ANALYSIS OF THE SHIPBREAKING IN INDIA

Submitted to the School of Maritime Management, Indian Maritime University in partial fulfilment for the award of degree in MBA Port and Shipping Management

Submitted

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DECLARATION

I, **Akhil Balachandran (Reg. No. 2103304002),** student of School of Maritime Management, Indian Maritime University –Chennai Campus, hereby declare that this Project report titled **Analysis of ship breaking in India** submitted in partial fulfilment of the requirement for the degree of Master of Business (MBA) in Port and Shipping Management is my original work carried under the guidance of my project guide. It has not formed the basis for the award of any Degree/Diploma of any University/Institution. The information submitted is true and original to the best of my knowledge.

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CERTIFICATE

This is to certify that the project report entitled **'Analysis of ship breaking in India'** submitted to the School of Maritime Management, Indian Maritime University, Chennai Campus., in partial fulfilment for the award of the degree of Master of Business Administration (MBA) in Port & Shipping Management, is a recordof work carried out entirely by **Akhil Balachandran,** Reg. No. **2103304002.**

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ABSTRACT

This dissertation is a study of the economic and environmental impact of the shipbreaking industry in India. Unquestionably, compounds onboard ships nearing the end of their economic lives need to be handled properly, both for the sake of the environment and the safety of the crew. It is clear that the problem that shipbreaking activity poses in terms of the environment, industry, and commerce needs to be addressed.

The maritime business as a whole is investigated, as well as the various elements that affect a ship's lifecycle. There was also discussion of the safety and environmental issues that observers of the industry have said the Asian nations that break ships ignore. This has led to research on the idea of shipbreaking practices in underdeveloped nations.

An overview of the current initiatives being made by environmentalist groups and shipping associations is provided. A national government may find it useful to take into account the specified international legal standards in the future when revising its own legislation with regard to the issue of ship scrapping. These principles are relevant to the industry.

In order to better safeguard the marine environment, the government is given the opportunity to take a quick look at the Indian shipbreaking industry and examine its potential.

In the final chapter, conclusions are drawn and some suggestions are offered. The limitations that can impede the growth of the sector are identified, as are the shortcomings.

Table of content

Table of Figures

List of Tables

CHAPTER I

INTRODUCTION

1.1 Background

The Ships represent a considerable value even after its economic life when the carrier is no longer economically viable to the shipowner. A vital source of raw materials for steel mills is scrap steel provided by ageing vessels that are about to be decommissioned. It is estimated that up to 90% of the weight of a ship is made up of structural steel. If it is not salvaged and is allowed to degrade, it represents a significant waste of resources.

During the nineteenth century, ship recycling, as it is now known, was restricted to the European continent. It involved recovering steel, functional machinery, tools, and other dismantled elements. However, as countries in this region industrialised and developed, and environmental concerns gained traction, the ship recycling industry relocated to developing nations that are working to achieve the much-needed expansion of their industrial sectors.

Ship recycling requires a lot of labour and is a valuable, reasonably priced source of steel for building; nonetheless, shipbreaking is a dirty, risky activity for the environment. The majority of ship scrapping in the globe today is done manually, laboriously, on beaches with little to no infrastructure and with environmental concerns frequently taking a backseat. Over time, there has been an increase in worry about the activity of scrapping ships in developing nations and the potential effects this may have on the environment and public health.

Because of the construction boom that occurred in the early 1970s, the shipping industry is currently dealing with a sizeable number of ships that are getting close to retirement age. The International Safety Management (ISM) Code's implementation, new, stricter regulations for tankers entering their fifth survey, and new regulations for ageing bulkers are anticipated to make it easier for most of these ships to reach the shores of the major shipbreakers. India, Bangladesh, and Pakistan are currently the top three nations for shipbreaking. The identification of relevant international venues to address the issue that the sector represents has greatly benefited from newspaper articles that have been published about ship scrapping activities in these nations. Observers are persuaded that the shipping industry, particularly the shipowners, are partially to blame for the accident after reports from Alang in India, both in

the form of television programmes and print media that are accompanied by pictures and show the scrapping operations being carried out without using basic safety equipment like hard hats and protective boots.

The shipbreaking activity is currently one of the most important topics being discussed in international forums, following the trend that shipbreakers, shipowners, and national administrations have recently become the target for the future control measures related to the safety practises in the shipbreaking industry. Although these control measures are not anticipated during the next several years, a number of initiatives and suggestions could be started to lessen the issues. The acceptance of this advice and the ideas will then depend on developing countries' readiness to take into account the potential economic benefits that the ship recycling sector may provide.

1.2 Aims and Objectives

This project aims to conduct an investigation of the numerous factors that affect shipbreaking activities in India. It tries to examine the crucial questions regarding how the current shipbreaking practise could be improved. The following list of the study's objectives is included in this:

1. To present an evaluation of the environmental effects of shipbreaking.

2. To provide a review of the shipbreaking industry's financial effects.

3. To compile necessary and appropriate rules, suggestions, and proposals for shipbreaking action.

4. To investigate India's shipbreaking industry.

5. To offer suggestions in light of the analysis.

1.3 Methodology

The selection of the subject was timely, thus gathering research hasn't been as simple as anticipated. The majority of the information for the study comes from journals, conference proceedings, and technical reports because there aren't many published books that cover the subject. The study was initially done by collecting papers and data. The Ministry of

Environment and Forest (MoEF) and the Ministry of Port Shipping and Waterways (MoPSW), which regulate shipbreaking in India, have also been contacted. Some of the opinions and inferences made in this study are purely mine and are based on my examination of the data gathered.

1.4 Scope and Limitation

This study is limited to the ship demolition industry in India focused on the Indian state Gujarat, on the western coast of India. Since shipbreaking is such a vast subject, this dissertation won't cover everything related to it, including the management, investment, and financial components. Instead, it will concentrate on broad and useful issues pertaining to shipbreaking practises, which must be governed by national law. In relation to the environmental and safety concerns during the ship scrapping operation, an overview of the most recent global perspectives on shipbreaking practises in developing nations will also be given. The emphasis is on the safety element of ship dismantling and how it might be improved.

The study done, as well as the results and suggestions provided in this paper, may offer accurate and illuminating information concerning the potential effects of the shipbreaking activity. An administration might utilise this information when deciding whether to build the facility and pass national legislation to enhance safety procedures in the shipbreaking sector.

1Figure Ship Demolished in Alang yard

CHAPTER II

SHIP RECYCLING AS AN INDUSTRY

2.1 Ship demolition, Ship scrapping, Ship recycling

When the industry was founded in the 19th century, the disposal of old ships was simply referred to as "ship demolition" or "ship scrapping" (Sinha, 1998). Both phrases indicate that the ship has already reached the end of its useful economic life and that its worth has been gone. The ship's hull and primary engines are then destroyed and separated as scrap metal, which is later used for other projects.

As the industry developed, various authors and publishers coined the term "shipbreaking" to describe this type of ship disposal. This was the popular term until the International Maritime Organisation (IMO) was informed of the issues the industry poses to the less regulated region of the world, including the transportation of dangerous chemicals and shipbreaking practises. This so-called industry was included in the report (MEPC 44/16) of the IMO's Marine Environmental Protection Committee as one of the issues on its agenda.

Ship makers are being pushed to take more responsibility for the disposal of their products because to environmental concerns. Concern organisations involved in this global issue have begun to think about what contributions they might offer. Plans and recommendations are being created, but the name of the sector is also being updated. The phrase "ship recycling" is becoming more common. According to shipowner and head of the International Chamber of Shipping (ICS), Rolf Westfal-Larsen, ships are recycled rather than scrapped because nothing is wasted and everything has another use (Varcoe, 1999).

The Basel Action Network noted that although the term "recycling" has a good connotation, in reality, it is merely another word used to cover up the risk of putting hazardous material on board a ship for eventual disposal (BAN, 1999).

Controlling the disposal of hazardous waste is a sensitive topic, thus when representatives of international environmental organisations began investigating the safe practices of ship scrapping, other watchdog organisations began to support the sector under the name "ship recycling." The only things the environmental group wants are better safe working conditions

at disposal sites and restrictions on the transportation of hazardous garbage on board ships. The basic reason the industry was started is still valid today: outmoded ships can be disposed of in a way that allows the interested party to partially recoup his investment in the ship

2.2 The Ship

The modern commercial vessel, to put it simply, is a flatform machine consisting of welded steel frames, beams, and plates designed to safely transport particular cargo across the ocean. The shipowner must decide on the importance of speed, cargo capacity, fuel economy, and intended route before determining the body of this construction. Diesel engines power the majority of seagoing commercial vessels, and speed has given way significantly to efficiency in design. The cost of fuel is rising, which encourages ship designers to focus on stronger hull designs, fuel-efficient primary engines, and efficient propulsion systems. Today, commercial ships are constructed in accordance with strict rules.

There are many different types of ships, and some of them can serve in two capacities or as a combined carrier fleet. Tankers, combination carriers, bulk carriers, multi-deck tramps, container ships, refrigerated ships, and passenger liners are the most significant in the world of international shipping.

Although it is not required, a ship must be "classed" in order to have enough insurance coverage and the crucial trading certifications that must be displayed at her port of call in order to be competitive.

If a ship must be used in international trade, its earning potential is determined by its measured tonnage and cargo capacity. These details are utilised to classify the ship throughout her trade career and serve as a guide when determining the necessary dues and fees. The Light Displacement Tonnage (LDT), often known as the actual weight of the ship without cargo, is the specific tonnage figure that is used by shipbrokers when negotiating for the sale of the vessel when it is ready for disposal.

2.3 The life cycle of a ship compared to market cycle

In the maritime industry, the ship is the center of attention. The ship is what makes it possible to conduct global trade in an efficient manner. The commercial ship must complement the enterprise. It becomes clear that the kind of ship utilised on a specific trade route depends on

the kind of cargo the ship must transport. In this regard, it is believed that the need for transport determines the demand for ships, and the shipowner has the choice of which type of ship to employ in order to maximise profit. There may be a wide range of ship types used in the global shipping industry today, but they all share the same requirement for economic efficiency and adherence to national and international regulations regarding human, environmental, and safety protections.

The risk involved in owning, running, and staffing a ship is more than it has ever been. In a very volatile shipping industry, the notion of buying low and selling high works effectively. The challenge is deciding when to make these judgements. For a set number of years, there are abrupt booms and equally abrupt slumps in the shipping sector. The market cycle (Stopford, 1988) is the term used to describe these alternating gains and losses. The life cycle of a ship is directly tied to the "boom and bust" cycle in the maritime industry.

A ship has an average economic life of twenty years. The shipowner may face upswings and downturns in the freight industry over a certain length of time. The shipowner faces a significant task in figuring out how to safeguard the life of his ship through extended economic downturns. The owner of the ship will make the decision to sell it at some point in its lifetime. Long-term shipowners with the least amount of flexibility would then have to weigh the ship's net present residual worth against the net present value of selling it, either for further trade or for scrap. The only purchasers the shipowner would have, particularly if he is short on cash, would be the shipbreakers and speculators who offer a low price. If the best resale value is only provided by the shipbreakers, the decision to sell would then become a decision to scrap, and it might be realised right away.

2.4 Procedure prior to ship recycling in India

This include the procedure for the Arrival of vessel, Anchoring and Beaching process

2.4.1 Information to be submitted prior to vessels arrival in India

- Every ship must inform the Maritime Rescue Coordination Centre (MRCC) of its expected arrival date before sailing into the Indian Exclusive Economic Zone. This notice must be given at least seven days before the ship is scheduled to arrive in India's Exclusive Economic Zone.
- The following information should be included in the notification that is to be given:

a. that the ship is headed to the recycling yards for ship recycling.

b. the location's coordinates;

c. the anticipated length of stay in the anchorage.

This will allow the MRCC to assist the ship(s) as needed in the event of a mechanical failure, preventing any accidents involving the Ocean Data Acquisition Systems (ODAS) and other ships in outer anchorages.

2.4.2 Anchoring and Beaching

• A ship is permitted to anchor by lowering one or more anchors to the ocean floor upon entering the Port area. This stops the ship from drifting, anchors it in place, and makes it possible for boats to board. Lifting the anchors allows a ship at anchor to sail away. Thus, ship mooring is completely reversible.

• Beaching is the procedure by which a ship is towed or pulled ashore to land or is purposefully grounded in shallow water. A ship that has hit a shore is rendered immobile and cannot be raised. Thus, beaching cannot be stopped.

2.4.2.1 Process of Anchoring

- **Notice to the SMB/ Port Authority**:- The Ship Owner shall report to the State Maritime Board /Port Authority, his intention to deliver the ship to the Authorized Ship Recycling Yard as per format supplied in Annexure-I at least 7 days prior to the arrival of his ship(s) for recycling.
- **Submission of Documents for Desk Review**:- The shipowner or recycler must also submit the following information and/or documents to the State Maritime Board/Port Authority, State Pollution Control Board, and the Customs Department for a desk review, which may include a determination of the documents' authenticity.

  Details of ship, which include:

  1. Name of the Ship
  2. International Maritime Organization (IMO) No of Ship.
  3. Flag of the ship
  4. Call Sign
  5. Name of the Master of the Ship and his nationality
  6. List of the crew

7. Gross Registered Tonnage (GRT)/Net Registered Tonnage (NRT)/Light Displacement Tonnage (LDT) of the ship with supporting documents
8. Port clearance from the last port of call
9. Proof of ownership
10. Details like name, address, contact number, e-mail address of the owner of the vessel and master of vessel.
11. Undertaking from the Shipowner that they will submit Non- Encumbrance certificate within 7 days from the date of anchorage of vessel at outer anchorage. It is made clear that permission for beaching will be granted by State Maritime Board only on production of the Non- Encumbrance Certificate and not just the undertaking.
12. Copy of Memorandum of Agreement with Ship Recycler.
13. Assessment of hazardous wastes in the structure of the ship, and on board as far as practicable by reference to the ship's drawings, technical specifications, ship's stores, manifest, in consultation with the ship builder, equipment manufacturers and others as appropriate. In the case of ships of special concern, in addition to the identification and marking of all areas containing hazardous wastes/hazardous substances, quantification of such wastes/substances would also be necessary.

- **Payment of port charges:-** Along with submitting Annexure 1 and the aforementioned documentation, the shipowner or ship recycler must also pay any port fees required to secure approval for the ship to enter the port. If the shipowner or the ship recycler is in default of payment of prior dues, the SMB/Port Authorities reserve the authority to deny permission to enter the port.
- **Verification of documents:-** The SMB/ Port Authorities, may, at their discretion, consult the Directorate General of Shipping to verify the genuineness of the above documents submitted to them.
- **Denial of permission:-** The ship owner will not be given permission to beach and/or break if any of the documents supplied are found to be untrustworthy, false, or omit any important information. Within five days of receiving the application in the form of Annexure 1 below and the supporting papers, the shipowner/ship recycler will be informed of the rejection of authorization.
- **Anchoring :-** In case anchorage of the ship is refused by any one of these agencies, the ship owner would be entitled to appeal to the concerned statutory authorities, who will entertain

and hear the appeal in accordance with their respective statutes. Any decision regarding anchorage of the ship will be made by the Port Authority/the State Maritime Board concerned after the desk review by the Port Authority/State Maritime Board (SMB)/State Pollution Control Board (SPCB)/Customs.

