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Occupational Injury and Health Hazards in Ship Breaking Industries in Chittagong, Bangladesh: A Challenge in Implementation of Laws

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Abstract

The due rights and diligence to working class in our country is always ignored and sometimes are compelled to work in hazardous circumstances, which frequently result in serious accidents and even death is not a surprising one. In Chittagong, a coastal city of Bangladesh is famous ship breaking place where the workers do their job without meaningful safety precautions against explosions, asbestos, heavy metals, oil residues, TBT, PCBs, or a variety of hazardous compounds present within the ship. The majority of the workforce continues to work either without taking any precautions since they are unaware of the health risks posed by ship-borne chemicals or careless and dam caring attitudes from yards' owners of foreseen threat that may cost a lot. Suffocation from breathing in Carbon dioxide (CO2) and other unpleasant inflammatory petroleum and gasses trapped in ship chambers, unexpected falls of heavy steel plates and gas explosions are the leading causes of accidents at ship scrapping yards. Workers dealing with poisonous and explosive things without proper uniform, face mask, protective gloves and goggles took more than 400 lives and thousands injuries in last two decades despite of having laws and regulations in this behalf. The study's objectives are to identify the primary sources of risks associated with ship breaking and recycling, the provisions of existing laws and conventions pertaining to occupational safety, and after examining the difficulties, to suggest mechanisms for workers' safety.

Keywords: Environment pollution, Industry, Injury, Shipbreaking, Workers' safety

1. Introduction

In modern Bangladesh, shipbreaking—also known as ship scrapping and ship recycling—is one of the most lucrative business sectors. The recycling of vessels is often carried out at piers and dry docks in developing nations with slip-structured beaches, such as Bangladesh. Shipbreaking countries contribute significantly to the world economy by preventing the abandonment or sinking ships those are no longer functional due to their lifespan or other manufactural or mechanical defects (U.S Department of Labor, 2010, p. 28). In ancient time, abandoned and broken ships were burned nearby beach or their timbers were used to rebuild a new one as those were wooden and bamboo made. But in this modern era, ships of different sizes and purposes such as bulk carrier and tanker are metal-built.

The lifespan of a ship is about 25 to 30 years (Dinu & Ilie, 2015). Because ships are structurally complicated, shipbreaking is also a difficult procedure due its huge size and life threatening toxic materials. The Sitakunda, a north coastal city of Chittagong having 18 km long yards, is one of the biggest shipbreaking locations in the globe. Despite the fact that this uprising industry drives the nation's economic growth, the hip disassembly generates hazardous contaminants that affect the whole community as well. Bangladesh emerged as the world's leading destination for abandoned ships after demolishing around 47.20 percent of oceangoing vessel in worldwide (OS, 2020). According to the United Nations Conference on Trade and Development's (UNCTAD) study , a report was revealed in "Review of Maritime Transport, 2019" stating that 70–80% of the global market for recycling oceangoing vessels is made up of Bangladesh; Pakistan 21.5% and India 25.6% (Alamgir, 2020). These three countries are in dire need of scrap metal. The steel from these broken ships is rerolled in Bangladeshi mills to enable the massive growth of building and construction projects and other industrial needs. Since the 1980s, Bangladesh's ship breaking and recycling sector has advanced significantly and at present more than 150 yards of different sizes and more than 2,00,000 workers are engaged in this sector.

Though ship breaking industry has potential future aspects in regard to economy and employment but dismantling the ships has many consequences to human and environmental issues. Hazardous materials like asbestos, heavy metals, mineral oil, bilge and ballast water, polycyclic aromatic hydrocarbons, polychlorinated biphenyls and sludge oil are all present in the vessels themselves. If not disposed of appropriately, these materials can be harmful to both people and the environment. The Ministry of Industry designated the shipbreaking sector as red, which has the greatest duty to adhere to environmental regulations, in light of such risks. In addition to the ministry, the ship breaking industry must comply with other laws and international convention and get a clearance certificate from the Department of Environment (DoE) in accordance with the Environmental Perseveration Rules, 1997. However, on October 10, 2021, the Department of Environment reduced the hazardous shipbreaking sector in Chittagong from Red to Orange, giving the operators of ship recycling yards additional freedom to contaminate the environment (Yousuf, 2021). Up until the 1960s, shipbreaking operations in developed nations were thought to be highly automated. Italy, Germany, the United Kingdom, and the United States of America were regarded as pioneers in shipbreaking operations. The UK controlled half of the worldwide sector and Scotland was

the leading world's top shipbreaking nations (Dunkley, 2016). Shipbreaking and recycling moved to South Asian countries like Bangladesh, China, India, and Pakistan when laborers desperately needed a job and health and safety laws were relaxant (Hossain & Islam, 2006). For this, shipbreaking laborers in Bangladesh receive little attention in respect of paying and health safety; domestics and international laws are not complied with properly for safety of surrounding environments. As a result, the study's objectives are to examine the current shipbreaking sector in Bangladesh, identify legal compliance barriers, identify health risk factors and provide recommendations for improvement.

