A Project Report On

A STUDY ON SHIPBREAKING TO SHIP RECYCLING: CHALLENGES AND SOLUTIONS AN INDIAN PERSPECTIVE

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MASTER OF BUSINESS ADMINISTRATION

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CERTIFICATE

This is to certify that the Project titled "A STUDY ON SHIPBREAKING TO SHIP RECYCLING: CHALLENGES AND SOLUTIONS AN INDIAN PERSPECTIVE" submitted by SPARSH VIJAYVARGIA register number 2105305035 student of MBA (ITLM) is a bonafide record of his Project report and submitted to the School of Maritime Management, Indian Maritime University, Kochi campus, under the supervision of Dr. Aravind. T.S, Faculty IMU, Kochi campus. It is also certifying that the above work has not previously formed or submitted for the award of any degree, diploma, associateship, fellowship, or other similar titles, and it is an independent work done by the candidate.

Dr. Aravind. TS

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SELF DECLARATION

I, **SPARSH VIJAYVARGIA** (Registration No: 2105305035) student of School of Maritime Management,
INDIAN MARITIME UNIVERSITY-COCHIN hereby declares that this project report titled
"A STUDY ON SHIPBREAKING TO SHIP RECYCLING: CHALLENGES AND SOLUTIONS AN INDIAN PERSPECTIVE"
submitted in partial fulfilment of the requirement for the degree of Master of Business Administration in International Transportation & Logistics Management is my original work carried under the guidance of Dr. Aravind TS. I also confirm that the report is only prepared for my academic requirement, not for any other purpose. It might not be used with the interest of the opposite party of the corporation.

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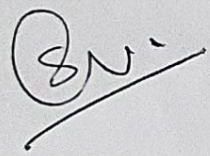

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I perceive as this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement, in order to attain desired career objectives. Hope to continue cooperation with all of you in the future.

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EXECUTIVE SUMMARY

Shipbreaking, the process of dismantling ships for the recovery of valuable materials, has traditionally been associated with various environmental and social problems such as pollution, occupational hazards, and exploitation of workers. In response to these concerns, the emergence of ship recycling has been driven by increasing awareness of the environmental and social impacts of shipbreaking, as well as regulatory and market pressures.

Ship recycling involves dismantling ships in a manner that maximizes the recovery of materials while minimizing environmental and social impacts. This typically involves the use of specialized equipment and facilities, as well as the implementation of strict environmental and labor standards. The International Maritime Organization (IMO) has developed a number of regulations and guidelines aimed at improving the safety and environmental performance of the shipbreaking industry, while various industry initiatives have been launched to promote sustainable ship recycling practices.

Despite challenges such as the lack of infrastructure and economic viability, there are significant opportunities associated with ship recycling, including job creation, economic development, and the recovery of valuable materials. As such, there is growing recognition of the need for a more sustainable and responsible approach to ship dismantling, and a range of initiatives are currently underway to promote the development of the ship recycling industry.

One major challenge is the lack of infrastructure and capacity for ship recycling in many countries, particularly in the developing world where much of the shipbreaking industry is currently located. Additionally, there are concerns about the economic viability of ship recycling, as the cost of implementing sustainable and safe practices can be higher than traditional shipbreaking methods. This has led to calls for greater financial support and incentives for ship recycling, as well as the development of new business models and partnerships to promote sustainable and safe practices.

In conclusion, ship recycling represents an important step towards more sustainable and responsible practices for the dismantling of ships. While there are challenges to be addressed, there are also significant opportunities associated with ship recycling, and initiatives are underway to promote the development of the ship recycling industry.

OBJECTIVES OF THE STUDY

The objectives of a study on shipbreaking to ship recycling can vary depending on the specific scope and focus of the research. However, some common objectives of such a study might include:

a) To analyze the environmental and social impacts of shipbreaking and the potential benefits of ship recycling.
b) To evaluate the regulatory frameworks and policies related to shipbreaking and ship recycling, and identify gaps or areas for improvement.
c) To examine the economic viability of ship recycling, including the costs and benefits of implementing sustainable and safe practices.
d) To identify best practices and case studies of successful ship recycling initiatives, and evaluate their potential for replication and scalability.
e) To assess the capacity and infrastructure for ship recycling in different regions of the world, and identify opportunities for collaboration and investment.
f) To explore the potential for innovation and technology development in the ship recycling industry, including the use of automation and digitalization.
g) To engage stakeholders from industry, government, civil society, and academia in a dialogue about the future of ship recycling and the key challenges and opportunities.

Overall, the objectives of a study on shipbreaking to ship recycling would be to provide a comprehensive and nuanced understanding of the issues and opportunities related to sustainable ship dismantling, and to inform policy and decision-making in this area.

RESEARCH METHODOLOGY

Research methodology on shipbreaking to ship recycling involves the systematic process of gathering and analyzing data to answer research questions or address research objectives. The following outlines the general steps involved in conducting research on shipbreaking to ship recycling:

a) Research question or objective: The first step in conducting research is to define the research question or objective. This involves identifying the specific topic to be studied, the purpose of the study, and the research questions or objectives that the study aims to answer.
b) Literature review: A literature review is a critical analysis of existing literature and research studies related to the research question or objective. The literature review helps to identify gaps in the existing research and provides a foundation for developing the research methodology.
c) Research design: The research design involves outlining the overall approach to the research, including the research methods, data collection techniques, and analysis methods. The research design should be appropriate for the research question or objective and should be guided by the literature review.
d) Data collection: Data collection involves gathering information relevant to the research question or objective. This may involve collecting primary data through surveys, interviews, or observation, or secondary data from existing sources such as government reports or industry publications.
e) Data analysis: Data analysis involves analyzing the data collected to identify patterns, trends, and relationships relevant to the research question or objective. This may involve statistical analysis, qualitative analysis, or a combination of both.
f) Results: The results of the research should be presented in a clear and concise manner, highlighting the key findings and conclusions relevant to the research question or objective.

Conclusion: The conclusion should provide a summary of the research findings and recommendations for future research or policy decisions.

CHAPTER: 1

INTRODUCTION

INTRODUCTION OF STUDY

Shipbreaking, also known as ship demolition or ship recycling, is the process of dismantling an old or decommissioned ship for its scrap metal and other valuable materials. Shipbreaking is an important industry worldwide, and it plays a significant role in the recycling and reusing of materials.

India is one of the major shipbreaking nations in the world, with the Alang-Sosiya shipbreaking yard in the state of Gujarat being one of the largest in the country. The shipbreaking industry in India started in the 1980s and has since grown significantly, with several other shipbreaking yards being established in various parts of the country.

Shipbreaking in India is mostly carried out manually, using traditional methods that involve cutting and breaking down ships with hand-held tools and equipment. This process can be hazardous for workers due to the risks of accidents, injuries, and exposure to toxic materials such as asbestos, PCBs, and heavy metals.

In recent years, the Indian government has taken several measures to regulate and improve the shipbreaking industry in the country. The Ministry of Shipping has established guidelines and regulations for safe and environmentally friendly ship recycling, including the implementation of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships.

Despite these efforts, the shipbreaking industry in India still faces challenges related to worker safety, environmental pollution, and the need for modernization and technological advancements. However, with continued efforts towards regulation and improvement, India's shipbreaking industry can become a safer and more sustainable part of the global economy.

One such initiative is the "Green Ship Recycling" program, which promotes environmentally friendly ship recycling practices and provides financial incentives for shipowners who choose to recycle their vessels in environmentally sound facilities.