2.4.2.2 Onboard inspection

The State Maritime Board/Port Authority will issue anchorage safety instructions when all relevant agencies have completed their desk reviews and recommended that the ship be anchored. They will also coordinate the physical inspection of the ship by the Atomic Energy Regulatory Board (AERB) for war ships and NAVY ships, as well as the Petroleum and Explosives Safety Organisation (PESO) for petroleum tankers and cargo fold tanks.

2.4.2.2.1 Documents to be provided at the time of boarding the ship by concerned authorities:- Boarding is to be done after anchorage permission has been given under clause 2.4.2.1 The following documents, along with those listed in Annexure-II, must be presented in original form by the Ship Recycler to the Port Authority/State Maritime Board at the time of boarding so that they can be examined for authenticity and their contents.

i) Master's certificate-original with IMO No. and showing

1. Inventory of hazardous materials

2. Inventory of gases,

3. Inventory of radioactive material on board,

4. CO2 declaration,

5. Confirmation of Ballast water exchange at high seas,

6. Confirmation of the Bunker oil / lube oil or other Oil substances that are remaining on board

(ii)Cargo declaration form;

(iii) Safe Manning Certificate;

(iv) Competency certificates of crew;

(v) The Inventory of Hazardous Material (IHM) Certificate as may be certified/prepared by International Classification Society once the Hong Kong Convention for Safe and Environmentally Sound Ship Recycling Convention is ratified by India and till such time inventory signed by master of the ship by provided to SMB.

(vi) Seller/agent pays applicable port dues to the port at the prevailing rate.

(vii) The name of the State whose flag the ship is entitled to fly:

(viii) Hull number on building delivery;

(ix) The name and type of the ship along with the date of

such registration;

(x) The port at which the ship is registered:

(xi) The name and the address of the ship owner;

(xii) The name of the classification society (ies) with which

the ship is classed: and

(xiii) The ships main particulars such as length overall (LOA), Breadth (Moulded), Depth (Moulded) Lightweight Cargo Carrying Capacity, Gross and Net tonnage, and engine type.

2.4.2.2.2 Physical Boarding and verification:- At anchorage/location specified by the Port authority for waiting prior to beaching, the ship would be boarded and physically verified by-

(i) Representatives of Customs Department for all vessels,

(ii) For petroleum tankers for their cargo hold by the representatives of the Petroleum & Safety Organization (PESO)

(iii) For chemical tankers, in its cargo hold, by the competent authority as approved by SMB/ Port authority.

(iii) For War Ships, Naval Ships Nuclear Powered Vessels and large passenger liners, by the, representative of the AERB and Indian Navy. It deemed fit, above agencies shall give clearance to SMB/Port Authority for issuance of Beaching Permission.

(iv) Representatives of SPCB for Large Passenger Liners more than 20000 LDT.

(v) Personnel the RSO of SMB/Port Authority trained and certified by AERB who shall inspect the ship from a radiological survey safety point of view for all ships other than War Ships, Naval Ships, and Nuclear Powered Vessels. If necessary, SMB/State Government/Port Authority without an RSO may instruct the Ship Recycler to contact the AERB for clearance for ships falling under the general concern category.

(vi) Certified true copy of 'Certificate of Registry' in his favour certifying that the ships has no registered mortgage with email identity of the respective Registrar of Ships. Such certified true copy of the certificate of registry should not be dated earlier than 7 days.

(vii) Prior approval of the Ministry of Defence for vessel warships, naval ships and nuclear powered ships to be scrapped, shall be obtained by the Ship owner through State Maritime Board/Port Authority.

- Provided that the shipowner/ ship recycler shall be responsible for the identification and marking of all areas containing hazardous wastes/hazardous substances, in the structure of the ship, and on board as far as practicable (by reference to the ship's drawings, technical specifications, ship's stores, manifest and in consultation with the ship builder, equipment manufacturers and others as appropriate) and shall be provided to the concerned agencies at the time of boarding of the vessel.
- Quantification of such wastes/substances would be provided at the time of boarding by the concerned agencies in the case of ships of special concern as listed in Chapter-II, identification and marking of all areas containing hazardous wastes/hazardous substances. Additional information would be provided, including the details listed in Annexures-V and VI.
- It shall be mandatory for the SPCB to undertake an assessment of hazardous waste/hazardous substances available on the ship (passenger vessels > 20000 LDT) and likely to be generated during the ship recycling process.
- Any differences between the information supplied during the desk review and in section 2.4.2.2.2 that are discovered by the inspecting authorities after the inspections required by that section must be reported to the appropriate SMB/Port authority. The SMB/Port authority has the option of refusing to allow the boat to be beached. The shipowner/ship recycler must be informed of this choice as soon as possible, but not after permission to beach the ship has already been obtained.

2.4.2.3 Customs Procedure:- In order for the Customs Authorities to fulfil all customs formalities as required by the Customs Act of 1962, the Ship Recycler must also submit all paperwork and information requested by the Customs Authorities at least three days before the vessel is anticipated to arrive at the anchorage**.**

- Customs Officers shall board the vessel within 24 hours of ship's arrival (as per Customs regulation) to complete all procedures and processes required under the Customs Act, 1962.
- When all steps outlined in 2.4.2.2.2 have been followed, the Ship Recycler will pay the duty as lawfully determined by the Customs Act of 1962. The Customs Authorities must immediately provide a No Objection Certificate to the SMB/Port Authorities expressing their No Objection to issuance of permission to land the vessel upon the ship recycler showing the proof of payment of such duty by production of the Import Duty Challan. It is acknowledged that the SMB/Port Authority is responsible for approving vessel beaching requests.
- It is also understood that any sweepings of cargo (leftover from the previous shipment) will be allowed to be cleared after the proper import procedures have been completed. If the sweepings or left out cargo have no commercial value or are unfit for consumption or use, such cargo shall be disposed of by the ship recycler in accordance with the relevant statutes and rules framed there under.
- In the presence of the importer, the appropriate officer must board the vessel and demolish any wireless equipment, restricted radio equipment, or navigational equipment. The importer must then provide any items, as specified by the MOA/IGM, to the agent for onward transhipment or delivery to Customs, as appropriate.
- The Customs Authority would grant free of charge and clear the ship for recycling if all of these requirements had been completed and all dues and duties on the vessel had been paid.
- The SMB/Port Authority will grant permission for beaching within two working days of receiving the necessary clearances from all pertinent departments and agencies.
- Port Authority/State Maritime Board authorization for beaching:- The Port Authority/State Maritime Board may only authorise beaching for the following individuals:

  Plot owners

  (a) who have been given plots by the port authority or who have been granted permission by the Port Authority/SMB;

  (b) whose SRFMP has been approved along with authorization provided by SPCB for managing hazardous waste generated by ship recycling.

  Beaching permission shall be granted-to ships subject to observing specific requirements in

respect of the following cases:-

The Petroleum and Explosives Safety Organisation (PESO) requires the following documentation:

(a) Gas-free for hot work certificates for oil cargo tanks and oil slop tanks;

(b) No Objection Certificates (NOC) from the Atomic Energy Regulatory Board for ships of special concern; and

(c) NOCs from the Naval Department, the AERB, and the Customs Department for warships and naval vessels.

- Ship recycling activities are classified as hazardous processes under Section 2(cb) of the Factories Act, 1948, and are therefore subject to the provisions of Chapter-IVA, Sections 41A to H of the same Act. When deemed necessary, the Directorate of Industrial Safety and Health will inspect the ship recycling facility to verify that all requirements under the 1948 Factories Act are being followed.
- One ship or ships may beach at a time, provided that their width is less than 5 metres greater than the width of the plot. The ships in a single line across the plot must not be behind any other ships.
- Oil tankers cannot beach if they lack "fit for hot work" certificates for all of their cargo tanks, slop tanks, forward deep fuel oil tanks, and forward coffer dams.

2.4.2.4 Beaching:- When a ship is beached, the ship recycler must take the required steps to ensure that:-

(i) the vessel is secured appropriately; and

(ii) leftovers in the bunker are removed carefully with adequate ventilation in the engine room.

(iii) A registered dealer for petroleum products will receive the bunker and its contents.

(iv)Only registered recyclers and refineries are employed for the disposal of spent oil and sludge;

If the ship recyclers are discovered to have violated the aforementioned provisions during an inspection of their plots or yards by the respective agencies, they will be subject to penalties, fines, and potentially cancellation of their licence for ship recycling.

2.4.3 Other Procedures

2.4.3.1 Permission from the State Pollution Control Board (SPCB):- The Ship Recycler is responsible for removing all loose and hazardous waste, such as oil and petroleum hydrocarbon, from tanks, stop tanks, and other vessels once they have been beached. After an inspection, which will be conducted with adequate lighting in the engine room, the SPCB will give a decontamination certificate to the ship recycler. The relevant authority or agency must simultaneously issue a gas-free and hot work permit in accordance with Section 68 H of the Factories Act 1948 after assuring the safe and thorough removal of all oils, spent oil, and hydrocarbons.

2.4.3.2 Security aspects:- In collaboration with the Navy and the Coast Guard, the concerned SMB/Port Authority shall issue the necessary orders on all security-related matters and distribute them for strict adherence.

- The SMB/Port Authority shall keep a record of all ships reporting for breaking, including the nature and specifics of the ships, and shall give that data to the Naval and Coast Guard as soon as their Expected Time of Arrival (ETA) is received.
- The SMB/Port Authority shall keep a photographic record of all ships reporting for recycling and shall make it available to the Navy and Coast Guard.
- Prior to the crew's actual arrival and departure, the concerned Naval Authority must be informed of the arrival and departure details, including off-signer details, in particular for the foreign crew members.
- Each Port Authority/SMB shall have a monthly security and intelligence meeting with participation from the local police, Intelligence Bureau, Coast Guard, and Navy.
- All shipbreaking yards are required to provide adequate physical security, including boundary walls, armed guards/forces, security personnel, strict access controls, material inspections upon removal, and sufficient checks for the possibility of contraband or radioactive elements entering the hinterland. The local state police, Intelligence Bureau, Coast Guard Authorities, Naval Authorities, and/or any other security agency of the Government of India shall conduct routine security audits of all shipbreaking yards.

2.5 Ship recycling process

2.5.1 Recommendation for Ship Recycling:

The Ship Specific Recycling Plan and the Management Plan for the Recycling Facility should make up the Ship Recycling Plan. The plots' dimensions should be such that, when cutting the ship, workers can move freely on both sides of the beached ship, with at least 5 meters of space freely available on each side, or as instructed by the port authority or state maritime board in question.

- In order to issue a gas-free, fit-for-hot work certificate to ships other than petroleum tankers and petroleum slops, the Directorate of Industrial Safety and Health (DISH) shall conduct the inspection; alternatively, the Department of Explosives may issue the certificate.

2.5.2. Ship Recycling Facility Management Plan and requirements:- The plots are distributed to the ship recyclers for the purpose of ship recycling by the State Maritime Board (SMB)/Port Authority. The area needs to be big enough to support safe and environmentally friendly ship recycling. If the Ship Recycling Facility Management Plan (SRFMP) complies with the following criteria, the concerned SMB/Port Authority will approve it:

(i) Availability of requisite and valid documents

a. Authorization for handling Hazardous waste generated from ship recycling activities issued by the SPCB.

b. Registration as a Member of the Hazardous Waste Treatment, Storage and Disposal Facility (TSDF) from TSDF operator.

c. License for storage of LPG Cylinders required under the Gas Cylinders Rules, 2004 from Explosives Department.

License of the plot under Factory Rules.

Map showing the yard layout and other components of

the facilities.

f. Any other document(s) or No Objection Certificate/Permission letter required from the

concerned-authority

g. License and SRFMP approval under the provisions of the Factories Act, 1948 and rules made there-under.

(ii)Provisions of shelter/rest room and lunch room and canteen as per Sections 46 and 47 of the Factories Act, 1948. I n addition, provision for adequate lighting as per Sec 17, adequate clean drinking water as per Section 18, latrines and urinals as per Sec. 19, washing facilities as per Sec.42 and first aid as per Sec.45 of the Factories Act, 1948. The list of trained first aiders and fire fighters shall be displayed at a conspicuous place.

(iii)Storage Go down with adequate safety precautions for Temporary Storage for Hazardous/Non Hazardous Waste Materials.

(iv) Temporary asbestos handling and removing and storage facility or appropriate mobile asbestos handling facility.

(v) Storage Go down for Liquefied Petroleum Gas (LPG) Cylinders as per Explosives Act

(v) Sanitation and 'Rest Room' facilities for a minimum 50 workers, as per the Factories Act, 1948.

(vi)Workers Change Room.

(vii) First Aid Facility.

(viii) Firefighting facility and Emergency Response

System including oil spill Combat system.

(ix)Certified Material Handling Equipment and Personal Protection Equipment of BIS Standard or equivalent.

(x) List of the trained and certified labours of all disciplines (lightening, gas cutting, waste handling; working in confined spaces, using various gadgets like oxygen and other gas detectors, crane and material handling systems etc.).

(xi)Hazardous area classification of the facility in accordance with Petroleum Rules-2002 for providing safe electrical fittings.

(xii) Other necessary facilities, if any required.

- After the plots are assigned to ship recyclers, the concerned SMB/Port Authority must issue SRFMP approval within one month. During each cycle of five years of allocation to one agency, this approval would be a one-time task that would be subject to review every six months. The ship recycler should act quickly to implement any necessary corrective measures that result from such six-month reviews, if any are found to be necessary.
- Following the allocation of plots to ship recyclers, the SMB/Port Authority in question must, within one month, give an SRFMP approval. Every cycle of five years of allocation to one agency would require this permission; it would be a one-time process, subject to review every six months. The ship recycler should act quickly to implement any necessary corrective actions that may be identified during these six-month reviews.
- According to Section 29 of the Factories Act, 1948, all lifting equipment, including wire ropes and lifting tackle, must be tested and certified by a competent person who has been approved by the DISH.
- After receiving DISH's comments and opinions regarding the compliance with the requirements under the Factories Act, 1948 and Rules, the SMB/Port Authority in question shall provide licence to engage in ship recycling activities.
- The SMB/Port Authority may revoke permission for the Ship Recycling Facility Management Plan and the ship recycler would not be permitted to beach any ships until the necessary components under the Ship Recycling Facility Management Plan are made operative in accordance with the requirements if any of the Ship Recycling Facility Management Plan components of the Plot are discovered to be inoperative and not in place during the inspection by any of the concerned authorities.
- So, before allowing ships to enter the recycling plot, the SMB/Port Authority must carefully verify the aforementioned factors using the Ready For Recycling Certification Document as per Annexure-III and Annexure-I.
- The Ship Recyclers must submit a properly filled-out application to the Port Authority as per Annexure-IV in order to acquire permission to cut. Within three days, the port authority must evaluate the cutting request and either approve it or warn the applicant of any faults that need to be fixed.
- In addition to the aforementioned, before the Ship Recycling Facility Management Plan is approved, the Ship Recycler must provide an assurance to the SMB/Port Authority that they will adhere to the Safety, Health, and Environment (SHE) management aspects as per the SHE

Policy as listed below.