2. Method

In order to make the shipbreaking sector in Chittagong safe, economical, and sustainable, the study looks at health issues, occupational injuries, environmental effects, and difficulties enforcing local rules and regulations as well as international agreements and conventions. This research project is mostly qualitative in nature and is based on primary and secondary data. Qualitative phenomena are the focus of qualitative research. It is significant in the behavioral sciences, where the goal is to identify the fundamental cause of human conduct, and it deals with the subjective evaluation of legal issues, circumstances, and attitudes (Boukema, 1980). This article utilizes primary data from observations, surveys, and case studies, as well as secondary data from books, reports, research studies, case references, newspaper stories, papers, journals, and online documents. Analyzing the data, the research approaches mainly to examine the occupational injuries prevalent in the ship-breaking industries in Chittagong, Bangladesh, focusing on the challenges in the implementation of safety frameworks.

3. Study Area

The years 1980–2023 will be covered by this study. The period chosen due to significant development in ship breaking sector of Bangladesh. About 20 kilometers long beach lies in southwest of Chittagong metropolitan – Sitakunda areas named as *Fauzdarhat-Bhatiary-Kmira.* According to Figure 1, the geographical position of the ship scrapping zone is situated between latitudes 22º 25′ and 22º28′N and longitudes 91º42′ and 91º45′E. When examining both domestic and foreign laws, the study's goals will be economic effect and environmental hazard with special focus.