Furthermore, the Indian government has established the Shipbreaking Code, which sets out guidelines for the safe and environmentally sound recycling of ships. The code aims to ensure that ships are recycled in a manner that protects the health and safety of workers, prevents pollution of the environment, and promotes the sustainable use of natural resources.

In conclusion, shipbreaking is an important industry in India, but it faces significant challenges related to environmental and safety concerns, labor rights issues, and inadequate infrastructure. The Indian government has taken steps to address these challenges, including the implementation of policies and regulations aimed at improving safety and environmental standards, the promotion of sustainable ship recycling practices, and the establishment of guidelines for safe and environmentally sound ship recycling.

CHAPTER: 2

LITERATURE REVIEW

Environment:

Waste quantification on board:

Actual waste content and the proportion that is released into the environment are two important environmental impacts of EOL ship dismantling. Few studies have focused on estimating the actual waste content in the ships, with uncertainty and variability arising from ship type and age (Carvalho et al. 2011, Hiremath et al. 2015, Rahman et al. 2016, Jain et al. 2016). Actual waste content based on different types of ships was estimated as 0-3% by weight in Carvalho et al. (2011) based on five type of ships, 2% in Jain et al. (2016) based on a bulk carrier, 5-10% in Demaria (2010) and 6% in Sujauddin et al. (2015). Structural organization, material use and distribution, in addition to ship type, make it difficult to obtain reliable and consistent data of waste content and the associated impact (Carvalho et al. 2011, Du et al. 2012, Jain et al. 2016). Waste content models by ship type and age may be developed in the future (Hiremath et al. 2016, Jain et al. 2016).

The consideration of content as waste also depends on cultural, institutional and market conditions (Gregson et al. 2010, Rahman and Mayer 2015), thus requiring the incorporation of additional social variables in waste quantification modelling. This area of on board waste content deserves more research attention in order to generate reliable waste data, and to model actual waste discharge to the environment in shipbreaking countries.

Pollutant assessment in shipbreaking areas:

A total of pollution assessment studies of the 38 Environmental Science papers revealed a strong research focus on identifying pollution potentials of shipbreaking. The studies differ in terms of type and nature of pollutants, affected areas and seasons. Most of the literature estimated the concentration of common water and air pollutants such as oil, heavy metals, asbestos and persistent organic pollutants, demonstrating concentration levels above safety threshold values in India (Reddy et al. 2003, 2004 and 2005 Patel et al. 2012, Patel et al. 2013, Patel et al. 2014, Jumaila et al. 2015, Shah et al. 2015), in Bangladesh (Siddiquee et al. 2009, Sharifuzzaman et al. 2016, Khan et al. 2017, Hasan et al. 2013, Khan and Khan 2003, Hasan et al. 2013, Islam and Hossain 1986, Abdullah et al. 2013, Aktaruzzaman et al. 2014, Hossain et al. 2016, Kibria et al. 2016), and in Turkey (Neser et al. 2008, 2012a, 2012b, Kacar and Kocyigit 2013). This high level of pollution threatens ecosystems and local communities. However, pollution assessment studies can be more precise if the diverse sources of pollutant release

are taken into account in discussing pollution from shipbreaking (Neser et al. 2008).

The major attempts to identify and separate sources of pollutants diagnosed in coastal soil, water and air were taken by Aydin et al. (2014) and Kara et al. (2014). They used multiple site analysis and principal component analysis to understand the level of pollutants emitted from each of multiple sites: biomass and coal combustion 40% (residential and industrial coal combustion), iron and steel production (27%), unburned crude oil and petroleum products (27%), diesel (3%) and gasoline exhaust emissions (3%; Ayedin et al. 42 2015). In Bangladesh, Kibira et al. (2016) conducted a pollution assessment on 7 heavy metals in three regions in Bangladesh: Dhaka (3 sites), Chittagong (4 sites) and Khulna (2 sites). The study found that the sites near the shipbreaking industry yield less impact compared to the other sites where both shipbreaking and other industries exist. The highest impact was observed in Dhaka (the capital of the country), with five out of seven heavy metals measured beyond safety thresholds. This source-specific pollutant estimation indicates a nuanced understanding of shipbreaking impacts.

Impact assessment

Applying life cycle assessment methods in Bangladesh shipbreaking, Rahman et al. (2016) found that the core activities that happen during ship dismantling in the yards record less environmental damage compared to the other stages that occur outside of the yards, such as rerolling of scrap metals. In addition, the study modelled waste discharge to coastal waters based on interview data and secondary data and found that the waste impact in three damage categories comprise only 0.3% of the total impact. The results of this study conformed to findings of Ayedin et al. (2014), Kara et al. (2015a) and Kara et al. (2015b), necessitating changes of research direction towards sophisticated impact assessment methods that can model waste discharge and its impact on ecosystems. Although the waste content, waste release and impact mechanism within the ecosystem greatly varies based on ship type, size and age, these studies provide evidence that environmental pollution studies require inclusion of source apportionment research and actual waste content and release of EOL ship.

Engineering:

Design for Environment:

Three articles discussed ship design for improved recycling and avoided environmental pollutants and hazardous materials. Shivaprashad and Nandakumar (2013) discussed extended life cycle thinking and recyclability

analysis to include EOL ship dismantling in the design phase. Jain et al. (2015) stated that the EOL stages are ignored in the design process, despite the fact that 96% of ships are dismantled in shipbreaking yards with environmental, social and safety issues, leading to serious environmental injustice for the shipbreaking nations. The EOL consequences make it necessary to incorporating ship dismantling into design thinking (Sunaryo and Pahalatua 2015,Jain et al. 2017b). The purpose of design for ship recycling is three fold: reduce or replace hazardous materials, provide an inventory of hazardous materials, and allow for easy dismantling (Sivaprasad and Nandakumar 2013, Jain et al. 2015, Jain et al. 2017a). Following IMOs instruction, some research has already been conducted on replacing asbestos, tri-butyl-tin (TBT) in antifouling paints, and chloro-fluoro carbons (CFCs) in refrigerants (Jain et al. 2015).

Best Management Practices:

Given the 20-30 year life span of a ship, the benefits of the "designing for dismantling" approach need to be accompanied by a risk reduction strategy and waste management plan – these two areas constitute the management strategy of ship dismantling. To do this, Garmer et al. (2015) developed a three step risk assessment method with subsequent validation to ensure that the risk assessment method can be practically applied. The method development is based on a team of yard personnel comprising yard officials, safety and inspection officials, but no involvement of workers. The first step includes preparing ship-specific documents with detailed arrangements of decks, firefighting equipment, logbooks of tank substances, and other pertinent information (Garmer et al. 2015). The second step includes hazardous tasks identification, deployment of safety analysis personnel, and development of inspection/screening tools. Finally, a deeper risk assessment is conducted to advance recommendations for risk minimization. While the process itself is rigorous and provides an important contribution to reducing shipbreaking risks, without involving workers and yard managers, the validation process remains incomplete. The management approach lacks identification of actor characteristics and cost apportionment of the risk adjusted management approach (Hiremath et al. 2016). Life cycle costing (LCC) and social life cycle assessment may be useful for understanding the cost structure (stepwise and define fraction of cost) required to produce a certain level of risk adjusted social benefits.

Safety Management:

A total of 16 publications were identified in this category, with 9 addressing exposure assessment and 6 on working conditions and workers' rights.

