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Ship recycling : analysis of the shipbreaking countries in Asia

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SHIP RECYCLING:
ANALYSIS OF THE PROBLEMS IT REPRESENT TO SHIPBREAKING COUNTRIES IN ASIA

By

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DECLARATION

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

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

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ABSTRACT

Title of Dissertation: **SHIP RECYCLING:**
Analysis of the Problems it Represent to
Shipbreaking Countries in Asia

Degree: **Master of Science**

This dissertation is a study of the economic and environmental impact of the shipbreaking industry in the developing countries, especially in Asia. Ships reaching the end of their economic life unquestionably have substances onboard, which require proper handling, whether from a personnel protection or an environmental point of view. There is an obvious need to address the environmental, industrial as well as the commercial problem that the shipbreaking activity represents.

A study is made on the shipping industry in general and the several factors that influence the lifecycle of a ship. The environmental concern and safety issue that the industry watchers have claimed to be neglected by the shipbreaking countries in Asia was also presented. Relative to this, the concept of the developing countries' shipbreaking practice has been studied.

The present efforts of the shipping associations and environmentalist group are briefly examined. The international legal principles that are related to the industry are enumerated which can be of use for future consideration by a national administration in reviewing its own legislation with regard to the problem of ship scrapping.

A brief look on the Philippines shipbreaking activity is taken and analyzed as to its capability and how the government could improve it for the protection of the marine environment.

Conclusions are formulated in the final chapter, with a number of recommendations presented. It identifies the constraints that could affect the development of the industry and areas that have to be improved.

KEYWORDS: Shipbreaking, Environment, Pollution, Protection, Safety

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LIST OF ABBREVIATIONS

BAN	Basel Action Network
CFC	Chlorofluorocarbons
CODEC	Community Development Center
DENR	Department of Environment and Natural Resources
DNV	Det Norske Veritas
DOLE	Department of Labor and Employment
DWT	Dead Weight Tonnes
EEC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ELAC	Environmental Legal Action Center
EMB	Environmental Management Bureau
ICS	International Chamber of Shipping
ILO	International Labor Organization
IMO	International Maritime Organization
ISM	International Safety Management
Intertanko	International Association of Independent Tanker Owner
LDT	Light Displacement Tonnage
OECD	Organization for Economic Cooperation and Development
MARINA	Maritime Industry Authority
MEPC	Marine Environmental Protection Committee
MGDIC	Moro Gulf Industrial and Development Company
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
RA	Republic Act
TBTO	Tributyl Tin Oxide
TBTC	Tributyl Tin Chloride

ULCC	Ultra Large Crude Carrier
UNEP	United Nations Environment Program
USEPA	United States Environmental Protection Agency
VLCC	Very Large Crude Carrier
WHO	World Health Organization

CHAPTER 1
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. Ageing vessels, due for decommissioning, provide important raw materials in the form of scrap steel for steel mills. The structural steel of a ship is estimated to be as much as 90% of its weight. It is a great waste of resources if left to deteriorate and not be recovered.

The process of recovering steel, usable machinery, instruments, devices, and other dismantled parts, which is referred today as ship recycling, was limited to the European region during the 19^{th} century. However, as nations from this region developed and industrialised with environmental consideration gaining momentum, the ship recycling activity has shifted to developing countries that are endeavouring to attain much needed growth of their industrial sector.

Ship recycling is a labor-intensive industry and an important source of steel for construction at a moderate price; but it is a known fact that shipbreaking is a dirty and environmentally hazardous activity. Today, the majority of the world ship scrapping activity is carried out in a manual, labor-intensive manner on beaches with almost complete lack of facilities and where environmental concerns often are of secondary priority. Over some time, a growing concern has risen regarding the ship scrapping activity in developing countries and the consequences this might impose on the environment as well as on human health.

The shipping industry is facing a considerable volume of ships that are approaching the age of retirement as a result of the building boom during the early 1970s. It is expected that new, stricter regulations for tankers that are entering 5^{th} survey, the introduction of the International Safety Management (ISM) Code and the implementation of new rules for aging bulkers, will provide a shortcut for the majority of these ships to the shores of the leading shipbreakers.

The leading shipbreaking countries today are India, Bangladesh, and Pakistan. Newspaper articles that have been published regarding ship scrapping activities in these countries have contributed immensely to the subsequent recognition of appropriate international forums to address the problem that the industry represents. Reports from Alang in India, both in the form of television programs as well as in the print media that are accompanied by pictures where the scrapping operations are shown to be carried out using basic tools and without basic protective gear such as hard hats and protective boots have convinced observers that the shipping industry is partly to be blamed, especially the shipowners.

Following the trend that shipbreakers, shipowners, and national administrations have recently become the target for the future control measures related to the safety practices in the shipbreaking industry, the shipbreaking activity is now one of the major issues being discussed in international forums. These control measures are not expected to come within the next few years, but several actions and proposals could be initiated to minimize the problems. The acceptance of this guidance and the proposals will then depend on the willingness of developing countries to consider the economic benefits that the ship scrapping industry could offer.

1.2 AIMS AND OBJECTIVES

This dissertation attempts to carry out a study the various aspects that influence the shipbreaking activity in developing countries. It aims to analyze the pressing issues on how the shipbreaking practice at present could be improved. Incorporated in this are the objectives of the study, as follows:

1. To provide an assessment on the environmental impact of the shipbreaking activity.
2. To provide an assessment on the economic impact of the shipbreaking activity.
3. To collate relevant and pertinent regulations, recommendations, and proposals of the shipbreaking activity.
4. To examine the shipbreaking practice in the Philippines.
5. To make recommendations based on the analysis.

1.3 METHODOLOGY

Due to the fact that the selected topic is current, the collection of information has proved not to be as easy as expected. The study was conducted initially through the gathering of documents and data; but considering the scarcity of published books that deal with this topic, most of the information comes from periodicals, conference proceedings and technical reports. Those Institutions involved in regulating the shipbreaking activity in the Philippines, the Department of Environment and Natural Resources (DENR) and Maritime Industry Authority (MARINA), have also been approached. Some of the views expressed in this study are solely the opinion and inference of the author, based on the analysis of the information gathered.

1.4 SCOPE AND LIMITATION

Since the shipbreaking is a very broad topic, some areas such as the management, investment, and financial aspects will not be touched upon in this dissertation. It will instead focus on the general and practical matters concerning shipbreaking practices, which have to be regulated by national legislation. An overview of the current international perspectives on shipbreaking practices in developing countries will also be provided as it relates to the environmental and safety aspects during the ship scrapping operation. The focus is on the safety aspect of the ship scrapping operation and how it can be further enhanced.

The analysis made and the conclusions and recommendations realised in this paper could provide factual, as well as insightful information about the possible impact of the shipbreaking activity. This information could be used by an Administration when considering the development of the facility and national legislation to improve safety practices in the shipbreaking industry.

CHAPTER 2

SHIPBREAKING AS AN INDUSTRY

2.1 Ship Demolition, Ship Scrapping, Shipbreaking, or Ship Recycling

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

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

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

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

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

2.2 The Ship

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

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

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

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

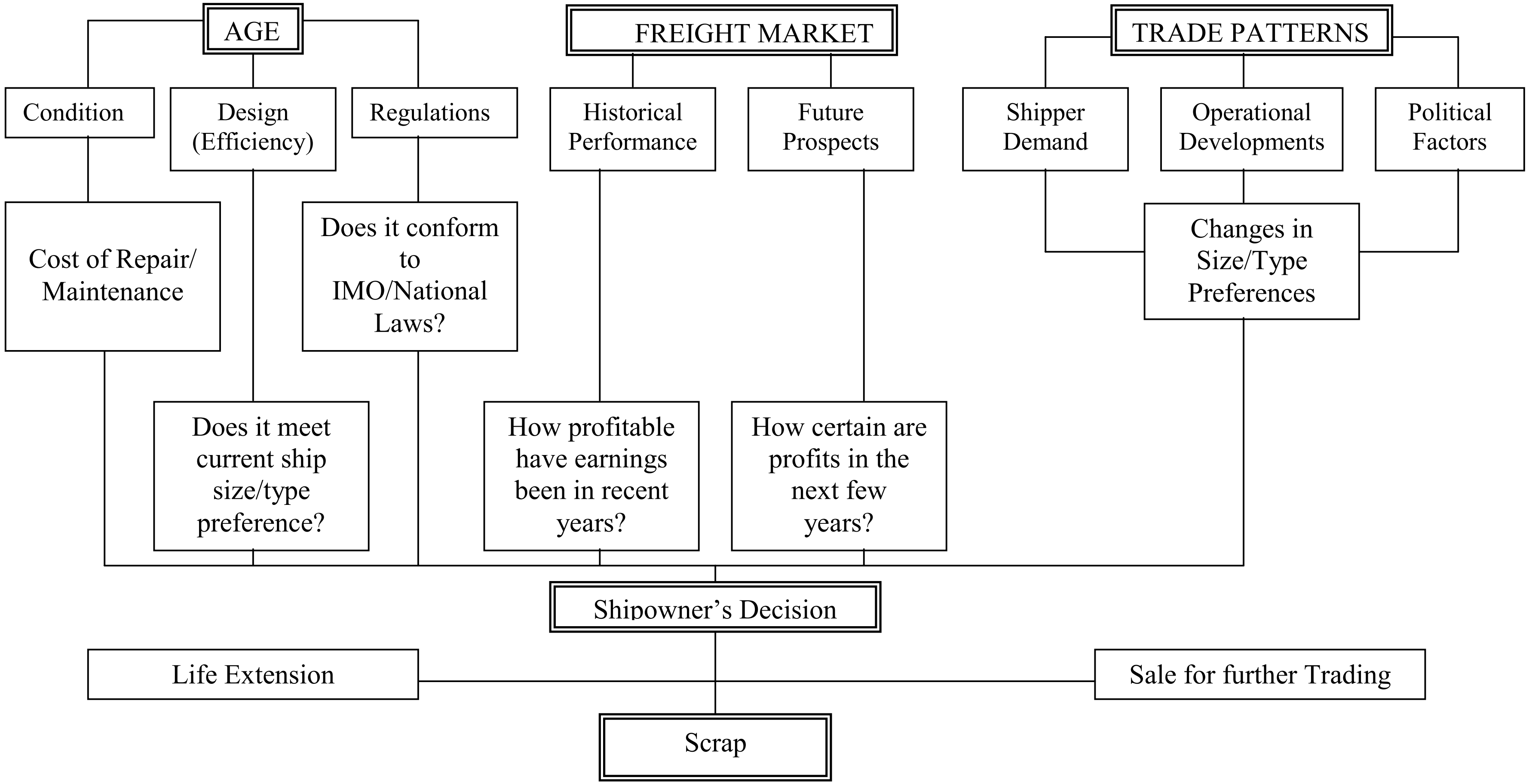
2.3 The Life Cycle of a Ship as Compared to the Market Cycle

The Ship is the focal point in the shipping industry. It is the ship that enables world trade to be undertaken in economical means. The merchant ship has to fit into the business. It is then apparent that the type of ship used on any given trade route is dependent on the type of commodities that the ship has to deliver. In this aspect, it is considered that the demand for ships is derived from the demand for transport, and the shipowner has the option of what type of ship to utilize that could bear the biggest profit. There may be a large inventory of various types of ship today in the international shipping trade; but they still have the same thing in common, the need to be economically efficient, consistent with the safety, environment, and human considerations as required by the national and international regulations.

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

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

FIG. 2.1: SCRAPPING DECISION PROCESS



Source: Drewry Shipping Consultants (Ship Scrapping, 1996, p. 58)

2.4 Factors that Influence the Economic Life of a Ship

In the previous section the author has presented briefly some of the aspects that affect the life cycle of a ship as viewed in relation to the prevailing market condition. It can not be avoided to emphasize the significance of the known factors that influence the life cycle of a ship – obsolescence of the ship; it is not just a single factor that will serve as a primary basis but consolidation of all the factors. These same factors are related to each other and contribute directly to the number of ships that should be scrapped for a given period of time (See Fig. 2.1).

2.4.1 Age

It is oftentimes perceived that the aging of a ship is a significant factor that influences the shipowner to sell his ship for scrapping. Apparently, this is not so as it is just one contributory factor. If age were to be used as the only category for ships to be scrapped many well-maintained vessels of traditional shipping companies would be lost. The suitability of the ship for further trading has to be carefully studied. The increasing size and sophistication has left the old, less desirable ships in the international shipping trade to look for a suitable trade area where competition is low. The speed and cargo handling capacity of a modern ship reduces the competitiveness of older ships; especially, if it is a specialized carrier designed for continuous service in a specific trade. The average age of various ships that were demolished during the period 1992-1998 ranges from 22.5 –26.7 years (See Table 2.1).

Older ships are subjected to excessive wear and tear during their service and may require higher repair and maintenance costs. Throughout the economic life of a ship, it is subjected to periodical surveys designed to maintain its hull, machinery, and equipment in good condition. The fourth or fifth survey that the ship has to undergo in order to comply with safety and environmental standards usually requires massive expenditure. This also demands higher insurance coverage, which the owner has to pay.