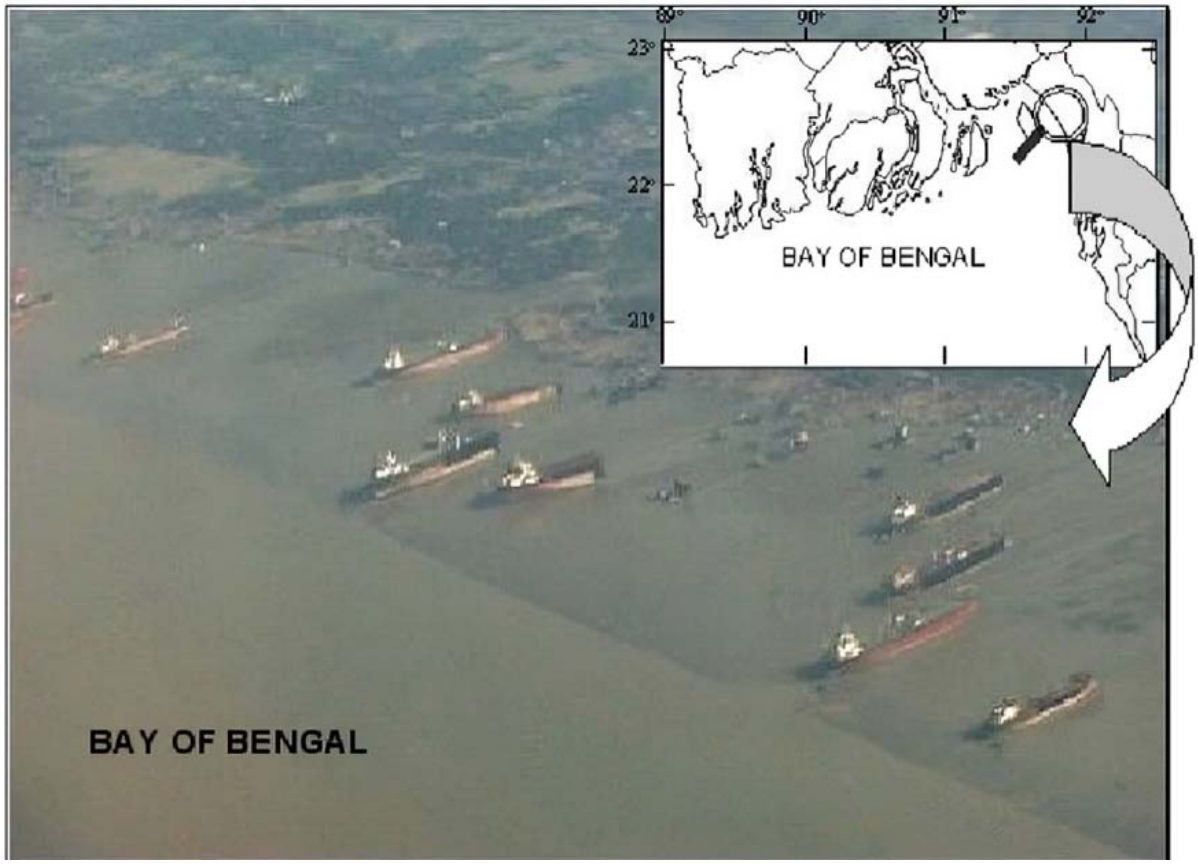

Figure 1. Geographical position of ship breaking and recycling areas at Chittagong in Bangladesh

4. History of Ship Breaking in Bangladesh

The economy Bangladesh greatly benefits from shipbreaking and recycling which produce income and reduces unemployment creating jobs in this sector. A World Bank analysis states that the ocean economy contributed US$ 6,192.98 million to Bangladesh's gross value added in 2014–15, or around 3.33 percent of the country's total GDP (Sharwar, Aamgir, & Mahmud, 2023). Shipbreaking is undoubtedly a prosperous business for the expansion of the national economy, but it also poses risks to the environment, the lives of those who work in it or live nearby, and the sea itself. Ship breaking and recycling, though inaugurated in the hands of West mainly in USA, UK, Germany and Italy, but gradually, may be due to rapid devotement of East, from 1980s to onward, the world industry is occupied by Philippines, China, Pakistan India and Bangladesh. With 30% of the global market as of January 2020, Alang Ship Breaking Yard in India is the largest, followed by Gadani Ship Breaking Yard in Pakistan and Chittagong Ship Breaking Yard in Bangladesh.

Bangladesh has a long history of shipbreaking, having developed from a small sector into one of the biggest ship recycling hubs in the world. A foreign ship of Greek flag, MD Alpine, was forced ashore near at Fouzdarhat on Bangladesh's Chittagong coast in 1960 amid a catastrophic tidal wave. The frantic attempt to refloat the ship was unsuccessful. At the end,

the ship was sold for scrap considering as abandoned. The Chittagong Steel Mills purchased the ship, moored it, dismantled it and thus the ship breaking and recycling was born in Bangladesh. Again, in 1971, Indian Air Forces bombed the Pakistani ship Al Abbas during the liberation war. Later on, it was saved and taken to the shores of Fauzdarhat shipbreaking and was purchased as scrap by Karnafully Metal Works Ltd in 1974 which marked the beginning of commercial shipbreaking in Bangladesh. However, the 1980s marked the beginning of today's vast size, prosperity and lucrative position in the shipbreaking and recycling industry. Noted that with 26 identified successful blue economy industries, shipbreaking is one of the primary opportunities for the growth of Bangladesh's blue economy (Hussain & Alam, 2019). The Bangladeshi coast's natural features also provide several benefits, making it an ideal location for shipbreaking. The region was favored by a continental shelf's lengthy, muddy beach. The extended beach had the required slopes, two spring tides throughout a lunar month, and mot importantly highway-connected transit with capital city that further connected Bangladesh countryside and other areas (Haque, 2017). In 180 shipbreaking yards, three different kinds of vessels are typically scrapped: tankers, cargo ships, and container ships. Over 50 shipyards have shut down and another 20 have stopped operations in the past year and a half, mostly as a result of the dollar crisis (Yousuf, 2024).

5. Socio-Economic Importance of Ship Breaking

Most of the ship breaking workers comes from the poverty stricken northern region of Bangladesh where there are limited employment opportunities. Statistics show that 35.19% workers from Chittagong region, 13.43% from Khulna region, 7.87% from Barisal region, 1.85% from Dhaka region, 0.92% from Sylhet region and 40.74% from Rajshahi region workers work in this industry (Hossain, CHowdhury, Jabbar, Saifullah, & Mansur, 2008). In the majority of yards, employees often do not get a formal appointment letter.

They are therefore unable to use protest to demand their pay. The type of employment, skill level, and working hours all affect pay.

