to offer higher price for a vessel. However, the study was conducted 10 years back, and it did not include India.

Based on the critical analysis of the above-mentioned literatures, this study has chosen the following four economic factors for the competitive analysis –

a) Price of Scrap Steel in National Market
b) Labour Cost
c) Govt. Tax and Tariffs on ship recycling
d) In-house Demand of Scrap Steel

4.3.2 Methodology of Competitive Analysis:

The unitary and the reverse-unitary methods have been used on the respective data as discussed in Chapter-1. A weight of 5 for each factor has been assigned, and the total competitive score of a country has been shown out of 20 (4 factors multiplied by weight of 5 for each). Higher price of scrap steel increases the profitability of ship recycling firms; similarly, the ship recycling industry (SRI) gets more policy advantage from the government when the contribution of the industry is high to the national steel demand. In other words, the higher the

price and the contribution, the better the competitive position of a country. Hence, the basic unitary method has been used for the steel price and the demand of scrap steel as the method assigns more score for higher value. On the contrary, the reserve unitary method has been used for labor cost and tax rate, because the lowest wage or tax paying country will be in the most advantageous position. So, the higher wage or tax paying country should be assigned less score. Relevant data of the above factors have been shown in the following table-

Table-4.2: Competitive analysis based on factors of profitability

	India	Bangladesh	Pakistan
Steel Price[3]			
Re-rollable/Scrap Steel	$472/ton	$496/ton	$420/ton
Labor Cost[4]			
Unskilled	Unskilled- €59	Unskilled- €45	Unskilled- €80
Skilled	Skilled- €119	Skilled- €180	Skilled- €180
Taxes & Tariffs[5]			
Approximate tax rate on per LDT price of scrap ship	22%	12%	17%
Demand of Scrap Steel[6]			
Total national Steel Demand	Around 100 million MT	Around 6 million MT	Around 7 million MT
Contribution of the SRI to the national demand	Around 7%	Around 60%	Around 10%

[3] Average monthly price of scrap steep from January 2020 to June 2021 have been taken from Indian Steel Corporation Ltd., https://indiansteels.com/new-cold-rolled/; Bangladesh Steel Manufacturers Association (BSMA), https://www.bsma.com.bd/; and Database of Industrial Associations of Pakistan, http://www.pastic.gov.pk/database-indust-associations.aspx;

[4] Wage rates for skilled and unskilled labor have been collected from the bi-annual report of the NGO Ship Breaking Platform for 2018-2019 (https://www.shipbreakingplatform.org/wp-content/uploads/2019/01/Worldwide-overview_FINAL_2017.pdf). Here, skilled labor means the worker who has more than 1 year work experience in ship recycling yards.

[5] According to the Revenue Department of Gujarat Govt. https://revenuedepartment.gujarat.gov.in/g-r-books , the tax and tariffs rate on scrap ships varies significantly based on the types of vessels and the import procedure ranging from 18.3% to 26.85%. the report of Business Standard.com,https://www.business-standard.com/article/economy-policy/indian-ship-breaking-industry-losing-out-to-neighbours-106020901016_1.html and ZAUBA.com https://www.zauba.com/customs-import-duty/ship-scrap-/india.html suggest that the average tax rate is 20% on the per LDT price of a scrap ship. Hence, 20% has been used as a standard tax rate for India. Tax rate of Bangladesh has been collected from the National Board of Revenue, Bangladesh, https://nbr.gov.bd/; There are VAT of BDT 1000/ton (about $12/ton), BDT 1660/ton or $20/ton custom duty and 5% Advance Tax totaling around 12% on per LDT price of a scrap ship. Balochistan Revenue Authority,of Pakistan has set a fixed rate of 17% on the per LDT price of a scrap ship. https://bra.gob.pk/

[6] MSTC Ltd. under the Ministry of Steel of the central gov. of India has estimated the contribution in the annual report for 2020, https://steel.gov.in/sites/default/files/Annual%20Report-Ministry%20of%20Steel%202020-21.pdf. For Bangladesh and Pakistan data have been collected from Bangladesh Steel Manufacturers Association (BSMA) and Database of Industrial Associations of Pakistan respectively. Average steel demand from 2016-2020 of the three countries have been taken in this analysis.

4.3.2 Analysis & Findings:

Steel Price in National Market: The price of scrap steel is the main source of revenue for a recycling yard (Sarraf et. al., 2010). Intense internal demand of steel, lack of iron mine, and higher import duties on scrap steel are the main reasons for high re-rollable scrap steel price in Bangladesh (Ahammad & Sujauddin, 2017). Moreover, the steel industry of Bangladesh is heavily dependent on the ship recycling industry for the supply of its raw material that has given a higher bargaining power to the recyclers (Ahammad & Sujauddin, 2017). The situation is totally opposite in India and Pakistan. Both of the countries have iron mine and the contribution of the ship recycling industry to the national steel demand is also very low.

Score for Scrap Steel Price in National Market= $(x * w)/k$ [where, Country score <= w]

Here, k = value of the highest price

w = weight

x = Scrap Steel Price of the evaluating country where $x > 0$

Bangladesh = $(x * w)/k$ = ($496*5)/ $496= 5

India = $(x * w)/k$ = ($472*5)/ $496= 10= 4.76

Pakistan = $(x * w)/k$ = ($420%*5)/ $496= 4.23

Demand of Steel & Contribution of the Ship Recycling Industry: There are two sub-factors under this driver- total national demand of steel and the contribution of the SRI to the national demand. The contribution of the ship recycling industry (SRI) to the national steel demand carries more weight (3) than the total national demand (2) because the industry gets more policy advantage from the government when the contribution is high.

The score of each country for the above-mentioned two sub-factors comprises the total score of the factor that has been calculated using the basic unitary method-

Country Score = $(x * w)/k$. [where, Country score <= w]

Here, k = Average global ship recycling volume of last five years

w = weight

x = the total national demand of the evaluating country where $x > 0$

Here, the average global ship recycling volume of last five years has been taken as the value k (the standard) because any country with that national demand of that amount or more is capable of recycling all the scrap ships in a year.