Table 2.1: SUMMARY SHOWING THE NUMBER, TONNAGE AND AVERAGE AGE OF VESSELS SOLD FOR SCRAPPING 1992-1998

Year	No., DWT and Age	Tankers	Bulk Carriers	Combos	Gas vessels	Other dry	All Vessels
1992	**No.**	94	67	11	4	64	**240**
	´ 000 DWT	10,22	3,913	1,296	0,011	0,775	**16,215**
	Age	23,8	23,6	20,8	26,8	24,7	**23,9**
1993	**No.**	110	50	15	10	129	**314**
	´ 000 DWT	10,685	2,557	2,27	0,111	1,398	**17,021**
	Age	23,1	24,2	21,9	24,9	29,4	**25,9**
1994	**No.**	87	70	18	7	112	**294**
	´ 000 DWT	12,558	4,351	2,421	0,018	1,234	**20,582**
	Age	22,6	24	21,9	26,3	26,5	**24,5**
1995	**No.**	93	33	9	1	91	**227**
	´ 000 DWT	10,794	2,093	1,229	0,002	1,195	**15,313**
	Age	25,2	25,2	22,4	30	27,2	**25,9**
1996	**No.**	72	128	15	5	168	**388**
	´ 000 DWT	6,829	7,297	1,904	0,021	1,967	**18,018**
	Age	25,3	25	23,1	27,9	27,2	**26**
1997	**No.**	40	161	6	6	187	**400**
	´ 000 DWT	3,611	7,707	0,746	0,075	2,596	**14,735**
	Age	28,3	25,5	23,6	28,4	26,5	**26,3**
1998*	**No.**	33	185	8	6	154	**386**
	´ 000 DWT	3,71	8,758	1,166	0,028	2,493	**16,155**
	Age	25,3	25,2	23,5	27,5	25,6	**25,3**
1992-1998*	**No.**	**529**	**694**	**82**	**39**	**905**	**2249**
	´ 000 DWT	**58,407**	**36,676**	**11,032**	**0,266**	**11,658**	**118,039**
	Age	**24,8**	**24,7**	**22,5**	**27,4**	**26,7**	**25,4**

Sources: Fearnleys/DNV, Vessels of size >10,000 DWT only (Jan-Sep 1998)

2.4.2 The Prevailing Market Condition

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

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

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

To lay up a ship for indefinite periods of time would lead to the deterioration of the hull and machinery. The cost that the ship may incur while idle would be a great burden to the shipowner. Most likely, the ship would be offered for sale to a shipbreaker.

In the steel making industry, the demand for iron and steel scrap would, one way or another, affect the price of a ship for scrapping.

2.4.3 The New Regulations

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

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

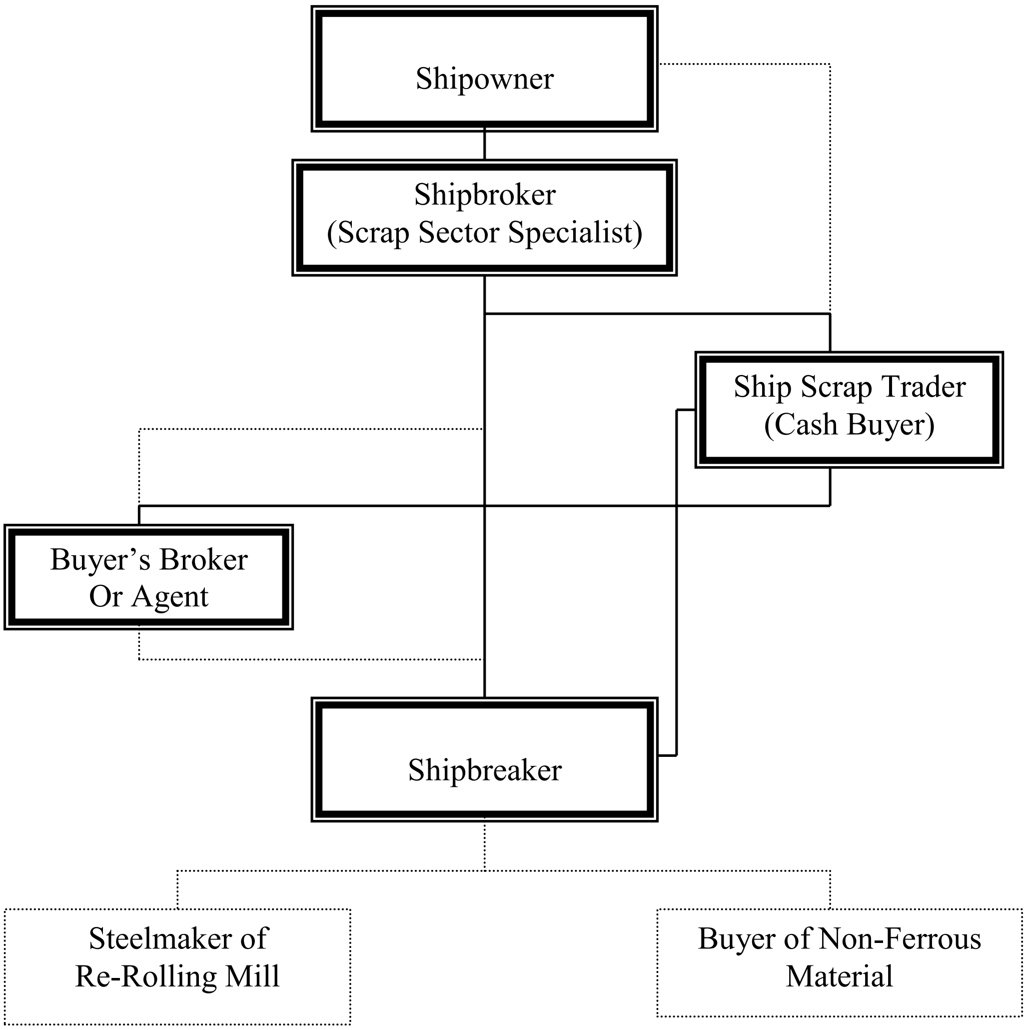
The introduction of new regulations would likely accelerate the scrapping of uneconomical ships. The Erika incident last December 1999 had lead to stricter port state control and early phasing out of single hull oil tankers.

2.5 The Principal Players

In the shipbreaking industry, ships are sold for scrapping not just because of obsolescence but also according to the demand of scrap metal in the steel industry.

When the shipowner decides to sell the ship for scrapping, this involves other interested parties – the shipbrokers and the shipbreakers. These parties decide what fair price they could offer with the present condition of the ship and market status. The presence of shipbrokers to consummate the deal contributes largely to the efficiency of the market and may guarantee a perfect match with a smooth conclusion of the deal (See Fig. 2.2).

FIG. 2.2: PARTICIPANTS IN THE SCRAP PROCESS



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

2.5.1 The Shipowner

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

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

2.5.2 The Shipbroker (Intermediaries)

In the shipping business, the shipowner is used to the practice of buying or selling ships being done through a recognised group of brokers or trading houses. It is normal that the owner will involve shipbrokers, or trading houses, or international traders specialising in ship scrapping. The shipbroker acts as a middleman in the sale. His knowledge on the current and expected market situation and the efficiency to search for potential buyers usually ensures a better deal.

Depending on the circumstances, the shipowner may choose to seek the services of more than one shipbroker and on some occasions the shipbroker may deal with another shipbroker working on behalf of the shipbreaker.

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

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

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

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

2.5.3 The Shipbreaker

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

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

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

2.6 The Leading Shipbreakers

Shipbreaking centers were first established in industrialised nations but have now shifted to the Far East. During the early days scrap metal was recycled for domestic use. The domestic demand for scrap steel and other materials that can be recycled from the ship does not always determine the location of a shipbreaking yard. The relocation of a shipbreaking yard can be attributed to increased labor costs, stricter safety regulations, and the environmental problem represented. (See Table 2.2)

Table 2.2: THE MOVEMENT OF SHIP SCRAPPING CENTERS OVER THE LAST 50 YEARS

ERA	MAIN SHIP SCRAPPING CENTERS
1945-80	USA and Europe
1980-88	Korea, China, and Taiwan
1980-98	India, China, Pakistan, and Bangladesh

Source: DNV

The emergence of the three leading shipbreakers today, India, Bangladesh, and Pakistan, was due to the withdrawal of South Korea, Taiwan, and lately China. The decline of shipbreaking operations in China, as a result of the austerity program of the government, has also contributed to the emergence of these new leading shipbreakers. The numbers of ships that is being demolished in China has started to decline during the year of 1994 (See Table 2.3)

India is now the largest shipbreaking country in the world. The shipbreaking industry started in 1978 at Bombay and Calcutta and then later expanded to the following sites, Alang, Jamnagar, Beypore, Cochin, Visakhapatnam, Haldia, Madras, and New Mangalore (Drewry, 1983). In their first year of operation India's shipbreaker had to rely on the supply of ships from Metal Scrap Trade Corporation (MSTC), a government organization who handle the purchase of foreign ships.

During the recent years, the industry has seen remarkable rates of growth when government controls were withdrawn which gives a better opportunity for Indian shipbreakers to have easier access to the foreign market. The Alang site has grown into a center of shipbreaking not only in India, but in the international shipping as well. Alang beach lies on the Arabian Sea coast of Gujarat, in north-west India. The exceptionally large difference between the high and low tides with a soft and shelving seashore make shipbreaking possible with minimum requirements of construction. The ships are simply run ashore.

Table 2.3: SHIP DEMOLITION BY LOCATION 1991-1998

Nation/Year	1991	1992	1993	1994	1995	1996	1997	1998*
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. *Jan-Sep 1998, Figures are in *1000 DWT, Does not include Navy vessels or vessels under 10 000 DWT

The difficulty that the shipbreakers in China are facing has also lead to the growth of shipbreaking activities in Bangladesh and Pakistan. Like India, Bangladesh and Pakistan shipbreakers were also supported by their government and were able to attain a better access to the foreign exchange rate. The method of shipbreaking is the same with that of India, running the ships during high tide towards the sandy beach. In Bangladesh, the shipbreaking activity is centered on the beach of Chittagong. There are limited numbers of sites for ship demolition in Bangladesh compared to India, but these site have a large capacities and larger vessels and tankers in particular are broken in Chittagong. Pakistan shipbreakers have also expanded their interest in large ships. Ship demolition in Pakistan is concentrated at Gadani beach outside Karachi.

Aside from the common methods of shipbreaking, these three leading shipbreaking countries employ several shipbreakers along their beaches. Within a shipbreaking site there might be a hundred plots being rented or leased from the government by several groups of shipbreakers. A plot or a pen has the capacity to handle one large and two small ships at any time.

2.7 Known Procedures and Practices in Breaking Up a Ship

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

Although it is possible to increase productivity by using mechanised shipbreaking methods, these are capital intensive and require special investments, this is not easily justifiable among shipbreakers from developing countries considering that they are financially constrained. The process of non-mechanised shipbreaking falls into three stages. At the preparatory stage, the owner of the ship removes all equipment that is not included in the transaction together with potentially explosive materials. If the vessel is a tanker, it must be cleared of explosive gas; the shipowner must be able to secure a Gas-Free Certificate from a company recognised by the country where the ship has to be broken up.

The second stage is when the ship is already delivered to the shipbreaking site. Ships are normally run at full speed or are towed towards the beach during high tide.

Anchor chains are then attached to ensure that the ship is secure. Independent buyers of all items that are not fixed, or can be easily removed, board the ship and start unloading the selected items. Once this operation is complete, a scrapping plan will be drawn up.

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

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

2.8 The Scrap Material

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

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

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

CHAPTER 3

ECONOMIC CONSIDERATIONS

3.1 THE SUPPLY AND DEMAND ISSUE

As described in the previous Chapter, the manner of how ships are sold for scrapping is just like in any other sector of the shipping industry. The shipbroker plays a vital role in the shipping market. When there is a downward trend in the freight market, a reduction in the supply of tonnage follows soon after in order to balance the demand generated by international seaborne trade. The shipowners are put under pressure to scrap older or less productive vessels.

There might be a demand for ships for scrapping from shipbreakers, however, the prices that can be offered would be subject to a number of factors that are common in the shipping industry. The expected ship “residual value” that corresponds to the assessed investment when the ship was built, would not be meet with what is being offered in the ship scrapping market. Whatever may be the market price that is being, it can still be viewed as an essential factor in order to have a healthy shipping market.

Aside from the basic factors that influence the life cycle of a ship for demolition, the price for ship scrap may be prone to sudden ups and downs. There is no real mechanism to regulate the price movements in the market and the ship scrap is sold on a month-to-month or day-to-day basis with no long-term contract to hold on to especially in the international market of the steelmaking industry.

The purchase of ships for scrapping is done without survey or inspection compared to ships which is intended to engage in international trade. The shipbreaker only bases his estimate on how many tonnes of ferrous scrap could be recovered and the quality of the steel plate of the ship's hull from the information that the shipbroker provides. In this case, the shipbreaker can only appreciate the possibility of having a huge or marginal profit when the ship is already delivered to the shipbreaking yard.

The demand for ferrous scrap from the ship scrapping activity depends not only on the requirement of the construction industry, but also on the availability of ships for scrapping and the relative prices of ferrous scrap from a variety of other industrial sources.

3.2 RECYCLED MATERIALS

The common question raised by proponents of the ship scrapping activity is - What do you do with a ship when her economic life is over? Do you sink her? The shipbreakers naturally describe this as a great national waste. Ships are not to be hidden away and left to rust or deteriorate. Ships are being sold for scrapping not only because a certain percentage of the investment that the shipowner has put into the ship can still be recovered, but must of all for the resources that can be recovered from the ship which are of great help to the local market.

The scrap material can either be ferrous or non-ferrous. The ferrous scrap from ship is one of the major sources of material for the country's steel production, especially the re-rolled reinforcing bars for building construction. The consumers of serviceable equipment are oftentimes short of cash and have no financial capability to procure brand new machinery. The material and equipment on board the ship is entirely re-used and finds its way to local markets to supplement the demand of consumers from economically depressed areas.

3.2.1 FERROUS SCRAP

In the steelmaking industry, the ferrous scrap recovered from a ship has to compete with all other types of ferrous waste, including old industrial plants, junked cars, and obsolete railway equipment. The ship scrap forms a very small part of the total market for ferrous scrap. There are three distinct sources of ferrous scrap that are available on the international market and are being used as melting charge in the iron and steel production, as re-rolled reinforcing bars, or as material in the electro-metallurgical processors depending on their quality.

- Recirculating or Home or Revert Scrap; this is generated during the steelmaking process. The quality of scrap that may be produced during the normal casting operation may vary depending on the steel processing technology used.
- Prompt and Process Scrap; this arises from industrial manufacturing activity of iron and steel products. It is most common in the automobile industry where surplus steel material arises during the manufacturing process.
- Obsolete and Capital Scrap; this is the recovered ferrous scrap from railway equipment, machinery, old industrial plants, and ships (Drewry, 1996).