Exposure assessment:

Workers face three types of occupational risks: occupational hazards with immediate consequences such as accidents and injuries; short-term exposure to hazardous materials via the inhalation of toxic fumes (infecting respiratory systems); and long-term consequences that appear after retiring from dismantling activities. Most of the studies focused on occupational hazards and short-term exposure because the damage is relatively easy to determine and noticeable (Anderson et al. 2001, Hossain et al. 2016).

Hazards-specific exposure assessments have been conducted in several areas: asbestosis (Courtice et al. 2011, Wu et al. 2015), lead exposure (Goldberg et al. 1963, Maccallum et al. 1968, Tola and Karskela 1976, Nosal et al. 1990), paint exposure (Engstrom et al. 1990), metal exposure during cutting (Ho et al. 1989), and long term mortality among shipbreaking workers in Taiwan (Liu et al. 2003, Wu et al. 2013). In Bangladesh, 87% of the shipbreakers were not aware what "asbestos" was and 41% did not recognize photographs of it (Tola and Karskela 1976).

Metal cutting activities dominate 71% of the total labor force. These activities pose risks to cutters and helpers due to inhalation of fumes released during cutting (Deshpande et al. 2013, Rahman et al. 2016). The connection between asbestos exposure and cancer detection was also studied on 4427 shipbreaking workers in Taiwan from 1985-2008, and the authors recommended continuous monitoring of workers for early detection of asbestosis and cancer (Wu et al. 2013, 2015). Liu et al. (2003) provided information regarding exposure-induced mortality rates and externally caused mortality in Taiwan through a 13 year retrospective study. Symptoms develop over time and thus require continuous health surveillance throughout a worker's life (Ho et al. 1989).

The exposure assessment studies summarize the exposure of heavy metals, exposure to occupational hazards and differences of exposure in terms of distances, times and type of work/workers, with some retrospective references to the long-term impacts on worker health and mortality. It is noteworthy that similar studies have not been conducted in the current shipbreaking nations (except Deshpande et al. 2012 and Courtice et al. 2011), signaling a critical gap in our understanding of impacts on workers' long-term health in developing countries.

Working conditions:

Working conditions and worker rights mostly revolve around medical facilities, safety equipment, and accidents and injuries management (Anderson 2001, Bianchi 2005, Sahu 2014). Our review revealed an observed disparity in conditions and rights across the three largest shipbreaking nations. The Gadhani shipbreaking yard in Pakistan provides safety equipment and emergency medical care while India and Bangladesh devolve responsibility to the workers (Iqbal and Heideggar 2013, Sahu 2014). Gadhani shipbreaking surpasses India and Bangladesh in terms of application of heavy machinery, the existence and functioning of labor unions, and compensation enforcement for accidents and injuries. With no report of child labor, no night shifts with less overtime, higher wages, and strong inspection teams, the Gadhani yard represents a higher social responsibility to workers and working conditions. However, issues such as lower use of protective equipment, awareness of asbestos removal, training for workers, health screening, the contractual nature of employment, and causes of deaths and injuries remain comparable to India and Bangladesh (Iftikhar et al. 2016). It is common practice for these three Asian nations to sell asbestos to local communities, demonstrating the low awareness of its dangers (Ahmed and Siddiqui 2013). Another common theme of this working conditions 0literature is the lack of proper documentation of accidents and their consequences for the workers.

While poor working conditions have dominated conversations about shipbreaking from NGOs, few peer-reviewed research has been conducted on the specificities of the workers engaged in this risky industry, indicating an urgency of a social life cycle assessment across different scales (Tiwary et al. 2008). This will provide interesting comparability among shipbreaking nations and identify critical areas of improvement. It is also noteworthy that except for general discussions of working conditions in the sub-standard yards, we still lack information that relates these risks to workers' long-term wellbeing.

Policy challenges:

The Basel Convention and the Hong Kong International Convention on the Safe and Environmentally Sound Recycling (HKC) are important policies that regulate the shipbreaking industry, along with the latest European Ship Recycling Regulations (ESRR). Policy publications mostly focused on national and international policy gaps and challenges for improvement of the industry (Alam and Faruque 2014, Zhang and Chang 2014, Rahman and Mayer 2016, Alcaidea et al 2016), technical and financial incentive structures (Rahman and Mayer 2016), and international regulatory loopholes (Alcaidea et al. 2016). These

regulations mostly focus on “polluter pays principals”, “proximity principals” and “extended producer responsibility”. The ESRR forbids EU ships from being dismantled in substandard yards, as per proximity principals and guided by the Basel Convention. The HKC provides detailed procedural guidelines, from dismantling decisions by shipowners to dismantling ships in yards, through the deployment of proper documentation, certification and inspections (Karim 2014, Rahman and Mayer 2016, Alcaidea et al. 2016).

Practices of selling ships for dismantling are not well regulated: loopholes exist which allow owners to reflag EOL ships before beaching, relaxing ship owner responsibilities and boosting their profit margin (Saraf et al. 2010, Alcaidea et al. 2016). These loopholes and perverse economic incentives need to be addressed (Schoyen et al. 2017). The economic incentives of the ship-owners for substandard recycling facilities and strong demand for metal scraps in the recipient countries reinforce lax regulations that come at the cost of worker safety (Rahman and Mayer 2016, Cairns 2014).

Another important issue is the difference in commitment to regulations of international policy institutions and the implementing nation state (Alam and Faruque 2014). Given the consequences of the strict enforcement of international regulations (e.g., leakage effect, lack of enforcement of polluter pay principals), national policies often only superficially respond to improvement mechanisms (Rahman and Mayer 2016). While there are several causes and factors that prevent nation states from enforcing laws, the extent to which the national level regulators influence the existing working conditions and tolerate pollution levels is still unknown (Garud 2012). A national/ global level LCSA study should identify to what extent the lack of suitable international policies allows yard owners to maintain the status quo.

The noteworthy concept of technical and funding assistance stipulated in the HKC was mentioned in most of the publications in this category, but there is not a single paper which focuses on that as a main concept to formulate guidelines for assistance. This is another critical research need.

Cultural aspects of recycling networks:

Gregson and colleagues (2011, 2013) developed a strong argument, drawing from economic and cultural geography, which shapes an innovative perception of shipbreaking practices. According Gregson et al. (2011), the resource recovery activities epitomize a corporeal vulnerability that disregards space and time – be it in developing countries or developed countries (Gregson et al. 2011, 2014). The

microscale activities represent “dirty” work capable of attracting migrants and the underprivileged, creating spatial injustice (Gregson et al. 2014).

Hazardous waste is often culturally contingent (Gregson et al. 2011). In the context of developing countries, the ship-scrapped materials (glass wool, asbestoses, black paint oil and furniture) are used by lower and middle classes in South Asia (Gregson et al. 2010a, Gregson 231 et al. 2012, Gregson et al. 2013 and Crang et al 2013). For example, the formation of the secondary processing industry across Bangladesh and consumption of EOL consumer products indicates a cultural inclination that is intricately bound with the global flow of waste, a symbiotic relationship that spans local to global scales.

A social life cycle study is thus important to quantify how the processing of so-called “waste” endangers and/or uplifts a recycling society through the consideration of local, social, cultural and individual preferences and expectations.