According to a survey, there are over 5,00000 direct employees and around 1,00000 indirect employees working in shipbreaking without understanding their legal rights because they are illiterate and failing to take safety precautions which leads to frequent accidents at work (YPSA, 2024). The workers are impoverished, have no other employment options and their safety is frequently disregarded since they are not well-informed about the laws governing fundamental occupational health and safety requirements. The shipbreaking sector contributes significantly to our economy in a number of ways, despite several barriers and difficulties, including-

a. By eliminating the need to import steel materials, ship scrapping provides the nation with a major source of steel and saves a significant quantity of foreign currencies. Over 350 re-rolling mills have been providing more than 60% of the raw materials for the local steel industry and ship scrapping is an unavoidable source of raw materials.

b. Nearly everything aboard the ship is recycled, used, and sold again. Iron, wood and wooden materials, ware, lubricates, paints and even house hold cookeries and re-useable.

c. One of the biggest sources of government revenue, it collects taxes in a number of methods, including import duties, yards tax, and other levies.

d. About a million people work in this industry, despite concerns about worker safety, which has helped to alleviate the unemployment curse for some of the poorest people in Bangladesh, particularly those in the north, who would not otherwise have a job (Uddin, 2024).

Because of these mostly financial advantages and challenges, shipbreaking has become a significant business. However, the social and environmental costs should be taken into account in addition to these economic advantages.

6. Health Hazards and Challenges in Ship Breaking

Because of the ships' intricate structural design and the numerous safeties, health and environmental concerns involved, shipbreaking is a difficult task in countries. Workers remove all equipment in order to finish disassembling and recycling it. The workers are exposed to a variety of health risks throughout their ship recycling journey including death. In addition to the workers, shipbreaking has a significant negative influence on the air and water environments and to the local population as well. Hazardous material and chemicals including heavy metals, leads, mercury, ballast, and paint coatings, electrical switches, light fittings, fire detectors, tank-level indicators, chlorofluorocarbons (CFCs), water coolers and small freezer units are causes of life and environment threat (OSHA, 1999). Depending on its size and the contaminated cargo it transports, shipbreaking is a very dangerous and health-hazardous activity. Depending on their size and function, scrapped ships have an unloaded weight of between 5,000 and 40,000 tones and on average of more than 13000 tones, of which 95% is steel, 10 to100 tones of paint containing lead, cadmium, arsenic, zinc and chromium. Tankers additionally hold up to 1,000 cubic meters of residual oil, bilge oil, hydraulic and lubricants most of which are defined as hazardous waste under the Basel Convention (Hossain & Islam, 2006).

The majority of accidents are brought on by hazardous gas explosions, but it is not uncommon for large metal plates to fall from top decks—which may reach heights of 70 meters—to lower decks where workers are working without safety (FIDH, 2002). The majority of workers are impoverished, illiterate, and unaware of their health rights. They are also unaware of the harmful consequences of the toxic chemicals they handle on a daily basis, which contribute to fatalities that are not appropriately reported or documented. Due to the fact that yard owners view shipbreaking workers as interchangeable tools "by one for another" and even contractors failed to inform their families of these tragedies, it seems that no one is especially concerned about the suffering of these workers.

6.1 Bio-Diversity Impacts of Ship Breaking and Recycling Process

Through the release of ammonia, burnt oil spills, floatable grease balls, iron rust and other disposable waste items, ship breaking industry pollutes the coastal soil and sea water environment, harming ecological balance. The dismantling and recycling of ships releases contaminants such as petroleum hydrocarbons and heavy metals, which have a major effect

on biodiversity by polluting the environment, destroying aquatic life, and endangering marine ecosystems. In Bangladesh vessels which carry tones of noxious substances like Persistent Organic Pollutants (POP's), Asbestos are scrapped on open beaches is a serious threat to both human health and marine environment (Rabbi & Rahman, 2016). One of the causes of mesothelioma, a rare disease that affects the lining of the lungs, chest cavity, or abdomen, and asthma is asbestos. The environment becomes contaminated when heavy metals, such as polyvinyl chloride (PVC) and aromatic hydrocarbons, come into contact with it. By decreasing light intensity and preventing the flow of carbon dioxide and oxygen throughout the air and seawater, oil spills inflict significant harm. Plankton growth is impacted as a result, which severely depletes coastal fisheries. Heavy metal contamination in sediments at Bangladesh's shipbreaking location is at an alarming level, according to a study done to determine the trace metal content in the sediments (Siddiquee, Parween, Quddus, & Barua, 2012). The maritime ecosystem and human health are at risk when ships are not adequately cleansed of dangerous chemicals and odors before beaching. Heavy metals like lead are included in many ship components, including paints, coatings, anodes and electrical equipment. Through exposure to air, water, and food sources, lead is a toxic, dangerous, and cumulative environmental contaminant that impacts all biological systems (Showva & Rashid, 2019). Even though the shipbreaking business has made a substantial contribution to Bangladesh's economic growth, supplies raw materials for other industries, and creates jobs, its inherent hazardous aspects have a negative impact on the environment and human life. Sadly, such dangerous things are handled recklessly with liberal attitudes toward laws and conventions, despite the fact that they pose a lot of hazards.

