

CHAPTER 1

act of shipbreaking



As a point of departure, this chapter will clearly outline current methods of ship disposal and ultimately propose this study's outcome as a fourth alternative. Moreover, the process and environmental hazards associated with shipbreaking will be outlined in order to prominently accentuate the dire need of spatial intermediation.



Figure 1.1. Young Welder (McCurry, 1994)

THE ACT OF SHIPBREAKING

“We must plant the sea and herd its animals using the sea as farmers instead of hunters. That is what civilization is all about, farming replacing hunting...”

Jacques Yves Cousteau , 2010

The process associated with the clearance of vessels at the conclusion of their commercial lifespan devises a pronounced connotation on the recurrent regeneration of the merchant marine fleet industry and the sustainable development thereof (Sundelin,2008). As briefly introduced in the introduction of this study, currently there are three primary methods of ship disposal being deployed within the maritime industry. Listed in terms of preference and admiration, **domestic recycling** (also known as shipbreaking), **long-term storage** and **reefing** allows for a diverse range of methods to be employed upon the decision of sanctioning a ship to be scrapped.

Long terms storage is the **least desired alternative**. As the berthing and conversion of vessels into applicable storage facilities are **expensive** and still do not alleviate the **inclining amount of decommissioned vessels** currently situated within ship graveyards. As opposed to complete dismantling, long-term storage is the course of action with the greatest amount of cost uncertainty. These uncertainties are primarily associated with the ships **declining age and intervals between dry dock inspections**. “Preservation costs for ships in long-term storage comprise the direct labor and material costs for maintaining these vessels’ long-term integrity while waterborne and the indirect facility and support costs associated with this maintenance” (Hess et al, 2002:10). Long term storage is regarded by many as **not truly being a feasible option** for the problem of ship disposal, as it only **defers the problem** from one generation to the next. Whether a ship is stored for a certain amount of years, it would still have to be dealt with in the end.

As the **least desired method of disposal**, reefing allows for a promising and novel alternative to this budding occurrence. During 1830, the first documented artificial reef was created, where log huts were sunk off the coast in order to improve fishing conditions. Ever since the latter part of the twentieth century, 80% of all artificial reefs constructed within international waters utilise **consumed materials of opportunity**. These include rock formations, fauna and flora, ocean-going vessels, and in very recent years , unwanted oil and gas recovery structures (Marine Fisheries Commission, 1997:45). As this deed is regarded as being a **humanitarian act** of courtesy toward marine surroundings, the donation of a “clean” ship to be reefed, possesses **little to no monetary gain** for its owner. On the contrary, the conversion of ships up to environmental standards is quite costly, as **all hazardous entities** contained onboard must be **disposed of before the sinking** of such a ship can commence - thus rendering this method as the least desired disposal option.

At present, there are **no unvarying federal criterions over areas under international cognisance**. Moreover, the responsibility of **reefing standards** is typically engendered by the body responsible for the project in conjunction with the local federal environmental and/or coastal zone regulators (International Department of Natural Resources, 1991:n.p.). Even though reefing is not employed as habitually desired, there is a history of success associated with the usage of sunken ships to construct artificial reefs that **advance marine life, commercial and sport fishing, and leisure diving** (Hess et al, 2002:66).

Ship breaking is the third and most common method associated with the disposal of discharged ships (refer to figure 1.2.). Shipbreaking is the practice vessels are subjected to upon **decommissioning**, during which the obsolete **structure is dismantled for scrapping or disposal purposes**. Generally conducted at grave docks or dismantling piers, the removal of all equipment and machinery, along with the actual cutting down of the ship's infrastructure, occurs. Due to the structural convolution of oceanic liners and the numerous **safety, health and ecological disputes** involved, shipbreaking is regarded as being an **impudent and laborious procedure** (OSHA, 2001:n.p.). During this time, 95% of a ships' valuable steel can be recovered, rendering it as a highly profitable ship disposal opportunity (Greenpeace, 2005:n.p.). Since the onset of this practice, "ship breaking activities migrated to semi-industrialised countries, such as Spain, Turkey and Taiwan, mainly for the availability of **cheaper labour** and the existence of the **re-rolled steel market**" (Hossain and Islam, 2006:2).