Economics of shipbreaking:

There were only six papers with economics as a main content of analysis. The studies mostly discussed disposal decisions of shipowners (Knapp 2008, Kagkarakis et al. 2016), economic feasibility of ship dismantling in developed countries (Mackenny 1994, Choi et al 2016), funding estimates for yard capacity development of the south Asian countries (Yujuico 2014, Rahman and Mayer 2016) and dwindling competitiveness of Chinese yards (Du et al. 2017). Choi (2016) provided interesting information about the cost of the standard recycling method of ships in the US, and found that the decision to recycle ships in developed countries can be profitable, in addition to the benefits derived through the production of metal scrap. Yujuico (2014) described the need to apply the “polluter pays principle”, and estimated about 53.5 million USD would be needed to upgrade Bangladesh shipbreaking capabilities (as well as 43M USD for Gadhani, Pakistan). His analysis incorporated the needs for developmentally appropriate aid and good governance, supported by strong international policies. The Chinese shipbreaking market has been shrinking despite its satisfactory safety management and higher environmental standards setting (Du et al. 2017). The increasing investment costs in greener 253 facilities require government monetary incentives (subsidies) and other trade supports in order to remain competitive, as is the case for China (Du et al. 2017). This demonstrates a strong need to employ Life Cycle Costing (LCC) in the shipbreaking industry in order to understand complex dynamics such as cost vs competitiveness.

Shortcomings of the existing research:

- Environmental impacts beyond pollutant assessment The environmental impacts of shipbreaking have been reduced to pollution impacts. There is some recognition that the pollution assessment research is incomplete; there is a need for better identification of all sources of pollutants (Neser et al. 2008). According to this review, pollution apportionment research has only been conducted in Turkey and India (Aydin et al. 2014). More research is needed on direct ship-based waste quantification, and life cycle assessment to identify impacts of those pollutants on human health and ecosystems.

- Institutional conditions that can promote fair working conditions are neglected Institutional and policy setting is highly specific to country context. Therefore, it is important to understand how (and to what extent) socio-political context can impede policy and regulatory improvements. This knowledge is key to developing better policies at multiple scales, and understanding interactions across scales.

- An interdisciplinary approach is missing. The shipbreaking literature predominately covers environmental and social issues from a single discipline approach. Few studies have addressed environmental, social and safety issues together in a holistic framework. For example, Neser et al. (2008) and Devault et al. (2016) generally discussed the environmental, social and safety issues but did not incorporate economic aspects such as cost distribution or funding mechanisms for regulatory enforcement.

Proposed LCSA methods in SBI research:

System integration:

It is evident so far that shipbreaking research represents conventional disciplinary boundaries and ignores synergistic interactions, conflicting social goals and trade-offs (Liu et al. 2015). System integration enables coupling of human and ecological systems in order to understand system complexity and enhance synergies among factors (Liu et al. 2015). Shipbreaking generates impacts across scales (local, national and global), dimensions and organizational levels. For example, asbestos use threatens yard workers (local impact) but adds to local secondary business including yard owners' income (economic dimension) and reduces environmental waste production (environmental dimension). The business culture, in turn, supports the persistence of EOL ship trade in the international market (global impact). Improving yards is not a goal in itself. For example, facility improvement in China reduced overall business competiveness, resulting in net negative impacts through leakage effects, which in turn influenced yard owners' decisions in other countries (Du et al. 2017).

Shipbreaking income provides economic security but may reduce family solidarity through labor migration and threatens health through exposure to occupational hazards.

CHAPTER: 3

SHIPBREAKING TO SHIP RECYCLING AS AN INDUSTRY

3.1 Ship Demolition, Ship Scrapping, Shipbreaking, or Ship Recycling

When the industry was established during the 19th century, the disposal of old ships was simply referred as “ship demolition” or “ship scrapping” (Sinha, 1998). Both words mean that the ship has already reach the final stage of its economical life and that its value is considered to have been lost. The hull and main engines of the ship are then demolished and cut off as scrapped materials, which would then be used for other purposes.

As the industry evolved, several writers/publishers described such disposal of ships as “shipbreaking”. This has been the common word used until the problem that the industry represents to the less-regulated part of the world, the transport of hazardous materials and shipbreaking practices, was presented at the International Maritime Organization (IMO). This so-called industry was brought up as one of the items on the agenda of IMO’s Marine Environmental Protection Committee and was presented as Ship Recycling in its report (MEPC 44/16).

With the environmental issues, ship manufacturers are under pressure to take more responsibility for the disposal of their products. Concern groups that are taking part 6 in this multinational issue have started to consider what contributions they could make. Not only are plans and guidance being developed but also the name of the industry is being refreshed. The word “ship recycling” is gaining popularity, according to Rolf Westfal-Larsen, shipowner and chairman of International Chamber of Shipping (ICS), ships are not scrapped but recycled – nothing goes to waste, everything has a further life (Varcoe, 1999).

The Basel Action Network pointed out that although the word “recycling” provides a positive meaning; in its true essence, it is just another word giving a superficial cover as to the danger of dumping hazardous waste present on board the ship during its final disposal (BAN, 1999).

The aspiration to control the dumping of hazardous waste is a sensitive issue and when members of the international environmental organizations set out to look into the safe practices of ship scrapping, other concern groups started to promote the industry with a new title, “ship recycling”. What the environmental group only wishes for is to control the transport of hazardous waste on board the ship and improve safe working practices at disposal sites. The ultimate purpose of why the industry was established remains the same; obsolete ships can be disposed of in a manner such that the interested party could recover part of his investment

from the ship. Indeed, improvement is needed to correct the present practices, but what about the name, do we need to change it?

3.2 The Ship

To describe it simply, the modern merchant vessel is a flatform device made of welded steel frames, beams, and plates designed to carry specific cargo safely across the ocean. The body of this structure may vary depending on the significance of speed, cargo capacity, fuel economy, and intended route of which the shipowner 7 has to determine. The majority of sea-going commercial vessels are propelled with diesel engines and the designs have shifted considerably from speed to economy. The increase in fuel cost contributes to the improvement of ship design giving emphasis on economical propulsion, fuel-efficient main engines, and better hull design. Modern merchant ships are built today according to stringent regulations.

There are several distinct types of ship and some have a dual role or a combined carrier fleet. The most important in the international shipping trade are tankers, combined carriers, bulk carriers, multi-deck tramps, container ships, refrigerated ships, and passenger liners.

For a ship to be competitive, although it is not mandatory, it has to be "classed" in order to have an adequate insurance coverage and the much needed trading certificates which has to be presented at her port of calls.

The earning potential of a ship, if it has to be employed in international trade, is based on its measured tonnage and cargo capacity. This information is used for categorising the ship throughout her trading life and serving as a reference in assessing the required dues and charges. When the vessel is ready for disposal, the particular tonnage figure, which is utilised by shipbrokers when negotiating for its sale is the Light Displacement Tonnage (LDT), simply known as the actual weight of the ship without cargo.

3.3 The Life Cycle of a Ship as Compared to the Market Cycle

The Ship is the focal point in the shipping industry. It is the ship that enables world trade to be undertaken in economical means. The merchant ship has to fit into the business. It is then apparent that the type of ship used on any given trade route is dependent on the type of commodities that the ship has to deliver. In this aspect, it is 8 considered that the demand for ships is derived from the demand for transport, and the shipowner has the option of what type of ship to utilize that could bear the biggest profit. There may be a large inventory of various types of

ship today in the international shipping trade; but they still have the same thing in common, the need to be economically efficient, consistent with the safety, environment, and human considerations as required by the national and international regulations.