6.2 Human Rights Violation Issue

The question of gross human rights violations in the shipbreaking industry arises because of the workers, their families, and the general public, especially the local community who suffer from breathing in polluted air, drinking contaminated water, eating fish from nearby water bodies, and consuming vegetables grown nearby. A business of scrap ships in Bangladesh is hazardous to lives and environment thought explores profits in exchange. Shipping companies and Bangladesh ship breakers association (BSBA) should take responsibility for the safe and responsible management of their garbage and cease abusing international standards (HRW, 2024). The shipbreaking sector undoubtedly generates profits and is essential to Bangladesh's sustainable growth, but the harsh reality is that workers are underpaid, lack training and operate without personal protective equipment (PPE), all of which raise serious concerns about fundamental human rights (Das & Shahin, 2019). The universal charter of human rights named Universal Declaration of Human Rights, 1948 specifies in article 25 of it ensures adequate standard of living with health and safety of every workers. In 2023, Human Rights Watch and the non-governmental organization (NGO) Shipbreaking Platform published a report titled "Trading Lives for Profit: How the Shipping Industry Circumvents Regulations to Scrap Toxic Ships on Bangladesh's Beaches." The report exposed how ship owners from East and South Asian nations are frequently breaking international laws and human rights by disposing of ships in Bangladesh at a lower cost than in safer shipbreaking yards abroad (BHRRC, 2023).

7. Legal Frameworks on Ship Breaking

7.1 National Legislations on Ship Breaking and Recycling

Because of having international features and maritime boundary which cannot be divided in any way from other sovereigns, shipbreaking in coastal regions is not just a problem for the individual country but for the whole globe. In the international community, which encompasses both national and international legal frameworks on a wide range of themes, including environmental concerns and labor rights and standards, the technical components must be assured.

Officially, ship breaking, also referred to as ship dismantle of end-of-life vessels began in 2006. There is no clear legislative regulatory mechanism in Bangladesh to oversee this continuous environmental damage, despite the industry's elusive scale and serious impacts. Although there are several international instruments that control the shipbreaking industry worldwide, Bangladesh has neither adopted any of them nor created thorough local laws to handle these issues (Alam & Faruque, 2014). The Bangladesh Constitution's Article 18(A) mandates that the state, among other things, conserve the environment and natural resources. However, following native frameworks are related in any ways to be complied in ship breaking and recycling process:

- Bangladesh Labor Act, 2006.
- Bangladesh Labor Rules, 2015
- Bangladesh Environmental Conservation Act, 1995.
- Environmental Preservation Rules, 2023
- Natural Waters & Lake Preservation Act, 2000
- Fatal Accidents Act, 1855
- Bangladesh Ship Recycling Act, 2018
- Ship Breaking and Recycling Rules, 2011.
- Hazardous Wastes and Ship Breaking Wastes Management Rules, 2011
- Environmental Court Act, 2000
- Ocean Fisheries Ordinance, 1983
- Chittagong Development Authority Act, 2018
- Fish Preservation Act, 1985
- Territorial Waters and Maritime Zones Act, 1974
- Bangladesh Commercial Naval Vehicles Ordinance, 1983

- National Occupational Safety and Health Policy, 2013
- The Penal Code, 1860

Among these legislation frameworks, following most important and relevant laws are high lightened below:

7.2 The Labor Act, 2006

The Labor Act (Act no. XLII, 2006) subsequently referred as BLA is the main stream law that ensures labor safety, security and workplace environment. Employers are subject to certain duties and liabilities under the Act to maintain a safe workplace, as well as occasional liability for noncompliance. The BLA's Chapter XI and a portion of Chapter XII provided a detailed description of the safety measures for employees in commercial and industrial settings. Over the past 20 years, more than 400 workers have died and 6,000 have been badly injured, amongst which the explosion of the Iranian tanker *TT Dena* on May 31, 2000, resulted in 50 deaths and thousands of irreparable illnesses because of the poisonous compounds it contained (UKEssays, 2017) Section 79 states that no worker will be assigned to an industry in a situation where there is a significant danger of illness, poisoning, or physical harm unless it is declared to be hazardous (BLA, 2006a). Chapter XII of the BLA fails to enforce corporate accountability and provide an inappropriate remedy for occupational deaths and injuries by placing arbitrary limitations on the amount of compensation that victims and their families can receive Tk. 200,000 for deaths and Tk. 250,000 for permanent disabilities.