In the section to follow, this process will be elaborated upon, casting light on its **environmental impact** and **altruistic repercussions**.

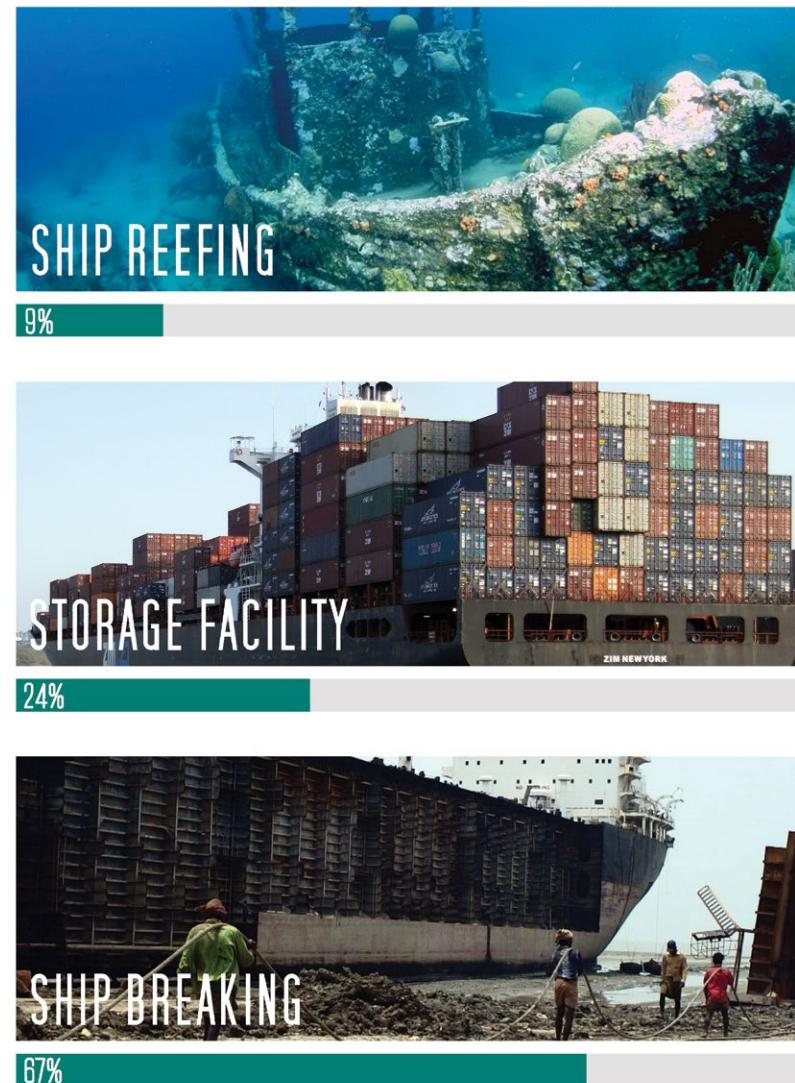


Figure 1.2. Popularity of Ship Recycling Techniques (Author, 2016)

1.1

THE SHIPBREAKING PROCESS

The lifespan of any oceanic vessel consists out of **five fundamental periods**. As illustrated in figure 1.3, the life cycle of a ship is initiated upon its Initial planning during which conceptualisation and design transpires. Thereafter, the equipment and infrastructure is ordered and the ship is constructed. The fourth phase, being the lengthiest on average between 25 -30 years, is dedicated towards the **operational extent of a vessel**. The fifth and **final stage** dedicates its progression towards the concluding nature of any **decommissioned vessel**. In order for the convoluted process of shipbreaking to ensue, the present proprietor of the ship must choose between **two selections of trade**. The first being to **retail the ship directly to a scrap yard operator**, on the condition that the ship be transported to the facility. Alternatively, the second option allows for the decommissioned vessel to be **sold to a cash buyer**, who subsequently will resell it to the shipbreaker (Sawyer, 2002:548).