The business of owning, operating and manning a ship is as risky as it ever has been. The strategy of buying low and selling high is a philosophy well adopted in a highly volatile shipping market. The problem is choosing the right moment to make such decisions. In the shipping market there are sudden booms and equally sudden slumps, for a certain number of years. These alternating gains and losses are referred to as the market cycle (Stopford, 1988). The "boom and bust" cycle in the shipping market is directly related to the life cycle of a ship.

The average economic life of a ship is about twenty years. Over a given period of time the shipowner may experience freight market booms and depressions. During the protracted periods of recession it is a great challenge to the shipowner as to how he can ensure the survival of his ship. At some point in the life of the ship, the owner will reach a decision to sell his ship. The least flexible shipowner in the long run would then have to compare the net present residual value of the ship against the net present value of selling the ship, either for further trading or for scrap. The shipbreakers and speculators, who offer a bargain price, would only be the available buyers that the shipowner could have, especially if he is desperate for funds. The decision to sell would then become a decision to scrap and it could be realised immediately if the best resale value is only offered by the shipbreakers.

3.4 Factors that Influence the Economic Life of a Ship

In the previous section the author has presented briefly some of the aspects that affect the life cycle of a ship as viewed in relation to the prevailing market condition. It can not be avoided to emphasize the significance of the known factors that influence the life cycle of a ship – obsolescence of the ship; it is not just a single factor that will serve as a primary basis but consolidation of all the factors. These same factors are related to each other and contribute directly to the number of ships that should be scrapped for a given period of time.

3.4.1 Age

It is oftentimes perceived that the aging of a ship is a significant factor that influences the shipowner to sell his ship for scrapping. Apparently, this is not so as it is just one contributory factor. If age were to be used as the only category for ships to be scrapped many well-maintained vessels of traditional shipping companies would be lost. The suitability of the ship for further trading has to be

carefully studied. The increasing size and sophistication has left the old, less desirable ships in the international shipping trade to look for a suitable trade area where competition is low. The speed and cargo handling capacity of a modern ship reduces the competitiveness of older ships; especially, if it is a specialized carrier designed for continuous service in a specific trade. The average age of various ships that were demolished during the period 1992-1998 ranges from 22.5 –26.7 years. Older ships are subjected to excessive wear and tear during their service and may require higher repair and maintenance costs. Throughout the economic life of a ship, it is subjected to periodical surveys designed to maintain its hull, machinery, and equipment in good condition. The fourth or fifth survey that the ship has to undergo in order to comply with safety and environmental standards usually requires massive expenditure. This also demands higher insurance coverage, which the owner has to pay.

3.4.2 The Prevailing Market Condition

For a shipowner, it is the question of how to maximize the profit. The shipping market is volatile and there is no shortage of potential buyers. The decision to sell is oftentimes harder than the opportunity to buy and creates a problem in the balance of supply and demand, considering that the ship is treated as commodity rather than as a transportation unit.

The operational competitiveness of a ship could be maintained as long as it is continuously employed and is earning enough profit to cover its operating expenses. The "reputation" of a ship also demands a good figure; its historical performance, earning potential, and how many owners the ship has been through would either strengthen the competitiveness of the ship or provide some doubts to a potential customer or buyer.

Utilization of unreliable ships would be remote, if there were an increase in the supply of available tonnage for a specific shipping sector. The increase in tonnage supply may not guarantee the employment of modern ships. When the freight markets are low, the employment of the ship is of major consideration, even newly constructed big ships would have a problem to fit into a specific shipping trade. The shipowner would then have to consider the choice of laying up the ship or selling it for scrap. This happened in the early 1980s when superbly specified ULCCs and VLCCs were sold for scrapping due to lack of employment (Drewry, 1999).

To lay up a ship for indefinite periods of time would lead to the deterioration of the hull and machinery. The cost that the ship may incur while idle would be a

great burden to the shipowner. Most likely, the ship would be offered for sale to a shipbreaker.

3.4.3 The New Regulations

Ships are, by and large, engaged in international trade and operate on the open seas. Having this international commitment, ships have to comply with international regulations. In formulating this regulation there are a lot of international bodies involved. The enforcement of regulations in shipping activities is interpreted by some as an obstacle (Ma, 1999). This, by nature generates additional costs on the part of the shipowner whenever new regulations are enforced.

In recent years, stricter regulations have been introduced requiring major renovation to existing ships in order to have appropriate certificates and for them tocompete in international shipping. The cost of maintaining the present class of the ship as set down by the classification society, and the cost of installing the necessary equipment in order to meet the national and international standards, will affect the projected revenue of the ship. The environmental safety requirement, which is of utmost importance, has contributed to the changes in the design of ships.

The introduction of new regulations would likely accelerate the scrapping of uneconomical ships. The Erika incident last December 1999 had lead to stricter port state control and early phasing out of single hull oil tankers.

3.5 The Principal Players

In the shipbreaking industry, ships are sold for scrapping not just because of obsolescence but also according to the demand of scrap metal in the steel industry. 14 When the shipowner decides to sell the ship for scrapping, this involves other interested parties – the shipbrokers and the shipbreakers. These parties decide what fair price they could offer with the present condition of the ship and market status. The presence of shipbrokers to consummate the deal contributes largely to the efficiency of the market and may guarantee a perfect match with a smooth conclusion of the deal.

3.5.1 The Shipowner

It is but natural that the shipowner's main interest is to maximise the earning capability of his ship; this covers even during the disposal of the ship. The shipowner has an option to deal directly with the shipbreaker or through a shipbroker, but often times the assistance of the shipbroker is preferred. The knowledge and experience of the shipbroker in the prevailing market condition is of great benefit to the shipowner.

Employing the services of the shipbroker does not mean that the shipowner is relieved of other responsibilities. In order to achieve the maximum amount of revenue and smooth completion of the transaction, it is significant that the shipowner should be able to provide to the shipbroker the much needed clearance, details about the ship, list of items that are included in the sales agreement, financial documentation, and arrangements regarding the ship's crew.

3.5.2 The Shipbroker (Intermediaries)

In the shipping business, the shipowner is used to the practice of buying or selling ships being done through a recognised group of brokers or trading houses. It is normal that the owner will involve shipbrokers, or trading houses, or international traders specialising in ship scrapping. The shipbroker acts as a middleman in the sale. His knowledge on the current and expected market situation and the efficiency to search for potential buyers usually ensures a better deal. Depending on the circumstances, the shipowner may choose to seek the services of more than one shipbroker and on some occasions the shipbroker may deal with another shipbroker working on behalf of the shipbreaker.

The shipbroker chosen by the shipowner to work out the sell of his ship will then relay the details of an offer to individual brokers, trading houses, or purchasing groups. In return, any offers the shipbrokers receive for the ship will then be relayed back to the shipowner. The amount of time that will take the ship off from the negotiating table will depend on the prevailing market condition and volume of ships available.

For a good quality ship, fierce competition among buyers usually prevails, and within a matter of hours the ship being offered will be disposed of to a qualified buyer. On any sale that is successfully concluded, the shipbroker will be earning a commission in the magnitude of 1% - 2% of the total sale price (Drewry, (1996). On some occasions, an independent shipbroker usually puts up the capital fund to buy a vessel "as is", "as is, where is", in lay-up or after discharge of the last cargo. The said shipbrokers are only active in this scheme if there is a customer waiting, otherwise they have to take control of the ship until the required payment and delivery is formalized.