Annual Global Ship Recycling from 2016-2020 (Million Gross Tonnage)						
YEAR	2016	2017	2018	2019	2020	**Average**
World	29.41	23.14	18.97	12.04	17.40	**20.19**

Source: UNCTADSTAT from 2016 to 2020

Countries score for total national demand:
Bangladesh = $(x * w)/k$ = (6*2)/ 20 = 0.6
India = $(x * w)/k$ = (100*2)/ 20 = 10= 2 [Country score <= w]
Pakistan = $(x * w)/k$ = (7*2)/ 20 = 0.7

Countries score for the contribution of the SRI to the national demand:
Country Score = $(x * w)/k$. [where, Country score <= w]
Here, k = value of the most contributing country

w = weight

x = value of the evaluating country where $x > 0$

Bangladesh = $(x * w)/k$ = (60%*3)/ 60% = 3
India = $(x * w)/k$ = (7%*3)/ 60% = 10= 0.35
Pakistan = $(x * w)/k$ = (10%*3)/ 60%= 0.50

Labor Cost: Ship recycling is a labor-intensive industry in South-Asia and cheap labor is the most significant factor for the profitability of South-Asian yards which use the beaching method (Hougee, 2013). According to the bi-annual report of the NGO Shipbreaking Platform for 2018-2019, around 80% of the worker force in South-Asian ship recycling yards are unskilled workers. Hence, out of 5, 4 (80%) weight has been assigned on the unskilled labor cost and 1 (20%) for skilled labor cost.

Score for Cheap Labor Cost = $(k * w)/x$ [where, Country score <= w]

Here, k = value of the lowest wage paying country

w = weight

x = the value of the evaluating country where $x > 0$

For unskilled worker:

Bangladesh = $(k * w)/x$ = (€45*4)/ €45 =4

India = $(k * w)/x$ = (€45*4)/ €59 = 3.1

Pakistan = $(k * w)/x$ = (€45*4)/ €80 = 2.25

For unskilled worker:

Bangladesh = $(k * w)/x$ = (€119*1)/ €180 = 0.66

India = $(k * w)/x$ = (€119*1)/ €119= 1

Pakistan = $(k * w)/x$ = (€119*1)/ €180 = 0.66

Tax & Tariffs: Different tax and tariffs account around 25%-30% of the total cost of recycling a ship (Sarraf et. al., 2010). Tax rate indicates the policy intension of the government to any particular product or industry (Olsen & Osmundsen, 2001). Tax rate on scrap ships in Bangladesh has increased recently (detailed discussion in the next chapter) but it is still lower than that in India and Pakistan.

Score for Lower Tax & Tariffs = $(k * w)/x$ [where, Country score <= w]

Here, k = value of the lowest tax paying country

w = weight

x = the value of the evaluating country where $x > 0$

Bangladesh = $(k * w)/x$ = (12%*5)/ 12% = 5

India = $(k * w)/x$ = (12%*5)/ 20%= 3

Pakistan = $(k * w)/x$ = (12%*5)/ 17% = 3.53

Findings of the Competitive Analysis: The above analysis shows that Bangladesh is in more favorable position than India and Pakistan. Lower labor cost, lower tax rate and higher contribution of the industry to national steel production are the main sources of competitive advantage for Bangladesh. Bangladesh steel industry heavily depends on the ship recycling industry and so the government is much more flexible in regulating the industry with stringent environmental and labor laws (Hossain, 2017; Ahmed, 2020). The government is overlooking the environmental impacts of the industry, and indirectly supporting it for continuing the supply of cheap steel. On the contrary, policy makers have imposed higher taxation and stringent regulations in India and Pakistan that has reduced their competitiveness in the international market.

Table-4.3: Competitiveness Analysis of ship recycling countries based on industry drivers

	Weight	India	Bangladesh	Pakistan
Steel Price	5	4.76	5	4.23
Labor Cost	5	4.10	4.66	2.91
Tax & Tariffs	5	3	5	3.53
Demand for Scrap Steel	5	2.35	3.60	1.2
Total Score	**20**	**14.21**	**18.26**	**11.87**

4.3 SWOT Analysis and Competitive Advantage of Bangladesh

SWOT is a method of analyzing the internal strengthens (S) and weaknesses (W) as well as the external opportunities (O) and threats (T) of a firm or an industry. The method was first developed by Albert Humphrey, a management professor of the Stanford University, back in 1960s and early 1970s (Leigh, 2009). SWOT is particularly useful to answer the following questions-

- What a firm or an industry does better than its competitors?
- What the competitors do better than the firm/ the industry?
- What are the available and accessible opportunities for the firm or the industry?
- What are the possible threats that can affect the performance of the firm or the industry?

Based on the information presented in the previous chapters and previous sections of this chapter, a SWOT analysis has been executed on the ship recycling industry of Bangladesh. The result of the analysis forms a matrix of positive and negative factors as shown in Figure -4.6.

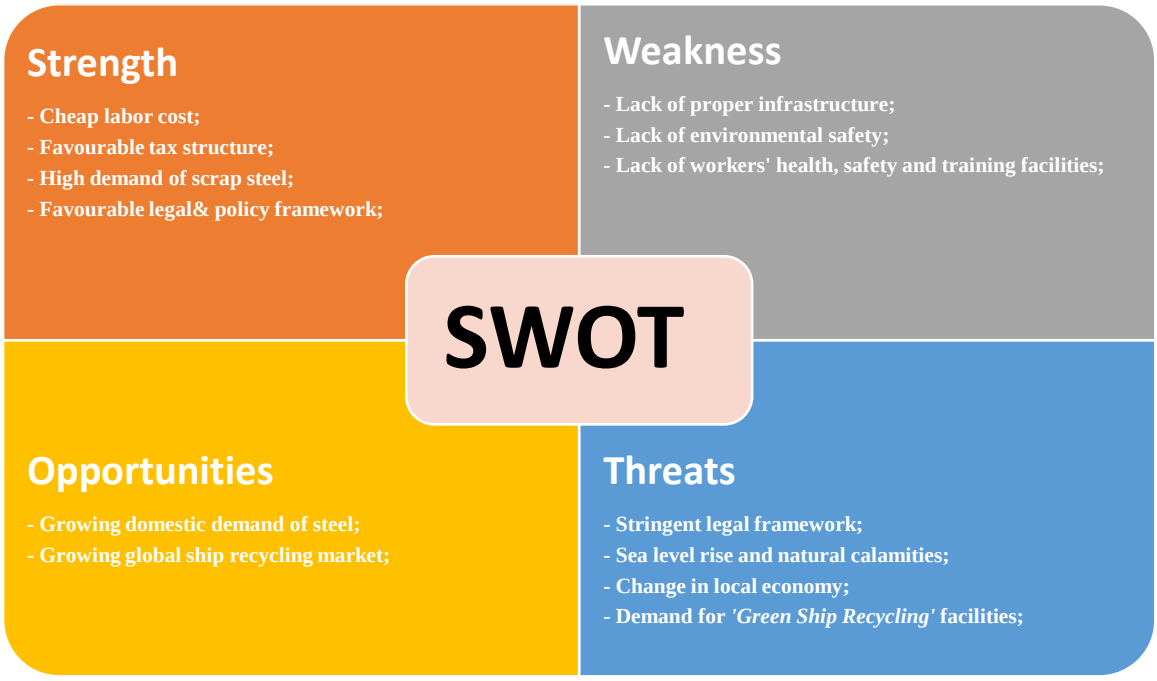

Figure-4.6: SWOT Analysis of the Ship Recycling Industry of Bangladesh

The SWOT analysis shows that the main strengths of Bangladesh lay in cheap labor cost, low tax rate, and high demand for scrap steel. Favorable geographic condition and flexible legal framework are also significant for the rapid growth of the industry. However, stringent international laws and conventions pose huge threat to the existing national legal framework. Because of the international pressure, the government may tighten the laws that will consecutively put pressure on the competitiveness of the industry by increasing the costs.