Although ship scrap has the tendency to be the main source for the re-rolled reinforcing bars and construction angles, its market is limited only to developing countries. A single ship may have a different chemical composition of its plate considering that not all shipbuilders and repairers have a common source.

In most industrialized construction markets, using re-rolled scrap-derived material for reinforcement bars have been stopped, because it can not meet the required material standard. It is in developing countries that the re-rolled product is still acceptable for construction material and this could be one of the reasons why the shipbreaking industry in India, Bangladesh, Pakistan, and other developing countries is flourishing.

The recovered ferrous scrap from ship scrapping activity is sold domestically in developing countries as it can not meet the demand of scrap material for industrial construction. The need for rapid economic development and growth of the industrial sector calls for a regular supply of steel and the shipbreaking industry can provide it at a cheaper price.

3.2.2 NON-FERROUS SCRAP

Any equipment that can be reused is sold through secondhand dealers who establish their shops on the roads close to the shipbreaking yards. Buyers can find various items in varying states of repair such as chairs, desks, doors, china, life jackets, fire hoses, pumps, washing machines, refrigerators, and diesel engines. This accounts for approximately four percent of the shipbreaker's income.

For local shipowners in developing countries having a ship that is more than twenty years old it would be a financial burden to acquire new spare parts to maintain its operating status. The availability of secondhand items or excellent spare parts could extend for a number of years the earning potential of the ship with reasonable margins of safety. Even the asbestos material that is used as heat insulation for engines is extracted by the buyers themselves from the ship and used again as insulation on locally built ships or generators in factory shops.

For a country that is still in the process of acquiring the technical know-how of certain machinery that is recovered from a ship for scrapping, this could easily be acquired at throwaway prices. It was pointed out by Nadkarni (1999) that most Indian industrialists do not have adequate knowledge of brand names like Daihatsu or Yanmar. Not only India, but also common in other developing countries is that the capability to manufacture medium speed-engines and is not yet obtainable locally.

3.3 THE WORKERS

It is often stated that the reasons why the shipbreaking industry has moved to developing countries and is not profitable to have it in industrialized countries is due to the high cost of labor and strict regulations regarding the handling of materials that are harmful to humans and the environment. The shipbreaking industry has become an important source of income for the leading shipbreakers in developing countries.

The profit might be minimal for some of the owners of shipbreaking yards when compared to other owners who started earlier in this type of business; but the number of jobs being generated by the industry is of no less importance. With their willingness to work hard, indulge in tough work for long hours, and their efforts to get the most out of vessels that their former owner has no more use for, several shipbreakers who have started out with limited capital in their pockets has grown rich.

In Alang, India, the world's largest graveyard for ships where more than half of the world's fleet is broken up when the financial year ended last March 31, 1999, it was revealed that the shipbreaking industry in India is alive and prospering. More than three million tonnes worth of ship was demolished providing much needed employment for an estimated thirty five thousand to forty thousand migrant workers from the eastern Indian states. In addition, the industry also provides indirect employment to more than one hundred thousand petty traders, scrap processors, transport and re-rolling industry workers, and oxygen plant employees (Nadkarni, 1999).

For Sikatunda alone, a community in Chittagong, Bangladesh, it was reported that more that thirty thousand people were employed in the shipbreaking industry. As much as ninety percent of the steel rolling mills in Bangladesh are dependent on the steel that can be recovered from the shipbreaking industry. The number of people involved is estimated to reach 100,000 (Ronning, 2000).

What attracted the attention of the shipping industry was how the different reports presented the process where ships are broken up manually by the worker with limited protective gear, and for some, nothing at all. If comparison has to be made, the shipbreaking operation in India, Bangladesh, and Pakistan is actually done by thousands of workers; whereas, the shipbreaking operation in South Korea and Taiwan is highly mechanized. The latter shipbreaking countries have invested a lot on infrastructure and do not employ hundreds of workers and find it expensive to recover steel from the shipbreaking activity at this stage of time. On the other hand, the three leading shipbreaking countries today find it profitable due to the abundance of workers and the labor is cheap. It is so cheap in the sense that they are in need of money – a worker's end in order to survive.

3.3.1 SALARIES AND EMPLOYMENT

What is being practiced in Bangladesh is that the owner of the shipbreaking yard is responsible for the procurement of suitable ships, the mooring arrangement of the ship, and the final disposition of the scrap and how it should be sold to the potential customers. In a single yard there might be several sub-contractors depending on how the shipbreaking operation is organized, each sub-contractor being responsible for a specific task, from cutting up of the ship to segregation and loading scrap materials on designated lorries for subsequent delivery to the shop of the buyer.

As one example, the RM yard in Bangladesh has nine sub-contractors and fifty permanent workers, as estimated by Ronning (2000), during his survey on the said shipbreaking yard, with around one thousand workers being employed.

The salaries that these workers received vary according to their employment status and the experience they have gained. For the permanent employee, an initial salary of two thousand taka a month is being offered, one hundred taka is equivalent to one USD and ninety six cents. The sub-contractors are paid by the shipbreaking yard owner at a rate of four hundred taka for every tonne of steel that is already cut loose. The salary of the contract workers, who actually do the work, is differentiated from five taka an hour for the lowest salary level to twelve taka per hour for the foreman who is responsible for a work team which may be composed of fifteen workers. The average salary for a working period of one month is reported to range from five hundred to one thousand five hundred taka.

What is being offered to these workers is almost the same as that of other shipbreaking yards in Bangladesh. Ronning (2000) also learned that according to the representative of the Community Development Center (CODEC) in Chittagong, they have a dormant minimum wage act that is one hundred taka a day. The principle of "no work – no pay" is clearly emphasized to the workers and the youngest worker employed is twelve years old, which is below the recognized international standard on labor practice. In India, the representative of the Greenpeace Society noted that the youngest worker was fifteen years old.

3.3.2 SOURCES

The majority of shipbreaking industry workers is from other rural districts, who are forced by poverty to seek other employment. These workers are either farmers who work a larger farms or with a small piece of land to cultivate during the rainy season and no other job opportunity for them to live off in their districts. The only chance for paid work that is open to these farmers and does not require much skill is shipbreaking.

To a certain degree some of the shipscrappers are former mariners who were not able to continue sailing and their knowledge to determine working parts from scrap material and sell them at higher margins has contributed to the increase earnings of the shipbreaking yard.

In developing countries, the common problem is how to control the population and how to create job opportunities for the growing population. For the leading shipbreaking countries, it is of relief to a certain degree on the part of the administration that the industry is creating job and contributing to the country's economy.

Pravin Nagarseth, president of the Iron and Steelscrap and Shipbreaker's Association of India (ISSAI), explained during his interview that as many as thirty thousand migrant workers from Bihar and Orissa come to Alang looking for jobs. They have traveled more than two thousand miles and with no other place to go these people have to stay in slum areas, the choice being between hunger and bread (Nadkarni, 1999). It is evident that these people are suffering greatly and need work to survive so that they can endure the harsh living and working conditions at the shipbreaking yard.

It is in this aspect that the environmentalist groups have continuously criticized the shipbreaking operation in developing countries, with the complete disregard of the safety of the workers.

3.4 THE SHIPBREAKING YARD AND ITS NEIGHBORING VILLAGES

The shipbreaking yards in Alang, India and Chittagong, Bangladesh are divided into several numbers of lots. A single shipbreaking yard may occupy a number of lots, which may give the owner an advantage compared to other shipbreakers in the locality. Having a longer shoreline at your disposal means a comparative advantage to handle bigger ships, but this requires a large amount of capital which investors from developing countries are short of.

According to the report of Ronning (2000), the beaches in Chittagong, which are owned by the authorities, are rented out to shipbreaking yards on a ninety nine year lease often stretch over several kilometers. With the growth of the shipbreaking industry, Bhatiary, a fishing village that was formerly located on the northern part of Sikatunda, was relocated in 1986 to a site in between two shipbreaking yards in the southern part of Sikatunda. The village people were left with only one hundred to two hundred meters of beach for the mooring area of their fishing boats and nets. For the whole district of Chittagong, it was stated that between sixty and seventy fishing villages were relocated.

The manner of how the ships are broken along the beach makes it hazardous for small fishermen who have to cast their nets where ships are moored. The sharp objects submerged in muddy areas that are not recovered pose danger to these fishermen. The households in the village are not exempted from enormous disturbances the shipbreaking operation is creating; especially when big chunks of steel that are cut off tumble on to the beach. There is reverberation on the ground producing big cracks in the floors and walls of nearby houses.

Within the Hindu community, the fishermen in Bangladesh are known as “jaladas” (“jala” means water and “das” means slave), who belong to the lowest level of the caste system. At the early age of ten to twelve, the boys are already engaged in fishing. What makes it worse is that the authorities neglect their right to educate and fishing is the only alternative means that they could have.

Although these fishermen are considered to be on the bottom level of their society, they provide the fish that has to be sold in return by the Muslim villagers in their community market and from the economic point of view this covers a broad economic aspect. Based on the report that Ronning (2000) has prepared, the villagers have encountered problems, where fisheries is their primary source of income, as a result of the growth in shipbreaking activities and the industrialisation in the region in general. The problems that the villagers have presented are that the fish has disappeared from the coastal area and their fish catch has thus considerably decreased.

The decrease in the fish catch means that these traditional fishermen have to fish farther from the beach, which requires motorized boats. The limited fish stock that has to be shared among these local fishermen, along with the intrusion of bigger fishing boat, means the daily earnings of these fishermen will deteriorate if left unattended by the authorities. The traditional social structure of which the country has to preserve would then be disrupted.

If the fishermen can not sustain the demand of the consumers, the populace has to look for another market source. Not only the volume of the fish catch will be affected with the shipbreaking activity in the locality, but also the quality of the fish as a result of the introduction of contaminants from the ships being broken. The concentration of contaminants into the marine sediment within the vicinity of the shipbreaking yard will in turn affect the food chain, which will probably be present for the next ten to twenty years.

CHAPTER 4
ENVIRONMENTAL CONSIDERATIONS

4.1 THE "GREEN" ISSUE

In the shipping industry, the increase in demand of tonnage for the transport of commodities gradually leads to an expansion of shipbuilding activities. Ships that were built during the 1960s and 1970s were designed to accommodate the services they were intended for whereas the materials used were chosen exclusively without due regard to their ill effect but to benefit durability with their function as a component structure of the ship. There was no ban on hazardous substance then.

Today these ships are persistently described as redundant and highly toxic as they are built with hazardous materials, including heavy metals and asbestos. These ships are now sold and exported to developing countries for breaking up. In shipping, the shipbreaking industry is a business sector that is described as completely out of control, where workers face death related to the dismantling of gigantic steel constructions and where environmental toxins such as lead, asbestos, PVC, freon, and PCBs are introduced directly into the local environment. The amount of environmentally hazardous substances varies according to the size and type of the ship. For a VLCC to be dismantled, an estimated volume of hazardous substances would be of substantial quantities (See Table 4.1).

Table 4.1: ENVIRONMENTAL HAZARDOUS WASTES GENERATED DURING THE DEMOLITION OF A VLCC

SOURCES	DESCRIPTION
Cathodic Protection	*More than 110 000 kg of anodes was fitted to the vessel originally. Both Al and Zn anodes were used. Approximately 65 000 kg (totally) is assumed to remain when vessel arrives for scrapping. The anodes contain In, Cd, and Pb in smaller amount.*
Batteries	*Approximately 200 kg of batteries are identified. These contain Pb, Cd, Ni, and sulphuric acid. The number is assumed low and is probably only representing the amount required and additional back-up batteries. It is assumed that the real figure is closer to the double.*
Coatings and Paints	*Originally more than 65 000 litre of paints was used. A large volume of this has been worn off due to the operation and maintenance. However, new paints have been added over the years. The amount remaining is therefore likely to exceed the original volume. The amount of paint residues on board is assumed to be limited. These products are likely to be taken care of and used locally. Paint and coatings can contain chemical compounds such as Cl, Zn, Cu, PCB, and Pb. In addition one should expect to find considerable quantities of TBT in the anti-fouling paint.*
Fire-fighting	*Volumes of powder, CO_2 and foam have been identified. Mobile fire-fighting devices are more likely re-used. Fixed systems will be scrapped causing the spread of the identified substances. These are not assumed to have local environmental effects.*
Refrigerants	*Substances servicing the cooling plants contain chlorodiflourmethane (R22) and dichloroflourmethane (F12). A total volume of appr. 1000 litre is expected.*
Thermal Insulation	*Asbestos was commonly used as thermal insulator at the ship when built and approximately 7000 kg has been identified. This is assumed to be a conservative estimate. The figure is checked with other smaller vessels and seem to be representative for vessels from 100 000 DWT and over.*
Steel Structure	*Approximately 15% of the vessels DWT is steel. Paint and coatings cover most of the steel, and the recovery (recalculation) will cause gaseous discharge following the cutting processes. Released components might include dioxins and others.*
Electrical Insulation	*A total of 50 000 m. of cabling is to be likely in the vessel. Cables are most likely burnt locally on the beach. Substances include Cu and PVC, combustion caused the discharge of dioxins and chloronated furans. Electrical components in light fittings include PCB and Hg.*
Oil Residues	*Remaining oil have been categorised as "clean", or as waste. The products in the first group to carry a market value and hence to be recoverable. The latter group represents contaminated oil-products or unrecoverable products. The main group is represented by residues from cargo tanks. This might contain in the region of 1500-2000 m^3 of a mixture of oil, rust and sand/sediments.*
Preparations prior to Scrapping	*The vessel is normally required to sail to its scrapping destination. This requires that all systems in general must be in operational order. This eliminates the possibility to remove substances in system prior to demolition. Stores such as oil, chemicals and paint products can be removed. Further, tanks can be emptied, cleaned and ventilated prior to demolition.*

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

The present shipbreaking operations, which are along the tidal zone of the ocean may lead to the contamination of sea water, air, and soil with toxic and hazardous substances from the ship. The danger to the environment and health of workers caused by the scrapping operation of ship bring about a degree of concern among the international shipowners and alliance of environmental and industry protesters. These concern groups demand that appropriate measures should be undertaken to improve ship scrapping standard and this has to be done in a manner that is sensitive to human life, nature, and the environment.