7.3 The Ship Breaking and Recycling Rule, 2011

One important piece of legislation in Bangladesh that governs the safe and environmentally responsible dismantling of ships is the Ship Recycling Rule, 2011, after ward referred as SRR, 2011 which focuses on minimizing the negative effects on the environment and safeguarding the health and safety of those employed in the shipbreaking sector in Port City Chittagong. The aforementioned Rule of 2011 was introduced in an attempt to bring Bangladesh's shipbreaking sector into compliance with global norms, such as the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (known as Hong Kong Convention, 2009) and the International Maritime Organization (IMO). Besides this, in accordance with the order of the Honorable Supreme Court in writ petition number 726 of 2008, the Ministry of Industry is responsible for administering and formulating the provisions of this Rule. The Rule as following key features:

- ✓ For environmental safety, the Rule requires ship recyclers to make sure that no dangerous materials are discharged into the environment and to dispose of hazardous items (including asbestos, heavy metals, and oil) according to the correct processes; and the ships need to be cleaned and decontaminated prior to breaching in yard (SRR, 2011).
- ✓ For the safety of the workers they must be provided with the proper safety equipment, such as respirators, gloves, and helmets and get specific safeties training

to reduce the risk of accidents due to their frequent exposure to toxic chemicals and heavy machinery.

- ✓ The process of improving working condition, sustainable environmental preservation and implementation of occupational safety and health management should be implemented by ship recyclers (SRR, 2011a).
- ✓ Financial penalties for breaking the rules were also stipulated in Chapter VIII of this Rule, 2011. According to Section 45, the recycler must notify the SBSRB (Board) and the police as soon as possible after an accident occur. The SBSRB will suspend recycling operations for seven days while the yard is properly investigated. If it is established that the accident was caused by the yard owner's negligence, the recycler will be fined between one lakh and ten lakh, depending on the severity of the injury (Chapter VIII of SRR, 2011b).

7.4 Bangladesh Ship Recycling (BSR) Act, 2018

The purpose of this Act is to control the nation's ship recycling sector, guaranteeing safer and greener ship disassembly procedures. The Act is applicable in addition to the Ship Breaking and Recycling Rule, 2011 is also applicable. Section 8 of the Act establishes the Bangladesh Ship Recycling Board, or Board, to oversee ship recycling and ensure compliance with other international treaties, including the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, the ILO's obligations, the Labor Act of 2006, and the Environmental Conservation Act of 1995. Basic features are:

1) Designating particular areas for shipbreaking and recycling and establishing yards inside those areas, the Act governs the shipbreaking business. Violators face legal action and the forfeiture of their assets (BSR Act, 2018).

2) Importing ship will be anchored with permission; a team of Board will physically examine on it and provide No Objection Certificate (NOC) for beaching at yard.

3) Within three years of the yard's installation, yard owners must build Treatment Storage & Disposal Faculty (TSDF) in accordance with Hong Kong convention and guarantee appropriate waste management for environmental safety. To ensure worker safety, the Board will open a training facility to instruct employees, and yard owners must provide life insurance for their workers.

4) Chapter VII of the Act outlined several penalties for different types of offenses, including: establishing a yard, importing a ship, and beaching without the Board's consent. Establishing a yard outside of the zone carries a fine of up to 30 lac or a maximum 2 years imprisonment, which can be doubled for repetition of the same.

7.5 The Bangladesh Environmental Conservation Act, 1995

An excellent instance of environmental protection law that specifically addresses shipbreaking is the Bangladesh Environmental Conservation Act (BEC), 1995 that was substituted by the Environmental Pollution Control Ordinance, 1997. It offers a legislative