Moreover, Bangladesh is one of the most vulnerable countries to sea-level rise and natural calamities that poses a huge threat of environmental pollution from ship recycling (Sarraf et. al., 2010; Rahman & Kim, 2020). Besides, the economy of Bangladesh is growing rapidly with consistent GDP growth rate (World Bank Data, 2021). GDP per capita is increasing significantly along with literacy rate and better employment opportunities. These economic changes threat the availability of cheap labor.

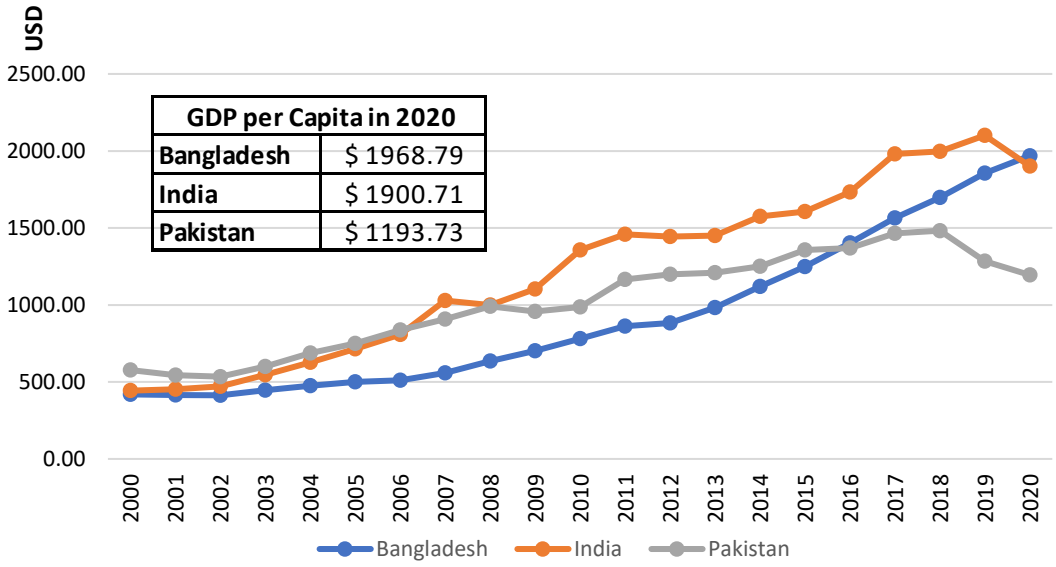

Figure-4.7: GDP Per Capita in India, Bangladesh & Pakistan (Source: World Bank)

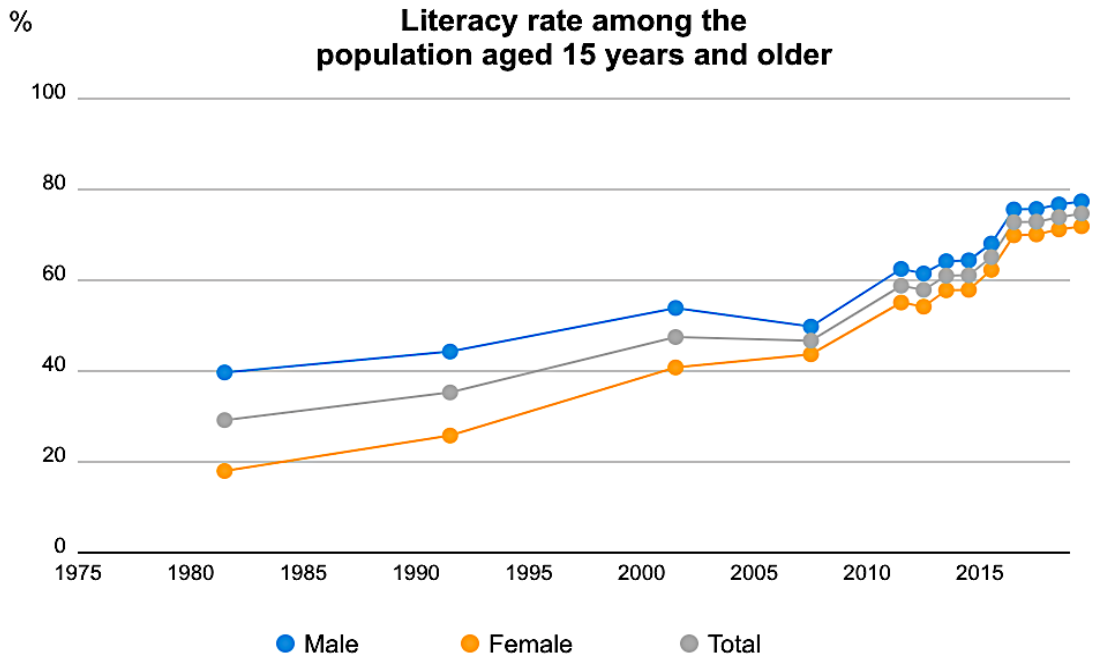

Figure-4.8: Literacy Rate in Bangladesh (Source: UNESCO)

As working in a ship recycling yard is a risky and under-paid profession, better job opportunities outside the industry can lead to higher labor cost. Moreover, stakeholders are

consistently putting pressure for sustainable ship recycling as awareness is growing regarding the workers' health issues and the environmental pollution. Hence, the industry may be driven by the green ship recycling yards in future. India, the major competitor of Bangladesh, is far ahead in respect of sustainable ship recycling as discussed in Chapter-2 & 3. However, several projects are going on to improve the condition of the ship recycling facilities in Bangladesh as mentioned in the previous chapter that may help to face this threat.

The global ship recycling industry is growing along with the size of the global fleet. The average life time of ships is decreasing because of new regulations and more efficient technologies (UNCTAD, 2018). Hence, the ship recycling industry offers a huge opportunity for the developing countries like Bangladesh with high demand of scrap steel. The annual demand of steel in Bangladesh has significantly increased from 2.5 million MT in 2005 to 7.5 million MT in 2020 (Faruque, 2021). The government itself represents 40%-60% of the total demand to construct various public infrastructures (IDLC, 2020). Hence, the government and the policy-makers understand the importance of the industry very well. However, the ecological degradation and the increasing death rate of workers is putting pressure on the government to strictly regulate the industry. In this context, poor infrastructure to manage pollution as well as the lack of workers' health, safety and training facilities are the two main weaknesses for Bangladesh.