(i) A policy with a strong emphasis on sufficient worker safety, the protection of human health and the environment, as well as the setting of objectives that will eventually result in the eradication of the negative impacts of ship recycling on human health and the environment.

(ii) A system for ensuring that national regulations are followed, that the company's policy objectives are met, and that the processes utilised in ship recycling activities are committed to ongoing improvement.

(iii)Identification of the duties and obligations of managers, vendors, and employees.

(iv) A plan for workers' proper training and the provision of suitable PPE and material handling tools.

(v) The plot's emergency readiness and response strategy.

(vi) A system for keeping track of the effectiveness of ship recycling operations.

(vii) A system for reporting how ship recycling operations would be carried out, including a system for reporting discharges, emissions, and accidents, including mishandling of hazardous wastes and materials that contain hazardous substances that resulted in damage or the potential for damage to the environment, worker safety, and human health.

- The ship recycler shall ensure that:-

i) A board with crucial safety instructions (does and don'ts) for ship recycling is placed prominently throughout the plot, and it is written in English and any local dialects that the employees employed there can understand.

(ii) All equipment on the plot, including cranes, winches, chain rope and shackles, generator sets, and any other safety equipment that may be prescribed at any time, must be installed and maintained in accordance with the Factories Act of 1948 and Rules made thereunder, as well as any other applicable Acts and Rules.

(iii) The plot is equipped with an operational explosive gas detector, a multigas monitor that includes a hydrogen sulphide (H2S) gas monitor, and an oxygen percentage analyser.

(iv) The yard's lighting is set up properly.

(v) Every SRF ought to have a thorough emergency and evacuation plan (v). Every six months, the emergency plan should be practised. Furthermore, a once-a-year drill should be held to prepare and test an off-site emergency plant for the entire district.

- The SMB/Port Authorities may not grant permission for ship-recycling activities under this Code to any ship-recycler unless such ship-recycler has met with all SRFMP requirements.

2.5.3 Ship Specific Recycling Plan and Requirements:- Once the Ship Recycling Facility Management Plan is approved by the SMB/Port Authority for the plot, the ship recycler shall be required to submit application to the SMB/ Port Authority along with the Ship Specific Recycling Plan and details as per Annexure-IV, along with details of Ready for Recycling Document duly filled in. Removal of oil from the vessel may be permitted prior to submission of Ship Specific Recycling Plan (SSRP).

Requirements of Ship Specific Recycling Plan (SSRP) shall be as under:-

Details about the ship, and in particular, a fair assessment of hazardous wastes and hazardous materials.

(i) Ship breaking schedule with sequence of work.

(ii) Operational work procedures.

(iii) Availability of material handling equipment and Personal

Protection Equipment (PPE).

(iv) Certification from the State Pollution Control Board (SPCB) that all kinds of oils and other loose hazardous wastes are completely removed and the decontamination certificate issued by SPCB shall be attached with the SSRP.

(v) "Gas-free and fit for hot work" certificate issued by the Petroleum and Explosives Safety Organisation (PESO) for oil tankers and for slop tanks, or any competent agency authorized by the Directorate of Industrial Safety and Health (DISH) under the Factories Act; This certificate shall be attached with plan document. In case a false certification is given, the concerned explosive inspector/official shall be liable for prosecution departmental action and action may be taken to cancel the license of the ship recycler in such cases.

(vi) Hazardous waste handling and disposal plan: - Identification and marking of all non - breathable spaces by the Recycler in the ships documented in the plans with drawings.

Identification and marking of all places containing/likely to contain hazardous substances/hazardous wastes in the ships and the same be documented in the plans with drawings. Identification and marking of all places containing /likely contain hazardous substances/hazardous wastes in the ships documented in the plans with drawings.

(vii) Confirmation from the Master of the Ship to the effect that ballast water has been exchanged in the high seas. The requirements should address all the three phases of recycling, i.e.

(a) Preparation phase.

(b) Dismantling phase.

(c) Waste stream management phase.

(viii)Ballast Sediments shall be discharged along with the ballast water with proper churning and shall be handed over to authorized agency of the SMB/ Port Authority on payment of the fees, for suitable disposal.

(ix) Asbestos being a major area of concern, the scheme for

removing asbestos, and asbestos containing materials (ACMs) on board, and on shore, shall be specifically provided. The plan shall include arrangements for removal handling treatment and disposal. Locations having asbestos/ACMs shall be m a r k e d before commencing dismantling operations and shall conform to Bureau of Indian Standards for Cleaning of Premises and Plants using Asbestos fibers (IS 11767:1986). Those ships having asbestos quantification more than 100 metric tonnes should go for negative pressure chamber technique.

(x) System and procedure shall be followed to document and keep track of all hazardous wastes generated during recycling as well as hazardous substances found onboard the ship, and their transport to the disposal facility or registered recycling facility shall be provided in the SSRP.

- After verifying that the aforementioned 5.10.2 requirements have been met, the Port Authority may give the Ship Recycling Permission. The following is the order in which permits and recycling tasks must be completed:

I. A competent person must issue you a First-Man admission certificate. This Man Entry Certificate must be obtained three days before employment begins. A new Certificate must be obtained if the start of the work is delayed in any way. This new Certificate must be valid for 3 days before the start of the work.

II. Second - Cargo holds should be cleaned up and all the loose sludge on board vessel should be cleaned up properly. The State Pollution Control Board shall issue the Decontamination

certificate only on being satisfied that the cargo holds have been fully and properly cleaned up.

II. Third - An inspection must be conducted by a DISH competent person to make sure that all ignitable material has been removed from confined spaces, that the other areas of the engine room have adequate venting and are virtually gas-free, and that the areas are well within explosive limits. For the engine room, bunker area and other areas of common ships where there is a probability of the creation of ignitable gases, a gas free and hot work (Naked light) certificate for cutting shall be granted upon satisfactory compliance with this inspection. In case of Oil tankers and Chemical tankers, there should be compartment wise practice of issuance of hot work permit just before actual cutting operations are initiated by ship recyclers irrespective of SMB/Port Authority's permission of ship dismantling of whole ship.

IV . All the material handling systems i.e. winches, cranes and such other systems which includes, chain rope and shackles, generator set etc., valid fitness certificate should be available before ship recycling permission is granted.

2.5.4 Reporting upon completion

A Statement of Completion, as described in Annexure VII, must be issued by the Ship Recycler and notified to the SMB/Port Authority when a ship's recycling is complete in compliance with the requirements of this Code.

2.6 Factors that Influence the Economic Life of a Ship

The author gave a quick overview of a few of the factors that influence a ship's life cycle when examined in connection to the current state of the market in the preceding section. It is impossible to resist highlighting the importance of the aspects that are known to affect a ship's obsolescence over its lifetime. A combination of all the factors, rather than just one, will serve as the foundation.

2.6.1 Age

It is frequently believed that a ship's advancing years have a significant role in the shipowner's decision to sell his vessel for scrap. This is obviously not the case, as it is only one of several contributing factors. Many well-maintained ships of traditional shipping corporations would be lost if age were the only factor considered to determine which ships should be demolished.

It is important to thoroughly consider if the ship is suitable for continued trading. Older, less desirable ships in the international shipping trade must now search for a good trading location with little competition due to the growing size and sophistication of ships. Modern ships are faster and more capable of carrying goods, which makes them less competitive, especially if they are specialised carriers intended for continuous duty in a particular trade.

2.6.2 The prevailing market condition

The main concern for shipowners is how to maximize their profits in a volatile shipping market where potential buyers are plentiful. However, deciding whether to sell a ship can be difficult and can create an imbalance in supply and demand, as ships are seen more as commodities than transportation units.

To maintain a ship's operational competitiveness, it must be consistently used and earn enough profit to cover its operating expenses. A ship's reputation, based on its past performance, earning potential, and ownership history, can also impact its competitiveness.

If there is an increase in available tonnage for a specific shipping sector, there is little use for unreliable ships. However, an increase in tonnage supply does not guarantee the employment of modern ships, particularly when freight markets are low. In these situations, shipowners must consider laying up the ship or selling it for scrap.

Keeping a ship idle for extended periods of time can lead to deterioration of the hull and machinery, resulting in significant costs for the shipowner. As a result, many shipowners opt to sell their ships to shipbreakers instead. This was seen in the 1980s when ULCCs and VLCCs were sold for scrapping due to lack of employment. The price of a ship for scrapping in the steel manufacturing business would be impacted by the demand for iron and steel scrap in one way or another.

2.6.3 New regulations

Ships primarily engage in international trade and must adhere to international regulations, which are formulated by various international bodies. However, some view the enforcement of regulations as a hindrance that increases costs for shipowners whenever new regulations are introduced.

In recent years, more stringent regulations have been introduced, requiring significant

renovations to existing ships to obtain the appropriate certificates and compete in the international shipping market. The cost of maintaining the ship's current classification set by the classification society and installing necessary equipment to meet national and international standards can impact the projected revenue of the ship. Environmental safety requirements are also crucial and have influenced changes in ship design.

The introduction of new regulations could lead to the scrapping of uneconomical ships at a faster rate. For example, the Erika incident in December 1999 resulted in stricter port state control and an earlier phase-out of single-hull oil tankers.

The 2019 Recycling of Ships Bill has been enacted into law. On December 13th, 2019, it gained the President of India's assent and became an Act. The government made the decision to introduce this Act in order to regulate ship recycling by establishing a set of global standards and establishing the legal framework for their enforcement. The Hong Kong International Convention for Safe and Environmentally Sound Recycling of Ships, 2009 has also been decided to join by the government. As a result, on November 28, 2019, India ratified the Hong Kong International Convention for Safe and Environmentally Sound Recycling of Ships, 2009.

Whether a ship is intended for recycling or not, the Recycling of Ships Act, 2019, regulates and forbids the use or installation of hazardous materials. When a law becomes effective, a restriction or prohibition on the use of hazardous materials will apply to all new ships immediately, but older ships will have five years to comply. Warships and other government-operated non-commercial ships would not be subject to restrictions or bans on the use of hazardous materials. The inventory of hazardous materials used in ships must be inspected and certified for all ships.

Ship recycling facilities must be authorised in accordance with this Act, and only those authorised ship recycling facilities may recycle ships. A ship-specific recycling plan must be followed, according to this Act's additional provision. Ships that will be recycled in India must have a Ready for Recycling Certificate that complies with the HKC.

The collection and management of hazardous waste from ships must be done safely and sustainably, according to the Act, which places a legal obligation on ship recyclers. To discourage any infringement of statutory provisions, the Act has been amended to include appropriate criminal penalties.

2.7 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.

Other interested parties, such as shipbrokers and shipbreakers, get involved when the shipowner decides to sell the ship for scrapping. Based on the ship's current condition and the state of the market, these parties determine the fair price they could give. The availability of shipbrokers to close the contract makes a significant contribution to the market's efficiency and may ensure a perfect match and a straightforward transaction (See Fig. 2.1).

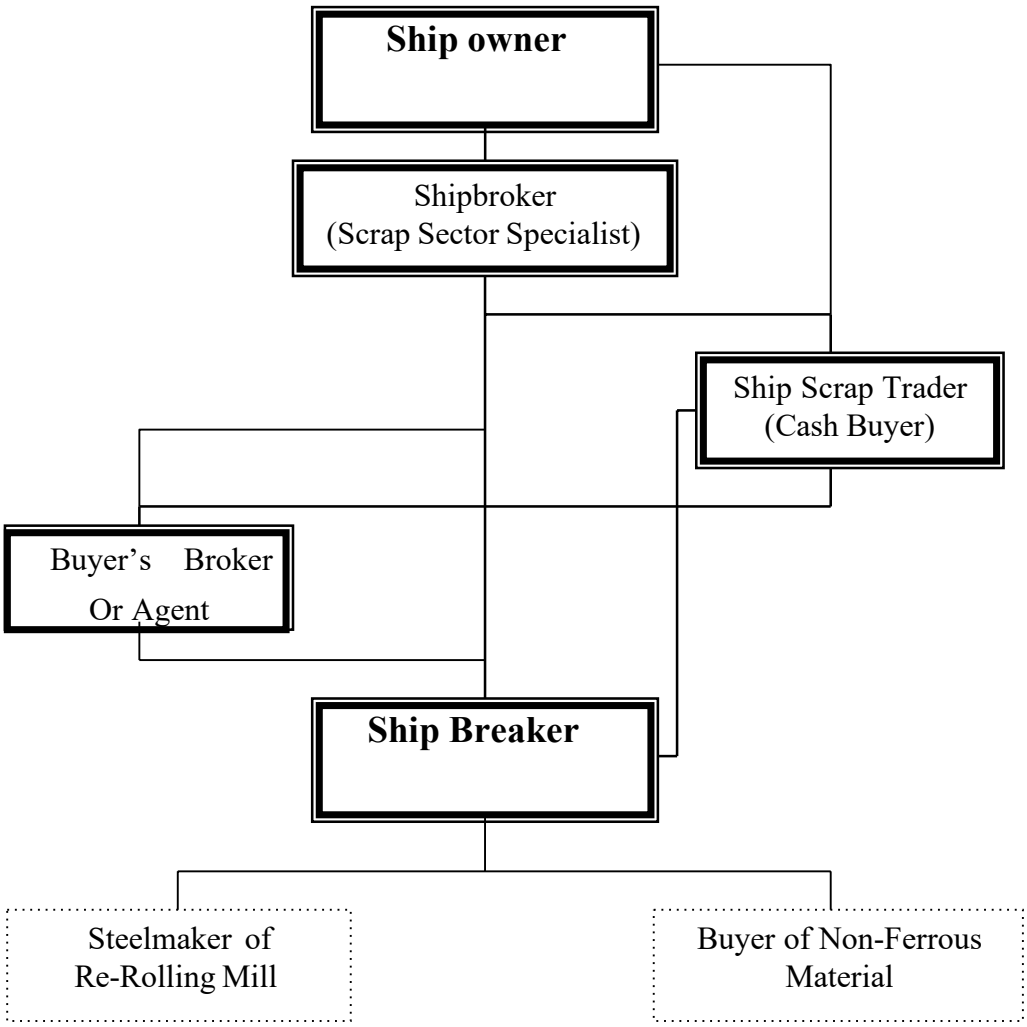


Figure 2 PARTICIPANTS IN THE SCRAP PROCESS

Source: Drewry Shipping Consultants (Ship Scrapping, 1996, p. 19)

2.7.1 Ship Owner

Maximising the earning potential of his ship is obviously in the shipowner's best interests; this holds true even when the ship is being sold. The shipowner has the choice of dealing with the shipbreaker directly or through a shipbroker, however the latter is frequently preferable. The shipowner greatly benefits from the shipbroker's expertise and experience in the current market environment.

The shipowner is still responsible for other duties even if they use the shipbroker's services. The shipowner must be able to give the shipbroker the necessary clearance, information about the ship, a list of the items that are covered by the sales agreement, financial records, and arrangements regarding the ship's crew in order to maximise revenue and ensure a smooth transaction.