framework that governs the operations of ship breakers and importers with regard to hazardous waste management. On May 17, 2009, due to continuous pursuance from Bangladesh Environmental Lawyers Association (BELA), the High Court of Bangladesh announced a landmark judgment forbidding ship dismantling yards from importing vessels without first obtaining an environmental clearance certificate (ECC) from the Department of Environment (Jobaid, 2014). Ship importers, yard owners, and anyone involved in this sector are responsible for making sure that the hazardous waste from shipbreaking doesn't have an adverse effect on the environment. After ensuring a safe working environment for employees and that shipyard have suitable procedures for disposing of hazardous waste and protecting the environment, the government must make sure that ships are broken. (The Daily Star, 2009). The Court also prohibited any harmful ship designated by Greenpeace from entering Bangladeshi waters. As expressly stated in Section 15 of the Act, the department may take civil or criminal legal action against the defaulter if it so chooses (BEC Act, 1995). The Ministry of Environment and Forestry released "Hazardous Waste and Management of Hazardous Waste in Ship Breaking-2011" following the required amendments to the Act of 1995 in 2010. This rule states that in order to import ships for breaking, a No Objection Certificate (NOC) must be acquired from the respective Ministry. In addition to the enactments, on March 5th, the Ministry of Environment, Forests, and Climate published the Bangladesh Environment Conservation Rules (BECR), 2023 in the gazette. This Rule stipulates that the ministry must evaluate the Environment Assessment Impact of an industry before approving it and then classify it into green, yellow, orange, and red categories (BECR, 2023: 2).

7.6 International Legal Framework

Several international conventions and agreements have been formed to control ship recycling and handle the threats to the environment and human health. These are intended to guarantee that shipbreaking is carried out in a manner that causes the least amount of damage to communities, employees, and the environment. Few of these are-

7.7 International Convention for the Prevention of Marine Pollution from Ships (MARPOL), 1973 and Protocol of 1978

The International Maritime Organization (IMO) adopted the MARPOL Convention in 1973 that forbids ships including ferries, yachts, small pleasure craft, general cargo and container vessels, oil tankers, and cruise ships from releasing rubbish, into the ocean that could contaminate the marine environment. Any ship transporting toxic liquids needs to get an international pollution prevention certificate. Additionally, the idea of "special sea areas" is introduced, which are thought to be vulnerable to oil contamination and where oil discharge is strictly prohibited, with very few exceptions (MARPOL, 1973). From six Annexes, Annexes I, II, IV, and V of the MARPOL Convention require the establishment of suitable waste-reception facilities in order to receive garbage from ships during ship breaking (Alam & Abdullah, 2014).

7.8 Basel Convention (BaC) on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal, 1989

Promoting environmentally sound waste management and disposal, reducing the quantity of hazardous waste, and encouraging local waste management are the three goals of the Basel Convention. The aims of BaC are to reduce the harmful effects that the production and trans-boundary transportation of hazardous waste has on ensuring the environment and human health safe. Additionally, it regulates the safe and environmentally responsible disposal of hazardous material (Werven, 2019). It is a global agreement that was created with the intention of limiting the flow of hazardous waste between countries, particularly from developed to developing ones. Under the BaC, end-of-life ships may be classified as hazardous waste, and their trans-boundary movement is governed by territoriality, with the exporting and importing nations sharing jurisdiction and accountability for ensuring their environmentally sound disposal (Hadjiyianni & Pouikli, 2024).

7.9 The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009

Bangladesh ratified the convention on 26 June, 2023. The convention also referred to as the Hong Kong Convention (HKC) that ratified on 15th May in 2009 in China and subsequently the Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and Their Disposal was developed in collaboration with the International Labor Organization, IMO Member States, and nongovernmental organizations. The convention's goal is to guarantee that recycled ships won't cause any unwarranted dangers to people's health or safety due to present shipbreaking procedures and to guarantee that ship recycling is carried out securely and without endangering the environment or public health (Roy, Mojumder, Sakin, & Shaheen, 2022). As per HKC, throughout the course of the ships' lives, ship owners must submit an Inventory of Hazardous Materials (IHM) and are subject to restrictions on the use of specific materials during construction and maintenance. Flag states are required to set up training, provide protective gear for the workers, and have a ship recycling plan for any ship they destroy. The ship owners must inform the flag state before dismantling takes place to get a "Ready to Recycle" certificate for the ship (Otsubo, S. 2014). The HKC mandates safe and environmentally friendly ship breaking procedures for oceangoing and coastal ships weighing 500 gross tons or more, prohibiting hazardous materials on dismantled ships (Ahammad & Sujauddin, 2018).

8. Economic Contribution of Ship Breaking Industry

In the current globalized world, no nation can rely solely on its natural resources. Therefore, it is essential to source alternate resources, particularly for emerging nations like Bangladesh. Experts refer to it as the "blue economy" since the seas are thought to be a source of food, minerals, medicine, and energy. Shipbreaking industry of Bangladesh has contributed significantly to the economic development of the nation by fostering commerce, employment, and the construction of infrastructure, among other areas. A summary of its contributions is provided below:

8.1 Contribution to Steel Industry

Contributing between Tk1,200 and Tk1,400 crore in import duties, VAT, taxes, and certification fees, the shipbreaking sector is a major source of income for Bangladesh. In addition to its financial benefits, the sector has helped to support the nation's steel industry, which now generates Tk50,000 crore in revenue annually (Yousuf, 2024).