The unit of currency in which a buyer is compensated for is determined by the **Light Displacement Tonnes (LDT)**, which amounts roughly **equivalent to the steel weight of a ship**. As the amount of steel used during construction varies from on vessel to another, it is approximated that the average steel content mounts up to **90% of the total resource** usage. The measurement obtained from the LDT provides an **upright assessment of the quantities of materials that can be obtained when the ship is dismantled** (Mikelis, 2008:228). In addition to the actual quality and quantity of steel, the price per LDT is also subjected to market demand and supply, ship type, equipment onboard and the current domestic taxation on scrapping tonnage. It has yet to be determined whether or not the amount of hazardous materials (used during construction or operation) onboard also affects this price (COM, 2007:5).



Figure 1.3. The Lifecycle of an Oceanic Vessel (Author, 2016)

Upon purchase, the ship is delivered in its **current condition**. Customarily this final voyage will also act as a **concluding opportunity to transport cargo** to the destination where it will also be disposed of. The quality of the scrap yards differ amongst the five main shipbreaking states - resulting into a **differentiation of methods** applied when breaking a ship. In more developed countries, such as China and South-America, dock-like facilities are utilised. However, in the absence thereof, a **vessel is merely steered up onto the seashore, a procedure called beaching**. Out of the five capitals, beaching is essentially used in Bangladesh, Pakistan and India (Sawyer, 2002:546). High tide permits the possibility of shoring a ship far up the beach so that the ship is effortlessly manageable by the workers during low tide.

Once the ship is **moored into position**, have it be in a dock or on a beach, the process of actual **shipbreaking can occur**. As outlined by the International Maritime Organisation (IMO) (2010:5), the procedure should be carried out in the following sequential arrangement:

- VESSEL SURVEY -

The **identification** of all storage areas, compartments and tanks that might contain **hazardous liquids and materials** must be drawn up diagrammatically. Materials onboard currently classified as being hazardous can include fuels, oils, asbestos, PCBs, lead and other perilous waste. Once identified, a **systematic sampling approach** is conducted on compartments that will be cut first. However, in lieu of sampling, most developing countries **discard this step, assuming that particular substances hold harmful substances, thus choosing to dispose them as such**. When this occurs, proper engineering control must be practiced by employer in order to ensure that both workers and those in close vicinity of the removal are **appropriately guarded from exposure**.

- REMOVAL OF FLAMMABLE MATERIAL AND LIQUIDS -

The **subtraction** of leftover fuels, oils and other liquid such as bilge and ballast water from the ship commonly happens throughout the shipbreaking procedure. Water accumulated in the bilge (part on the external façade of a vessel's hull where the perpendicular flanks meets the bottommost curvatures) is **appraised and disposed of suitably**. As water may continuously amass on the beached vessel due to rain and hot work cooling, it will unremittingly have to be removed appropriately. Booms are positioned around the vessel in order to contain any spillage that might occur during the above mentioned process. Following removal activities, Once removed, **a marine chemist must certify the overall insurance of admission and commencement of recycling**. Thereafter, it is required that a proficient individual constantly **monitor areas of contact** to ensure that it remains compliant with the previously issued marine chemist's certificate.

- REMOVAL OF EQUIPMENT -

To begin, small fixtures such as **anchors and chains are removed**. Thereafter all large, reusable equipment, such as **engine components**, are removed depending on their accessibility. In order to allow for the hull to be pulled into shallow water, the **propellers** will have to be removed, if not already detached during the initial beaching stage.

- REMOVAL AND DISPOSAL OF ASBESTOS AND PCB -

The removal of **polychlorinated biphenyls (PCBs)** and **asbestos-containing materials (ACMs)** are conducted in two phases. Prior to cutting away a section of the vessel, **ACM is removed from areas that are to be cut and PCBs are removed from areas that are readily accessible**. The same process is followed when the expurgated section is moved ashore and the dismantling thereof commences. As the **boiler and engine quarters of most decommissioned vessels contain the most asbestos**, it is expected that the removal of all ACMs therein be the **most time-consuming**.