4.2 SHIPBREAKING SITES

What is being practiced today by the leading shipbreakers is to run the ship at full speed towards the beach. The ships are broken up manually with the aid of hand held cutting torches. The steel scrap from the ships is drawn and stacked haphazardly on the beach. With the continuous cutting, pounding and hammering of scrap steel at a shipbreaking site prior to its delivery for processing, metal fragments and rust, particularly of iron, accumulate along the beach. This also includes various refuse and disposable materials that are discharged or spilled into the sea or the beach soil during the operation.

Ship steel may be composed of several compounds and the most common contaminants of soil within the ship breaking sites are nickel and lead compounds. The dismantling of metal parts at the beach contributes in part with the contamination of chromium contamination that comes from the paint.

The report made by representatives of Greenpeace Germany (1999) revealed that several contaminants were noted when soil samples were taken at the shipbreaking sites and one of the samples taken in Alang (No. 306) was one kilometer inland from the scrapping site. Other samples were also taken by the group that serve as background levels in order to be able to assess the concentration of contaminants found (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

Source: (Kanthak et al, 1999); Steel and Toxic Waste for Asia, p.17

A study conducted by Islam, K. L. et al (1986) along the coastal area of Chittagong revealed that the binding properties of beach soil have deteriorated due to extensive human and mechanical activities. Once the binding properties of soil have gone, the rate and amount of soil erosion along the beach will increase, not withstanding the turbidity of the sea water within the shipbreaking site. In turn this may result in lower dissolved oxygen levels, increased biological oxygen demand (BOD), and finally aquatic life in the area being affected.

The ship will always contain materials and liquids that could not be marketed or handled during the scrapping process. These wastes are usually burned or find their way to the sea.

4.2.1 WATER POLLUTION

The introduction of harmful substances coming from an old ship can be detected as early as its arrival to the mooring area. One of the pioneering ideas conceived during the infancy age of the shipping industry was how to minimize the operating cost of a ship. The unwanted growth of algae, barnacles, and mussels on the hull of a ship create a frictional drag and raise fuel consumption. Since the beginning of the 1960s, anti-fouling paint was introduced in the shipping industry to kill off aquatic organism on the hull of a ship. Anti-fouling paints contain highly toxic substance such as tributyl tin oxide (TBTO) and tributyl tin chloride (TBTC). These substances determine the leaching rate or the release of TBT into the water.

The presence of TBT in the water endangers all other marine animals, kills off oyster larvae, deforms shells, and harms the entire aquatic ecosystem. To avoid damage to marine organisms, the content of TBT in sediment must be within 0.005-0.5 μg/kg. Kanthak et al (1999) reported that if it has to be assessed based on the interim guidelines set by the Oslo-Paris Convention, for the protection of the marine environment in the North-east Atlantic, the content of TBT on sediment taken from Alang and Mumbai is way beyond the allowable amount (See Table 4.3).

Ships for scrapping are sold “as is” and have to be delivered by the shipowner to the shipbreaking yard. To make this happen, the ship has to be manned and provided with enough provision of food and fuel to complete its last voyage. The ship would then have to be laden with just enough fuel to reach its final destination-the shipbreaking yard. While it may be true that the tanks of a ship (particularly

VLCC/ULCC) can be cleaned prior its delivery, the oil waste generated during its last voyage would be of considerable quantity.

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, 1999); Steel and Toxic Waste for Asia, p.18

This oily waste can be in the form of fuel residues, sludge, oily bilge water, and oily tank washings. The problem is how would the shipbreaking yard treat such waste. Ronning (2000) of NorWatch has reported that waste oil and other chemicals are stored in old drums at the shipbreaking yards in Chittagong, Bangldesh were seeping out. It is common knowledge that such types of waste would find their way gradually to the tidal zone leading to the sea.

With what happened in India due to a series of accidental explosions, the authorities, for a ship to be demolished, require a Gas-Free Certificate, and their shipbreakers have stopped accepting ships with sludge (Nadkarni, 1999). As a result of this stricter regulation, the Indian shipbreakers have lost some of their demolition market and several tanker shipowners are selling their ships to Bangladesh and Pakistan. This shows that the problem was not permanently solved but transferred to other shipbreaking countries.

Apart from fuel oil, the ship has to be loaded with “ballast water” to achieve the required stability of the ship when sailing safely to its destination. The “ballast water” would then be discharged within the waters off the shipbreaking site before the ship is run at full speed towards the beach. At any one time with the discharge of “ballast water” from the ship hundreds, possibly thousands of non-indigenous species are being introduced into marine environment. These non-indigenous species could be a combination of microscopic bacteria, viruses to molluscs and crustaceans, and even free swimming fish.

The sediment that is retained in the ships ballast tank is released or discharged within coastal maritime zones. A large number of potentially harmful aquatic organisms that form part of the sediment are trapped by stiffeners, ribs, and scantlings projecting inside the tanks and are only removed and released into the sea when the ship’s hull is broken up.

The introduction and spread of non-indigenous species into the marine environment is viewed as the most pressing marine environmental problem (Loy, 2000). Compared to oil pollution, the introduction of non-indigenous species is difficult to ascertain unlike oil pollution; and when these species have already established themselves it is of great difficulty to remove them from the ecosystem. Some of these non-indigenous species that have survived in the new environment have a direct impact on the existing ecological balance. The introduction of disease may also arise when local water is contaminated with large quantities of “ballast water” containing viruses, bacteria, and other harmful organisms. The potential harm that the “ballast water” represents is already recognised by the International Maritime Organization (IMO) and World Health Organisation (WHO).

4.2.2 AIR POLLUTION

When the work at the shipbreaking yard is in full swing, every now and then, parts of the ships fly through the air and land with a thump on the beach or in the water. These chunks of steel are cut with hand-held cutting torches and as long as the ship is standing much of the cutting is carried out. Paints applied to old ships can have components containing chlorine and when the metal is cut apart toxic vapors are released into the atmosphere and lead to the formation of dioxin (Kanthak et al, 1999).

The shipbreaking workers are continuously exposed to toxic lead fumes and lead is a potent blood, nerve, and kidney poison. Metallic lead and its compound that is present in the air can enter the body through ingestion, inhalation, and skin absorption. Depending on the levels of lead exposure, the effect on the human body may vary from impairment of blood count, damage to the nervous system or may contribute to cancer of the stomach and duodenum. Aside from lead compounds, arsenic and nickel contaminants are also common during the dismantling of the metal parts (See Table 4.4).

Burning of unmarketable material is commonly practiced along the shipbreaking sites and this could be attributed to the inadequacy of the facility. In Alang, waste oil is burned on the shore "in order to prevent the sea from being polluted" (Kanthak et al, 1999). Everything that cannot be sold and will burn is thrown into the fire of used oil and these fires burn constantly with their deep black smoke plumes producing pollutants.

Table 4.4: HEAVY METALS AND ARSENIC DETECTED IN PAINTS

Sample No.	**108**	**117**	**213**	**214**	**215**
Date	2.10.98	2.10.98	2.10.98	2.10.98	2.10.98
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

Source: (Kanthak et al, 1999); Steel and Toxic Waste for Asia, p.15

The burning process of materials from ships, which may contain flame retardants, usually produces smoldering fires. Pollutants are produced when incineration is incomplete and may include diverse hydrocarbons. The simplest form of pollutant is carbon monoxide which may include polyvalent hydrocarbons which, in turn, may have several interconnected benzene nuclie-polycyclic aromatic hydrocarbons, commonly known as PAH (Kanthak et al, 1999). PAHs are regarded as health hazards and are produced depending on the condition of a fire as influenced by the availability of oxygen, temperature, and the materials to be burnt.

The workers are permanently exposed toxic vapors emanating from multi-layered coatings when the metal is cut apart and other pollutants that may result during the burning of other ship materials. They have no opportunity to recover, considering that they also live in the immediate vicinity of the scrap yard.

4.3 TOXIC WASTE AND HAZARDOUS SUBSTANCES

The environmental movement and concern groups in some rich OECD countries have voiced their criticism to shipowners who assume no responsibility for the toxic substances on their ships and sell them as pure steel to shipbreakers in Asia. Greenpeace and the environmental movement at large started their campaign on the illegality of this activity with the affirmation of the “Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal” into European Union waste legislation. Substances of environmental concern will vary according to ship type and for a VLCC an estimate regarding substances and volume is presented in Table 4.5.

Table 4.5: HAZARDOUS SUBSTANCES THAT CAN NOT BE EXPORTED FROM OECD COUNTRIES TO NON-OECD COUNTRIES

Code	Type of Waste	Material (found in)	Location	Amount
AC30	Oily waste for	Oil sludge	Cargo and D.B. drain tank	1800 m^3 in cargo tanks assuming a 15 cm layer at the bottom of the tanks, while the drain tank can hold up to 20 m^3
		Heavy fuel oil	H.F.O. tanks	
		Lubrication oil	Lub. Oil tanks	
AC060		Hydraulic oil	3 Main Hydraulic System	
AC060	Waste oils/water, hydrocarbons/water	Ballast water	Normally in wing tanks no. 4, but additional 3 pairs of wing tanks can	
RA010	Waste, substance and articles containing	PCB in light fitting capacitors, PCB in paint	Possibly all over	
AD070	Waste from production, formulation and use of ink, dyes, pigments, paints, lacquers, varnish	Paint (Cu, Zn, TBT, & Pb)	All over	
AA100	Mercury (Hg) ashes and residues	Fluorescent light fittings	All over	
AA170	Lead-acid batteries, whole or crushed	Batteries	Battery room and lifeboats	
RB010	Asbestos (dust and fibers)	Heat insulation	Engine room, chimney and storage are for food	
AC150	Chlorofluorocarbons (CFC)	Refrigeration units	Storage area for food	

Source: MEPC 43/18/1, Scrapping of Ships, p. 8

The problem with hazardous substances is their final disposal even OECD countries which have a longer experience in dealing with toxic waste find it economical to dump in non-OECD countries if unchecked. The proper management of waste is expensive, and the threat of adverse health and ecological damage can not be eliminated. Ronning (2000) has pointed out that at this time even Norway has not established any system that could recycle all materials contained in a modern ship in a profitable manner.

The asbestos material taken from ships is a hazardous, carcinogenic working substance. The carcinogenic potential of asbestos depends upon the form and size of the fiber and if the diameter is less than one micrometer with a length of five micrometers or more its effect to the body is certain (Kanthak et al, 1999). The workers in the Alang shipbreaking yard are exposed daily to the hazards of this material and even contribute to the spread even to their household areas.

The removal of asbestos material from the ship is done without protective masks and uncovered hands, in everyday clothing, deposited in an uncontrolled area and sometimes sold in the shop. The manner of how this type of material should be handled is completely in violation of the rules, laws, and regulations that are being observed by authorities and workers alike from OECD countries.

4.4 MANAGEMENT OF WASTE

The cause of pollution at shipbreaking sites may be attributed to the absence of a dedicated reception or disposal facility for hazardous substances and unmarketable materials that could pose a danger to health and environment.

By referring to the arguments that have been deliberated upon in determining appropriate measures on how to handle ship-generated waste, IMO (1995) specifies that the development of a waste management strategy is a powerful tool in establishing a coherent system of waste handling practice and the facilities to respond adequately to the following concerns:

- Ship-generated waste should not be isolated from the land base waste handling practices;
- An integrated approach to waste handling incorporating the entire life cycle of waste may save considerable future expenses;
- Ship-generated wastes, as well as land generated wastes, may contain valuable materials, which could be reused; and
- Waste minimization is an important factor so as to avoid unnecessary burdens that may arise with waste transport, treatment, and disposal facilities.

Waste generated during the scrapping of a ship may be peculiar compared to the normal operation of a ship, but to consider the measures to be undertaken related to the above cited arguments could be a good starting point on how to establish a medium term solution pending on the consideration of the international regime. It is better to do something than investigate and debate what actions to choose for too long. Temporary measures may be useful to a certain degree but if they have to be explored, because of the hazardous properties that waste represents, a suggested guideline was given by IMO (1995) to ensure that temporary measures can lead to improvements:

- Temporary solutions as short as possible with a firm deadline;
- Possible treatment or recovery of waste in the future should be considered (records of location where waste is disposed of should be maintained);
- Future utilization of the site (for landfill) has to be considered; and
- As a useful way to gain experience in waste handling, temporary operational control should be designed.

The present scenario on shipbreaking activity calls for implementation of a temporary solution. It may be short and limited in scope but it could silence the critics and provide the much needed confidence that the shipbreaking countries are expected to demonstrate. Initiating an early improvement in waste collection and disposal, although it may be a relatively modest effort at a limited cost, would lay the foundations of a more systematic waste management in the long term. More so, the associations of shipowners from OECD countries are already thinking of the means on how to contribute improvements in the shipbreaking activity in developing countries.

4.5 ENVIRONMENTAL IMPACT ASSESSMENT

Driven purely by economic incentives, the authorities where shipbreaking activity thrives are often blamed for not being responsible enough to meet their obligations to protect not only their citizens but also the environment. The primary reason why shipbreaking was relocated to developing countries was due to the absence of strict marine environmental regulations. Among the leading shipbreaking countries today it is apparent that their administrations have failed to consider the importance of the EIA in consideration of the much needed supply of industrial steel at moderate prices and it is a labor intensive industry, which is well suited to the economy of developing countries.