2.7.2 Ship Brokers (Intermediaries)

The practice of buying or selling ships through a reputable group of brokers or trading houses is one that shipowners are accustomed to in the shipping industry. It is typical for the owner to enlist foreign dealers who specialise in ship scrapping, trading houses, or shipbrokers. In the sale, the shipbroker serves as a middleman. His understanding of the existing and anticipated state of the market, along with his effectiveness in finding potential buyers, almost always results in a better offer.

The shipowner may decide to use more than one shipbroker, and in some cases the shipbroker may engage with another shipbroker who is representing the shipbreaker, depending on the specifics.

The shipowner's selected shipbroker will then communicate the specifics of an offer to different brokers, trading firms, or purchasing organisations. In exchange, the shipowner will be informed of any offers the shipbrokers receive for the ship. The quantity of available ships and the state of the market will determine how long the ship will be removed from the negotiation table.

Strong buyer competition typically prevails for good quality ships, and the ship being offered will be sold to a suitable buyer in a matter of hours. The shipbroker will receive a commission

on each sale that is successfully completed that ranges from 1% to 2% of the total sale price (Drewry, 1996). An independent shipbroker may occasionally provide the financial fund to purchase a vessel "as is," "as is, where is," during lay-up, or following discharge of the last cargo. The aforementioned shipbrokers can only participate in this arrangement if a customer is waiting; if not, they must take custody of the ship until the necessary payment and delivery are formally arranged.

The shipbroker considers the time between the time the deal is completed and delivery to be the most challenging. Renegotiations may result from a rapid shift in the market, and the shipbreaker may then make claims about the state of the ship when it arrives at the location for breaking.

The written contract between the parties is also something that the shipbroker is expected to prepare. There is no predefined or required format for the Memorandum of Agreement (MOA), according to Drewry Shipping Consultants Ltd. (1996), but a typical agreement typically comprises standard terms.

2.7.3 The Ship Breaker

The shipbreaker has limited methods for estimating the size of the shipping industry, in contrast to the shipowner who has a thorough awareness of the shipping market. The shipbreaker typically purchases the ship "as is" and relies on the information that the shipbroker will supply regarding the ship. A sound cost estimate might be made using the ship's Light Displacement Tonnage (LDT).

The shipbreaker can determine the amount of non-ferrous metals on board and the quality and thickness of the steel plate by knowing the owner, kind, age, and location of construction. Although the ship's value is primarily derived from its scrap steel, a significant portion of the shipbreaker's income comes from non-ferrous materials. Typically, the scrap steel is heated before being rerolled into concrete reinforcing rods for the building sector. The shipbreaker must balance the costs of buying a ship for scrap with the money that may be made from selling the junk.

If the deal goes through, the shipbreaker will need to open a letter of credit and obtain the paperwork required to import the ship.

2.8 Leading Ship Breaker

Shipbreaking facilities were initially built in developed countries, but they have now relocated to the Far East. In the beginning, repurposed scrap metal was used for home purposes. The location of a shipbreaking yard is not usually determined by the domestic demand for scrap steel and other recyclable ship parts. Increased labour costs, higher safety standards, and the resulting environmental issue are all reasons for moving a shipbreaking yard.

Table 2.1 THE MOVEMENT OF SHIP SCRAPPING CENTERSOVER THE LAST 70 YEARS

ERA	MAIN SHIP SCRAPPING CENTERS
1945-80	USA and Europe
1980-88	Korea, China, and Taiwan
1980-2022	India, China, Pakistan, and Bangladesh

(Source: DNV)

South Korea, Taiwan, and most recently China withdrew, which led to the development of India, Bangladesh, and Pakistan as the top three shipbreakers today. These new top shipbreakers have emerged as a result of the fall in shipbreaking operations in China as a result of the government's austerity programme. 1994 marked the beginning of a drop in the number of ships being destroyed in China.

India is currently the world's biggest shipbreaker. Beginning in 1978 in Bombay and Calcutta, the shipbreaking industry gradually spread to the following locations: Alang, and Jamnagar (Drewry, 1983). The Metal Scrap Trade Corporation (MSTC), a government agency in charge of the procurement of foreign ships, provided ships to India's shipbreaker during their first year of operation.

Government limitations were removed in recent years, which gave Indian shipbreakers a better opportunity to have easier access to the overseas market. As a result, the business has grown at astounding rates. The Alang facility has developed into a shipbreaking hub for both domestic and international trade. The beach at Alang is located in Gujarat, northwest India, on the shore of the Arabian Sea. Shipbreaking is made possible with the barest minimum of construction because to the extraordinarily big difference between high and low tides and a soft and shelving

shoreline. Simply running the ships ashore.

Table 2.2 SHIP DEMOLITION BY LOCATION

Nation/Year	2015	2016	2017	2018	2019	2020	2021	2022
Bangladesh	940 20%	2284 13%	2594 14 %	3947 19 %	4915 33 %	4231 26 %	2978 22 %	3163 21 %
China	374 8%	8921 52%	9318 52%	3397 16 %	676 5 %	1331 8 %	164 1 %	979 7 %
India	1079 23%	3140 18 %	2949 16%	5917 29 %	4868 33 %	7851 48 %	7577 55 %	7427 49 %
Pakistan	1280 27%	1609 9%	1921 11 %	5301 26 %	3623 25 %	2043 13 %	1630 12 %	1962 13 %
Others	22 %	8 %	7 %	10 %	4 %	5 %	10 %	10 %
Total	**4685**	**17228**	**17982**	**20714**	**14677**	**16313**	**13744**	**15021**

Source: Drewry Shipping Consultants. Figures are in *1000 DWT

Shipbreaking operations have increased in Bangladesh and Pakistan as a result of China's shipbreakers' difficulties. Similar to India, Bangladesh and Pakistan shipbreakers received official help and were able to access the foreign exchange rate more easily. Running the ships towards the sand during high tide is the same shipbreaking technique used in India. On Chittagong Beach in Bangladesh, shipbreaking is the main industry. at comparison to India, Bangladesh has fewer sites for ship demolition, but those that do exist have significant capabilities, and larger ships—particularly tankers—are smashed at Chittagong. Large ships are now more appealing to Pakistani shipbreakers. In Pakistan, Gadani beach, which is outside of Karachi, is the main location for ship demolition.

These three major shipbreaking nations use several shipbreakers along their beaches in addition to the usual methods of shipbreaking. There could be multiple groups of shipbreakers renting or leasing 100 plots from the government inside a shipbreaking site. One large and two tiny ships can be accommodated in a plot or a pen at any given moment.

2.9 Known Practices in ship recycling

Compared to shipbuilding, shipbreaking is a less economically complex industry. Most shipbreaking operations use a manual way to disassemble the ship on a suitable beach while having little access to mechanised equipment. Ships are sliced and set afire as workers use hand-operated oxy-fuel gas cutters to remove metal, given the scope of the operation.

Although using mechanised shipbreaking methods can increase productivity, these methods are capital intensive and necessitate special investments, which are difficult for shipbreakers from developing countries to justify given their limited financial resources. There are three steps in the non-mechanized shipbreaking process. The ship's owner removes all non-transferable equipment, as well as potentially explosive materials, during the preparation phase. The shipowner must be able to get a Gas-Free Certificate from a business recognised by the nation where the ship is to be broken up if the vessel is a tanker and must have been cleared of explosive gas.

When the ship has already been delivered to the site for shipbreaking, it is in the second stage. Normally, during high tide, ships are either dragged towards the shore or run at full speed.

After that, anchor chains are fastened to guarantee the safety of the ship. Independent buyers board the ship and begin unloading the chosen products, including all non-fixed or easily removable objects. A scrapping strategy will be created after this operation is finished.

The shipbreaker will decide how the separate components of the ship will be removed during the final stage of the process based on the ship's structural characteristics. The ship must be deconstructed symmetrically to prevent it from shattering or toppling over. Prior to starting the steelwork, openings of about six by ten feet are cut along the hull, but the lower portion is left unaltered so that when it is pressed outward, a horizontal platform is created. These gaps will act as ventilation and exit points. Transportable components are thrown overboard using cutting torches and hauled on shore with winches.

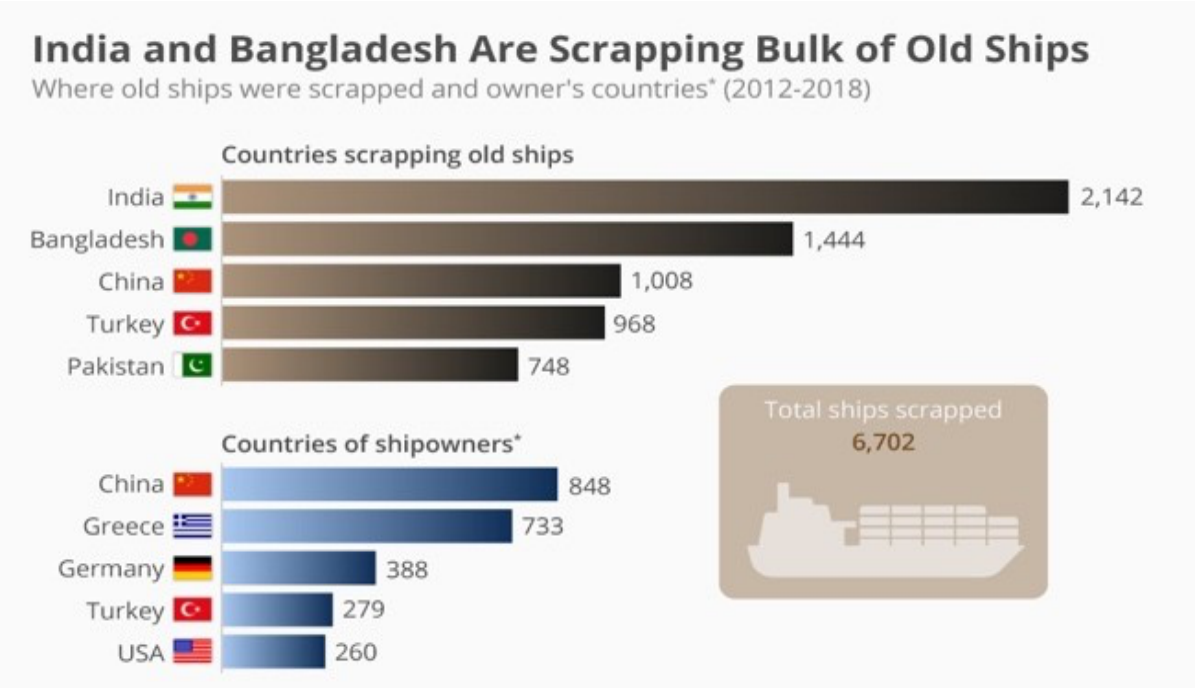
During high tide, the ship is gradually dragged towards the beach where it is being slowly destroyed. The time it takes to disassemble a ship mostly depends on its size.

2.10 The Scrap Material

The ship's components are reused in large numbers. Although the ship's available ferrous and non-ferrous scrap brings in much-needed money for the shipbreakers, other equipment onboard also makes a small but significant contribution to cost recovery. Iron scrap is the primary output of shipbreaking. The steel industry receives the ship's chunks of steel that need to be processed for reuse. Depending on the nature and quality of the ferrous scrap, it is typically re-rolled into reinforcement bars for low-stress building construction or used as a melting charge in the production of steel and iron.

Non-ferrous metals are meticulously segregated and sold locally, including the ship's propeller, aluminium construction, copper piping, and electrical wire. Shipbuilders in the United States who are located close to shipbreaking yards are the typical customers of such materials. The engine, diesel engines, pumps, winches, radar, and other electrical devices are all included in this. The majority of the materials aboard the ship are essentially recycled. Drums, tools, and furniture accessories are also sold.

The shipbreakers are forced to use the simplest methods of getting rid of unmarketable items because there are no waste recycling facilities. The remaining materials are subsequently burned if they can't be sold.



3 Fig 2.2 2012-18 data of ships demolished and countries of those ship owners

Table 2.3 LIST OF BEST SHIP DEMOLITION COMPANIES IN THE WORLD

NAME	Head Quarter	Status	Logo
Isiksan Ship Recycling And Trading Co Ltd	Turkiye	Independent	
Priya Blue Industries Pvt Ltd	India	Independent	
VMS Industries Limited	India	Independent	
P Patel Ship Breaking Company	India	Independent	
Shree Ram Group	India	Independent	

Baijnath Melaram	India	Independent	
Leela Ship Recycling PVT.LTD	India	Independent	

Source Global Data

CHAPTER III

ECONOMIC CONSIDERATIONS OF SHIP RECYCLING

3.1 The Supply and Demand issue

The process of selling ships for scrap is the same as it is in every other area of the maritime industry, as was mentioned in the previous Chapter. In the shipping industry, the shipbroker is crucial. A decrease in the supply of tonnage quickly follows a downward trend in the freight market in order to balance the demand brought on by global seaborne trade. The owners of older or less productive ships are under pressure to scrap them.

Shipbreakers may have a need for ships to be scrapped, but the rates that can be provided depend on a variety of elements that are typical in the maritime sector. The predicted ship "residual value" would not match what is being offered in the ship scrapping market, which corresponds to the assessed investment when the ship was built. Whatever the current market pricing may be, it can still be considered a crucial element for a robust shipping market.

Aside from the fundamental elements that affect a ship's life cycle for demolition, the cost of ship scrap can fluctuate drastically. Ship scrap is sold on a month-to-month or day-to-day basis with no long-term contract to hold on to because there is no actual system in place to control market price fluctuations, particularly in the global market of the steelmaking sector.

In contrast to ships designed for international trade, those meant for scrapping are purchased without survey or inspection. The shipbreaker solely bases his estimate on the amount of ferrous scrap that could be salvaged and the calibre of the steel plate that makes up the ship's hull. In this scenario, the shipbreaker cannot recognise the potential for a significant or negligible profit until the ship has already been transferred to the shipbreaking yard.

The demand for ferrous scrap from the ship scrapping activity is influenced by a number of factors, including the availability of ships for scrapping and the relative costs of ferrous scrap from various other industrial sources, in addition to the demands of the building industry.

3.2 Recycled Materials

It is not acceptable to store ships away and let them rust or degrade. Ships are sold for scrapping not only because some of the shipowner's investment can still be recouped, but also because of the materials that can be extracted from the ship and are very beneficial to the local market.

There are two types of scrap material: ferrous and non-ferrous. One of the main sources of raw materials for the nation's steel production is ferrous ship waste, particularly the re-rolled reinforcing bars used in building construction. Customers of usable machinery are frequently strapped with funds and unable to afford to buy brand-new machinery. To meet the demand of customers from economically struggling areas, the ship's materials and equipment are totally recycled and end up in local marketplaces.

3.2.1 Ferrous Scrap

The ferrous scrap collected from a ship must compete in the steelmaking sector with all other sorts of ferrous trash, such as disused industrial facilities, junked automobiles, and outdated railroad equipment. The market for ferrous scrap as a whole does not include much ship scrap. Depending on their quality, the three different types of ferrous scrap that are offered on the global market are utilised as melting charges in the manufacturing of iron and steel, as rerolled reinforcing bars, or as material in electro-metallurgical processors.

Although the primary source of re-rolled reinforcing bars and construction angles tends to be ship scrap, its market is only available to developing nations. Since not all shipbuilders and repairers have a single source, a single ship's plate may have a different chemical composition.