- PREPARING SURFACES FOR CUTTING -

Preservative coatings such as paint or varnish **must be stripped** in addition to the removal of ACMs, PCBs and combustible materials. Cut-line preparation may be required on hard-to-remove material surfaces. In such an event where flame removal and grit-blasting of paint is needed, precautionary measures must be enlisted as the released **toxic metals and volatile components** of paint can be **harmful to workers** if exposed thereto.

- METAL CUTTING -

During the cutting phase, the upper decks, superstructure and systems are cut first, followed by the main deck and lower decks. Metal cutting is usually done manually, using oxygen-fuel cutting torches, but may be done with shears or saws for nonferrous metals. Typically, as large parts of the vessel are cut away, they are lifted by crane to the ground where they are then cut into specific shapes and sizes required by the foundry or smelter to which the scrap is shipped. As cutting continues and the weight of the structure is reduced, the remaining hull floats higher, exposing lower regions of the hull. Ultimately, the remaining portion of the hull is pulled ashore and cut.

- RECYCLING OR DISPOSAL OF MATERIALS -

Scrap metals, including steel, aluminum, copper, copper nickel alloy and lesser amounts of other metals are **sorted by grade and composition**, and **sold to remelting firms or to scrap metal-brokers**. Valuable metals such as copper in electric cable that are mixed with nonmetal materials may be recovered using shredders and separators. The shredders produce a gravel-like mixture of recyclable metal particles and nonmetal 'fluff', which is not recyclable and needs to be sampled for hazardous materials and disposed of according to state and federal regulations. The metals are then separated from the fluff using magnetic separators, air flotation separator columns, or shaker tables.

Since the onset of the above manifesto in 2010, only **two out of the five major shipbreaking capitols are governed under its legislation**, as most developing countries **cannot afford the costly technology associated with the correct procedure of environmental conscious shipbreaking** (refer to figure 1.4). Being that these developing countries account for most ship recycling activities, the question of whether or not **ecological dismantling** of ships is occurring remains dubious.

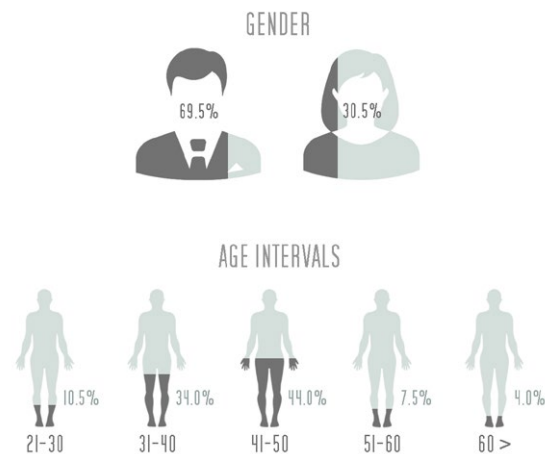


Figure 1.4. Shipbreakers at Work in Bangladesh (National Geographic, 2015)

1.2 ENVIRONMENTAL AND OCCUPATIONAL HARMS

The activities associated with shipbreaking are being condemned as the entire progression necessitates numerous **tasks deemed highly treacherous**. Regardless of the copious amount of hazardous substances to both **ambient environments and workers present** during the practice, the entire scrapping process remains **manual**. As no training or preparation is provided and no safety measures implemented, workers are unaware of the potential threats.

Presented (figure 1.5) in table format are all environmental harms and common work-related hazards that may result into **injuries, ill-health and in severe instances, death**.



SERIOUS ACCIDENT HAZARDS

Fire and explosion: explosives, flammable materials | Falls from height inside ship structures | Being struck by falling objects | Struck by moving objects | Compressed between heavy objects | Slipping on wet surfaces | Snapping of cables, ropes, chains, slings | Sharp objects | Handling heavy objects; poor access to progressively dismantled vessels | Oxygen deficiency in confined spaces | Lack of PPE, housekeeping practices, safety signs



HAZARDOUS SUBSTANCES

Asbestos fibres, dusts | PCBs & PVC (combustion products) | Heavy and toxic metals: lead, mercury, cadmium, copper, zinc etc. | Welding fumes | Organometallic substances: tributyltin, etc. | Volatile organic compounds and solvents | Lack of hazard communication: storage, labeling, material safety data sheets | Inhalation in confined and enclosed spaces | Batteries, fire-fighting liquids | Compressed gas cylinders