The need to have concrete data and determine the environmental impact of waste generated during the shipbreaking activities has been echoed by environmental groups. Attention to health and the ecological risk is increasing and this trend is expected to accelerate. In order to understand the likely impacts, Sinha (1998) has suggested that an environmental impact assessment (EIA) be carried out for the shipbreaking industry, which may include, but not be restricted to, the following issues:

- Baseline study of the sea in the vicinity of the shipbreaking yard;
- Checklist of the wastes/effluents generated, separately for each type of ship;
- Quantification of known waste products and an analysis of their chemical characteristics; and
- Identification and quantification of the potential impact.

Cartel (1996) describes the environmental impact assessment as "the systematic identification and evaluation of the potential impacts (effects) of proposed projects, plans, programs, or legislative actions relative to the physical-chemical, biological, cultural, and socioeconomic components of the total environment". Although several studies have already been conducted related to shipbreaking activities, these are but limited to making an eyewitness record, photographically and on video, of the conditions of the shipbreaking yards, and with the ultimate objective to make it known to the public. What they have done is to take samples of materials from the ships and environmental samples from the soil and sediments at various locations along the shipbreaking yard.

The other report that was initiated by the association of shipowners from OECD countries was to make an on-site assessment and verify the problems and impacts of the hazardous substances on board the ships and the future trends in demolition market. What is being done at this stage of the shipbreaking industry is a reactionary measure on how to deal with the pressing problem that the industry represents and the shipping industry in general with a large number of ships reaching their obsolescence within the next five years.

The primary purpose of the EIA process is to promote the consideration of the environment in planning and decision making and to ultimately arrive at actions which are more environmentally compatible. The usefulness of an environmental impact assessment may be questioned on some occasions when the proponents of the study work for the agency proposing the action or work as consultants to agencies or the private sector which are project proponents.

This concern can not be dismissed easily but if professionals who have training and experience such as engineers and planners, conduct the impact studies, under a professional code of ethics, an appropriate job within the constraints of the study would be accomplished.

The process that can be considered during the conduct of an environmental impact study can be divided into seven stages;

- Identification of issues and impacts
- Baseline studies of the environment
- Prediction and evaluation of impacts
- Mitigation planning
- Comparison of alternatives
- Decision making relative to the proposed action
- Study documentation through the preparation of environmental assessment (Cartel, 1996).

An ideal approach in an environmental impact study is to have a well documented activity and sources of information utilised and to conduct appropriate public information and consultation activities. The participation of the public is of great importance so as to clarify conceivable questions that linger in the minds of interested individuals and groups who are either supporters or opponents of the proposed project. Putting the environmental issues before the public would influence the decision making process of an administration and this has become popular among foreign nations for the legislation of environmental policy to take place.

CHAPTER 5

ORGANIZATIONS, LEGAL REGIMES, AND PROPOSALS

5.1 RELEVANT INTERNATIONAL ORGANIZATIONS AND REGIMES

When the industry watchers presented the dismal working conditions and environmental situation at shipbreaking yards in developing countries, the absence of control measures was amplified. It was even reported that a shipbreaking country might have a national law for the protection of the environment and a labor act, but either the authorities failed to enforce it fully or the labor act is old and the country's economy could not conform with the international standard. The shipping industry is already aware of the environmental and social problems that the industry creates but the issues are beyond its capabilities.

The need to address the problem at an international forum brought about the uncertainty of what appropriate organization has the capacity to handle the conflicting issues. A proposal was made by the Norwegian government that the International Maritime Organization (IMO) adds the subject of ship recycling to its work program and this was supported by the shipping organizations, environmentalist groups, and the workers federation. Although the IMO has already considered the proposals to be part of its work program, the designated working committee, the Marine Environment Protection Committee (MEPC), is seeking a further study and participation of other organizations that have the technical capabilities to address the specific issues that are critical to the industry.

In the next few years, it is anticipated that actions that will be initiated in relation to shipbreaking activities will take the form of increased environmental pressure, publication of industry codes of practice and guidelines, and the development of appropriate legislation. The International Association of Independent Tanker Owner (Intertanko) foresees that in the long term, over the next twenty years or so, more legislation will be initiated, including international standards for the recycling of ships (Fairplay, 2000).

5.1.1 THE UNITED NATIONS ENVIRONMENT PROGRAM AND ITS CONVENTIONS

The United Nations Environment Program (UNEP) provides leadership and encourages partnership for the protection of the environment by providing the means for the nations and peoples to improve their quality of life. It serves as the leading international environmental authority and as an advocate for the protection and improvement of the environment. It promotes environmental management, transfer of environmentally sound infrastructure technologies, and dissemination of best practices in preserving the environment.

The need to support and sustain the environment is clearly manifested in its various work areas and it is the principal proponent of the new concept, "sustainable development". It has created world-wide awareness of emerging environmental problems and helps to integrate environmental considerations in social and economic policies. As an international advocate of environmental protection, UNEP identifies issues that require international cooperation and helps on the formulation of international environmental conventions. Some of the conventions that are relevant to the issues concerning the shipbreaking industry are as follows:

- 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. The convention itself promotes in the end that the potential exporting countries have to manage their own waste and minimize if it can not be prevented, the production of waste in consideration of country's economic development. The problem with this convention is it refers to OECD countries and its application does not cover ship scrapping considering that the ships were sold "as is" and not transported or sold as waste.

- 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 designed to protect the stratospheric ozone layer. This convention and the following protocols that were adopted stipulate that production and consumption of compounds that deplete the ozone in the stratosphere, such as chlorofluorocarbons (CFC), halons, carbon tetrachloride, and methyl chloroform, are to be phased out. Some of these compounds are present during the shipbreaking operation.

5.1.2 THE INTERNATIONAL LABOR ORGANIZATION AND ITS CONVENTIONS

The International Labor Organization (ILO) is one of the oldest intergovernmental organizations and provides an international forum for discussion of world social and labor problems and sets international standards and policies. These standards have continued to exert a profound influence both on industrialized countries and on developing countries. It helps to work out policies in order to ensure that the fundamental rights of workers are protected.

The problems that affect the people who are at work are, to a certain degree, related to ILO. Labor conditions that may involve injustice, hardship, and deprivation of an individual's economic security and equal opportunity calls for an improvement. For a group of workers that are vulnerable to the said conditions, it is only through an international action that their protection could be guaranteed.

There is a wider range of problems involved in the shipbreaking activity. In addressing the working conditions, it is interesting to note that the occupational and safety health issues, poor conditions of employment, and the absence of collective bargaining or industrial relations procedure are prevalent among the leading shipbreaking countries. On the proposals that were presented to the IMO by the Norwegian government, the Greenpeace society, and the shipping association, much of the emphasis was placed on environmental concerns and prevention of pollution. Little has been done on the working conditions in and around the vessels once they are beached.

Given that a ship has to be scrapped and that the workers must not be deprived of the little income that they can earn, the minimum levels of protection should still be afforded to them. During the Tripartite Meeting on the social and labor impact of globalization in the manufacture of transport equipment in Geneva on 08-12 May

2000, the social problem that besets the shipbreaking industry was discussed. Listed hereunder are the relevant conventions, recommendations, and codes of practice that are considered to be of significant importance to the shipbreaking industry. To improve the well being of workers is not the sole responsibility of the Organization but rather a coordinated effort among the government, the employer, and the workers; and a lot of work is still to be done for the benefit of workers in this type of industry.

- 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)

5.1.3 THE INTERNATIONAL MARITIME ORGANIZATION AND ITS CONVENTIONS

The International Maritime Organization (IMO) is a technical organization that provides machinery for cooperation among governments in all matters that affect shipping engaged in the international trade. It encourages and promotes the adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation, and prevention and control of marine pollution from ships. In order to carry out its work, IMO has established formal links with various elements of the maritime industry to include non-governmental organizations and intergovernmental organizations that have a significant interest with the shipping industry.

Maritime transport is subjected to rapid technological changes, which could be in the form of larger and more specialized ships, more sophisticated port installations, and a more complex information and communication system. For this, IMO has continually evolved to keep up with the changes and maintains its effectiveness by keeping the existing conventions up to date; this is being achieved by introducing amendments to its regulatory regimes. Apart from conventions, protocols, and codes that are adopted by IMO, recommendations are also published to provide guidelines, recommended practices, or to supplement the provisions of the convention.

Shore-based industries have been outside the mandate of the IMO. When the Norwegian government have recommended for the Organization to take responsibility for the investigation into the shipbreaking industry and develop the necessary standards, several opponents stressed that it would add an unnecessary burden on the heavy workload of the Organization.

- The 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (1972) was established to control pollution of the sea by dumping of wastes which could create hazards to human health or to harm living resources and marine life, to damage amenities, and to interfere with other legitimate uses of the sea. It encourages regional agreements in support to the Convention. It promotes the formulation of necessary measures to prevent pollution by hydrocarbons, other matter transported other than for dumping, wastes generated during operation of ships etc., radioactive pollutants and matter originating from exploration of the sea bed. It has a global character, and contributes to the international control and prevention of marine pollution. It requires a special permit for the dumping of a number of other identified materials and a general permit for other wastes or matter. The problem with this convention is that it does not cover disposal at sea of waste derived from the normal operations of the vessel, aircraft, or other man-made structures and that majority of the leading shipbreaking countries have not ratified or adopted it to their national legislation.

- 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 covers all aspects of international pollution and some aspects of accidental pollution from ships, but does not apply to the disposal of land generated waste into the sea. Under the respective annexes of the convention certain obligations were imposed on the Parties to ensure the effective implementation of its provisions. The maintenance of adequate reception facilities for the oil residues, noxious chemical substances, sewage, and garbage that are generated during ship operations ensures the prevention of pollution. This measure could be adopted for the protection of the marine environment before the ship is ready for scrapping. The main problem with this convention is that it no longer applies if the ship is already decommissioned and being broken up at the beach where the industry contributes to the degradation of the marine environment. It addresses only the provision of reception facilities for ships, the waste handling practices in the coastal areas and in the country are beyond the scope of the convention.

5.2 ACTIONS AND PROPOSALS

The shipbreaking industry has always been described as “dirty”, “hazardous”, and “environmentally unfriendly”. If it has to be compared with the shipbuilding operation, it is completely the reverse side of it - absence of careful planning and execution. The problem that the shipbreaking operation represents is threaten to get worse as a significant percentage of the world shipping fleet is at the stage of reaching their fifth survey period and may be enhanced by the rapid change in technology and introduction of more stringent regulations. The trend in the shipbreaking industry is set to increase and expand its operational base to other continents.

The hazards associated with ship scrapping represents a real challenge to the shipping industry. Initial discussions have already been started at a high level by shipping organizations and by the authorities with their counterparts from the shipbreaking countries. In effect, a consensus has been formed that shipbreaking is important in terms of national and international economy, the conditions at the shipbreaking site need to be improved, and standards have to be developed to serve as a basis for the improvement.

Among the studies that have been directed at the shore of the leading shipbreaking countries, it has been reported that it is a common observation at all shipbreaking sites, whether it may be in India, Bangladesh, or Pakistan, that:

- There is an absence of established routines on how to handle dangerous substances;
- Workers wear little or no protective equipment against physical injury;
- Workers are exposed to considerable health risks from hazardous substances; and

- Workers' salaries and contracts do not fulfil the minimum requirements for a decent life.

With the aforecited observations several proposals were also raised to minimize the impact of the shipbreaking industry on the environment and limit the exposure of the workers to the hazardous substances. The following proposals were brought up to reduce the number of accidents and discharges of hazardous substances from ships during the shipbreaking operation:

- The development of international standards related to the safety of workers and environment protection;
- A "cradle-to-grave" approach for future ship construction;
- The establishment of a "Global Scrapping Endowment Fund";
- International limitations on the vessel life cycle;
- The development of a guide for shipowners on how to minimize operational residues on vessels sold for scrapping;
- The development of a system of certification of scrap yards;
- Requirements for decommissioning or scrapping of ships be documented; and
- The transfer of the technology or funding necessary to improve shipbreaking facilities and working practices.

The first three proposals can be categorized as proactive measures and will take a lot of time before they could appreciated in the industry. This does not mean to undermine the said proposals, as they are of significant importance and the cooperation among international organizations would bring about an ideal solution which would be proactive measures rather than just promoting reactive measures.

Table 5.1: DWT AND NUMBER OF TANKERS THAT WERE BUILT IN THE PERIOD 1973-78, WHICH WILL REACH THE 25-YEAR BARRIER IN THE PERIOD 1998-2003

Tankers entering 25-year barrier								
	> 200.000 DWT		>100.000 and ≤200.000 DWT		>10.000 and ≤100.000 DWT		> 10.000 DWT	
Reach 25-year barrier in:	No.	DWT	No.	DWT	No.	DWT	No.	DWT
1998	8	2 129 754	6	775 916	66	2 220 026	80	5 125 696
1999	32	8842244	27	3509020	99	4 248 016	158	16 599 280
2000	51	14599910	32	4253506	152	580304	235	19 433 720
2001	58	18 140 933	32	4 412 847	139	6 178 913	229	28 732 693
2002	23	7 885 328	24	3 305 397	97	4 213 570	144	15 404 295
2003	6	2 386 401	12	1 846 707	86	3 810 202	104	8 043 310
Total	**178**	**53 984 570**	**133**	**18 103 393**	**639**	**21 251 031**	**950**	**93 338 994**

Source: DNV's Technical Report No. 99-3065 (29)

Table 5.2: DWT AND NUMBER OF BULK CARRIERS THAT WERE BUILT IN THE PERIOD 1973-78 WHICH WILL REACH THE 25-YEAR BARRIER IN THE PERIOD 1998-2003

Bulk Carriers that become 25 years old								
	> 200.000 DWT		>100.000 and ≤200.000 DWT		>10.000 and ≤100.000 DWT		> 10.000 DWT	
Reach 25-year barrier in:	No.	DWT	No.	DWT	No.	DWT	No.	DWT
1998	1	22 363	4	497 585	105	3 391 429	110	3 911 377
1999	0	0	1	155048	161	4824648	162	4 979 696
2000	0	0	10	1266173	177	51594066	187	52 860 239
2001	0	0	11	1 403 411	270	8 656 819	281	10 060 230
2002	0	0	12	1 539 961	380	12 117 471	392	13 657 432
2003	0	0	5	595 117	235	7 408 194	240	8 003 311
Total	**1**	**22 363**	**43**	**5 457 295**	**1 328**	**87 992 627**	**1 372**	**93 472 285**

Source: DNV's Technical Report No. 99-3065 (31)

With the present age profile of the merchant fleet that may be sold for scrapping within the next five years (See Tables 5.1 and 5.2), the realization of the remaining proposals within that period would greatly enhance shipbreaking practice in developing countries. It is not a harsh proposal; it is just a matter of having a direction to the difficulty that the industry is having in the absence of a relevant international regime or standard.