4.3 Conclusion

The above analyses indicate that the competitive advantage of Bangladesh depends on cheap labor cost, low tax rate, high internal demand of scrap steep and flexible regulatory framework. However, the advantage in labor cost and regulation may not withstand for long time. Hence, the strategic policy must reduce the financial cost and the tax rate so that the industry can compensate the increasing labor cost and regulatory compliance cost. Moreover, the strategic policy should facilitate the use of modern technology and digitalization to achieve competitive advantage through operational efficiency. Thus, Bangladesh needs to adopt a strategic policy that will help to utilize the opportunities and remove the weaknesses mentioned above. The strategy will not only retain the competitiveness of Bangladesh but also protect the environment and ensure the workers' safety. In the next chapter, this study will develop a policy framework to achieve this objective.

Chapter-5: Strategic Policy Framework for Bangladesh

5.0 Introduction

This chapter critically analyzes the existing policy of Bangladesh for the ship recycling industry, and proposes a strategic policy framework. The framework will help the policy makers to bring necessary changes in the existing policy for retaining the competitive advantage that has been identified in the previous chapter. Moreover, it will provide future policy direction to develop new areas of competitive advantage in ship recycling.

5.1 Critical Analysis of Existing National Policy

There was no formal legal framework for the ship recycling industry in Bangladesh until 2011. The ***Labor Act-2006*** was the only applicable legal instrument. However, after landmark high-profile order of the Bangladeshi High Court to the government of Bangladesh on the 18th March, 2009 to regulate the labor safety issues in the ship breaking industry, the government adopted the ***Ship Breaking and Recycling Rules- 2011.*** But there was no parent legislation to the rules. Hence, the ***Bangladesh Ship Reprocessing Act-2018*** was passed in the Parliament addressing workers' rights and environmental safety. The Act has been formulated based on the compliance of the HKC (Islam, 2019). Chapter-II, VI and VIII (Table-5.1) of the *Bangladesh Ship Reprocessing Act-2018* satisfy all the requirements of Chapter-III and IV (see Appendix-ii) of the HKC. The *Bangladesh Ship Reprocessing Act-2018* has ordered to establish a multi-stakeholder's body named ***Bangladesh Ship Reprocessing Board (BSRB)*** to implement the Act and to regulate the ship recycling activities. According to Chapter-II, Regulation-7(2 & 3) of the Act. BSRB will follow the guidelines for the HKC (shown Table-3.1) to develop the national rules for authorization, certification, and inspection of the recycling yards. In short, BSRB will be the main legal body that will formulate policy for the sustainable development of the industry in accordance with the HKC as directed by the Regulation-7(1) of the Act. A timeframe of 5 years from 2018 has been set by the Regulation-7(2) of the Act. for necessary capacity building to comply the HKC. It indicates the intention of Bangladesh to ratify the HKC immediately after 2023.

Table-5.1: An overview of the contents of Bangladesh Ship Reprocessing Act-2018

Chapter	Contents
Chapter-I	Introduction and definitions of different terminologies

Chapter-II	Specific zones for ship recycling, rules of yard installation, operational rules of the yards, and rules for maintaining international standards in ship recycling.
Chapter-III & IV	Rules of the BSRB- establishment, composition of members, authority and responsibility of the board, etc.
Chapter-V	Rules related to health & safety, compulsory insurance, compensation of the workers as well as rules of environmental protection mechanism.
Chapter-VI	Regulatory provisions for the BSRB, such as- funding, budgets, annual report, accounting and auding of board.
Chapter-VII	Provisions of punishments for the non-compliance of the Act.
Chapter-VIII	Miscellaneous- '*One stop service'* center, committee formation, emergency rules, accountability, rule-making power under the Act. etc.

The most significant feature of the ***Bangladesh Ship Reprocessing Act-2018*** is the establishment of ***Bangladesh Ship Reprocessing Board (BSRB)*** with the representatives from all the related stakeholders. The BSRB has representatives from the Ministry of Industry, Ministry of Environment and Forest, Ministry of Labour and Employment, Department of Energy and Mineral Resources, National Board of Revenue, Ministry of Shipping, Bangladesh Police, Bangladesh Navy, and the district Commissioner. Most significantly the board also includes the President of the Association of Ship Reproduction Industry, Bangladesh and two representatives among the owners of the yards. The hybrid multi-stakeholder structure is the unique feature of the board. It enables the board to have policy inputs from different stakeholders and thus ensure the sustainable development of the industry. Among the members of the board, the member from the Ministry of Industry, Ministry of Labour and Employment, National Board of Revenue and yard owner's association are particularly important for ensuring the competitiveness of the industry.

5.2 Policy Recommendations for Retaining Competitiveness Advantage:

The competitive analysis in previous chapter suggests that competitive advantage of Bangladesh lays on the ability of offering higher price to ship owners. The ability of offering higher price as well as achieving higher profit margin comes from mainly three sources-

- cheap labor cost (under the jurisdiction of the ministry of Labour and Employment)
- low tax rate (under the jurisdiction of the National Board of Revenue)
- high national demand of scrap steel (the steel industry falls under the jurisdiction of the Ministry of Industry)

As a result, the proposed strategic policy framework must maximize the other two competitive advantages and create new competitive advantages through operational efficiency. This study proposed a novel policy framework (Figure-5.1) for the ship recycling industry of Bangladesh. The framework shows- the major challenges created by the new national and international regulatory framework, the strategic policy goal of Bangladesh, existing competitive advantages, and strategic policy guidelines to retain the existing competitive advantages as well as to create new competitive advantage. The framework proposes new wage rate, revised tax rate and incentives for using of ship-scrap in steel production to retain the existing competitive advantages of cheap labor cost, low tax rate and high demand of scrap steel respectively. Besides, the study also proposes to achieve competitive advantage in operational efficiency with the help of two enabling factors- digitalization and financial assistance.

5.2.1 Maintaining Competitive Labor Cost:

The Ministry of Labour and Employment is trying to enforce the minimum wage rate which is higher than the current rate. Moreover, the board as a whole will also try to ensure the rule of Chapter-V of the Act. that will further put pressure on the competitive advantage of cheap labor. Besides, the discussion on previous chapter suggests that GDP per capita in Bangladesh is increasing significantly. Thus, we can predict that the competitive advantage of cheap labor may not sustain for a long period of time.

The Bangladesh government published a gazette on 11 February 2018 that has fixed the minimum wage of Tk16,000/month (approximately €160/month) in total for the ship-recycling workers. The present wage is Tk 4500 or €45 in Bangladesh while the wage rate is €59 and €80 in India and Pakistan respectively (Platform, 2017). According to the report of the Daily Star on August 13, 2021[7] the average wage is Tk 9000/€90 (Tk300//€3 per day). However, the minimum wage rate set by the gazette is impractical as mentioned by the yards owners in the report of the Daily Star. The BSRB should fix a practical minimum wage rate which will not be too much to accept by the yard owners as well as it will not be too less for the unskilled workers to meet their basic needs.