The period between when the deal has been made and the time of delivery is regarded by the shipbroker as the most difficult time. A sudden change in the market may lead to renegotiations and then the shipbreaker may raise some contentions regarding the condition of the ship when it reaches the shipbreaking site.

The shipbroker is also required to prepare the written contract between the concerned parties. Drewry Shipping Consultants Ltd. (1996) point out that there is no predefined or prescribed format for the Memorandum of Agreement (MOA); but a typical agreement usually has standard clauses.

3.5.3 The Shipbreaker

Unlike the shipowner, who has a clear understanding of the shipping market, the shipbreaker has limited measures of determining the extent of the shipping industry. The shipbreaker usually buys the ship "as is" and relies on details that will be provided by the shipbroker regarding the ship. The Light Displacement Tonnage (LDT) of the ship would be a good basis for a reasonable cost estimate.

Knowing the owner, type, age, and place of construction will provide the shipbreaker with general information regarding the quality and thickness of the steel plate and estimated amount of non-ferrous metals on board. Although the scrap steel provides most of the value of the ship, the non-ferrous items represent a big percentage of revenue on the part of the shipbreaker. The scrap steel is generally heated and rerolled into concrete reinforcing rods for the construction industry. The shipbreaker has to determine the balance between the prices of ship for scrapping and the revenue that can be obtained from scrap material.

If the transaction is successful, the shipbreaker has to open a letter of credit and secure the necessary documents for importation of the ship.

3.6 Known Procedures and Practices in Breaking Up a Ship

Shipbreaking is an economically unsophisticated business compared to shipbuilding. Most of the world's shipbreaking facilities use the manual method in cutting the ship up on a suitable beach with limited mechanised equipment. Given the extent of the activity, ships are slashed and burned as workers cut out metal with hand operated oxy-fuel gas cutters.

Although it is possible to increase productivity by using mechanised shipbreaking methods, these are capital intensive and require special investments, this is not easily justifiable among shipbreakers from developing countries considering that they are financially constrained. The process of non-mechanised shipbreaking falls into three stages. At the preparatory stage, the owner of the ship removes all

equipment that is not included in the transaction together with potentially explosive materials. If the vessel is a tanker, it must be cleared of explosive gas; the shipowner must be able to secure a Gas-Free Certificate from a company recognised by the country where the ship has to be broken up.

The second stage is when the ship is already delivered to the shipbreaking site. Ships are normally run at full speed or are towed towards the beach during high tide. Anchor chains are then attached to ensure that the ship is secure. Independent buyers of all items that are not fixed, or can be easily removed, board the ship and start unloading the selected items. Once this operation is complete, a scrapping plan will be drawn up.

In the last stage of the operation, the shipbreaker will determine, according to the structural aspect of the ship, on how the individual parts of the ship will be taken out. The ship has to be dismantled symmetrically making sure that it will not break apart or topple over. Before the steelwork commences, openings of approximately six-byten foot are cut along the hull but leaving the lower part intact such that when it is pressed outward, a horizontal platform is made. These openings will serve as ventilation and escape routes. With cutting torches, transportable parts are dropped overboard and drawn on land with the use of winches.

The ship is drawn gradually towards the beach during high tide while it is slowly broken down. The length of time to break up a ship depends largely on its size.

3.7 The Scrap Material

Many parts of the ship are directly re-used. Although ferrous and non-ferrous scrap that are available from the ship provides much needed revenue for the shipbreakers, the other equipment onboard also contributes a certain percentage of cost recovery. In shipbreaking, the ferrous scrap is the main product. The chunks of steel that are cut out from the ship are delivered to the steel industry for reprocessing. Depending upon the type and quality of the ferrous scrap; it is normally used in steel and iron production as a melting charge or re-rolled as reinforcement bars in low stress building construction.

Non-ferrous metals like the ship’s propeller, aluminium structure, copper piping’s, and electrical wirings are carefully separated and marketed locally. The common consumers of such material are domestic shipbuilders that are close to the shipbreaking yards. This includes the ship’s engine, diesel motors, pumps, winches, radar and other electronic equipment. Almost all the materials on board the ship are practically re-used. The furniture fixtures, tools and drums are also marketed.

With the absence of waste recycling facilities, the shipbreakers have to resort to the easiest means of disposing unmarketable materials. The remaining materials that cannot be sold are then burnt.

CHAPTER- 4

CHALLENGES AND SOLUTIONS

AN INDIAN PERSPECTIVE

4.1 Indian Ship-recycling Industry

In India, full-fledged ship breaking practices started around 1980s in Mumbai and Kolkata and later Alang in Bhavnagar district, Gujarat was developed for ship breaking owing to its various advantages listed below and is considered the world's largest ship breaking facility. Alang became centre of ship breaking activities in the world post 1991-92. From 1991-92 to 2016-17, Alang has been a consistent player in ship breaking, demolishing close to 6899 ships. It accounts for 98% of total ships recycled in India.

1. The site falls in the high tide zone where the highest tide reaches up to 10 to 11 meters. This is considered to be most favorable for beaching purpose.

2. This site is located in the Gulf of Khambhat and whose harbors are protected areas during rainy season which allows ship breaking activity.

3. The coast of Alang is sloping and has a long dry area which facilities reaching up vessels.

4. The seabed at Alang dries up very quickly even during monsoon, thus facilitating the handling as all kinds of material and equipment.

5. The area along the coast as Alang is free from other competitive users, like merchant shipping, fishing and salt work.

Recyclable material classification and its proportion in various types of ships

The revenue generated by a ship recycling yard depends on what types of materials can be extracted from a ship and out of those extracted, what and how much can be classified and sold as recyclable material and reusable material. Such classification mainly depends on applicable local and international regulations and local market for reusable goods and scrap metals, such as steel, nonferrous metals, etc. The markets for reusable goods and scrap products differ from one country to another. In the advanced European countries, steel scrap is generally completely melted down to make new steel products whereas in the East and Indian subcontinent, steel scrap is sometimes simply heated and rerolled in reinforcing rods for use in the construction industry.

4.2 Factors Affecting Indian Ship-recycling Industry:

1. Movement in Freight Prices:

Majorly, the current earnings and future expectations drive the ship recycling industry. The movement in the freight prices is indicated by the Baltic Dry Index (BDI). BDI is basically shipping and a trade index created by London Based Baltic Index. Other index include Baltic Dirty Tanker Index and Baltic Clean

tanker index which is linked to freight prices of Oil tankers. These indexes specify the cost of transportation to ship owners. The cyclicality in the ship breaking industry is inherent with its negative correlation with the Baltic indexes. Better availability of ships are expected at the time of recession when the freight rates are lower as ship owners find it economical to send the ship for the purpose of recycling rather than using the ship further. Ship breaking at Alang had declined significantly in FY14 (refers to the period April 01 to March 31) over FY13 impacted by the availability of ship with rise in Baltic Indexes.

2. Scrap Prices vis-à-vis steel price movement:

Profitability of ship breakers is susceptible to steel scrap prices which are linked to global steel prices while post ship purchase ship recycler/breaker have to bear the price risk. The scrap prices hold less importance for ship owner when it comes to deciding whether a ship should be scrapped or not. The ship breaking industry contribute small proportion to steel industry viz. around 1.5% of the steel requirement and so the scrap prices are affected by the market scrap steel price rather than demand and supply of ship. The volatility in steel prices driven by demand and supply conditions in the global as well as local markets exposes ship-recycling companies to any adverse price movement on the uncut ship inventory as well as unsold inventory of steel scrap held by them. In past steel scrap prices had remained volatile in nature. For ship breakers the procurement prices should be compared with steel scrap prices with lag of 1-2 months which is the normal time taken for processing and approval. Furthermore, the price trend reflects the challenging scenario ahead with decline in profitability with increasing competition.