The problem with the shipbreaking industry is not a crisis but something that needs immediate attention. It has to be done in an orderly fashion to make sure that ships are recycled in a way that is not going to harm the environment, is safe for the workers, and one that the shipbreakers can afford.

A study was already conducted by DNV to determine the approximate volume and also type of waste that could be generated during the scrapping of VLCC (See Appendix 1). With this, the national administration could have a basis to determine what appropriate measures should be initiated to improve not only the safety of workers but also the protection of the environment. Relatively, the United States Environmental Protection Agency (USEPA) has also prepared a guidelines for the shipbreaker to consider of which the Administration would likely to inspect (Appendix 2).

In all of the presented proposals much of the emphasis is placed on the environmental concerns and prevention of marine pollution. The study that was initiated by the Norwegian government and Norwegian Shipowner's Association to assess the current and future environmental problems related to the scrapping of ships in international trade has already yielded convincing results of which several workable proposals could be adopted.

Det Norske Veritas (DNV) in particular who has conducted the on site assessment in Chittagong, Bangladesh has included in its agenda the preparation of a "Ship Breaking Industries Best Practice Guidelines" that would be used at the shipbreaking yards. In as much as the precautionary procedure that has to be undertaken before the demolition process has not been considered in the ship scrapping industry, DNV has also proposed several measures or procedures before the ship has to be decommissioned, which could be adopted by the shipowners (DNV,2000).

CHAPTER 6

CASE STUDY: SHIPBREAKING IN THE PHILIPPINES

6.1 GENERAL

The Philippines coastal resources are varied and diverse. They provide food and employment for the majority of the populace. Pollution and over-exploitation among others things, increasingly threatens the marine resources. At the start of the nineties there were some changes in strategies but not significant enough, especially on the implementation environmental laws. Traditional command and control methods continue to be the main means of enforcement, although the government has started to consider more innovative measures, such as market-based instruments and participatory approaches.

The country's growing population is still a continuing concern as it poses serious constraints on the environment and its capacity to sustain life. The cities continue to receive migrants from nearby provinces in search of better livelihood opportunities and basic services. On the international scene, the Philippines is one of the leading exporters of labor.

6.2 THE CLOSURE OF SHIPBREAKING FACILITY

The K & A Metal Industries Inc. in Balamban, Cebu, which is a joint venture between the Aboitiz family and Japanese partners, has been one of the facilities that given attention by local and international environmental groups. The issue was made public when the Environmental Legal Action Center (ELAC), based in Cebu City, directly reported to the Secretariat of the Basel Convention in Geneva, Switzerland that the shipbreaking facility was polluting the waters of Balamban with polychlorinated biphenyls (PCBs), tributyl tin (TBT), mercury (Hg), cadmium (Cd), and asbestos wastes.

The environmental groups have intensively campaigned for the closure of the facility and relate it directly to the negative and adverse impacts of shipbreaking activity in Mumbai, India. The authorities claim that the situation in Balamban is far different and must not be compared with the level of facilities in Mumbai that are considered an environmental nightmare.

The decision may be anchored on environmental protection as the primary consideration when the Philippine government has made the decision, the K & A Metal Industries Inc., has already stopped breaking up ships. The authority may not accept it directly but there has been a weak implementation of the law, particularly the Toxic Hazardous Law (RA 6969), and its implementing guidelines. The facility has reportedly failed to register, handle, and store the hazardous waste as prescribe under RA 6969.

6.3 SHIPBREAKING CAPABILITY

If it is to be compared with the India, Bangladesh, Pakistan, and China the shipbreaking industry in the Philippines is just in its infancy. The demolition of ships that are engaged in international trade started during 1995. There are only two known shipbreaking sites that were operating in the country during the period 1994 to 1999, and a total of seventeen ships were demolished during the period of five years (See Table 6.1). During the said period of time, F.F. Cruz & Co. Inc was able to demolished only two ships; the remaining number of ships being broken up by K & A Metal Industries Inc..

F.F. Cruz & Co. is also involved in construction and during the period under review the said company and was not actually active in ships demolition. Due to absence of reliable information, it is difficult to conclude if the second vessel was also demolished or rehabilitated as additional machinery for its construction firm, considering that the second vessel is a dredger.

If the capability of shipbreakers in the Philippines has to be described, it is clearly stated in Faiplay (April, 2000) that according to Greenpeace, although shipbreakers in the Philippines use more cranes and machinery, other practices such as the storing of asbestos in the open, dumping on-site and open burning of hazardous wastes, are no different from those Alang.

The Philippines could not even afford to demolish its own ships that are engaged in international trade. It was reported in New York Times that from the total number of three hundred forty seven ships that were scrapped in 1997 and generate a big earnings for the yard in Alang, India, many of them were from Korea, Japan, the Philippines, Russia, and United States (Burns, 1998).

The shipbreaking operation in China was very active but started to decline during the year of 1994 when their government has decided to impose taxes. In the Philippines, the operators of shipbreaking facility were not in any manner assisted by the government on the acquisition of ships at international market and are subjected to taxes.

Table 6.1: SHIPS BROKEN UP IN THE PHILIPPINES (1995-1999)

Date	Shipbreaker	Vessel Name	Vessel Type	Imported from
10 Feb. ‘94	K&A Metal Ind., Inc.	KAM MING 8	Dumb Lighters	Ting On Trans. Co. Ltd. & Yeung Kam Shing of H.K.
10 Feb. ‘94	K&A Metal Ind., Inc.	TING ON 3	Dumb Lighters	
21 Aug. ‘95	K&A Metal Ind., Inc.	SHINKO MARU 21	Tugboat	Tsuneishi Research and Development Corporation, Japan
14 Sep. ‘95	K&A Metal Ind., Inc.	YANG MING SHAN	Bulk Carrier	
18 Nov. ‘95	K&A Metal Ind., Inc.	SOUTHLAND	Frigate	
04 Dec. ‘95	K&A Metal Ind., Inc.	NEPTUNE DIAMOND	Car Carrier	
01 Jul. ‘96	K&A Metal Ind., Inc.	MIMOSA AFRICANA	Chip Carrier	
18 Sep. ‘96	K&A Metal Ind., Inc.	DAIHO	Chip carrier	
18 Nov. ‘96	F.F. Cruz & Co. Inc.	KIBITSU MARU	Bulk Carrier	
17 Apr. ‘97	K&A Metal Ind., Inc.	SYLVA	Bulk Carrier	
03 Jul. ‘97	K&A Metal Ind., Inc.	EL MAGNO	Chip Carrier	
01 Oct. ‘97	K&A Metal Ind., Inc.	SUPPORT	Bulk Carrier	
18 Dec. ‘97	K&A Metal Ind., Inc.	DAIKO MARU	Bulk Carrier	
30 May ‘98	K&A Metal Ind., Inc.	RAICHO	Chip Carrier	
27 Jul. ‘98	K&A Metal Ind., Inc.	OCEAN PEGASUS	Chip Carrier	
04 Feb. ‘99	K&A Metal Ind., Inc.	OHSHU MARU	Chip Carrier	
15 Oct. ‘99	F.F. Cruz & Co. Inc.	OTAKOU	Dredger	Illman Jones Inc., New Zealand

Source: MARINA

As early as 1996, Drewry Shipping Consultants published in its report (Ship Scrapping) that the Philippines is considered to be one of the candidates among the developing countries to establish a shipbreaking industry. Apparently, the reported development of a shipbreaking facility in Polloc, Mindanao, wherein the Philippine government has granted an initial five-year lease contract to the Manila based, Moro Gulf Industrial and Development Company (MGDIC) is still pending. This writer learnt from the office of the Environmental Management Bureau (EMB) that the operator is having a problem to acquire the much needed Environmental Compliance Certificate (ECC).

6.4 STATUS OF WORKERS

During the public protest for the closure of K & A Metal Industries Inc., the Department of Labor and Employment (DOLE) or its regional representative, failed to raise the issue on the welfare and working conditions of workers in the shipbreaking facility. The Greenpeace Society which was also critical of the working conditions when they reported on the shipbreaking practice in India, Bangladesh, and Pakistan, failed to criticize the workers safety and welfare at the shipbreaking yards in the Philippines. The author can only assume that the absence of such criticism might be that the number of unskilled workers employed by K & A Metal Industries Inc. is limited if it has to compare with the leading shipbreakers or it has been overlooked by the protesters. The said shipbreaker is apparently utilizing more cranes and machinery but has failed, or might have decided, not to consider the processing of generated waste materials from ships.

The RM yard in Bangladesh has nine sub-contractors and fifty permanent workers and was estimated by Ronning (2000) during his survey on the said shipbreaking yard to have around one thousand workers were employed and divided into three eight-hour shifts. As to the employment status at K & A Metal Industries Inc. that maintains an eight-hour working period a total of five hundred fifty one technical personnel and workers are employed and an additional thirty nine personnel work in managerial and administrative positions (See Table 6.2).

Table 6.2: THE PHILIPPINES' K & A METAL INDUSTRIES INC. (MANPOWER -1997)

TYPE	PERMANENT	CONTRACTUAL	TEMPORARY or CONTRACTORS
Managerial Personnel	5	None	None
Administrative Personnel	31	3	None
Technical Personnel	12	1	None
Skilled Workers	143	3	258
Unskilled Workers	3	9	122
TOTAL	**194**	**16**	**380**

Source: K & A Metal Industries Inc. Annual Report (1997)

6.5 GOVERNMENT CONTROLS

If a project has to be considered, the proponent is required to prepare an Environmental Impact Statement (EIS). It is a document of studies, which contains all the relevant information, details about the proposed project, the environmental impacts and appropriate mitigating and enhancement measures. The presented documents are validated by independent technical experts and professionals of known integrity from various fields being organized by the Environmental Management Bureau (EMB).

The acceptability of a proposed project can only be fully determined through meaningful public participation. All information about the proposed project has to be presented by the proponent to the public in a language and manner that is easily understood. It is through this stage that the public's concerns are fully integrated into the EIS system.

It is expected that the proponent of the project will comply with all the requirements of the EIS system and is committed to implement its approved Environmental Management Plan. To monitor the compliance of the proponent, a multisectoral team will be organized after the issuance of the ECC. The temporary closure of the K & A Metal Industries Inc. due to the absence of operational standards on handling of waste was initiated by environmentalist groups and was supported by the public sector.

The operator has to apply for an authority to import ships for scrapping with the Maritime Industry Authority (MARINA), which is responsible for monitoring that the imported ship goes directly to the scrapping yard and is not rehabilitated or put in operation in the domestic or international trade. It is also the same authority which issues licenses for the facility to operate and conduct the annual inspection for the purposes of monitoring and enforcing its rules and regulations with emphasis on the safety aspect. On some occasions, as the exigency requires, an unscheduled inspection is conducted.

What makes it difficult to maintain a shipbreaking facility in the Philippines, if it has to compete with that of the other leading shipbreakers in developing countries is the pressure coming from the environmentalist groups and is always supported by the populace. The only way to earn respect from this group is to have a quality shipbreaking facility, which requires a big investment.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

This study provides an overview of the current international perspectives on developing countries' shipbreaking practice with regard to various matters related to the consideration of its economic and environmental impact. Based on these perspectives, relevant practices in India, Bangladesh, and the Philippines are presented and examined. With the absence of international standards, remedial action has to be done.

7.1 CONCLUSION

From the analysis it is understood that a lot of factors have to be considered relative to the scrapping activity. Immediate action has to be undertaken by the national administration, shipowners, and shipbreakers to address the problem that the industry represents. The following conclusions are made according to the findings of the study:

- The practices observed at present in the shipbreaking industry are basic not only with regard to the operation itself, but also to safety. Methods used to recover the values represented by scrap metals contribute to the contamination and pollution of the environment.

- The discharge of gases from cutting and burn-off operations is of a general threat to the environment and in particular to the individuals exposed.
- The nearly complete absence of facilities for handling waste residues from the demolition process, underlines the need to further address the problem of wastes generated from a fast expanding shipbreaking industry.
- The considerable volume of remains, including wastes from electrical components, insulation material, accommodation inventory, special types of equipment and other materials such as plastics, plating material, rubber and others are collected in piles and burned on the beach.
- The existing or proposed guideline is centered on environmental concerns and the prevention of pollution. The issue of working conditions, of general human health and that of environmental protection, does not seem to be addressed with any priority by the authorities in the regions discussed.
- The economically depressed areas are in dire need of employment opportunities for unskilled workforce and it is seems to be one of the primary consideration that the leading shipbreakers tend to tolerate the negative impact shipbreaking activity not only to human but also to the marine environment.
- The holistic “cradle to grave” is central to the concept of sustainable development and would likely solve the problem that the shipbreaking operation represents.