This study recommends to set the minimum wage rate of Tk 10,000/€100/$118 which is Tk 2000 more than the minimum wage of the garments workers in Bangladesh (BG Press, 2019).

[7]Minimum wage eludes shipbreaking workers. https://www.thedailystar.net/city/news/minimum-wage-eludes-shipbreaking-workers-2012545

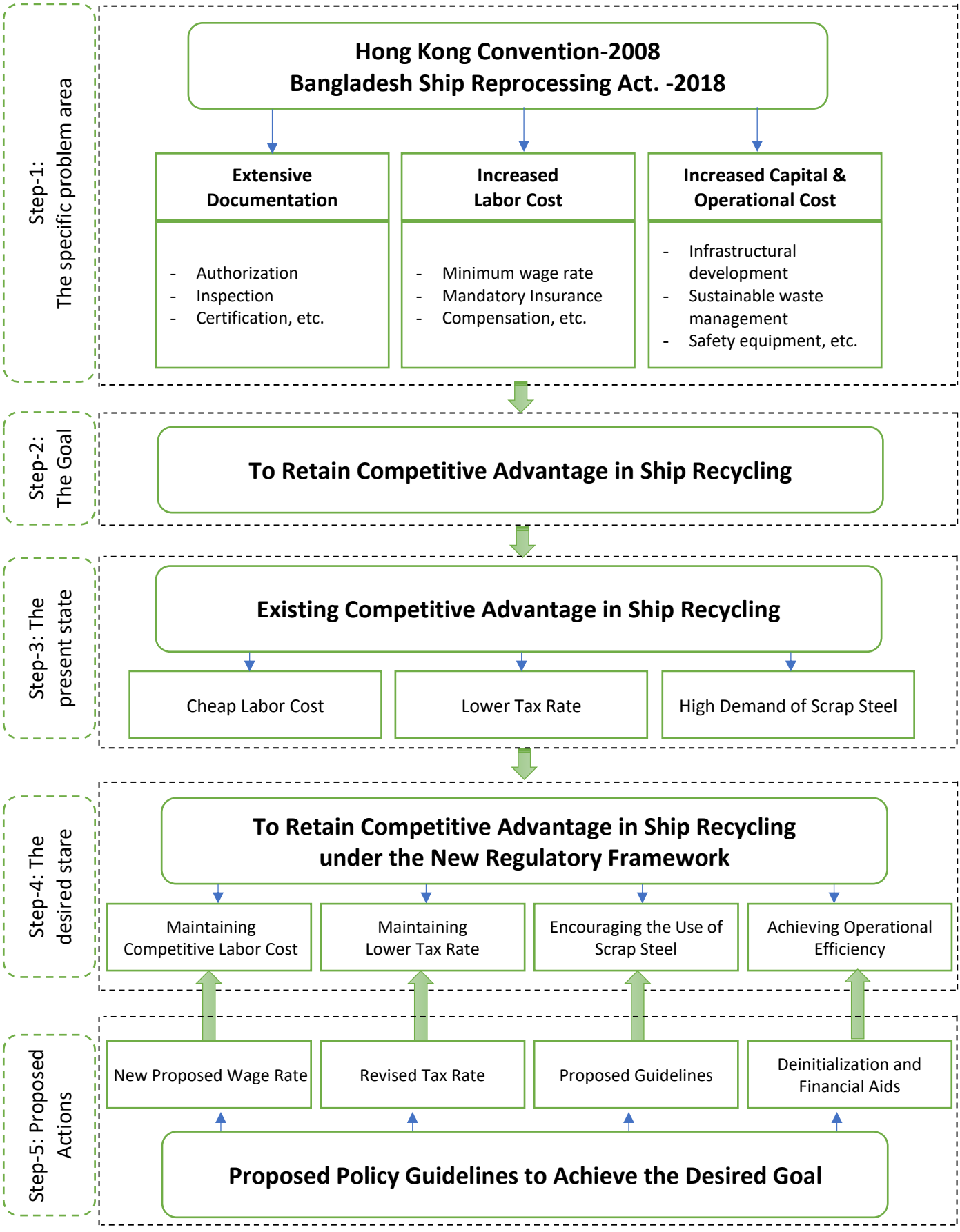

Figure-5.1: Proposed Policy Framework to Retain Competitiveness

As ship recycling is a hazardous industry according to the ***Labor Act-2006,*** the wage rate should be higher than the garments workers. Moreover, the compulsory life insurance policy and compensation for injury as mentioned in the ***Bangladesh Ship Reprocessing Act-2018*** make the recommended rate reasonable. This rate will ensure competitive balance with neighboring countries as well as it will not put much pressure on the yard owners. The rate will be revised after every three years which is the expiration time for each BSRB governing committee. Every new governing committee of BSRB will revise the minimum wage rate comparing with the rates in India and Pakistan where the representatives of the yard owner and worker's association will also provide their opinion.

5.2.2 Maintaining Lower Tax Rate:

According to the ***Value Added Tax (VAT)*** Law-1991 of Bangladesh, a ship recycling yard had to pay Tk 300 per ton and supplementary duties until 2018-19 fiscal year. But the government impose 5% ***Advance Tax (AT)*** and increased the VAT to Tk 1000/ton from Tk 300/ton in 2019-2020 fiscal year. Hence, an importer has to pay the total tax of around Tk 1800 to Tk 2200 per ton as shown in previous chapter. The law stipulates that the importers have the right to adjust the AT with their payable VAT while submitting the VAT return, and also to get back the excess amount within 15 days after making an application to the respective VAT commissioner. However, Nazimuddin (2020) reported that Tk 2.38 billion (Tk 238 crore) paid as AT in 2019-20 financial year has not been adjusted yet. This has locked up the working capital of the yards. The incidence of AT drastically reduced the import of scrap ships in 2019-20 financial year and the tax revenue of the government declined by Tk 3.14 billion (Financial Express, 2021).