Re-rolling scrap-derived material for reinforcement bars has been discontinued in the majority of industrialised construction markets because it cannot achieve the requisite material standard. Re-rolled products are still acceptable for use as building materials in developing nations, which may be one of the factors contributing to the booming shipbreaking business in India, Bangladesh, Pakistan, and other emerging nations.

Due to a shortage of scrap metal for industrial building, the recovered ferrous scrap from ship scrapping is sold domestically in developing nations. Steel must be regularly supplied in order for the industrial sector to expand quickly and economically, and the shipbreaking business can do it for less money.

3.2.2 Non Ferrous Scrap

Any reusable equipment is sold by secondhand merchants who set up shop along the roads leading to the shipbreaking yards. The commodities that buyers can find include seats, desks, doors, China, life jackets, fire hoses, pumps, washing machines, freezers, and diesel engines, among other things, in a variety of states of repair. Four percent or so of the shipbreaker's revenue comes from this.

For indigenous shipowners in developing nations, maintaining the operational status of a ship that is more than 20 years old would be an expensive endeavour. The earning potential of the ship may be prolonged for a number of years with adequate safety margins if high-quality used components or spare parts were readily available. Even the asbestos material used to insulate the heat of engines is removed from the ship by the buyers themselves and utilised once more in industrial shops to insulate generators or ships that were built locally.

This might be easily purchased at throwaway prices for a nation that is still learning how to operate certain machinery that is recovered from a ship for scrap. Nadkarni (1999) noted that the majority of Indian businessmen lack sufficient awareness of brands like Daihatsu or Yanmar. Medium speed engines can't currently be produced locally, a problem that is not unique to India but also prevalent in other emerging nations.

3.3 The Workers

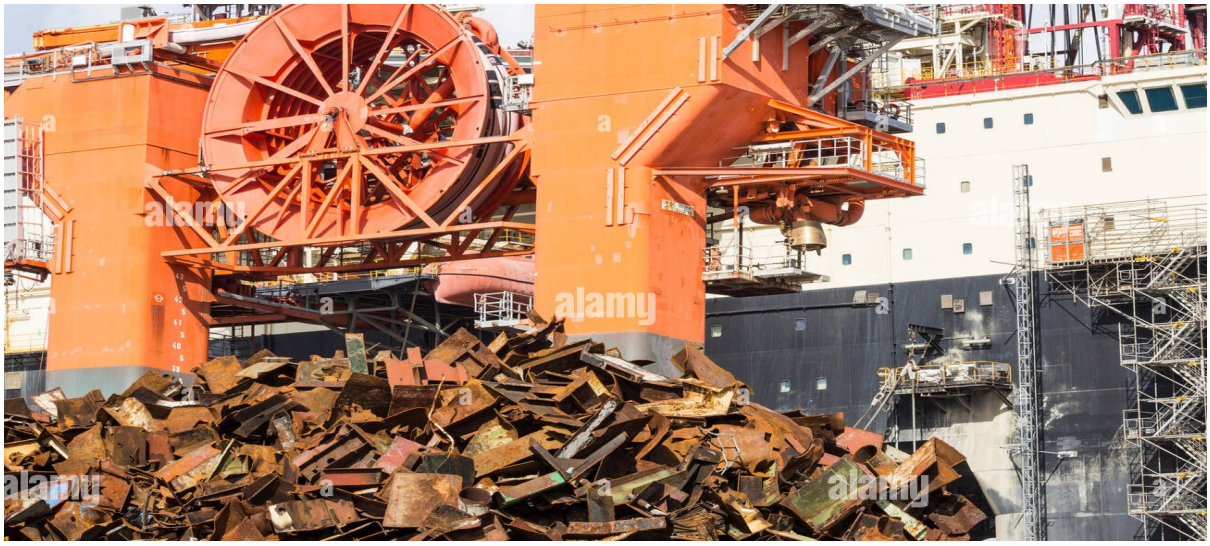
It is frequently claimed that the high cost of labour and strict regulations governing the handling of materials that are harmful to humans and the environment are the reasons why the shipbreaking industry has moved to developing nations and is unprofitable to have it in industrialised countries. The top shipbreakers in developing nations now rely heavily on the shipbreaking sector as a source of revenue.

Compared to other owners that entered this type of business earlier, some owners of shipbreaking yards may make a small profit, but the number of jobs the industry creates is of equal importance. Many shipbreakers who started out with little money in their pockets have become wealthy thanks to their willingness to work hard, indulge in difficult work for long hours, and make an effort to get the most out of vessels that their former owner no longer needs.

The shipbreaking industry in India is active and thriving, as evidenced by the fact that more

than half of the world's fleet is dismantled in Alang, India, the largest ship graveyard in the world. An estimated 35,000 to 45,000 migrant labourers from the eastern Indian states received much-needed employment when more than three million tonnes worth of ships were destroyed. More than 100,000 tiny traders, scrap processors, transport and re-rolling sector workers, and personnel of oxygen plants are also indirectly employed by the industry (Nadkarni, 1999).

The way that several accounts depicted the process of manually dismantling ships by workers while using scant protective gear or none at all caught the attention of the maritime industry. If a comparison must be made, it should be noted that the shipbreaking industry in India, Bangladesh, and Pakistan employs thousands of people, but it is heavily automated in South Korea and Taiwan. The latter shipbreaking nations have made significant infrastructure investments, but they do not employ hundreds of individuals, and they now find it expensive to reclaim steel from shipbreaking operations. On the other hand, because there are so many workers available and the labour is so inexpensive, the three most important shipbreaking nations now find it profitable. It is so inexpensive in the sense that they depend on income from workers to exist.



4Fig 3.1 Steel scrap from demolished ship for recycling

3.3.1 Salaries and employment

The Gujarat State Government has included all Alang worker jobs under the coverage of the Minimum Wages Act. However, it has been noted that some categories, particularly those for unskilled workers and a small number of skilled workers, have wage rates that are lower than those specified in the Minimum Wages Act. Data on minimum wages set by the Gujarati

government indicate that they were set in April 2002. Gujarat sets minimum pay for several types of workers. Unskilled/manual workers must make a minimum salary of Rs. 79 per day, whereas skilled workers must make a minimum wage of Rs. 89 per day. It has been determined that employees at Alang work an average of 26 days each month.The minimum salaries for skilled and unskilled labour are Rs. 2054 and Rs. 2314, respectively, when adjusted for a month (with 26 working days). There are 17 different categories in which the work done at the Alang shipbreaking yard can be put. Some of them fall under the category of skilled job, while others do not. The pay paid to workers at the Alang shipbreaking yard vary not just on their skill level and years of experience, but also on the type of work they do. Eight of the 17 categories are skilled, and the remaining 13 are unskilled. Here, an effort is made to confirm that the payment to the employees is based on minimum wage.

3.3.2 Source of employees

The majority of workers in the shipbreaking sector are from other rural areas, where poverty forces them to look for other employment. These labourers either work on larger farms or have a little plot of land that they cultivate during the rainy season because there are no other employment opportunities in their communities. Shipbreaking is their only available option for paying employment that doesn't take a lot of talent.

Some of the ship scrappers, who are ex-mariners who were unable to continue their careers at sea, have helped the shipbreaking yard's profits rise by using their expertise to separate working pieces from scrap and sell them at larger margins.

The majority of workers in the shipbreaking sector are from other rural areas, where poverty forces them to look for other employment. These labourers either work on larger farms or have a little plot of land that they cultivate during the rainy season because there are no other employment opportunities in their communities. Shipbreaking is their only available option for paying employment that doesn't take a lot of talent.

Some of the ship scrappers, who are ex-mariners who were unable to continue their careers at sea, have helped the shipbreaking yard's profits rise by using their expertise to separate working pieces from scrap and sell them at larger margins. It is clear that these guys are going through a lot of pain and need a job to support themselves so they can put up with the difficult living and working circumstances at the shipbreaking yard. Environmentalist organisations have consistently criticised shipbreaking operations in underdeveloped nations in this manner,

completely disregarding the safety of the employees.

3.4 Ship Breaking yard and nearby villages

Alang, Sosiya, Manar, Sathara, Kathwa, Bharapara, Mathavada, Takhatgadh, Jasapara, and Madva are the 10 villages within a 12-kilometer radius that have seen significant economic and social changes as a result of shipbreaking (UNESCO, 2001). After the arrival of ASSBY, people who had previously worked primarily in agriculture could find new jobs and business opportunities (often according to their caste) in the transportation, trade, and retail industries (Chaudhari, 1999).

The residents are concerned about a few of the environmental effects. Noise pollution has an impact on those who live nearby the operation yards. There are hundreds of disposal sites nearby, therefore locals typically complain to Sarpanches (leaders of villages) and local officials about the dumping of debris from destroyed boats. The preferred locations include wastelands, which have historically been utilised for grazing, as well as agricultural fields; according to reports, oxen and cattle have perished after consuming garbage. Villagers complain about skin and respiratory issues, especially when the trash is set on fire. The majority of the coastal settlements in this area experience water scarcity and salt problems. Because of population increase and worker immigration, the industry has made the issue worse by causing overexploitation of water resources, which has caused the level of groundwater to drop. Villagers mention renal problems linked to salt and pollution, in addition to the decline in agricultural and animal husbandry. A few wells have been abandoned because they are so filthy. Onions, mangos, chikos, coconuts, and other crops are grown on both large and small farms using both modern and traditional agricultural methods. Land and personnel costs have risen locally as the industry has stabilised. On the other hand, the size and quantity of the harvests have shrunk, and the flavour has altered.

CHAPTER IV

ENVIRONMENTAL CONSIDERATION OF SHIP RECYCLING

4.1 The Green Issue

Shipbuilding activities gradually develop as tonnage demand for the transportation of goods rises in the shipping sector. Ships constructed in the 1960s and 1970s were built to perform the tasks for which they were intended, but the materials used were selected solely for their endurance and their role as a component construction of the ship rather than taking into account any negative effects. Hazardous substances were not prohibited back then.

Asbestos and heavy metals were used in their construction, and these ships are frequently labelled as obsolete and highly poisonous. These ships are currently bought and shipped to underdeveloped nations for destruction. In the shipping industry, the shipbreaking sector is a business that is characterised as being completely out of control, where workers risk dying while tearing down enormous steel structures and where environmental toxins like lead, asbestos, PVC, freon, and PCBs are released into the neighborhood. Depending on the size and kind of the ship, several compounds that are environmentally dangerous are present. An estimated volume of hazardous materials would need to be removed in significant amounts in order to disassemble a VLCC (see Table 4.1).

Table 4.1 ENVIROMENTAL HAZARDAOUS SUBSTENCES GENERATED DURING THE DEMOLITION OF A VLCC

SOURCES	DESCRIPTION
Cathodic Protection	The vessel originally had anodes weighing more than 110 000 kg. There were both Zn and Al anodes used. When the ship arrives for scrapping, it's anticipated that there will be about 65 000 kg (total) left. In, Cd, and Pb are present in lesser quantities in the anodes.
Batteries	There are 200 kg or so of batteries found. These are made up of sulfuric acid, Pb, Cd, and Ni. The figure is deemed low and

	likely just represents the necessary amount and extra backup batteries. The real figure is thought to be closer to the double.
Coatings and Paints	More than 65 000 litres of paint were initially used. Due to the operation and upkeep, a substantial portion of this has worn off. Over time, more paints have been introduced, though. Therefore, the leftover quantity is probably greater than the initial volume. Onboard paint remnants are thought to be in relatively small amounts. These goods are probably utilised and cared for locally. Chemicals including Cl, Zn, Cu, PCB, and Pb can be found in paint and coatings. Additionally, one should anticipate finding a sizable amount of TBT in the anti-fouling paint.
Fire-fighting	Powder, CO2, and foam volumes have been measured. Mobile firefighting equipment is more likely to be recycled. The spread of the indicated compounds will result from the demolition of fixed systems. There is no assumption that they will affect the local ecosystem.
Refrigerants	Chlorodiflourmethane (R22) and dichloroflourmethane (F12) are substances used in cooling plants. Approximately 1000 litres of total volume are anticipated.
Thermal Insulation	When the ship was built, asbestos was frequently utilised as a thermal insulator, and 7000 kilogrammes of it have been found. It is believed that this is a conservative estimate. The figure appears to be indicative of vessels from 100,000 DWT and over when compared to other smaller vessels.
Steel Structure	Steel makes up about 15% of the DWT of the boats. The majority of the steel is covered in paint and coatings, and the

	recovery (recalculation) will result in gaseous discharge after the cutting processes. The components that were released could include dioxins and others.
Electrical Insulation	There will probably be 50 000 meters of cable in the entire ship. Most likely, locals burn cables on the beach. Cu and PVC are among the materials whose burning released dioxins and chlorinated furans. PCB and Hg are two electrical components found in light fixtures.
Oil Residues	The remaining oil has been designated as waste or "clean". The first group's products have a market worth and are therefore recoverable. The latter category includes tainted oil products and nonrecoverable goods. Remains from cargo tanks make up the bulk of the group. This could contain between 1500 and 2000 m3 of an oil, rust, and sand/sediment mixture..
Preparations prior to Scrapping	Normally, the ship must cruise to the location of its scrapping. This necessitates that all systems be in good working order overall. As a result, it is impossible to remove contaminants from the system before demolition. Stores containing things like paint, chemicals, and oil can be taken out.

Source: MEPC 43/18/1, Scrapping of Ships, p. 10

The current shipbreaking operations, which are located in the ocean's tidal zone, run the risk of introducing harmful and dangerous substances from the ship into the water, air, and soil. International shipowners and an alliance of environmental and business protestors are somewhat alarmed by the threat that the scrapping of ships poses to the environment and the health of workers. These advocacy groups advocate that adequate action be made to raise ship scrapping standards, and that action be conducted with consideration for the environment, nature, and human life.

4.2 Shipbreaking sites

Running the ship full speed in the direction of the beach is what the top shipbreakers currently do. Hand-held cutting torches help with the physical dismantling of the ships. On the beach, the ship's steel scrap is dragged and heaped carelessly. Metal shards and rust, particularly iron rust, amass along the shore as a result of the continual cutting, pounding, and hammering of scrap steel at a shipbreaking site before it is delivered for processing. This also includes any waste or disposable items that are dumped or leaked into the water or the sand while the process is in progress.

Nickel and lead compounds are the most frequent soil contaminants found in shipbreaking sites. Ship steel can be made up of a variety of different compounds. The breakdown of metal components at the beach has a role in the chromium pollution that results from the paint.

When soil samples were obtained at the shipbreaking sites, various pollutants were discovered, according to a report by Greenpeace Germany (1999), and one of the samples taken in Alang (No. 306) was taken one kilometer inland from the scrapping site. In order to evaluate the concentration of pollutants discovered, the team also collected additional samples that serve as background values (See Table 4.2).