8.2 In Employment Sector

In addition to directly employing more than 20,000 people from across the nation, the industry indirectly supports about 150,000 jobs in a variety of related sectors, particularly the establishment of three major business fields or markets in the area: Sitakunda, Kadamtali in Chattogram, and Postogola in Dhaka, where a variety of tools, machinery, and pipes salvaged from decommissioned ships are sold. Additional economic value is added when these items are recycled in nearby sectors (Yousuf, 2024a).

8.3 Foreign Exchange Earnings

Through the importation of huge amounts of decommissioned ships, primarily from Western countries, and the sale of their metal and parts to worldwide markets, the shipbreaking industry attracts international commerce and earns significant foreign cash. In addition to this, Bangladesh manufactures ships and merchant vessels that it sells to western nations.

Besides mentioned above fields, over 600 items including as paints, chemicals, crokeries, furniture, kitchen appliances, kids item, showpieces, sanitary products and numerous electrical items shops and manpower are involved in the shipbreaking sector. These goods are in great demand in local markets due to their affordability, durability, and quality, and they have the potential to be a major contributor to Bangladesh's economic development.

9. Findings and Recommendations

Although Bangladesh's shipbreaking sector contributes significantly to the country's economy; it has negative social, environmental and serious long run health effects. There are several occupational and environmental health concerns associated with shipbreaking since it is a dangerous and dirty work that endangers life and broader ecosystem. For making the ship dismantling industry safer and more sustainable as per local laws and international conventions and practices, it is recommended that-

1) The ship breaking agency must follow the Hong Kong Convention which prohibits the dismantling of life-ending ships without notifying the flag state in order to make the industry green and to protect the environment from hazardous materials carried in ships, is the most important international agreement that ensures safe and unnecessary health risks to people resulting from ship breaking. If a ship breaking agent or owner repeatedly violates the Convention's provisions, their license may be suspended or revoked.

2) On the one hand, shipbreaking is a rapidly expanding business that makes significant contributions to the national economy, but on the other, it is detrimental to the environment. Existing national laws and regulations must be closely adhered to for sustainable

development in order to improve the economic and environmental conditions.

3) The environment is physically and environmentally contaminated by the residual wrecked vessels which frequently combine with soil and seawater and have an adverse effect on local marine life and human health (Barua, 2017). For better balanced ecosystem, one must abide by the environmental preservation laws, rules, and recommendations of the apex court in this regard.

4) A specialized hospital and fire stations equipped with all the latest fire extinguishing equipment should be located nearby. The administration should choose a "confined, isolated and protected" region for ship scrapping rather than the coastal areas where only properly qualified workers would operate while wearing personal protective equipment (PPE).

5) The sector's contribution to the national economy does not outweigh the inherent environmental risks that ship disassembly poses now and in the future. Before beaching, vessels must pump out as much oil and other hazardous materials as possible at the anchorage. Yard owners who fail to do so risk legal repercussions for spilling or dumping these hazardous materials into the ocean or other coastal areas.

6) International organizations and NGOs should implement and oversee a sustainable shipbreaking policy that is shared by all countries engaged in this sector. Together, stakeholders should conduct short- and long-term scientific studies on the effects of ship breaking on the environment and human life and quantify the results immediately and appropriately without waiting for more serious damage.

7) Given that human life is more precious than the environment, the shipbreaking industry should ensure workplace safety management and an occupational health policy. The renewal of the yard's license should be contingent upon the minimal degree of policy compliance.

10. Conclusion

Bangladesh's ship breaking industry, with investments exceeding Taka 10,000 crore and an annual turnover of around $2.46 billion, is not only dismantling vessels but also forming the country's economic foundation (Yousuf, 2024b). Competing with other industries, the shipbreaking sector has emerged as one of the leading employment creators and contributors to the expansion of the national economy, primarily via the production of steel for infrastructure construction. Despite all of the opportunities and advantages, the shipbreaking industry nevertheless has challenges with worker safety, workplace accidents, and ecological imbalance due to pollution of the air, land, and water. While it is impossible to totally eliminate environmental damage, it can be minimized by adhering to international standards for the disposal of residual ship components. Providing workers with safety equipment and training in accordance with legal and convention requirements may help to ensure workplace safety and reduce casualties. Owners of the yards and the government should think and work together to hold and foster the global market of breaking.

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