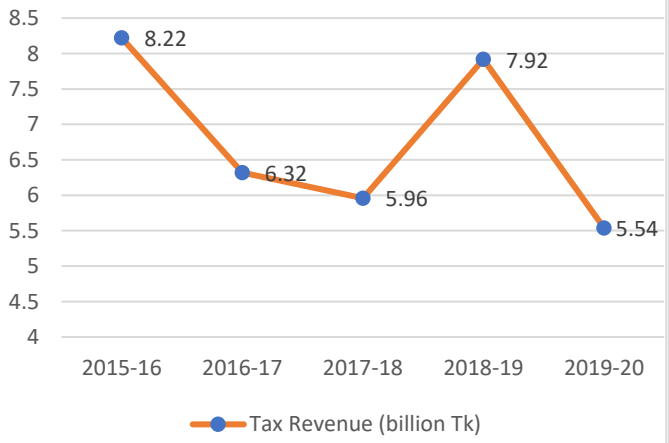

Figure-5.2: Tax Revenue from Scrap Recycling

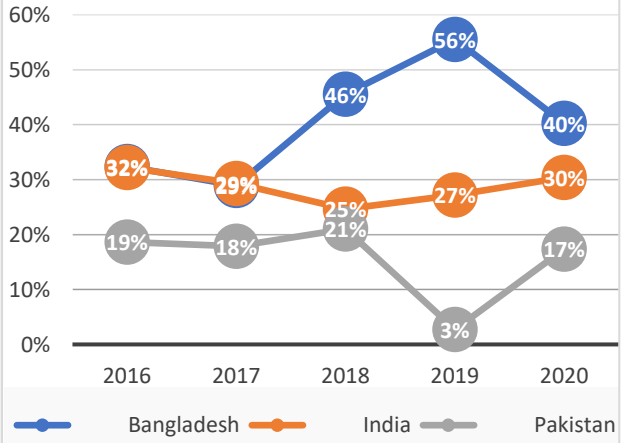

Figure-5.3: Changes of Market Share

Source: Author own elaboration based on data from National Board of Revenue, Bangladesh

As a result, this study suggests to remove the AT tan on the scrap ships as it does not add any extra revenue to the government rather it makes the tax collection complicated. Hence this study recommends to remove the AT on importing scrap ships. A committee of senior officials has already formed to examine the issue of AT waver for mobile phone, scrap and ship scrap (Financial Express, 2021). This study also recommends that BSRB must ensure that the VAT rate should not increase more than the present rate of Tk1000/ton which is much lower than that of India and Pakistan. The accumulated tax revenue from the ship recycling industry will be higher if Bangladesh can retain its market share. For example, if Bangladesh could retain it 56% market share in 2020, the total tax revenue from VAT only could have been 9.74 billion BDT or 2.74 billion BDT more than the actual as shown in the following table-

Table-5.2: Tax Revenue of Bangladesh Govt. from Ship Recycling in 2020

	Actual Senario with 40% Market Share	Expected Senario with 56% Market Share
Total Ship Recycling in the World (GT)	17400564	17400564
Ship Recycling in Bangladesh (GT)	7004595	9744316
Tax Revenue (VAT) @ BDT-1000/ton	7,00,45,94,768	9,74,43,15,840

Moreover, lower tax rate will increase the market share and the aggregated tax revenue of the government from the industry will also be higher. Moreover, recycling more ships will creates more employment not only in the ship recycling industry but also in other related industries such as steel production, ship building, etc. Thus, low tax rate on ship recycling will be more advantageous at large for Bangladesh.

5.2.3 Encouraging the Use of Scrap Steel:

According to the Bangladesh Steel Manufacturers Association (BSMA) report-2020, there are 235 steel mills in Bangladesh which produce more than 6 million tons of steel annually. The ship recycling industry supply more than 60% of raw material to the mills and the rest 40% is imported from United States, United Kingdom, Japan, Germany, etc. (BSMA, 2020). Md Shahidullah, secretary-general of the BSMA said in the interview (Appendix-iv) that there are several difficulties in importing scrap steel including higher price, higher duty & tax, fluctuation in container freight rate (a container can carry around 26 tons of scrap steel) and delay in shipment. Hence, the steel mills owner like to use the local source- the ship recycling industry. Due to the rise of scrap ship price in international market and the increased government tax, the supply of scrap steel from ship recycling has reduced significantly leading

to higher steel cost and infrastructural development cost. Md Shahidullah suggested that the government should remove import duty on scrap steel and scrap ships.

This study recommends removing the import duty and all other supplementary duties that account around BDT 1600-1700 or $20 as shown in previous chapter. Md Abu Taher, president of the shipyard owners' organization BSBRA, and Md Shahidullah, secretary-general of BSMA, said in the interview that the removing of AT, import duties, and supplementary duties on scrap ship can reduce the steel production cost by 15%-20%. This will reduce the price of steel product in the internal market and subsequently speed up the infrastructural development. Moreover, facilitating recycling industry will accelerate other industries and create more employment opportunities while importing scrap steel from other countries will not create these advantages. Rahman & Kim (2020) reported that the ship recycling industry contributes around $2 billion to the national economy and more than 0.2 million people are employed in this industry. Hence, considering the economic contribution and employment opportunities for unstilled workers who have limited job opportunities outside, the government should encourage the use of scrap steel from ship recycling rather than importing the scrap.

5.2.4 Achieving Operational Efficiency:

Besides retaining the above-mentioned competitive advantages, Bangladesh needs to achieve competitive advantage through operational efficiency. Soner et. al., (2021) reported that sustainable ship recycling requires more mechanization in the recycling process. Mechanization requires huge investment for purchasing modern equipment and modernizing the ship recycling facilities. On the other hand, HKC imposes a lot of documentation in authorization, inspection and certification of ship, yards and recycling plan that may hinder the operational efficiency of ship recycling, especially in South Asian countries because of the bureaucratic complexity (Ali & Pearce, 2020). Hence the study recommends the following policy guidelines to achieve competitive advantage in process of ship recycling –

Digitalization & One-stop service: Digital technologies and data exchange drive a significant part of the transformation to the circular economy (Lacy et al. 2020). According to *Bangladesh Ship Reprocessing Act-2018,* every yard has to collect the following certificates from, and submit the necessary documents to BSRB (Table-. If these documentation processes can be digitalized, it will not only reduce time and cost but also enhance the productivity.

Table-5.3: Mandatory Documents & Certificates for Ship Recycling Yards

Chapter	Section	Documents
Chapter-2	section-5(3)	Permission to establish ship recycling yard
Chapter-2	section-6(2)	NOC before importing ships for recycling
Chapter-2	section-6(3)	Clearance certificate for recycling after inspecting the ship
Chapter-3	section-11(c)	Approval of ship recycling plan
Chapter-3	section-11(d)	Approval of ship recycling facility (yard) plan
Chapter-8	section-40(1)	Submission of annual report of the yards

According to Chapter-8, section-38 of the Act., there is a provision of establishing an inter-ministry one-stop-service center to remove the administrative complexity related to ship recycling. Hence, this study recommends to digitalize the abovementioned administrative processes through the inter-ministry one-stop-service center. Moreover, the payment of different fees and fines as mentioned in Chapter-7, Chapter-2, section-6(6) of the Act. should also be electronic and digitalize. This will enhance the transparency and efficiency.