PHYSICAL HAZARDS

Noise | Vibration | Extreme temperatures | Poor illumination



MECHANICAL HAZARDS

Trucks and transport vehicles | Shackles, hooks; chains | Scaffolding, fixed and portable ladders | Cranes, winches, hoisting & hauling equipment | Impact by heavy and sharp-edged tools | Lack of safety guards in machines | Power-driven hand tools, saws, grinders, abrasive cutting wheels | Poor maintenance of machinery



BIOLOGICAL HAZARDS

Toxic marine organisms | Animal bites | Risk of communicable diseases transmitted by pests, vermin, rodents, and insects that's on ship | Infectious diseases: TB, malaria, dengue, fever, hepatitis, respiratory infections, etc.



ERGONOMIC AND PSYCHOLOGICAL HAZARDS

Repetitive strain injuries, awkward postures, repetitive and monotonous work, excessive workload | Mental stress, strained human relations: aggressive behavior, alcohol and drug abuse and violence | Long working hours and temporary employment | Poverty, low wages, under age, lack of education and social environment



GENERAL CONCERNS

Lack of safety and health training | Inadequate accident prevention and inspection procedures | Poor work organisation | Inadequate emergency, first-aid and rescue facilities | Inadequate housing and sanitation | Lack of medical facilities and social protection

Figure 1.5. Environmental and Occupational Harms (Author, 2016)

1.3

SHIPBREAKING LEGISLATION

As noted upon the examination of the aforementioned arrangement, it is quite evident that an **environmental intervention is required** in order to **administer the activity of shipbreaking**. In Member States of the Organisation for Economic Co-operation and Development (OECD), constituents that enclose harmful materials are subjected to severe observation, and their clearance harshly standardised, thus rendering it highly costly. As most substances found in ships are defined as hazardous under the existing 1989 Basel Convention Act, **industry avoids the affliction of adhering** to the elevated rates of compliance in developed countries. Subsequently, **health issues and occupational safety emerge** - particularly in association with the dismantling of beached ships in India, Bangladesh and Pakistan, where **regulations are limited and labour inexpensive** (Rousmaniere, 2007:57).

The **difficulties associated with maritime regulations** are governed by the fact that the world's oceans are **not owned by any country**. The fact that oceangoing vessels can sail freely between **different jurisdictions offers hindrance in terms of conventions** (refer to figure 1.6). With a regulatory framework being developed by various organisations, legislation on ship breaking is in its infancy. Regardless of current international obligations that shipping industries must honour based on either customary law or explicit treaties, "**unconsciousness and lack of government patronisation** are facing several internal and external problems" (YPSA, 2005:n.p.). Adopted in 1998, but only entered into force in 2004, the Rotterdam Convention on Prior Informed Consent (PIC) is one of the first illustrations of customary law pertaining to trans-boundary movement of hazardous waste produced by ship breaking. As dictated by customary law, upon arrival at the yard of dismantling, end of life vessels are subjected to



THE ROTTERDAM CONVENTION VOLUNTARY LAW

Not sufficient to stop unsafe scrapping. In several cases Greenpeace found out that end of life vessels have been exported to a ship breaking country without the importing authorities being alerted.



THE BASEL CONVENTION VOLUNTARY LAW

Open Ended Working Group has noted that a ship may become waste, in accordance with article 2, and that at the same time it may be defined as a ship under other international rules. This is a loophole that ship owners exploit.



THE LONDON CONVENTION VOLUNTARY LAW

The fundamental obligation is to prohibit the deliberate disposal of waste from vessels at sea. However, the application of this convention on the issue of ship breaking is debated. At the time of set up, the issue of ship breaking was not a problem.



PREVENTION OF MARINE POLLUTION FROM SHIPS (MARPOL) VOLUNTARY LAW

Shipbreaking would apply to the discharges that occur from ships sent for shipbreaking, which take place within the territorial waters. Interestingly MARPOL obliges the person in charge of the vessel to report any actual or probable discharge above the permitted level.