Table 4.2 HEAVY METALS IN SOIL AT SCRAPPING SITE AND BACKGROUND LEVELS

Sample	No. 110 (Bombay)	No. 306 (Alang)	No. 317 (Velavadar)	Holy Soil (Palitana Temple Area)
	mg/kg dry matter	mg/kg dry matter	mg/kg dry matter	mg/kg dry matter
Chromium	776	77	-	-
Iron	282	90	-	-
Nickel	347	108	-	-
Copper	888	112	58	34
Arsenic	163	35	2	2
Lead	806	<2	10	4
Zinc	2112	74	53	80

1 Table 4.2

Source: (Kanthak et al, 2020); Steel and Toxic Waste for Asia, p.17

4.2.1 Water Pollution

As soon as an ageing ship enters the mooring area, it is possible to tell if it is introducing dangerous elements. How to reduce a ship's running costs was among the innovative concepts conceived in the early years of the maritime business. On a ship's hull, unwelcome growths of algae, barnacles, and mussels increase frictional drag and increase fuel consumption. Anti-fouling paint has been used in the transportation sector to eradicate aquatic organisms from ship hulls since the early 1960s. Tributyl tin oxide and tributyl tin chloride, two highly poisonous substances, are found in anti-fouling paints. These elements control the amount of TBT released into the water or its rate of leaching.

TBT poisons oyster larvae, kills them, damages shells, and destroys the entire aquatic ecology. It also puts all other marine life in jeopardy. The concentration of TBT in sediment must be between 0.005-0.5 g/kg to prevent harm to marine species. According to Kanthak et al. (1999), the content of TBT in sediment taken from Alang and Mumbai is significantly higher than what is permitted under the interim standards established by the Oslo-Paris Convention for the protection of the marine environment in the North-east Atlantic (See Table 4.3).

Ships are sold "as is" and the shipowner is required to deliver the vessel to the shipbreaking yard. To accomplish this, the ship must be staffed and outfitted with sufficient provisions of food and fuel to finish its final voyage. Once at its final stop, the shipbreaking yard, it would need to be loaded with just enough fuel. While it's possible to clean a ship's tanks before delivery—especially for VLCCs and ULCCs—the oil waste produced during the ship's previous voyage would likely be in a sizable amount.

Table 4.3 TBT AT THE WORKPLACE AND IN THE ENVIRONMENT

Sample/No.	Sampled Site	MBT	DBT	TBT	TTBT
		µg Sn/kg dry matter	µg Sn/kg dry matter	µg Sn/kg dry matter	µg Sn/kg dry matter
Soil/110	Mumbai Scraping Yard	145	349	1090	67
Sediment at Sea/310	Alang Scrapping Yard, eastern fringe	18	33	119	<1

Sediment at Sea/314	Alang, 500 meters from eastern fringe	6	3	5	<1
Sediment at Sea/315	Alang, 400 meters from eastern fringe	7	3	9	<1
Sediment at Sea/401	Alang Scrapping Yard, western fringe	22	31	170	2
Sediment at Sea/402	Alang Scrapping Yard, western fringe	11	25	184	4
Sediment at Sea/306	Alang freshwater pool, 500 meters inland from scrapping yard	<1	<1	<1	<1

Source: (Kanthak et al, 2020); Steel and Toxic Waste for Asia, p.18

The ship must be loaded with "ballast water" in addition to fuel oil to achieve the necessary stability for travelling safely to its destination. After that, the "ballast water" would be released into the ocean nearby the shipbreaking facility before the ship was driven at top speed towards the shore. At any given time, hundreds or perhaps thousands of non-native species are being introduced into the maritime environment by the discharge of "ballast water" from ships. These non-native species may include a variety of microscopic bacteria, viruses that affect crustaceans and molluscs, and even free-swimming fish.

Within coastal maritime zones, the silt that has been held in the ship's ballast tank is released or discharged. When the ship's hull is broken up, a large number of potentially dangerous aquatic organisms that are present in the sediment are released into the sea, but are first trapped by stiffeners, ribs, and scantlings that protrude inside the tanks.

The most urgent issue facing the maritime ecosystem is thought to be the introduction and spread of non-native species (Loy, 2000). It is more challenging to control the invasion of non-native species than oil contamination.

It is quite difficult to eradicate these species from the ecosystem once they have established themselves, unlike oil contamination. Some of these alien species that have thrived in the new habitat have a direct bearing on the ecological balance that currently exists. When vast amounts of "ballast water" containing pathogens like bacteria, viruses, and other hazardous organisms

are contaminating the local water supply, disease may also be introduced. The International Maritime Organisation (IMO) and World Health Organisation (WHO) have already acknowledged the possible harm that the term "ballast water" signifies.

4.2.2 Air Pollution

Parts of the ships occasionally fly through the air and land with a thud on the beach or in the ocean when the operation at the shipbreaking yard is in full swing. Hand-held cutting torches are used to cut these steel pieces, and most of the cutting is done while the ship is still upright. Old ships may have been painted with chlorine-containing paints, and as the metal is broken apart, hazardous vapours are released into the air and create dioxin (Kanthak et al., 1999).

Lead is a strong blood, nerve, and kidney poison, and the shipbreaking employees are constantly exposed to deadly lead vapours. Through ingestion, inhalation, and skin absorption, metallic lead and the compound that it is made of that is present in the air can enter the body. The effects of lead exposure on the human body can range from impaired blood counts to harm to the neurological system to possibly causing stomach and duodenal cancer, depending on the level of exposure. In addition to lead compounds, nickel and arsenic contamination are also frequently found when disassembling metal components (see Table 4.4).

Table 4.4 HEAVY METALS AND ARSENIC DETECTED IN PAINT

Sample No.	**108**	**117**	**213**	**214**	**215**
Date	2.10.18	2.10.19	2.10.20	2.10.21	2.10.22
Site(Ship)	Bombay (Kapitan Kissa)	Bombay (Murray Express)	Alang (Columbus New Zealand)	Alang (Columbus New Zealand)	Alang (Columbus New Zealand)
Material	Paint green	Paint 1 mm	Paint above water line	Paint above water line	Paint above water line
Findings	mg/kg dry matter	mg/kg dry matter	mg/kg dry matter	mg/kg dry matter	mg/kg dry matter
Arsenic	0.2	5.5	0.88	0.42	0.84
Lead	21400	6380	34000	33300	51000
Cadmium	1.4	0.83	0.33	1.8	0.84

Copper	600	8.5	8.5	200	37000

2 Table 4.4

Source: (Kanthak et al, 2022); Steel and Toxic Waste for Asia, p.15

Smouldering fires are typically created when goods from ships, which may contain flame retardants, are burned. Incomplete incineration results in the production of pollutants, which might include a variety of hydrocarbons. Carbon monoxide is the most basic type of pollutant; it may contain polyvalent hydrocarbons, which may in turn contain many interconnected benzene nuclei-polycyclic aromatic hydrocarbons, or PAHs. The amount of oxygen available to a fire, temperature, and the materials being burned all have an impact on the production of PAHs, which are regarded as health risks.

When the metal is cut apart, toxic vapours from multiple layers of coatings are released, and the workers are also permanently exposed to any other pollutants that may be produced during the burning of other ship materials. Due to the fact that they also live close to the scrap yard, they have no chance to recover.

4.3 Toxic and Hazardous Substances

The environmental movement and advocacy organisations in certain wealthy OECD nations have criticised shipowners who sell their vessels to shipbreakers in Asia as pure steel while taking no responsibility for the harmful materials on board. With the incorporation of the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal" into European Union waste legislation, Greenpeace and the environmental movement as a whole launched their campaign against the unlawfulness of this practise. Depending on the kind of ship, different compounds of environmental significance will be present, and provides an estimate of the substances and volume for a VLCC.

The issue with hazardous compounds is that, if left unchecked, even OECD countries with more experience in handling toxic waste find it economically viable to dump in non-OECD nations. The threat of negative health effects and ecological damage cannot be completely removed, and proper waste treatment is expensive. Ronning (2000) has noted that as of right now, not even Norway has developed a method that could profitably recycle every item found on a modern ship.

A dangerous and cancer-causing material, asbestos is extracted from ships. Accord, Asbestos

has a definite effect on the body if its diameter is less than one micrometre and its length is five micrometres or more. Asbestos's carcinogenic potential is dependent on the shape and size of the fibre. Daily exposure to the dangers of this substance among the workers at the Alang shipbreaking yard even extends to their personal living spaces.

Without using protective masks or covering up their hands, the removal of asbestos from the ship is carried out while wearing regular clothing, dumped in an unsupervised area, and occasionally sold in a store. The way that this kind of material should be handled entirely contravenes the laws, rules, and regulations that are upheld by both employers and employees in OECD nations.

4.4 Management of Waste

The lack of a designated facility for receiving or disposing of hazardous substances and unsaleable commodities that could endanger human health and the environment is said to be the root of pollution at shipbreaking sites.

IMO (1995) states that the creation of a waste management strategy is a potent tool in establishing a consistent system of waste handling practise and the facilities to adequately address the following concerns by making reference to the arguments that have been considered in deciding appropriate measures on how to handle ship-generated waste.

- Ship-generated waste should not be separated from land-based waste handling procedures;
- An integrated approach to waste handling that takes into account the entire life cycle of waste could result in significant savings in the future;
- Both ship- and land-based waste may contain valuable materials that can be reused; and
- Waste minimization is crucial to avoid any unnecessary costs associated with waste transport, treatment, and disposal.

Considering the actions to be taken in relation to the aforementioned arguments could be a good starting point on how to establish a medium-term solution while the international regime is being taken into consideration. Waste generated during the scrapping of a ship may seem peculiar compared to waste generated during the normal operation of a ship. It is preferable to take action than to spend too much time researching and debating your options. Because of the

hazardous qualities that trash represents, temporary interventions may be effective to some extent. However, IMO (1995) provided a suggested guideline to ensure that temporary measures can result in improvements:

- Temporary solutions should be as brief as possible and have a set deadline;
- They should also take future waste treatment or recovery into account (records of the location where waste is disposed of should be kept);
- They should also take future site use (for a landfill) into account;
- And they should be designed as a practical way to gain experience in waste handling.

Implementing a temporary fix is necessary given the current shipbreaking situation. Even if it may be brief and of limited scope, it might be enough to quell the doubters and give the shipbreaking nations the much-needed boost of confidence they need. Even though it might be a very small effort at a low cost, starting an early improvement in waste collection and disposal would provide the groundwork for a longer-term, more systematic approach to waste management. And to make matters worse, organisations of shipowners from OECD nations are already considering ways to improve shipbreaking in poor nations.

4.5 Environmental Impact Assessment

Authorities in areas where shipbreaking is prevalent are frequently criticised for failing to uphold their duties to protect both their inhabitants and the environment since they are solely motivated by financial incentives. The lack of stringent marine environmental rules was the main factor in the relocation of shipbreaking to developing nations. Among the top shipbreaking nations today, it is clear that their governments have neglected to take the EIA into account when considering the necessity of a supply of industrial steel at reasonable prices and the fact that it is a labor-intensive sector that is well suited to the economies of developing nations.

Environmental organisations have underlined the need for concrete statistics to assess the environmental impact of debris produced during shipbreaking activities. Health and ecological risks are receiving more attention, and this trend is anticipated to pick up speed. Sinha (1998) has recommended that an environmental impact assessment (EIA) be conducted for the shipbreaking sector in order to comprehend the anticipated effects. This EIA may cover, but is not limited to, the following topics:

- Baseline investigation of the ocean around the shipbreaking yard;
- A list of the pollutants and effluents produced, one list per type of ship;
- Quantification of waste products that are already known and analysis of their chemical properties; and
- Determining and calculating the probable impact.

The systematic identification and evaluation of the potential impacts (effects) of proposed projects, plans, programmes, or legislative actions relative to the physical-chemical, biological, cultural, and socioeconomic components of the total environment is what Cartel (1996) defines as the environmental impact assessment. Even though there have already been a number of studies done on shipbreaking, they have largely focused on documenting the conditions of the shipbreaking yards through photographs and videos taken by eyewitnesses with the ultimate goal of making the information public. They have collected environmental samples from the soil and sediments at various sites throughout the shipbreaking yard as well as material samples from the ships.

The association of shipowners from OECD nations also commissioned a survey to analyse on-site the issues and effects of hazardous materials aboard ships as well as potential trends in the demolition market. As a large number of ships are expected to become obsolete within the next five years, what is currently being done in the shipbreaking industry is a reactionary response to the urgent problem that it and the shipping industry as a whole represent.

The main goal of the EIA process is to encourage taking the environment into account when making plans and decisions in order to finally come up with activities that are more ecologically friendly. When the study's proponents work for the organisation recommending the action or serve as consultants to organisations or the private sector that are project proponents, the utility of an environmental impact assessment may occasionally be called into question.

This worry cannot be readily ignored, but if trained and experienced professionals, such as engineers and planners, execute the impact studies in accordance with a professional code of ethics, a suitable job within the study's parameters would be completed.

This worry cannot be readily ignored, but if trained and experienced professionals, such as engineers and planners, execute the impact studies in accordance with a professional code of ethics, a suitable job within the study's parameters would be completed.

Seven phases can be used to categorise the process that can be taken into account while conducting an environmental impact analysis;

- Determination of problems and effects
- Baseline environmental studies
- Impact prediction and assessment
- Mitigation strategy
- Comparison of potential options
- Making decisions regarding the suggested activity
- Environmental assessments are created through study documentation (Cartel, 1996).

An excellent strategy for an environmental impact study is to use sources of information and actions that are well recorded, as well as to undertake the proper public information and consultation activities. It is crucial that the public participate in order to answer any queries that might be on interested parties' thoughts who may be either supporters or opponents of the planned project. Bringing environmental issues to the attention of the public would affect how an administration made decisions, and this has gained popularity among international countries for the implementation of environmental policies.

CHAPTER V

ORGANIZATIONS, LEGAL REGULATIONS AND PROPOSALS

5.1 Recycling of Ship Act 2019 (India)

The Indian government has published a notification for the Recycling of Ships Act 2019. In addition to providing the yard workers with suitable and safe working conditions, it aims to establish global standards for a safe and sound environmentally friendly recycling process. It is in accordance with the 2009 Hong Kong Convention, which outlines international norms. Once the convention is in effect, ship recycling businesses will need permission to operate, and only authorised yards will be allowed to import ships for recycling. For incoming vessels, Ship Recycling Plans (SRPs) that are ship-specific must be created. Prior to recycling, the ships must receive a "Ready for Recycling Certificate" in accordance with the HKC.

India's ratification of the HKC will promote recycling on green ships there. It will pique the desire of wealthy nations like Norway and Japan to recycle an increasing number of ships in India, boosting the industry's economic growth. Expanding the global economy will provide our nation with numerous employment and career prospects. It will improve the reputation of India's ship recycling facilities, boost sales, and solidify the country's position as the industry leader. Therefore, the ship recycling industry will undoubtedly experience tremendous growth in business activities, boosting the GDP of the nation.

On November 28, 2019, at the 31st session of the IMO Assembly, the document of India's accession to the Hong Kong Convention was recently delivered to the IMO General Secretary. Kitack Lim, the secretary general of the IMO, has expressed his appreciation for the accession.