7.2 RECOMMENDATIONS

Taking into account the on-going discussion at the international level on what measures have to be taken, if there is a need to formulate legal regimes, even the International Maritime Organisation (IMO), which regulates the maritime industry, is not playing much of a role at this stage of the game. Its status as an intergovernmental organisation is limited to the issuance of recommendations. The problem that the industry represents should not be a deterrent factor to relocate the shipbreaking operation or at worst to temporarily stop it. Inasmuch as the required standards are still to be materialised, the following are the recommendations that maybe of some help:

- Governments with limited financial and technical capabilities to develop the necessary guidelines and operational standards for the improvement of ship scrapping safety practices should approach international organisations that could provide the much needed assistance.
- The Administrations in the leading shipbreaking nations should manifest their concern at appropriate international forums, so that they can start looking into the matter and find adequate solutions.
- Administrations should open channels of communication with all sectors that are affected and get their feedback. Assistance should be provided to the industry by starting to the make necessary provisions for improvement of the safety aspect in advance and not wait for the adoption of new international laws.
- It might not be economical, but initiatives on a more in-depth approach have to be undertaken by the leading shipbreakers for the establishment of well planned facilities dedicated to ship scrapping that also offer waste reception and handling facilities. These facilities will lift the demolition process to an industrialised level and hence improve safety levels and working conditions in general.

BIBLIOGRAPHY

Brewer, J. (1999, July). IMO fires up scrap debate. Llyod's List. Retrieved April 5, 2000 from the World Wide Web: http://proquest.umi.com

Burns, J.F. (1998, August 9). On an Indian shore where ships go to die, profits is law. New York Times. Retrieved April 5, 2000 from the World Wide Web: http://proquest.umi.com

Carter,L. W. (1996). Environmental impact assessment. New York: Irwin/Mc Graw-Hill

Cobett, A. (2000). Japanese fighting 'dirty demolition'. Tradewinds, 11, 22, p. 18

Danger is siting on the dock of the bay. (1999). Telegraph, v. 32, n. 8. pp. 14-14. The Author

DENR. (1996). The Environmental impact statement (EIS), DENR Administrative Order No. 37, Series of 1996. Manila: Department of Environment and Natural Resources

DNV. (1999). Decommissioning of Ships. Environmental protection and ship demolition practices. Technical report no. 99-3065. Norway: Det Norske Veritas

DNV. (2000). Decommissioning of ships. Environmental standards. DNV RN 590. Norway: Det Norske Veritas

Drewry Shipping Consultants Ltd. (1999). Secondhand ships investment potential and value for money. London: Drewry Shipping Consultants Ltd.

Drewry Shipping Consultants Ltd. (1996). Ship scrapping: Locations, activity, price, trends and problems. London: Drewry Shipping Consultants Ltd.

Fairplay. (2000, February). Scrapping shock for shipowners. Fairplay Solutions. p.3

Fairplay. (2000, February). Scrapping: It could affect you. Fairplay Solutions. pp 8-9

Farthing, B. (1993). International shipping. London: Lloyd's London Press Ltd.

ILO. (1984). The ILO and the world of work. Geneva: ILO

ILO. (2000). The social and labor impact of globalization in the manufacture of transport equipment. Report for discussion at the tripartite meeting on the social and labor impact of globalization in the manufacture of transport equipment. Retrieved July 25, 2000 from the World Wide Web: http://www.ilo.org/public/dialogue/sector/techmeet/tmte2000/tmter.html

IMO. (1995). Comprehensive manual on port reception facilities. London: IMO

Islam, K.L et al. (1986). Effect of ship scrapping activities on the soil and sea environment in the coastal area of Chittagong, Bangladesh. Marine Pollution Bulletin, v 17, n 10. pp.462-463

Kanthak, J. et al. (1999). Ships for scrap: Steel and toxic waste for Asia. Geneva: Greenpeace International.

K&A Metal Industries Inc. (1997). Annual report. Cebu: K&A Metal Industries Inc.

Loy, J.M. (2000). Ballast water management in the United States- a Coast Guard Perspective. BIMCO Review 2000. pp. 100-101

Ma, S. (1999). Maritime economics. Unpublished book, World Maritime University, Malmö, Sweden

MARINA. (1994). Streamlined check-List of documentary requirement, Memorandum Circular No. 85. Manila: Maritime Industry Authority

MARINA. (1994). Revised guidelines on the licensing of shipbuilders, shiprepairers, afloat repairers, boatbuilders, and shipbreakers, Memorandum Circular No. 95. Manila: Maritime Industry Authority

MEPC. (1999). Scrapping of ships. Submitted by Norway, MEPC/43/18/1. London: IMO

MEPC. (1999). Scrapping of ships. Submitted by Greenpeace International and ICFTU, MEPC/43/18/6. London: IMO

MEPC. (1999). Scrapping of ships. Submitted by International Chamber of Shipping, MEPC/43/18/10. London: IMO

MEPC. (1999). Scrapping of ships. Submitted by Greenpeace International, MEPC/43/INF 8. London: IMO

Nadkarni, S. (1999, May). It's a story of two halves. Lloyd's List Maritime Asia. p. 12

Nadkarni, S. (1999, May). Shipbreaking in India – the graveyard shift. Lloyd's List Maritime Asia. pp. 9-11

Pablo, C. (1999, May 12). Another scrap ship coming. Philippine Daily Inquirer. Retrieved May 30, 2000 from the World Wide Web: http://www.inquirer.net/issues/may99/may12/news/news_9.htm

Packard, W. (1984). The Ships. Sea-Trading, vol. 1. London: Fairplay Publications Ltd.

Ronning, M. (2000, January). Stuck in the mud. The future in our hands. Retrieved March 29,2000 from the World Wide Web: http://www.ngo.grida.no/ngo/fivh/ennoBangla.htm

Sinha, S. (1998). Ship scrapping and the environment-the buck should stop!. Maritime Pollution Management, 25, 4, pp. 397-403

Stopford, M. (1988). Maritime economics. London: Unwin Hyman Ltd.

DENR. (1990). Toxic substances and hazardous and nuclear waste control act of 1990, Rules and Regulations of RA 6969, Manila: Department of Environment and Natural Resources

United Nations. (1998). Basic facts about the United Nations. New York: United Nations

USEPA. (2000). A guide for ship scrappers: Tips for regulatory compliance. Retrieved August 8, 2000 from the World Wide Web: http://www.epa.gov/oeca/fedfac/fflex.html

Varcoe, D. (1999). Makers and breakers. The Shipping Professional, 5-99, pp. 28-30

Worthington, S. (1994, January). Ripe to be taxed. Llyod's List Maritime Asia, p.10

APPENDIX 1

Extract from DNV Report

Decommissioning of Ships

Environmental Protection and Ship demolition Practices

Demolition Waste - A Generic Approximation

1.1 General

In order to establish some generic norm in relation to type and volume of substances of environmental concern that can be expected to be found in older vessels when demolition, a specimen vessel have been investigated. The vessel, a VLCC is chosen based upon statistics and expectations related to future trends in the demolition market. All estimates arrived at are illustrative of the pollution potential of the demolition process for this type of vessel. The estimates do not necessarily reflect initiatives initiated by owner during the life span or prior to demolition aiming at reducing such potentials.

1.2 Vessel details

The vessel is turbine powered and built in Europe in 1976. The ship has the following main (approximate) characteristics:

- Mdwt: 290000
- Loa: 345 m
- Br: 52 m
- Dr: 22 m
- Tanks: 23 (total liquid 345 000 m^3)
- Engine: 35 000Shp

Records show two owners since built.

1.3 Cathodic Protection

For protection against corrosion and fouling, a number of anodes are fitted to the vessels' hull and internally in tanks. Anodes of both Aluminium (Al) and Zinc (Zn) have been identified. Al is used both on the hull and in tanks, while Zn is used in tanks only. The estimates are based upon the original specifications, drawings and from then vessels maintenance records.

Table 6-1: Weight of anodes onboard the ship

Location	Type	Weight (kg)
Hull	Al	4 000
Tanks	Al	>70 000
Tanks	Zn	>40 000

In addition to Al and Zn, the anodes will contain small amounts of other compounds of concern such as Cu, Si, Fe, In and Hg.

Table 6-2: Metal in the Al anodes left on the vessel (70.000-kg initially)

Estimated remains of 70.000 kg Al Anodes						
Metal	**Content of metals in Al anodes (%)**	**Weight left at different level of corrosion in kg**				
		30 % remaining	**40 % remaining**	**50 % remaining**	**60 % remaining**	**70 % remaining**
Aluminium (Al)	95	19950	26600	33250	39900	46550
Zinc (Zn)	4,6	966	1288	1610	1932	2254
Indium (In)	0,22	46,2	61,6	77	92,4	107,8
Iron (Fe)	0,1	21	28	35	42	49
Silicon (Si)	0,05	10,5	14	17,5	21	24,5
Copper (Cu)	0,003	0,63	0,84	1,05	1,26	1,47
Other	0,027	324	432	540	648	756
Total %	**100**					

Table 6-3: Metal in the Zn anodes left on the ship (40. 000 kg Zn initially)

Estimated remains of 40.000 kg Zn Anodes						
Metal	**Content of metals in Zn anodes (%)**	**Weight left at different level of corrosion in kg**				
		30 % remaining	**40 % remaining**	**50 % remaining**	**60 % remaining**	**70 % remaining**
Aluminium (Al)	0,18	21,6	28,8	36	43,2	50,4
Zinc (Zn)	99,2	11904	15872	19840	23808	27776
Silicon (Si)	0,002	0,24	0,32	0,4	0,48	0,56
Cadmium (Cd)	0,6	72	96	120	144	168
Led (Pb)	0,002	0,24	0,32	0,4	0,48	0,56
Other	0,016	192	256	320	384	448
Total %	**100**					

1.4 Batteries

Table 6-4: Batteries onboard (excluding small units).

Location	Type	No.	Weight Wet (kg)	Weight Dry (kg)	Pb (kg)	H_2SO_4 (l)
Radio	3 WR 17	1	25,0	18,8	15	4,8
Intercom	6SPG 3G	1	40,0	31,0	24	7,0
Fire Alarm	6 SR 30	1	20,0	15,0	12	4,0
Emergency start	6 WT 27-3	1	67,4	51,0	41	12,8
Autostart equp.	6SPG 3G	1	40,0	31,0	24	7,0
Lifeboats	6 SR 30*	2	40,0	30,0	24	8,0
Total	-	7	232,4	176,8	140	43,6

*Actual type of batteries is not known.

The amount of batteries identified seems low in comparison with experience from vessels in general. Normally one would expect to find a number of spare batteries. Further note that, some vessels have configurations providing emergency lighting from a battery sources. This would increase the expected volume to be found on board.

1.5 Coatings and paint

In addition to anodes, coatings and paints are used on the ship in order to protect against corrosion and fouling (subsurface hull). Different structures are covered with different coatings depending on the physical and chemical wear to the surface. Coatings and paints are known to contain Pb, PCB, Zn, Cu, Cl, TBT (tin-organic compounds) and polyurethane.

Table 6-5: Painting and Coats used on the ship when it was built.

Type	Litre
Avanti Finish H.B	**1 311**
Avanti Midcoat H.B	**17 406**
Avanti Primer H.B	**9 684**
Cedrol Enamel Urethantype	**2 331**
Cedrol Finish	**217**
Cedrol Midcoat	**2 341**
Epigard 4 primer	**53**
Epitar 5	**3 483**
Marine Deckpaint Q.D	**4 754**
Marine Finish	**547**
Marine Polydur primer	**83**
Marine Protective Q.D	**4 271**
Nucol CR-HB Midcoat	**450**
Nucol CR-HB Primer	**514**
Polygloss Exterior Enamel	**102**
Sinkral HB	**3 121**
Stronglife OP Antifouling	**10 991**
Tectyl 121 A	**1 245**
Vinytar 7	**2 039**
Total	**64943**

1.6 Fire-fighting facilities

Onboard fire-fighting systems include both those fixed and those mobiles. Powder and water are substances in use in the mobile system, while the fixed fire-fighting systems are based on carbon dioxide and foam.

Table 6-6: Fire fighting equipment onboard

Type of extinguisher	Unit size (kg)	No. of units	Weight (kg)	Comment
Dry powder	12 kg (portable)	26	312	
	25 kg (mobile)	1	25	3. Platform
	50 kg (mobile)	1	50	
CO2	15.000 kg (fixed)	X	15.000	1. Deck
Water	10 litre (portable)	11	110	Accommodation only
Foam	8700 litre (fixed)	1	-	-

*It is assumed that the dry powder chemical extinguishers contain sodium bicarbonate (baking powder).

This ship is not fitted with Halon fire-fighting systems. However, such are still found in use in many vessels. They are normally servicing small and sensitive compartments of the ship and will be of limited volume.

1.7 Refrigerants

Shipboard cooling systems, refrigeration, air condition and water chillers, have used primarily trichlorofluoromethane (Freon-11, CFC_{l3}), dichlorodifluoromethane (Freon-12, CF_2Cl_{12}), dichlorotetrafluoroethane (Freon-114, CF_3CFC_{l2}) and chlorodifluormethane (R22, $CHClF_2$) as cooling agent.

Table 6-7: Summary of refrigerants

Location	Type	R22 / F12*
Control room	RKA 10	Ca. 10-20 kg
Air condition on the ship	2 stk. Compressor, condenser and batteries	Ca.240 kg
Storage rooms for food	3 stk. Lehmkul / York 2T	Ca. 120 kg
Refrigerator		Ca. 30* kg
Spare		Ca. 500 kg

1.8 Heat Insulation

Based on the available documentation, the insulation onboard the vessel is:

- Rock Wool
- Asbestos
- Glava elastic plating

Table 6-8: Insulating material

Type	Length	Width	Height	Weight (kg)	No. of units	Total Weight
Asbestos sheets	50 m	1 m	1,5 mm	480 kg/ sheet	100-120	4800-5760 kg
Asbestos string	30 m	1”	-	1,5 kg / bundle	500-1000	750-1500 kg
Asbestos plates	,5 m	,5	0,5 mm	4 kg/m^2	125 m^2	500 kg
75 mm RW*	-	-	-	180 m^3	not estimated	-
100 mm RW*	-	-	-	120 m^3	not estimated	-
75 mm G.E**	-	-	-	15 m^3	not estimated	-
100 mm G.E**	-	-	-	15 m^3	not estimated	-

*RW Rock Wool

**G.E Glava Elastic Plate

1.9 Steel Structures

The largest component of a ship is the steel structure. The sources of steel onboard a vessel might be of different qualities. Some large equipment units are also a source of steel scrap. The amount of steel will vary according to the ship type. Empirical methods suggests some 15 % of the DWT for VLCC and ULCC to be representative for the steel weight.