UNITED NATIONS CONVENTION ON THE LAW OF THE SEAS (UNCLOS) COMPREHENSIVE REGIME

Port states have discretion for enforcement within their territorial waters. Flag states are obliged to enforce the international rules and standards, as well as their own pollution laws and regulations, wherever the violation occurs.



INTERNATIONAL MARITIME ORGANIZATION (IMO) COMPREHENSIVE REGIME

Greenpeace believes that the IMO guidelines will not at all change the current practices of ship owners. The IMO failed to accept and complement the existing legislations and regulations dealing with the export of hazardous wastes.



UNITED NATIONS ENVIRONMENTAL PROGRAM (UNEP) VOLUNTARY LAW

These guidelines will make provisions for the proper removal of hazardous wastes and substances, including the collection and disposing of wastes in an environmentally sound manner. These guidelines will not, however, cover issues of health and safety.



THE INTERNATIONAL CHAMBER OF SHIPPING (ICS) VOLUNTARY LAW

Suggest the creation of a "green passport" for new, environmentally friendly ships. Here too, the voluntary and non-enforceable nature of these guidelines seriously weakens their domain and potential effect.

Figure 1.6. Shipbreaking Conventions (Author, 2016)

prior declaration of all known hazardous substances onboard. It is then the **responsibility of the notified importing country to arrange adequate treatment schemes before shipbreaking can commence.** Additional conventions recently established such as The Basel and London Convention, The International Convention for the Prevention of Marine Pollution from Ships (MARPOL) and The United Nations Convention on the Law of the Seas (UNCLOS), all rely on the prior notification of intention. **However, it has been reported that decommissioned ships remain to be exported to ship breaking countries without the importing authorities being alerted - thus no environmentally friendly methods of waste disposal utilised before shipbreaking occurs.**

Aside from these conventions, permissible organisations have been established that govern sea related matters. The function of the International Maritime Organisation (IMO) is to **administer all matters relating to issues that might arise during a ship's design, construction, operation and recycling.** Under the patronages of its Maritime and Environmental Protection Committee, the identification of **disposal guidelines** set out for all those involved are to be **followed voluntarily.** Greenpeace, a non-governmental environmental organisation, argues that **"these guidelines will not alter current practices, as it fails to accept and complement the existing legislations and regulations as proposed by numerous conventions"** (Vardar and Harjono, 2002:19), as mentioned above. Subsequently, the guidelines thereof fall **outside international law** allowing the possibility of misuse to asylum any prohibited practice. Additional organisations attempting to improve shipbreaking practices, such as The United Nations Environmental Program (UNEP) and The International Chamber of Shipping (ICS), weaken their potential effect and domain due to its non-enforceable and voluntary nature (Hossain and Islam, 2006:41).

Regardless of the previously stated conventions, it is extremely perturbing to note that **very little has been achieved in terms of enforcement.** Furthermore, the **lack of freedom of association, welfare provisions and social protection for the related labors are of identical distress.** In a state of total vulnerability, workers are forced to "work under the regulations of a private individual's will, rather than that of the law" (FIDH. 2002). As argued by Hossain and Islam (2006:45), "the problem is not so much the lack of legislation - but, as often, the nonenforcement of existing ones, and the weakness of remedies". As the **profit** of shipbreaking is dictated by **time**, any **obstacles preventing quick dismantling are eradicated, along with any securities and right of the safety and health of all workers.** As a result, the need of a **diverse and harmonious policy** for sustainable ship breaking activities **remains essential and unresolved.**

The purpose of this chapter was to place emphasis on the **environmental threats** associated with the **unprecedented course most ships are subjected to upon decommissioning.** On account of what have been stated, the dire need of a **precautionary solution to health and ecological perils**, inherent in the process of ship breaking, is obligatory. Founded on this precise demand for a solution, the feasibility of this research paper's pragmatic response aims to act as a possible alternative. **As opposed to regarding shipbreaking as being the only recycling method worthy of monetary gain, why not reuse these decommissioned vessels on land as a continual source of revenue?**



Figure 1.4. A Shipbreaker's World (Azri, 2013)