The passage of the Ship Recycling Act 2019 and India's membership in the HKC 2009 are significant developments for the country's marine industry. It is a significant step for the Hong Kong Convention, bringing it closer to entering into force globally, given the sizeable volume of ships recycled in India. The Indian government has assured that this business continues to function while maintaining the health and safety of yard employees and resolving all environmental problems related to it with the passage of this historic legislation. As a result, it represents a turning point in Indian maritime history. Unquestionably, it is a component of

ongoing, significant changes and the Modi government's ambition to growing India's economy to $5 trillion by 2025.

5.2 Relevant International Organizations and Regimes

The lack of control mechanisms was highlighted when industry watchers described the poor working conditions and environmental situation at shipbreaking yards in underdeveloped nations. Even though a shipbreaking nation may have a labour legislation and a national law protecting the environment, it has been stated that either these laws are not completely enforced by the government or the labour law is outdated and the nation's economy cannot meet international standards. The shipping industry is already aware of the environmental and social challenges it causes, but it is powerless to address them.

The inability to choose which appropriate organisation has the ability to tackle the competing challenges was brought on by the requirement to address the issue in a global arena. The shipping associations, environmental organisations, and the workers federation all endorsed the Norwegian government's suggestion that the International Maritime Organisation (IMO) include the topic of ship recycling in its work programme. The Marine Environment Protection Committee (MEPC), the designated working committee, is seeking additional study and participation from other organisations that have the technical capabilities to address the specific issues that are crucial to the industry, even though the IMO has already considered the proposals to be part of its work programme.

The establishment of relevant legislation, increased environmental pressure, the publication of industry codes of practise and recommendations, and other actions are predicted to be taken in the next several years in regard to shipbreaking activities. Long-term, over the course of the next twenty years or so, new regulations, including global standards for ship recycling, will likely be introduced, according to the International Association of Independent Tanker Owner (Intertanko) (Fairplay, 2000).

5.2.1 The United Nations Environment Programs And its Conventions

By giving countries and peoples the tools to raise their standard of living, the United Nations Environment Programme (UNEP) takes the lead and promotes cooperation for environmental conservation. It acts as a champion for the preservation and enhancement of the environment as well as the foremost worldwide environmental authority. It encourages environmental

management, the transfer of infrastructure technologies that are ecologically friendly, and the promotion of the top environmental preservation techniques.

Its diverse work areas clearly demonstrate the necessity to protect and sustain the environment, and it is the main proponent of the new idea of "sustainable development." It has raised awareness of new environmental issues throughout the world and aids in incorporating environmental factors into social and economic policy. UNEP recognises issues that call for worldwide cooperation and aids in the creation of international environmental treaties as a global champion for environmental conservation. The following are a few conventions that are pertinent to the problems with the shipbreaking industry:

- **The Basel Convention** regulates the transboundary shipment of hazardous wastes and other wastes, and prohibits the export of hazardous waste from OECD countries to non-OECD countries. In light of a country's economic progress, the convention itself encourages potential exporting nations to manage their own trash and reduce generation of garbage when it cannot be stopped. The issue with this convention is that it only applies to OECD nations and does not include ship scrapping given that the ships were sold "as is" and not as rubbish to be transported or sold.
- **The Vienna Convention for the Protection of the Ozone Layer (1985)** outlines the state responsibilities for protecting human health and the environment against the adverse effects of ozone depletion. It is an international agreement made to save the ozone layer in the stratosphere. This convention and the subsequent protocols call for the gradual phase-out of substances including chlorofluorocarbons (CFC), halons, carbon tetrachloride, and methyl chloroform that deplete the ozone layer in the stratosphere. Some of these substances are present when ships are being broken up.

5.2.2 The International Labor Organization and its Conventions

One of the first intergovernmental organisations, the International Labour Organisation (ILO) establishes global norms and policies while serving as a venue for debate of social and labour issues around the world. Both industrialised and developing countries continue to be significantly impacted by these norms. Creating policies that guarantee the protection of workers' fundamental rights is helpful.

To some extent, the issues affecting those who are at work are connected to ILO. It is necessary to change working conditions that may be unfair, difficult, and deprive individuals of equal

opportunity and financial stability. It is only via international action that the protection of a group of employees who are susceptible to the aforementioned conditions might be ensured.

The activity of shipbreaking involves a larger range of issues. Regarding the working circumstances, it's interesting to note that the top shipbreaking nations share a number of difficulties with occupational and safety health, bad working conditions, and the absence of collective bargaining or industrial relations procedures. Environmental issues and pollution control received a lot of attention in the proposals that the Norwegian government, Greenpeace, and the shipping association submitted to the IMO. The working conditions within and around the ships once they are beached have not received much attention.

The workers should nevertheless be provided with the bare minimum of protection given that a ship must be scrapped and that they cannot be denied the meagre wages they can make. The social issue that plagues the shipbreaking business was discussed at the Tripartite Meeting on the Social and Labour Impact of Globalisation in the Manufacturing of Transport Equipment held in Geneva on May 8–12, 2000. The pertinent conventions, suggestions, and rules of conduct that are seen to be extremely significant for the shipbreaking sector are listed below. There is still much work to be done for the benefit of workers in this type of industry; improving worker well-being is not the Organization's own responsibility but rather requires a collaborative effort from the government, the employer, and the employees.

Conventions:

- No. 13 - White Lead (Painting)
- No. 115 - Radiation Protection
- No. 119 - Guarding of Machinery
- No. 127 - Maximum Weight
- No. 136 - Benzene
- No. 139 - Occupational Cancer
- No. 148 - Working Environment (Air Pollution, Noise and Vibration)
- No. 155 - Occupational Safety and Health
- No. 161 - Occupational Health Services
- No. 162 - Asbestos
- No. 170 - Chemicals
- No. 174 - prevention of Major Industrial Accidents

Recommendations:

- No. 114 - Radiation Protection
- No. 118 - Guarding of Machinery
- No. 128 - Maximum Weight
- No. 144 - Benzene
- No. 147 - Occupational Cancer
- No. 156 - Working Environment (Air Pollution, Noise and Vibration)
- No. 164 - Occupational Safety and Health
- No. 171 - Occupational Health Services
- No. 172 - Asbestos
- No. 177 – Chemicals
- No. 181 - Prevention of Major Industrial Accidents

Codes of Practice:

- Occupational Safety and Health in the Iron and Steel Industry, 1983
- Safety in the Use of Asbestos, 1984
- Radiation Protection of Workers (Ionizing Radiation's), 1987
- Safety in the Use of Chemicals at Work, 1993
- Recording and Notification of Occupational Accidents and Diseases, 1996 (ILO,2000)

5.2.3 International Maritime Organisation and its Conventions

The International Maritime Organisation (IMO) is a technical organisation that offers tools for government collaboration on all issues affecting shipping involved in international trade. The implementation of the highest practical standards in areas such as maritime safety, navigational effectiveness, and the prevention and control of marine pollution from ships is encouraged and promoted. The International Maritime Organisation (IMO) has official relationships with a variety of maritime industry players, including non-governmental and international organisations with a keen interest in the shipping sector, in order to carry out its job.

Industries that are situated on land have been exempt from IMO regulations. When the Norwegian government suggested that the Organisation take charge of the inquiry into the shipbreaking sector and create the appropriate standards, a number of detractors emphasised

that it would add an unneeded burden to the Organization's already onerous job.

- **The 1996 Protocol to the Convention on the Prevention of Marine Pollution by the Dumping of Wastes and Other Matter (1972)** was established to prevent marine pollution by the disposal of wastes that could endanger human health, harm living things and marine life, harm amenities, and obstruct other legal uses of the sea. It promotes agreements at the regional level to support the Convention. It encourages the development of required precautions to stop contamination from hydrocarbons, other materials carried other than for dumping, wastes produced during ship operation, etc., radioactive pollutants, and materials found during seafloor exploration. It has a global scope and helps to prevent and regulate marine pollution on a global scale. It needs a general permit for other wastes or matter and a particular permit for the disposal of a few other recognised materials. The issue with this treaty is that it does not address how waste from the routine maintenance of ships, aeroplanes, and other man-made structures should be disposed of at sea, and the majority of the top nations for shipbreaking have not ratified it or incorporated it into their national laws.
- **International Convention for the Prevention of Pollution from Ships (1973/1978)** applies to any ship of any type and size, and fixed or floating platforms operating in the marine environment. It does not apply to the disposal of garbage produced on land into the water, but it does encompass all aspects of international pollution and some areas of accidental contamination from ships. Certain obligations were placed on the Parties under the individual annexes of the convention to ensure the effective implementation of its provisions. The prevention of pollution is ensured by the maintenance of sufficient receiving facilities for the oil residues, toxic chemicals, sewage, and waste that are produced during ship operations. Before the ship is ready for demolition, this measure could be used to protect the marine ecosystem. The fundamental issue with this standard is that it is rendered useless if a ship has already been decommissioned and is being broken up on the shore, where the activity contributes to the deterioration of the marine environment. The convention doesn't cover waste management practises in the country or in coastal areas; it primarily deals with the supply of ship welcome facilities.

5.3 Actions and Proposals

The shipbreaking industry has long been characterised as "dirty," "dangerous," and "unfriendly to the environment." If the process must be likened to shipbuilding, it is entirely the opposite: there is no rigorous planning or execution. A major portion of the global shipping fleet is approaching its fifth survey period, and the rapid advancement of technology and the implementation of stricter laws might make the problem that the shipbreaking operation represents even worse. Shipbreaking is an industry that is expected to grow and spread its operations to other continents.

The risks involved with ship scrapping provide a significant obstacle for the shipping sector. With their counterparts from the shipbreaking countries, shipping organisations and the authorities have already begun preliminary high-level conversations. As a result, there is now general agreement that shipbreaking is significant for both the domestic and global economies, that the circumstances at the shipbreaking site need to be improved, and that standards need to be created as a foundation for the development.

The consistent finding we observed in the investigations that were focused on the coast of the ship breaking shores of India was that;

- There are no established procedures for handling harmful compounds;
- Workers don't wear any or very minimal safety gear to prevent physical harm;
- Hazardous compounds expose workers to significant health risks; and
- The wages and contracts that workers receive fall short of what is necessary for a decent existence.

With the aforementioned observations, a number of proposals were also made to reduce the environmental impact of the shipbreaking industry and the exposure of workers to hazardous materials. To decrease the amount of mishaps and releases of hazardous materials from ships during the shipbreaking operation, the following suggestions were made:

- Creation of global standards for the preservation of the environment and the safety of employees;
- "Cradle-to-grave" strategy for building future ships;
- Creating a "Global Scrapping Endowment Fund";
- International restrictions on the life cycle of vessels;

- Creation of a shipowners' manual on how to reduce operating leftovers on ships sold for scrap;
- Creation of a certification system for scrap yards;
- Documented requirements for ship decommissioning or scrapping;
- The transfer of the know-how or resources required to enhance shipbreaking facilities and operational procedures.

The first three ideas fall under the category of proactive measures and will take a long time for the industry to accept them. This is not intended to be a criticism of the aforementioned recommendations, which are very important, as cooperation among international organisations would lead to an ideal resolution that would encourage proactive steps rather than merely reactive ones.

The implementation of the other measures within that time frame would significantly improve shipbreaking practise in developing nations given the age profile of the merchant fleet that may be sold for scrapping during the next five years. It is simply an issue of providing direction to the industry's challenge in the lack of an applicable international regulation or standard. The idea is not severe.

The issue with the shipbreaking business requires quick response even though it is not a crisis. To ensure that ships are recycled in a method that won't affect the environment, is safe for the workers, and is one that the shipbreakers can afford, it must be done in an orderly manner.

To ascertain the likely volume and type of garbage that could be produced during the scrapping of VLCC, DNV already completed a research. With this, the national government might have a foundation to decide what appropriate actions should be taken to enhance both worker safety and environmental preservation. In relation to this, the USEPA has also created rules for the shipbreaker to take into account, which the Administration is expected to inspect.

The prevention of marine pollution and environmental issues are heavily emphasised in all of the given suggestions. The study, which was commissioned by the Norwegian government and Norwegian Shipowner's Association to evaluate the present and potential environmental issues associated with ship scrapping in international trade, has already produced compelling findings from which a number of implementable solutions may be chosen.

CHAPTER VI

MIGRATION AND DEVELOPMENT: A CASE STUDY OF ALANG SHIP BREAKING YARD

6.1 Introduction

Since the beginning of time, people have been relocating from one location to another. This ongoing, global phenomenon is the result of a complex mechanism involving social, economic, psychological, political, institutional, and other determinants. Migration is a type of spatial or geographical mobility that entails a shift in a person's regular residence between geographically distinct entities. In social science, especially in population studies, the idea of migration is crucial. The significance is revealed not only by the flow of individuals between locations but also by its impact on personal development and urban development. Migration, in general, refers to a change in residence for a variety of reasons and for different lengths of time.

Recent urbanisation and industrialization have accelerated social change, which is happening quickly in developing nations. The least developed nations of Asia have some of the highest rates of urbanisation. The average annual growth rate of the urban population was found to be 3.4 percent for India, 6.5 percent for Bangladesh, and 4.2 percent for Pakistan and Sri Lanka over the course of 20 years, from 1970 to 1990. However, migration from rural to urban accounts for three-fifths to two-thirds of the urban growth rate. Rural-urban migration is more common in developing nations, and there is a clear selectivity with regard to age, sex, caste, marital status, education, occupation, and other factors. These socioeconomic groupings also have various migratory propensities. (Lee, 1996; Sekhar, 1993; Yadava, 1988).

When determining the type and extent of the population's socioeconomic and demographic impact, migration differential is crucial. Many academics have attempted to establish some consistency in migration patterns across all nations and eras. Age is a component in the migration process that is more or less the same in industrialised and developing nations. Adult males are more likely to migrate than other members of the group, according to numerous research (Rogaia, 1997; Singh and Yadava, 1981). According to several research, there are differences in the determinants of migration within and between nations. The socio-economic, demographic, and cultural factors influence migration in different ways. Some of the key factors influencing rural out-migration include

unemployment, low income, unequal land distribution, and the demand for civic facilities (Bilsborrow et al., 1987; Kadioglu, 1994; Nabi, 1992; Sekhar, 1993; Yadava, 1988).

The interaction of push-pull variables affects the migration process. People move to cities and towns because the metropolis' brilliant lights allure them. According to studies on migration, the amount of out-migration is positively correlated with the infrastructure development of a region (CUS, 1990). The underprivileged rural populace thought of migration as a means of surviving. On the other side, some people move from rural to metropolitan areas in search of a better education, a job, or a higher salary. Both of these categories are heavily influenced by economic factors. The decisions about migration are also influenced by information and communication (CUS, 1990; 1988).

Studies on migration in underdeveloped nations have typically focused on its economic elements. However, the majority of studies (Afsar, 1995; Hugo, 1991; Selvaraj and Rao, 1993; Yadava, 1988) focused primarily on the causes and effects of migration rather than the differences and determinants of migration. Apart from its effects on the economy, migration has other effects as well, such as the reduction of agricultural work in rural areas and the actual separation of husband and wife. Therefore, it is crucial to comprehend the reasons for and scope of migration.

The development of the adjacent regions has been positively impacted by the ship-breaking yard in Alang as a result of workforce migration from impoverished regions to Alang. However, the ship breaking industry is a recycling sector that has a significant positive impact on India's steel industry as well as the regional economy.