3. Competition from the global peers:

Indian ship-recycling yard face intense competition from the neighbor countries like Bangladesh and Pakistan due to availability of low wage labour, lax occupational health and environment related regulations, and partial enforcement. Furthermore, the currency also plays a key role in determining competitiveness of Indian ship breakers.

4. Forex Risk and high hedging cost:

Majority of the ship breakers purchase ships by way of Letter of Credit (LC) and tenure for the same depends upon the size of the ships and its recycling period which normally ranges from anywhere between 90-270 days. Since, the transaction is denominated in foreign currency at time of purchase of ship and there is time lag in actual sales after ship breaking leading to exposure of their profitability to forex risk. Banks normally keep 10% as FD margin and require

ship breakers to keep their sales receipts after meeting expenses as FD till full repayment. Furthermore, due to high hedging cost compared to low profitability, ship breakers are often resistant to hedge its cash flow.

5. Regulatory Risk:

The ship-breaking industry is highly regulated with strict working and safety standards to be maintained by the ship-breakers for their labourers and environmental compliance. Furthermore, the industry is prone to risks related to pollution as it involves dismantling of ships which contain various hazardous substances like lead, asbestos, acids, hazardous paints, etc. that have to be properly disposed-off as per the regulatory guidelines. The key areas include ground pollution, water pollution and health and safety of workforce. Over the period importance of green ship recycling procedures had increased significantly even for seller there are pressures for selling ships to the green certified yards. There are various certification agencies which certify the recycling facilities compliance to the Hong Kong International Convention guidelines. The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships adopted by the International Maritime Organization (IMO) in May 2009 and the European Regulation No. 1257 adopted by European Parliament and Council in November 2013, provide a legally binding instrument which ensures that the process of ship recycling does not pose risks to human health, safety and to the environment. The table elaborates on the major certification agencies with prominence in Indian ship breaking industry.

Normally, above certifications are issued to ship-recycling facilities that they are in compliance with Hong Kong convention, after confirming the ship recycling facility plan meet the requirement of the convention. However, above certification agency have its guideline regarding the waste disposal, effluent treatment, safety of workers and maintenance of records.

Rating dispersion of Care Rated entities in Ship Recycling Industry

Of the ship breakers rated by CARE Ratings Limited, 73% are in below investment grade category (‘BB’ and below category) due to several factors such as modest and fluctuating profitability with moderately leveraged capital structure and debt coverage indicators, Exposure to volatile raw material prices and regulatory and environmental risk. Credit profile of CARE rated entities mainly remained stable during FY17 with marginal improvement in coverage indicators.

4.3 Recent Developments

1. China to Stop Recycling Foreign-Flagged Ships: China has announced a ban on importing foreign-flagged vessels for recycling, applicable from January 1, 2019 as it toughens its stance on waste processing industries. This is expected to benefit other ship recycling countries.

2. India prepares to ratify and implement the Hong Kong Convention: The main international laws include EU regulations and Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships. The Hong Kong convention was adopted by International Maritime Organization in 2009. Furthermore, In August 2014, the ship-breaking industry, so far under the Steel Ministry, was brought under control of the Shipping Ministry. This move was to attract more ships to Indian yards, including the world's largest — Alang in Gujarat — and get marketed well at international shipping forums. In furtherance to this, Government of India has now decided to ratify and implement the Hong Kong Convention. Towards that, the ministry has drafted legislation to make the ship recycling industry safe for its workers and the environment and to implement the Hong Kong Convention (HKC).

3. Soft Loan Upgradation of Alang-Sosiya ship recycling shipyards: GoI signed $76 million loan deal with Japan International Cooperation Agency (JICA) for starting upgradation project related to environment management plan at Alang-Sosiya ship recycling shipyards. The project will be executed by Gujarat Maritime Board (GMB) and is likely to be completed by 2022. The total cost of project is $111 million out of which $76 million will be provided by JICA as soft loan. Out of remaining amount, $25 million will be borne by Gujarat Government as taxes and fees and balance $10 million will be shared by Ministry of Shipping. The components of project are outlined below:

a. Upgrading 70 yards, providing impervious floors to prevent pollutants in subsoil. Improvement of the existing environmental facility (Effluent Treatment Plant (ETP).

b. Introduction of mobile decontamination units (Pollution response equipment).

c. Introduction of large mobile cranes and beach cleaning wheel loaders and tank cleaning barge.

As per GMB Port policy discussion paper implementing the above plan, Alang would be able to get more vessels from OECD and western world as a result of which Alang would contribute to 51% of total global ship recycling volume from current share of 30%. This could translate into generation of additional revenue

to the tune of US$ 100 million over 20 years project cycle from case business services.

Prospects

Though, the size of the ship breaking industry is relatively small but its strong linkage with independent variables viz. environment regulations, freight prices and steel scrap prices sets it apart from other industries. Overall improvement in global trade and continued reliance on crude oil is expected to keep freight prices stable in medium-term while improvement in infrastructure activity in India and upward trend in steel prices is expected to be positive for Indian ship breaking industry. However, with increasing compliances and stringent regulations vis-à-vis global peers are expected to adversely affect the profit margins posing a challenge to the Indian ship breaking industry.

European Regulation on Ship Recycling (EUSRR) is scheduled to enter into effect on December 31, 2018 which means that large commercial seagoing vessels flying the flag of an EU member state will only be allowed to recycle in a ship recycling facility included in "European List of ship recycling facilities" which does not include any ship recycling facility in India, Bangladesh and Pakistan as per the list of May, 2018. If same is not expanded, it could have led to shortage of recycling capacity for ship-owners with EU-flagged vessels to dispose the end-of-life tonnage. India's steps for ratification and implementation of Hong Kong Convention and up gradation of Alang yard with cooperation of JICA is expected benefit in long run by adopting green recycling norms while addressing health and environmental concerns.

CHAPTER: 5

FINDINGS AND SUGGESTIONS

Shipbreaking is the process of dismantling and recycling old ships for their steel and other valuable materials. While it can be a valuable source of income for many countries and workers, it can also be a dangerous and environmentally damaging industry. In recent years, there has been a growing demand for more sustainable and safe ship recycling practices. In this article, we will discuss the findings and suggestions for shipbreaking to ship recycling.

Findings:

Environmental Hazards: Shipbreaking is an environmentally hazardous process that involves the release of toxic chemicals, such as asbestos, lead, and PCBs, into the air, water, and soil. These hazardous materials can have severe consequences for the health of workers, nearby communities, and the environment.

Labor Conditions: Shipbreaking is a labor-intensive process that often involves workers with little or no protective gear, who are exposed to dangerous chemicals, heavy machinery, and unsafe working conditions. Many workers in this industry work for low wages, and their job security is often precarious.

Economic Benefits: While shipbreaking can be a valuable source of income for many countries, the process is often carried out in developing countries with low labor costs, where regulations are lax, and workers' rights are not well protected.

International Regulations: The International Maritime Organization (IMO) has developed guidelines and regulations for the safe and environmentally sound recycling of ships. However, these regulations are not yet legally binding, and compliance with them is often voluntary.