Table 6-9: Weight of different structures on an oil tanker.

	***VLCC: 290.000 DWT**	**VLCC: 215.000 DWT**	**50.000 DWT**
Type	**Weight in ton**	**Weight in ton**	**Weight in ton**
Steel weight	34.110	28.000	11.000
Engines	1.190	1.800	1.500
Equipment	2.200	2.200	1.500
Total	**37.500**	**32.000**	**14.000**

*Vessel studied

Table 6-10: Amount of steel collected for different tankers.

DWT	**Steel collected**	**% Steel**
318.000	57.100 ton	18
290.000*	34.110 ton	11,8
229.000	32.000 ton	13,8
50.000	14.000 ton	28

*Vessel studied (estimated value of steel)

1.10 Electrical installations

The electrical system onboard can be divided into the following groups:

- Cables
- Light fittings

- Other heavy electrical equipment (generators, transformers, electrical motors)
- Light electrical equipment (instruments, switches, radios, radar, etc.)

Table 6-11: Components in electrical equipment

Type	Location	Component	Units	Weight
Cable	All over	Cu	50 000 m (25 mm^2)	≈45.000 kg
Cable	All over	PVC	50 000 m (25 mm^2)	≈10.000 kg
Cable	All over	Rubber (different types)	50 000 m (25 mm^2)	≈20.000 kg
Florescent light fittings	All over	PCB max 30mg	481	≈14 g
Florescent light tubes	All over	Hg max 15 mg	>1000	≈15 g
Heavy el. comp.	Mainly in machine room	Cu and Pb in generators and motors	-	-
Light el. comp.	All over	-	-	-

1.11 Oil residue

A tanker will normally contain a substantial amount of oil and oil residues also when discharged for cargo. The actual amount depends on factors such as the operational procedures adopted as well as effort made by the owner to clean the vessel prior to scrapping.

Sources of remaining oils onboard the vessel is divided into the following categories:

- Fuels and lubricating oils
- Cargo residues
- Oil contaminated ballast water
- Oil sludge
- Oil in lose containers / drums (not estimated)

Table 6-12: Lubrication oil on the ship

Lubrication oil		
Tank	**Volume (m^3)**	**30 % of volume (m^3)**
D.B. LUB. Oil Tank	28	8
LUB. Oil Storage Tank	38	11
Total volume	66	20

Table 6-13: Hydraulic oil on the ship

Hydraulic oil		
Type	**Location**	**Litre**
Large system	Machine room	6000
High pressure system (valves)	Steering machine room	1000
Transfer system (pumps)	Stern	4000
Hydraulic oil (reserve)		7000
Total		**18.000**

Table 6-14: Heavy fuel oil left on the ship before scrapping assuming that 2,5 % is left.

Fuel		
Tank	**Volume (m^3)**	**2.5% of volume**
H.F.O. Tank Forward	5306	133
H:F.O. Centre Tank	2044	51
H.F.O. Day Tank	780	20
H.F.O. Wing Tank P&S	5206	130
Total volume	**13336**	**333**

Table 6-15: Oil sludge left in the cargo tanks

Oil thickness (m)	Area (m^2)	Volume (m^3)
0,15	12 000	1 800
0,16	12 000	1 920
0,17	12 000	2 040
0,18	12 000	2 160
0,19	12 000	2 280
0,20	12 000	2 400

1.12 Other Items

In addition to the items mentioned above, there will be a whole range of different types of equipment, tools, machinery and furniture onboard the ship. Most of this equipment will be taken off the ship and sold on the second hand market locally. Some examples are listed below:

- Tools
- Galley equipment
- Furniture
- Floor covering
- Windows and doors
- Gaskets and sealing material
- Paint remains
- General wastes

Some materials listed like flooring and sealing materials are known to contain PCB (materials of the time). Other environmental substances of concern are most likely present in these and other components. Due to lacking data, the prospects of potential pollutants represented by such components have not been attempted quantified. This will require a more detailed investigation including sampling and analysing.

APPENDIX 2

Extract from
A Guide for Ship Scrappers:
Tips for Regulatory Compliance

INSPECTOR HIGHLIGHTS

The summaries of Inspector Highlights are presented in check boxes throughout sections of the guide. It intend to provide guidance to assist the ship scrappers in understanding their obligations under environmental laws; however, for a complete understanding of all legal requirements, the ship scrapper must refer to applicable federal and state statutes and regulations. The summaries, as well as the guide itself, is a compliance assistance tool only, and it neither changes nor replaces any applicable legal requirements, nor does it create any rights or benefits for anyone.

A. <u>ASBESTOS REMOVAL AND DISPOSAL</u>

"Asbestos" – mineral fibers often mixed with other material to provide insulation for pipes, fireproofing, thermal insulation, etc.

Caution: exposure to airborne-asbestos may cause health problems.

Danger of Asbestos:

Cancer and Lung Disease Hazard

Authorized Personnel Only

An Inspector may:

-check to see that workers at your facility received training in a language that they understand.

-check the training records for the workers and supervisors listed on the daily work logs.

-check the shower drains from the worker showers to make sure they have filters. Filters help remove lead and asbestos from the wastewater.

-check to verify that the notification of intent to scrap was submitted and that activities have been conducted according to the notification.

-observe on-site equipment and ask for verbal explanations to determine whether wetting and handling requirements are being met.

-check to determine whether regulated asbestos-containing material has been adequately wetted.

-examine removed units or sections to ensure that the regulated asbestos-containing material in these components is still intact. This may include looking at cut cables to see if any cables covered with asbestos were cut by torch or burned, both of which are violations of the asbestos requirements. An inspector may also want to know how the regulated asbestos-containing material on these units or sections will be removed, if applicable.

-examine any material that appears to be asbestos-containing material that is on the ground at your facility. The inspector may sample and photograph suspected asbestos-containing material, as well as the sources (such as nearby cable) that it may have come from.

-examine the waste shipment records to ensure that the records are complete, including all required signatures for each shipment.

-check for consistency between the facility asbestos-containing material waste logs and the disposal site records. Additionally, the inspector may check to see that the asbestos waste is placed in the disposal site without dispersing asbestos to the atmosphere, and that the site covers the asbestos waste daily.

B. SAMPLING, REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs)

"PCBs" – man-made organic chemicals used in electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products, etc.

Caution: toxic; may cause adverse health effects.

An inspector may

-check to see that workers at your facility received training in a language that they understand.

-review the PCB sampling plans and laboratory analysis results for the ship.

-verify that all PCB items are being identified and disposed of properly. For example, the painted canvas cover which is attached to fiberglass insulation may be a source of PCBs.

-conduct laboratory audits to verify that the laboratory is analyzing the PCB samples properly and that analytical results are accurate and reliable.

-examine PCB storage-for-disposal areas and check the floor and curb for cracks, measure to verify that the curb is at least 6 inches high, and check the capacity of the containment storage area against the total volume of PCBs in storage. He/she may also determine the 100-year flood plain location with respect to any storage area. Many ship scrappers are located within the 100-year flood plain and cannot have storage areas.

C. BILGE AND BALLAST WATER REMOVAL

"Bilge Water" – "dirty" water in oily waste holding/slop tanks which may contain pollutants, such as oil and
grease, metals, etc.

Caution: take precautions when entering confined spaces that contain bilge and ballast water.

An inspector may:

-check each item in storage for appropriate PCB marks and labels.

-evaluate transfer operations equipment to verify that all equipment is in proper working order and there is no evidence of spills or leaks.

-review site records to verify that the proper testing was conducted prior to and during the time that workers conducted cleaning in bilge and ballast water spaces.

-review site records to verify that proper air sampling was conducted prior to workers entering confined or enclosed spaces.

-review training records to verify that workers have the appropriate training to be working in confined and enclosed spaces.

-ask to see a copy of your facility's discharge permit covering wastewater discharges.

-ask to see your facility's wastewater monitoring records.

-prior to inspection, contact the publicly-owned treatment works to determine if a pretreatment permit is required for your facility. During the inspection, the inspector may review the permit to determine if your facility is in compliance with permit conditions.

-verify that the number of underground storage tanks match the number reported on the notification form(s) to the state.

-verify that there are appropriate containment and diversionary structures or equipment at the facility for all above ground storage tanks.

-inspect all oil storage containers or tanks to verify that they are labeled properly and there is no evidence of leaks or discharges of oil.

-track the shipments from your facility through the reclaimers to verify that the shipments of fuel and oil do not contain spent solvent or other hazardous waste liquids.

-ask if you have tested the oil and oily wastes to determine their pollutant concentrations and if they are hazardous. He/she may ask to review the test results.

-review your facility's analytical data for hazardous waste determinations.

-evaluate the total volume of waste on site at the time of the inspection and verify that it is within the limits for your facility's generator category.

-look at all hazardous waste on site noting the size and type of containers, their condition, and whether they are closed and protected from the weather. He/she may check the labels on the containers for the words "hazardous waste," and verify that the dates/information is complete on the label. The inspector may also check the containment for cracks or leaks.

-check personnel records, including job titles, to determine when hazardous waste duties were assigned and if proper training was provided to employees.

-review your facility's contingency plan or basic contingency procedures, and ask about any incidents requiring implementation of the plan or procedures.

-review the facility's spill prevention plans to ensure that they are certified by a registered professional engineer and that they are up to date.

-evaluate your facility's response plan measures for their ability to facilitate adequate response to a worst-case discharge of oil.

D. OIL AND FUEL REMOVAL

"Oil and fuel" – include petroleum, fuel oil, sludge, oil refuse, oil mixed with waste, etc.

Caution: Fire dangers!

An inspector may:

-evaluate transfer operations equipment to verify that all equipment is in proper working order and there is no evidence of spills or leaks.

-review site records to verify that the proper testing was conducted prior to and during the time that workers conducted cleaning in oil and fuel compartments.

-review site records to verify that proper testing was conducted prior to workers entering confined or enclosed spaces.

-review training records to verify that workers have the appropriate training to be working in confined and enclosed spaces.

-check with the state underground storage tank program office to verify that the number of underground storage tanks match the number reported on the notification form(s) to the state.

-verify that there are appropriate containment and diversionary structures or equipment at the facility for all above ground storage tanks.

-inspect all oil storage containers or tanks to verify that they are labeled properly and there is no evidence of leaks or discharges of oil.

-track the shipments from your facility through the reclaimers to verify that the shipments of fuel and oil do not contain spent solvent or other hazardous waste liquids.

-review your facility's analytical date for hazardous waste determinations.

-evaluate the total volume of waste on site at the time of the inspection and verify that it is within the limits for your facility's generator category.

E. PAINT REMOVAL AND DISPOSAL

"Paint" – you may find paint and preservative coatings on both interior and exterior surfaces of the ship.

Caution: paint may be flammable or contain toxic compounds and be harmful to you and the environment.

The inspector may:

-review your facility's records to verify that tests were conducted to determine if paints or other coatings were flammable.

-verify that highly flammable coatings have been removed prior to cutting.

-review surface preparation activities at the facility to verify that measures are being taken to protect worker health.

-evaluate the facility for compliance with specific permit conditions, if a permit has been issued by EPA or the state or local air pollution control authority.

-review your facility storm water permit to ensure that your facility is meeting all of the requirements of that permit.

-review your facility's storm water pollution prevention plan to ensure that it addresses all of the required elements. He/she may also review the waste storage area to ensure that your facility is taking appropriate measures to prevent storm water from coming into contact with wastes, including paint removal wastes.

-review your facility's analytical date for hazardous waste determinations.

-evaluate the total volume of waste on site at the time of the inspection and verify that it is within the limits for your facility's generator category.

-look at all hazardous waste on site noting the size and type of containers, their condition, and whether they are closed and protected from the weather. He/she may check the labels on the containers for the words "hazardous waste," and verify that the date/information is complete on the label. The inspector may also check the containment for cracks or leaks.

-check personnel records to determine when hazardous waste duties were assigned and if proper training was provided to employees.

-review your facility's contingency plan or basic contingency procedures, and ask about any incidents requiring implementation of the plan or procedures.

-review all records including but not limited to, annual or biennial reports and manifests.

F. <u>METAL CUTTING AND METAL DISPOSAL</u>

"Metal Cutting" – metals on ships are cut using a variety of torches and mechanical cutters.

Caution: air pollutants, exposure to metal fumes, particulates, and smoke may be harmful to your health.

The inspector may:

- -investigate any open burning activities at the facility. In addition, if a permit has been issued by EPA or the state or local regulatory agency, the inspector may evaluate the facility for compliance with the specific permit conditions.
- -verify that appropriate mechanical ventilation is provided for workers, if required, during metal cutting.
- -review your facility storm water permit to ensure that your facility is meeting all of the requirements of that permit.
- -review your facility's storm water pollution prevention plan to ensure that it addresses all of the required elements. He/she may also review the waste storage area to ensure that your facility is taking appropriate measures to prevent storm water from coming into contact with wastes, including metal cutting wastes.

G. <u>REMOVAL AND DISPOSAL OF MISCELLANEOUS SHIP MACHINERY</u>

"Ship Machinery" – various types of machinery are sold for reuse or recycled as scrap.

Caution: protect yourself from exposure to contamination with hazardous materials, including asbestos, PCBs, oils, and fumes.

The inspector may:

- -review your facility storm water permit to ensure that your facility is meeting all of the requirements of that permit.

-review your facility's storm water pollution prevention plan to ensure that it addresses all of the required elements. He/she may also review the waste storage area to ensure that your facility is taking appropriate measures to prevent storm water from coming into contact with wastes, including scrap metal and other wastes.