It is crucial to remember that throughout the migration process, a person's decision to immigrate is heavily influenced by their family history, therefore their traits alone cannot adequately describe the reason they are migrating. The sort of persons involved in migration can only be determined by an individual's qualities. In order to understand the reasons for migration, it is crucial to research the traits of migrant households and individuals. This essay's objectives are to highlight the socioeconomic circumstances of migrants and to pinpoint the variables affecting out-migration. This essay also discusses the effects of migration and the growth of the local economy.

6.2 Results and Findings

The prevalent assumption regarding the socioeconomic features of migrants is that they differ from the rest of the population in their country of origin in a number of significant ways. Age, education, wealth, connections to the area of destination, and the occupation of their family members are socioeconomic factors that significantly influence people's movements from one place to another in search of work.

A. Age

Age disparity illustrates how migration affects socioeconomic and demographic structure both at the point of origin and destination. According to Huge (1981), the loss of young people due to village movement undermines agricultural production by reducing agricultural workforce. According to Singh and colleagues' 1981 study on Uttar Pradesh, young male emigration causes a fall in fertility.

The age distribution of the responders from the various states is shown in Table 6.1. According to the data, 75.3% of the population is between the ages of 21 and 35. All of the respondents at the Alang shipbreaking yard are of working age, and the bulk of them are young. According to a study by Yadav, migratory differences by age are practically universal and are higher for those between the ages of 15 and 40 (Yadava, 1988). The average age of the migrants is 28.52, 31.03, 29.77, 27.13, and 30.70 years old, respectively, from Uttar Pradesh, Bihar, Orissa, Jharkhand, and Gujarat. In comparison to the other states, Orissa's respondents are younger on average, at 27.13 years. The responders from all states together had an average age of 28.81 years.

Table 6.1 AGE STRUCTURE OF RESPONDENTS AND THEIR NATIVITY

Age Groups	U.P	Bihar	Jharkhand	Orissa	Gujarat	Total
15-20	15.93(18)	3.23 (1)	2.78 (2)	9.46 (7)	--	9.34 (28)

21-25	24.78(28)	22.58 (7)	27.78 (20)	32.43 (24)	30.00 (3)	27.33 (82)
26-30	23.89(27)	25.81 (8)	33.33 (24)	24.32 (18)	--	25.67(77)
31-35	22.13(25)	29.02 (9)	20.84 (15)	21.62 (16)	20.00 (2)	22.33 (67)
36-40	7.96(9)	9.68 (3)	8.33 (6)	6.75(5)	20.00 (2)	8.33 (25)
41-45	2.65(3)	6.45 (2)	6.94 (5)	2.70 (2)	20.00 (2)	4.67 (14)
46+	2.65(3)	3.23 (1)	--	4.05 (3)	--	2.33 (7)
Total	100.00(113)	100.00(31)	100.00(72)	100.00(74)	100.00(10)	100.00(300)
AverageAge	28.52	31.03	29.77	27.13	30.70	28.81

Source , Field survey report of Hrudanand Misra. Note (figures in bracket are the number of respondents in his actual study)

B. Education

Education has an impact on a person's decision to immigrate. According to several studies, migrants often have higher educational levels than non-migrants in their country of origin and lower educational levels than non-migrants in their country of destination.

Orissa state has a higher illiteracy rate (47.3%) than other states. Studies on emerging nations have shown that the majority of migrants are educated, and migration processes are selective in terms of education (Singh and Yadava, 1981). But this study demonstrates that immigrants have lower educational levels. However, due to the high percentage of illiterates—more than 30%—migration is not an education-selective process. It has also been observed that those with higher levels of education have less interest in pursuing careers in agriculture.

C. Pre occupational Income

35 percent of migrants were found to be engaged in physical labour in agriculture, while 21.3% of migrants were unemployed before to their migration. Furthermore, only 14.7% of respondents were marginal farmers, and 29.7% of respondents worked in non-agricultural jobs. Therefore, it is evident that the majority of respondents—60% of them—were working in unskilled occupations. The majority of respondents in the ship-breaking yard in Alang had jobs related to non-agricultural industries before moving there from various states, which created opportunities for employment in the industrial sector due to their background in industrial work and was thought to be one of the driving forces behind their migration.

Low agricultural income, agricultural unemployment, and underemployment are the main issues driving migration to locations with more employment prospects in developing nations, particularly in Asia. One of the main theories on the causes of poverty and rural out-migration is the pressure of population leading to a high man-to-land ratio. Only a small portion of the labour force can be absorbed by agriculture using the current mode of production. Unless cottage and small-scale enterprises in rural areas are able to absorb the surplus labour, these people will travel to urban centres in search of gainful employment (Oberai and Singh, 1983).

6.3 Spread Effect of Ship Breaking Industry

This section's goal is to demonstrate how the ship-breaking industry has spread. However, the ship breaking industry is a recycling industry that has a significant positive impact on India's steel industry as well as the regional economy. Reprocessed steel accounts for 10 to 15 percent of India's total steel production. Both directly and indirectly, it creates substantial amounts of jobs, and it also has several spillover consequences.

The ships that are bought from various nations across the world are the main inputs to the

ship breaking industry. The acquisitions are made through a number of overseas agents of different nations. Finances for the purchase of the ships are provided by several financial entities. GMB serves as a facilitator for the ship breaking activities by offering the necessary sites and infrastructure. The activity of breaking ships requires a variety of apparatus and equipment. In addition, the production of product, which accounts for 90% of output, and byproducts, which account for 10% of output, requires oxygen and LPG gases in addition to manpower. This has a significant impact on industrial growth as well as other business opportunities.

90% of the products produced by the ship breaking business are steel scrap, while 10% are byproducts such electrical equipment, wood products, utensils, asbestos, glass, etc. Steel scrap, which accounts for 90% of the value of the ship breaking industry's output, is the primary product as a result.

With an annual turnover of about Rs. 17 billion, the shipbreaking sector in Alang contributes significantly to the national economy (International Metalworkers Federation, 2006: 41). Steel items are used in many industries nowadays, as well as in homes. As a result, the shipbreaking industry's significance has grown throughout time. In addition to being significant for other economic sectors, the ship breaking business contributes 10-15% of India's total steel production, which is crucial for satisfying the nation's steel needs. As a result, the region's different sectors are in their first stages of development. In Bhavnagar, a related phenomena has been noted. According to the International Federation of Human Rights (2000), there are 100 re-rolling mills, 20 oxygen facilities, and 12 LPG plants located inside or outside of the region. These sectors create a lot of job opportunities for individuals and also increase demand for other associated

The shipbreaking business in Alang has definite spillover effects and influences the growth of the area. The region's industrial chain can be thought of as beginning with the Alang shipbreaking yard. Steel scrap and other useful goods for household use are mostly produced by industry. The raw steel that was formerly imported from other nations is now produced at shipbreaking yards. Ships are sliced into small plates and pieces, and the scrap is then sent to re-rolling mills for additional processing.

Through the purchase of inputs and the sale of finished goods, Alang's shipbreaking industry is connected to numerous small and medium-sized businesses. Cylinders of oxygen and LPG used in cutting are purchased by shipbreakers from a variety of sources.

On average, 250 to 300 oxygen cylinders and 35 to 40 LPG cylinders are cut while cutting a ship. These are regarded as the fundamental components of the shipbreaking industry. The ship is sliced into plates and pieces, which are then sent to rolling mills for re-rolling, which is closely related to the ship breaking business. Construction industries have an indirect relationship with the shipbreaking sector since they buy steel products from the re-rolling mills for construction projects, such as rods and bars.

Depending on the nature of the products and their purposes, numerous small, medium, and big enterprises employ the products of the ship breaking industry to transform them into finished products. Shipbreakers sell their goods to a variety of businesses both inside and outside the region. For instance, because these companies effectively repair and transform these products into finished goods, they sell electrical equipment, wood products, motors, generators, and kitchenware to the unorganised sector. However, the majority of the steel scrap that is supplied to the organised sector's re-rolling mills. Therefore, the raw materials produced by the shipbreaking industry are considered scraps and other items because they are sold to both organised and unorganised sector industries to be transformed into finished goods.

6.4 Backward Linkage

Different materials are purchased by an enterprise, and these materials are acquired from various sources both inside and outside of the region. The procurement of inputs from various sources is required. It has been noted that the corporation frequently purchases input from middlemen rather than the manufacturers on a number of occasions. The inputs used in the shipbreaking business are divided into categories based on their nature. These categories include the import of ancient ships, oxygen plants, LPG plants, and machine tools, among others. The sector also depends on numerous local and distant service providers.

Shipbreakers either purchase these types of inputs from inside the Alang region or from outside the region. These inputs are crucial to the ship's dismantling procedure. The international market's supply of unusable ships for scrapping is the industry's most crucial input. Ship wreckers buy unusable ships and use them as raw materials to create a variety of products that are used as raw materials in a variety of industries. Equipment, machinery, LPG, and oxygen cylinders are alternatively significant inputs for the shipbreaking sector. The procedure of disassembling the ships calls for these inputs. Links to other regions are necessary because the

majority of inputs are not present in the Alang region. As a result, these supplies are imported for use by shipbreakers. This industry's reliance on other sectors for a variety of inputs is demonstrated by the connectivity of its inputs. Overall, it is discovered that Alang's shipbreaking sector has a strong backward connection in terms of its input requirements. Due to the industry's dependence on raw materials, recycling, which is a key activity, exhibits high backward links.

6.5 Forward Linkages

By examining the primary consumer of the ship breaking industry's output, forward linkage in the business may be understood. On the other hand, steel scrap, which is sold to small and medium re-rolling mills, is a significant output of the ship breaking sector. For the purpose of marketing its goods, Alang Shipbreaking Yard has connections with other industries. The sale of shipbreaking services to various businesses demonstrates that selling their products is not a challenge or problem for shipbreakers. Additionally, shipbreakers are in direct contact with the company that purchases the industry's output. The majority of the product from the ship breaking sector is supplied directly to re-rolling mills, where it is used as raw material for additional processing. For skilled and unskilled labourers, these re-rolling mills in the area or elsewhere create employment prospects that exhibit a strong forward link. Additionally, re-rolling mills sell sheets, rods and bar to a variety of industries. The last consumers of the output of the ship breaking business are the processing industries, which primarily include fabrication and equipment manufacture in addition to the construction industry. The construction industry is expanding at a pace of 10% annually, and it contributes 5% of India's GDP, compared to most other countries' figures of 6–9%. Numerous other industries that require steel and steel equipment also use the processed steel.

The sales of the ship breaking industry are divided into regions and industries based on where the output of the industry is sent to different industrial units. There are two categories used to group the industry's full output links. Re-rolling mills are an example of a direct tie, while a variety of other industries, including fabrication, equipment production, and construction, are examples of indirect links.

From the aforementioned description of the shipbreaking industry's connections, it can be seen that this sector has both direct and indirect connections to other industries. Overall, it can be said that the ship breaking industry has strong links with a number of other industries, whether

they are located in the area or not. Between 30,000 and 40,000 people are employed directly and up to 1.6 lakh indirectly by the ship breaking industry.

6.6 Conclusion

As long as there have been humans, migration has existed. It has been noted that the socio-economic development of the various states and districts within varies. Workers at the Alang shipbreaking yard make up a sizable share of migrants from other states. They primarily hail from Uttar Pradesh, Bihar, Orissa, and Jharkhand, which are underdeveloped states. Only 5 to 10 percent of employees are from the state of Gujarat.

The reasons why people migrate are crucial to the migration process. Both 'push' and 'pull' factors are seen to have an impact on migration among the causes of migration mentioned in the current study. A little over 35% of respondents said that "pull" factors were the primary reasons for their relocation, while 65% cited "push" factors as being more significant. The conclusion is that "push" factors have therefore been more significant than "pull" factors. In terms of 'push' factors, it has been found that unemployment in rural areas is the main driver of migration. Additionally, the current study reveals that 58 percent of migrants left rural areas because there was no work there. Low fixed property (5.3 percent) of the migrant at their home location is another significant push factor. It has been shown that the comparatively good salaries at Alang compared to their home region are one of the main "pull" factors that drive rural labourers to migrate.

According to the analysis, the majority of respondents left rural areas because of poverty, unemployment, and connections to Alang. These workers left their home country because it was not economically viable for them to stay, and they moved to work at the Alang shipbreaking yard. The study also supports the implementation of rural development initiatives by planners and decision-makers to lower rural emigration.

The ship breaking industry exhibits both direct and indirect ties to other industries, as can be seen from the description of the industry's expansion above. Overall, it can be said that the ship breaking industry has strong links with a number of other industries, whether they are located in the area or not. Between 30,000 and 40,000 people are employed directly and up to 1.6 lakh indirectly by the ship breaking industry.

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusion

It is clear from the analysis that there are several elements that must be taken into account in relation to the scrapping action. The national government, shipowners, and shipbreakers must take immediate action to solve the issue the sector represents. According to the research's findings, the following conclusions are drawn:

- The practises currently used in the shipbreaking sector are fundamental, both in terms of the operation itself and safety. The processes used to recover the value that scrap metals represent contaminate and pollute the environment.
- Gases released during cutting and burn-off activities represent a general harm to the environment and, more specifically, to those exposed.
- The necessity to further address the issue of wastes created from a rapidly growing shipbreaking sector is underscored by the almost total lack of infrastructure for processing waste residues from the demolition process.
- The sizeable amount of garbage, which includes scraps from electrical parts, insulation, inventory from lodgings, specialised equipment, and other materials like plastics, plating material, rubber, and others, is piled up and burned on the shore.
- The focus of the current or upcoming guidance is pollution prevention and environmental issues. The authorities in the regions under discussion do not appear to prioritise the issues of working conditions, general human health, or environmental protection.
- Unskilled workers in economically struggling locations are in desperate need of employment possibilities, and it appears to be a major factor that the top shipbreakers tolerate the harmful effects of shipbreaking activity on both the maritime environment and humans.
- The holistic "cradle to grave" approach that is at the heart of the idea of sustainable development would probably provide a solution to the issue that the shipbreaking operation raises.

7.2 Recommendations

Even the International Maritime Organisation (IMO), which governs the maritime industry, is not participating much in the current game when it comes to the ongoing international debate on what actions must be taken and whether it is necessary to create legal regimes. It only has the authority to make recommendations in its capacity as an intergovernmental organisation. The issue that the sector poses shouldn't serve as a barrier to moving the shipbreaking business, or at the very least, temporarily stopping it. Given that the necessary standards have yet to be realised, the following suggestions might be helpful:

- Governments that lack the resources and expertise to create the operational standards and guidelines required to enhance ship scrapping safety procedures can contact international bodies that could offer them the crucial support.
- In order to begin investigating the situation and coming up with acceptable solutions, the administrations of the top shipbreaking nations should express their concern at the proper global forums.
- Governments should establish channels of contact with all impacted sectors and solicit their opinions. By beginning to undertake the required preparations for the development of the safety aspect before new international rules are adopted, assistance should be given to the industry.
- Even though it may not be financially feasible, the main shipbreakers must make more extensive efforts to develop well-planned facilities for ship scrapping that simultaneously have waste reception and handling capabilities. By industrialising the demolition process, these facilities will raise overall safety standards and working conditions.

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