Suggestions:

Develop International Agreements: International agreements and treaties should be developed and enforced to ensure that ships are recycled safely and sustainably. These agreements should include binding regulations on labor standards, environmental protection, and the responsible disposal of hazardous materials.

Implement Best Practices: Best practices for ship recycling should be developed and implemented, including guidelines for the safe and sustainable dismantling of ships, the proper handling and disposal of hazardous materials, and the protection of workers' rights.

Encourage Transparency: The shipbreaking industry should be more transparent about its practices, including the sources of its ships, the methods used to dismantle them, and the disposal of hazardous materials. This transparency will help to hold shipbreakers accountable for their actions and encourage more responsible practices.

Invest in Research and Development: Research and development should be invested in to develop new technologies and processes for the safe and sustainable recycling of ships. This investment will help to improve the efficiency of shipbreaking while minimizing its environmental impact and ensuring worker safety.

Provide Economic Incentives: Economic incentives, such as tax breaks, should be provided to shipbreakers who adopt sustainable and safe recycling practices. This will help to encourage the adoption of best practices and create a more sustainable industry.

Increase Awareness: Awareness should be increased among stakeholders, including shipowners, shipbreakers, workers, and local communities, about the environmental and social impacts of shipbreaking. This awareness will help to

create demand for more responsible and sustainable practices and encourage the development of new technologies and processes.

Conclusion:

Shipbreaking is an important industry that provides a valuable source of income for many countries and workers. However, the environmental and social impacts of shipbreaking are significant, and there is a growing demand for more sustainable and safe recycling practices. By developing international agreements, implementing best practices, encouraging transparency, investing in research and development, providing economic incentives, and increasing awareness, the shipbreaking industry can become more responsible and sustainable.

CHAPTER: 6

CONCLUSION

Shipbreaking, also known as ship demolition, is the process of dismantling a ship that has reached the end of its useful life. It is an industry that has been around for centuries, with its origins dating back to the early days of sailing ships. Shipbreaking has become a controversial issue in recent years due to its negative impact on the environment and the working conditions of those involved in the process.

The shipbreaking industry has long been associated with environmental and human rights concerns. The process of dismantling a ship often involves the release of hazardous materials, such as asbestos and heavy metals, into the environment. These materials can pose a significant risk to the health and safety of workers and local communities. Additionally, the working conditions in shipbreaking yards are often dangerous and unregulated, with workers being exposed to a range of health and safety hazards.

In recent years, there has been a growing movement towards ship recycling, which seeks to address the environmental and human rights concerns associated with shipbreaking. Ship recycling involves the safe and environmentally sound disposal of ships, with a focus on recycling and reusing materials wherever possible. This approach aims to minimize the negative impact of ship demolition on the environment and to improve the working conditions of those involved in the process.

Ship recycling is a complex process that involves a range of stakeholders, including ship owners, shipyards, and governments. There are a number of international agreements and guidelines that have been developed to promote responsible ship recycling practices. These include the Hong Kong Convention, which provides a framework for the safe and environmentally sound recycling of ships, and the Basel Convention, which regulates the transboundary movement of hazardous waste.

The shift towards ship recycling has been driven by a range of factors, including increased public awareness of environmental and human rights concerns, as well as changes in international regulations and standards. Ship owners are also recognizing the benefits of responsible ship recycling, including reduced liability

and reputational risk, as well as the potential to generate revenue from the sale of recycled materials.

Despite the growing momentum towards ship recycling, there are still a number of challenges that need to be addressed. One of the main challenges is the lack of infrastructure and capacity for responsible ship recycling in many parts of the world. This has led to a concentration of shipbreaking activities in countries with lower environmental and labor standards, such as Bangladesh, India, and Pakistan.

Another challenge is the lack of transparency and accountability in the ship recycling industry. There have been instances of ships being illegally beached and dismantled in unregulated yards, which can pose a significant risk to the environment and the health and safety of workers.

To address these challenges, there is a need for greater collaboration between stakeholders, including ship owners, shipyards, governments, and civil society organizations. This collaboration should focus on developing and implementing responsible ship recycling practices, as well as improving the capacity and infrastructure for ship recycling in countries around the world.

In conclusion, shipbreaking is a controversial industry that has long been associated with environmental and human rights concerns. The shift towards ship recycling offers a promising alternative, with a focus on responsible and environmentally sound practices. However, there are still a number of challenges that need to be addressed to ensure that ship recycling is a safe, sustainable, and socially responsible practice. With greater collaboration and commitment from all stakeholders, it is possible to create a more responsible and sustainable future for the ship recycling industry.

CHAPTER: 7

BIBLIOGRAPHY

Abdullah, H. M., Mahboob, M. G., Banu, M. R., & Seker, D. Z., 2013. Monitoring the drastic growth of ship breaking yards in Sitakunda: a threat to the coastal environment of Bangladesh. Environmental monitoring and assessment. 185(5), 3839-3851.

Ahmed, R., & Siddiqui, K., 2013. Ship breaking industry in Pakistan- problems and 409 prospects. International Journal of Management. IT and Engineering. 3(9), 140.

Aktaruzzaman, M., Chowdhury, M. A. Z., Fardous, Z., Alam, M. K., Hossain, M. S., & 411 Fakhruddin, A. N. M., 2014. Ecological risk posed by heavy metals contamination of ship breaking yards in Bangladesh. International Journal of Environmental Research. 8(2), 413 469-478.

Alam, S., & Faruque, A., 2014. Legal regulation of the shipbreaking industry in Bangladesh: The international regulatory framework and domestic implementation challenges. Marine Policy. 47, 46-56.

Alcaidea, J. I., Piniella, F., & Rodríguez-Díaza, E.,2016. The "Mirror Flags": Ship registration in globalised ship breaking industry. Transportation Research Part D: Transport and Environment. 48, 378-392.

Alcaidea, J. I., Rodríguez-Díaz, E., & Piniella, F., 2017. European policies on ship recycling: A stakeholder survey. Marine Policy. 81, 262-272.

Andersen, A. B., 2001. Worker safety in the ship-breaking industries. International Labour Office, Geneva.

Aydin, Y. M., Kara, M., Dumanoglu, Y., Odabasi, M., & Elbir, T.,2014. Source apportionment of polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) in ambient air of an industrial region in Turkey. Atmospheric Environment. 97, 271-285.

Basha, S., Gaur, P. M., Thorat, R. B., Trivedi, R. H., Mukhopadhyay, S. K., Anand, N., ... & Jha, B., 2007. Heavy metal content of suspended particulate matter at world's largest ship-breaking yard, Alang-Sosiya, India. Water, Air, & Soil Pollution. 178(1), 373-384.

Cairns, G., 2007. Postcard from Chittagong: wish you were here?. critical perspectives on international business. 3(3), 266-279.

Cairns, G., 2014. A critical scenario analysis of end-of-life ship disposal: The "bottom of the pyramid" as opportunity and graveyard. Critical perspectives on international business. 10(3), 172-189.

Carvalho, I. S., Antão, P., & Soares, C. G., 2011. Modelling of environmental impacts of ship dismantling. Ships and Offshore Structures. 6(1-2), 161-173.

Chang, Y. C., Wang, N., & Durak, O. S., 2010. Ship recycling and marine pollution. Marine pollution bulletin. 60(9), 1390-1396.

Choi, J. K., Kelley, D., Murphy, S., & Thangamani, D., 2016. Economic and environmental perspectives of end-of-life ship management. Resources, Conservation and Recycling. 107, 82-91.