Easy Loan Facilities for Green-Recyclers: A ship recycling yard has to meet all the requirements of HKC to be certified as *'Green-Ship-Recycler'*. PHP Ship Breaking and Recycling Ind. Ltd. is the only green ship recycler in Bangladesh certified by the Class NK (the Japanese Classification Society) as mention in previous chapter. Mr Zahirul Islam, Managing Director of PHP Ship Breaking and Recycling Ind. Ltd., said in the interview (Appendix-iv) that it takes BDT 500,000,000 or USD 6 million and 2-3 years to modernize a traditional yard to a green yard. He reported that there is no special bank loan facility for the ship recycling yards to renovate their yards. He suggested that even if the government provides 50% of the renovation cost at the rate of 5% interest rate while the current interest rate is more than 15%, more than 30 yards will be transformed to green yards in next 3-4 years. The transformation of a yard to a green one involves investment in equipment, QHSE (Quality, Health, Safety and Environment Management) system, and adequate training of the workers. The major physical changes include-

a) Paving the recycling floor with concreate with appropriate drainage system;
b) Installation of heavy tower/floating cranes to lift the blocks from ships to concrete floor;
c) Building storage and treatment facilities with international standard (ISO)
d) Providing PPE equipment and medical facilities for workers

This study recommends to prepare a separate fund of BDT 3000 crore to provide bank loans of BDT 30 crore to each yard at an interest rate of 5% and payback period of 15 years. The

fund will be used to transform 100 existing yards to green yards. A yard has to pay 28.9 million BDT or around 0.342 million USD annually as the repayment of the loan which is not a big amount for a recycling yard.

Table-5.4: Annual Payment of Proposed Loan
(Using PPMT & IPMT Functions in MS Excel)

Loan Amount			30,00,00,000.00৳	
Pay Back Period			15	
Interest rate			5.00%	
Year	**Loan at beginning**	**Principle Payment**	**Interest Payment**	**Total Bank Payment**
1	30,00,00,000	(1,39,02,686)৳	(1,50,00,000)৳	(2,89,02,686)৳
2	28,60,97,314	(1,45,97,821)৳	(1,43,04,866)৳	(2,89,02,686)৳
3	27,14,99,493	(1,53,27,712)৳	(1,35,74,975)৳	(2,89,02,686)৳
4	25,61,71,781	(1,60,94,097)৳	(1,28,08,589)৳	(2,89,02,686)৳
5	24,00,77,684	(1,68,98,802)৳	(1,20,03,884)৳	(2,89,02,686)৳
6	22,31,78,882	(1,77,43,742)৳	(1,11,58,944)৳	(2,89,02,686)৳
7	20,54,35,140	(1,86,30,929)৳	(1,02,71,757)৳	(2,89,02,686)৳
8	18,68,04,211	(1,95,62,476)৳	(93,40,211)৳	(2,89,02,686)৳
9	16,72,41,735	(2,05,40,600)৳	(83,62,087)৳	(2,89,02,686)৳
10	14,67,01,135	(2,15,67,630)৳	(73,35,057)৳	(2,89,02,686)৳
11	12,51,33,506	(2,26,46,011)৳	(62,56,675)৳	(2,89,02,686)৳
12	10,24,87,495	(2,37,78,312)৳	(51,24,375)৳	(2,89,02,686)৳
13	7,87,09,183	(2,49,67,227)৳	(39,35,459)৳	(2,89,02,686)৳
14	5,37,41,956	(2,62,15,588)৳	(26,87,098)৳	(2,89,02,686)৳
15	2,75,26,368	(2,75,26,368)৳	(13,76,318)৳	(2,89,02,686)৳

BSRB will be responsible for selection, disbursement and implementation of the fund. The fund can be arranged from internal national budget allocation or from any international agencies. For example, the Phase-III of the SENSREC project of US$1.5 million (14 million Norwegian Kroner) funded by the Norwegian Agency for Development Cooperation (Norad) and implemented by the IMO has recently started to build a Treatment Storage and Disposal Facility (TSDF) in Chittagong as mentioned in Chapter three (IMO, 2020). This type of international project can also be sought for creating the above-mentioned fund.

5.3 Conclusion

The *Bangladesh Ship Reprocessing Act-2018* is the only existing legal and policy guideline for the ship recycling industry of Bangladesh. The Act. has been developed following the rules and guidelines of the Hong Kong Convention-2009 that clearly indicates the intention of ratifying the convention as also reported by the Mistry of Industry. These national and international regulations have created some significant challenges for the ship recycling

industry of Bangladesh. A strategic policy framework has been proposed to retain the competitive advantage under the new regulatory framework. Strategic policy guidelines and recommendations have been incorporated to successfully implement the framework. BSRB, the main regulatory body as proposed by the *Bangladesh Ship Reprocessing Act-2018*, has not become fully functional yet due to the COVID-19 pandemic. Hence, the policy development and implementation have been severely affected. However, as the pandemic situation is improving gradually, it is expected that BSRB will be fully functional very soon, and it will ensure the development of the industry considering the above-mentioned policy guidelines.

The proposed policy guidelines and framework will help the policymakers to bring necessary changes in the existing policy, and to develop the future strategies for the ship recycling industry. The study is novel in the field of maritime policy that examines the competitiveness of the major ship recycling countries and provides policy guidelines for retaining competitive advantage under the new regulatory framework of the HKC. However, the study has some limitations including- the lack of primary data, physical investigation of the recycling yards, and limited time of three months to conduct the study. Because of these limitations, several research gaps that have been identified in the study, remain unexplored. Major Asian ship recycling countries during 1970s and 1980s have become the major ship building countries, such as South-Korea and Japan. Similar pattern can be found in China also as shown in Chapter-2. Hence, a significant research gap exists to investigate whether the ship recycling industry contributes to the development of the ship building industry. Moreover, ship recycling has moved from one part of the world to another, and now it has settled in South-Asia. Where will be the next destination of the industry is an important area of further in-depth study. Among the major South-Asian ship recycling countries, only India has ratified the convention in 2019. Hence, it is the perfect time to examine how the ratification the HKC is influencing the business of the Indian ship recycling yards. Evaluating the performance of the Indian yards before and after the ratification of the HKC is a significant area for further study. The above-mentioned research gaps and research questions should be investigated in future studies.

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Appendix-i

List of Studies used in Systematic Literature Review

	Reference of the studies	Excluded Studies
JOURNAL ARTICLES		
1	Ahmed, I. (2020)	
2	Alcaide, J. I., Rodríguez-Díaz, E., & Piniella, F. (2017)	
3	Ali, M., & Pearce, P. (2020)	
4	Bhattacharjee, S. (2009)	
5	Boviatsis, M., Alexopoulos, A. B., & Polemis, D. (2019)	
6	Chang, Y. C., Wang, N., & Durak, O. S. (2010)	
7	Čulin, J. (2018)	X
8	Devaux, C., & Nicolaï, J. P. (2020)	
9	Engels, U. D. (2013)	
10	Gopikrishna Chockalingam Gopikrishna Chockalingam, D. K. S. (2021)	X
11	Hiremath, A. M. (2017)	X
12	Hui, W., & Yuxian, X. (2017)	
13	Jain, K. P., Pruyn, J. F. J., & Hopman, J. J. (2013)	
14	Ma, R. (2015)	X
15	Matz-Lück, N. (2010)	
16	Mishra, S. (2018)	
17	Moen, A. E. (2008)	
18	Molenda, M. (2010)	
19	Moncayo, G. A. (2016)	
20	Nassar, M. H., & Moursy, A. H. (2016)	
21	Pastorelli, S. (2014)	
22	QIU, Q. (2009)	X
23	Rossi, V. (2010)	
24	Samiotis, G., Charalampous, K., & Tselentis, V. S. (2013)	
25	Sivaprasad, K., & Nandakumar, C. G. (2013)	
26	Solakivi, T., Kiiski, T., Kuusinen, T., & Ojala, L. (2021)	
27	Thakur.Y(2019)	
28	Tsimplis, M. N. (2010)	
29	Tsimplis, M. N. (2014)	
30	Xiangming, Z., & Di, R. (2012)	X
31	Yujuico, E. (2014)	
32	Zhao, Y., & Chang, Y. C. (2014)	X
BOOK CHAPTERS		
1	Engels, U. D. (2013)	
2	Engels, U. D. (2013)	X
3	Mikelis, N. (2019)	
4	Puthucherril, T. G. (2010)	

THESIS		
1	CAMERON-DOW, L. L. D. (2020)	
2	Carey Jr, T. (2012)	
3	Choudhary, G. K. (2011)	
4	Eriksson, J. I. (2010)	
5	Hoel, I. K. (2020)	X
6	Prabowo, H. (2019)	X
7	Shahnawaz, M. (2017)	X
8	Tao, J. (2015)	
9	Zhou, L. (2013)	
CONFERENCE PROCEEDINGS & SLIDES		
1	Fang, Y., & Mejia Jr, M. Q. (2012)	
2	Mikelis, N. (2009, July)	
3	Mikelis, N. (2010, June)	
4	Mikelis, N. (2010)	
5	Mikelis, N. (2013)	
6	Raju, M. S. P., & Anandh, A. P. (2019, February)	X
OTHER ARTICLES (Without open-access)		
1	CHINA, O. (2012)	X
2	De Larrucea, J. R., & Mihailovici, C. S. (2012)	X
3	Feng, Z., & Xue-wu, H. (2012)	X
4	Kamaev, A. (2019)	X
5	Rodrigo de Larrucea, J., & Steliana Mihailovici, C. (2011)	X
6	Shi, J. (2013)	X
7	Yermolenko, A. S. (2018)	X

Appendix-ii

Regulations of Hong Kong Convention

CHAPTER-1 (GENERAL REQUIREMENTS: REGULATIONS 1-3)	
	Regulation 1 – Definitions
	Regulation 2 – General applicability (Area and scope of the convention)
	Regulation 3 – Relationship with other standards, recommendations and guidance
CHAPTER 2 – REQUIREMENTS FOR SHIPS	
Part A – Design, construction, operation and maintenance of ships	
	Regulation 4 – Controls of ships' Hazardous Materials
	Regulation 5 – Inventory of Hazardous Materials
	Regulation 6 – Procedure for proposing amendments to Appendices 1 and 2
	Regulation 7 – Technical Groups
Part B – Preparation for Ship Recycling	
	Regulation 8 – General requirements
	Regulation 9 – Ship Recycling Plan
Part C – Surveys and certification	
	Regulation 10 – Surveys
	Regulation 11 – Issuance and endorsement of certificates
	Regulation 12 – Issuance or endorsement of a certificate by another Party
	Regulation 13 – Form of the certificates
	Regulation 14 – Duration and validity of the certificates
CHAPTER 3 – REQUIREMENTS FOR SHIP RECYCLING FACILITIES	
	Regulation 15 – Controls on Ship Recycling Facilities
	Regulation 16 – Authorization of Ship Recycling Facilities
	Regulation 17 – General requirements
	Regulation 18 – Ship Recycling Facility Plan
	Regulation 19 – Prevention of adverse effects to human health and the environment
	Regulation 20 – Safe and environmentally sound management of Hazardous Materials
	Regulation 21 – Emergency preparedness and response
	Regulation 22 – Worker safety and training
	Regulation 23 – Reporting on incidents, accidents, occupational diseases and chronic effects
CHAPTER 4 – REPORTING REQUIREMENTS	
	Regulation 24 – Initial notification and reporting requirements
	Regulation 25 – Reporting upon completion

Source: The Honk Kong Convention, 2009

Appendix-iii

Revenue and Cost Items of a SRF in Bangladesh

(An example of recycling a Panamax oil tanker)

Ship		**Panamax Oil Tanker**	
DWT		**80,000**	
LDT		**14,800**	
Category	**Element**	**Bangladesh**	**Revenue & Cost (%)**
Revenue	Steel	$ 47,71,500	85.00%
	Other recyclable items	$ 8,42,000	15.00%
	Total Revenue	$ 56,13,500	100.00%
Costs	Purchase Cost (Ship Price)	$ 38,48,000	82.01%
	Investment Costs	$ 21,900	0.47%
	Fianacial Costs	$ 1,47,900	3.15%
	Labour Cost	$ 92,700	1.98%
	Consumables	$ 3,02,200	6.44%
	Taxes, duties & tariffs	$ 2,63,000	5.61%
	License, pemits & levy	$ 2,700	0.06%
	Others	$ 13,800	0.29%
	Total Cost	$ 46,92,200	100.00%
Profit	Net Profit	$ 9,21,300	16.00%
	Profit Per LDT ($/ldt)	$ 62	

Source: Based on data from Annual Report of PHP Ship Breaking and Recycling Industries Limited, Bangladesh

Appendix-iv

List interviews with relevant shareholders

(Published during January, 2020 to June, 2021)

Interviewee	Designation	Publisher	Link
Mr Zahirul Islam	MD of PHP Ship Breaking and Recycling Ind. Ltd. and PHP Ispat Ltd.	Steel Mint Events	https://www.steelmintevents.com/3rd-srmc/increase-in-tax-structure-pulled-down-bangladesh-scrapped-vessel-imports-in-2019-php/
Md Shahidullah	Secretary of the BSMA	The Business Standard	https://www.tbsnews.net/dropped/industry/fear-further-steel-price-hike-amid-soaring-raw-material-costs-266683
Rizwan Dewan Farooqui	Chairman Pakistan Ship-breaking Association (PSBA)	Business Recorder	https://www.brecorder.com/news/468833/
Dr. Anil Sharma	Founder & CEO of GMS	GMS Leadership	https://www.youtube.com/watch?v=do4RmAjtLmk